St.John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B.Sc Chemistry
Course Name	In organic Chemistry II
Course Code	SMCH12
Class	I year (2018 -2021)
Semester	Even
Staff Name	Mr. D. Jim Livingston
Credits	4
L.Hours / P.Hours	4/ WK
Total 60 Hrs/Sem Internal Test – 3 Hrs Model Test – 3 Hrs Dept.Meetings – 2 Hrs College Meetings – 2 Hrs Remaining 50 Hrs (5 units; 5 ×10=50; 10 Hrs/unit)	

Course Objectives

- ❖ To know the basic principles of metallurgy and the chemistry of d- Block elements
- ❖ To learn the chemistry of f- Block elements
- ❖ To understand the basic concepts of coordination chemistry and early theory
- ❖ To learn the basic analytical methods
- ❖ To study the chemistry of noble gases

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester – II / Core - 3

SEMESTER II – PAPER – III

INORGANIC CHEMISTRY- II

UNIT-I NOBLE GASES

Occurrence - isolation of noble gases from the atmosphere - separation of the gases from one another - general physical properties - special properties of helium - isotopes of helium - uses of noble gases - importance of inert gases in theoritical chemistry - chemical properties - xenon chemistry: preparation and properties of fluorides, oxides and oxofluorides of xenon - xenates and perxenates - xenon fluoride complexes - structure and bonding in xenon compounds. Fluorides of Krypton and Radon - hydrates and clathrates of noble gases - uses of clathratecompunds.

UNIT II- CHEMISTRY OF d - BLOCK ELEMENTS

Occurence, General characteristics of d- Block elements – Group study of Titanium, Vanadium,Iron, Coinage and Zinc group metals. Important compounds of transition metals: Ziegler – Natta catalyst. Prussian blue, Sodium nitroprusside, Turnbull's blue, Nickel DMG complex, Wilkinson's Catalyst- KMnO4 and K2Cr2O7.

UNIT III- CHEMISTRY OF f- BLOCK ELEMENTS

Occurrence, General characteristics of f-block elements, Synthetic elements, comparative account of lanthanides and actinides – oxidation states, magnetic properties, colour and spectra – separation by ion exchange and solvent extraction methods – lanthanide contraction — preparation, properties and uses of ceric ammonium sulphate, thorium dioxide, thorium nitrate, uranium hexafluoride, uranylacetate.

UNIT IV- METALLURGY

Occurrence of metals- Ores and minerals in lithosphere -Mineral wealth of India- principles of metallurgy-concentration of ores – froth floatation, magnetic separation, calcination,roasting and smelting. Purification of metals – electrolysis, zone refining, van ArkeldeBoer methods. Extraction of the following metals in pure form - Li, Be, Ti, V, Th and U

UNIT V: THEORY OF INORGANIC PRACTICALS

Qualitative Analysis: Applications of solubility product and common ion effect in the precipitation of cations – Interfering acid radicals and their elimination (oxalate, fluoride, borate, phosphate, chromate, arsenite and arsenate).

Titrimetry: Primary standard- Molarity, molality formality, normality, wt% ppm, milli equivalence and millimoles -problems Types of titrimetric reactions – acid-base, redox, Iodometric, Iodimetric, precipitation and complexometric titrations – Indicators.

Gravimetric analysis: Precipitation from homogeneous soloution- precipitants -conditions for precipitation – co-precipitation and post precipitation - washing of precipitates. Minimisation of errors.

Reference Books

1. Puri B.R., Sharma L.R., Kalia K.K., Principls of Inorganic Chemistry, 28th edition, Vallabh Publication, 2004, New Delhi.

2. R.D. Madan, Advanced Inorganic Chemistry, 2nd edition.S. Chand & Company, 2005, New Delhi.

3. Concise coordination chemistry – R. Gopalan, V. Ramalingam, Vikas publishing House, PVT LTD, 2001, New Delhi.

4. J.D.Lee, Concise Inorganic Chemistry, 5th edition, Oxford University Press, New Delhi 2008.

5. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denny, Vogel's Text book of Quantitative Chemical Analysis, 5th Edn., ELBS, 1989.

6. D.A.Skoog and D.M.West, Fundamentals of Analytical Chemistry, Holler Saunders

College publishing, USA.VI Ed., 1998.

Course Calender

Hour Allotement	Class Schedule
	Even Semester begins on 16-6-2018
1.L-1	UNIT-I NOBLE GASES-Introduction
2.L-2	Occurrence - isolation of noble gases from the atmosphere
3.L-3	Separation of the gases from one another
4.L-4	Ramsay Raley method and Dewar's method
5.L-5	Physical method of separation of noble gases
6.L-6	General physical properties - special properties of helium
7.L-7	isotopes of helium - uses of noble gases
8.L-8	importance of inert gases in theoritical chemistry
9.L-9	preparation and properties of fluorides, oxides and oxofluorides of xenon - xenates and perxenates
10.P1	**Department meeting**
11.L-10	xenon fluoride complexes - structure and bonding in xenon compounds. Fluorides of Krypton and Radon
12.L-11	hydrates and clathrates of noble gases - uses of clathratecompunds.
13.L-12	UNIT II- CHEMISTRY OF d - BLOCK ELEMENTS - introduction
14.L-13	Occurence, General characteristics of d- Block elements
15.L-14	Characteristics of d-block elements – Continuation.
16.L-15	Group study of Titanium group elements
	Allotting portion for Internal Test-I
17.L-16	Group study of vanadium and iron group elements
18.IT-1	**INTERNAL TEST-I**
19.L-17	Group study of copper and zinc group elements
20.L-18	Preparation, properties and uses of Prussian blue, Sodium nitroprusside
21.L-19	**Test paper distribution and result analysis** –Preparation and uses of Turnbull's blue.
	Entering Internal Test-I marks into University portal
22.L-20	Preparation and uses of KMNO4
23.P2	**College level meeting/cell function**
24.L-21	Preparation,properties and uses of K2Cr2O7
25.L-22	Preparation and uses of Ziegler, Wilkinson's catalyst and Ni-DMG complex
26.L-23	UNIT III- CHEMISTRY OF f- BLOCK ELEMENTS - Introduction
27.L-24	Occurrence, General characteristics of f-block elements
28.L-25	Synthetic elements, comparative account of lanthanides and actinides
29.L-26	Properties of f-block elements - oxidation states, magnetic properties, colour and spectra
30.P3	**Department meeting**
31.L-27	separation by ion exchange and solvent extraction methods
32.L-28	lanthanide contraction
33.L-29	VSEPR theory and geometry of molecules
	Allotting portion for Internal Test-II
34.L-30	preparation, properties and uses of ceric ammonium sulphate, thorium dioxide

35.L-31	preparation, properties and uses ofthorium nitrate, uranium hexafluoride, uranylacetate
	Allotting portion for Assignment/Seminar
36.IT-II	**INTERNAL TEST - II**
37.L-32	UNIT IV- METALLURGY – Introduction
38.L-33	Occurrence of metals- Ores and minerals in lithosphere
39.L-34	Mineral wealth of India- principles of metallurgy
40.L-35	concentration of ores
41.L-36	**Test paper distribution and result analysis.** Purification of metals
	Entering Internal Test-II marks into University portal
42.L-37	Electrolysis, zone refining, van ArkeldeBoer methods
43.P4	**College level meeting /function**
44.L-38	Extraction of Li, Be
45.L-39	Extraction of Ti, V
	Submission of Assignment/taken seminar
46.L-40	Extraction of Th, U
47.L-41	UNIT V: THEORY OF INORGANIC PRACTICALS – Introduction
48.L-42	Applications of solubility product and common ion effect in the precipitation of cations
	Allotting portion for Internal Test-III
49.L-43	Interfering acid radicals and their elimination
50.L-44	Principles behind Titrimetry
51.IT-III	**INTERNAL TEST-III**
52.L-45	Types of titrimetric reactions
53.L-46	Problems based on Titrimety. **Test paper distribution and result analysis**
54.L-47	Theory of Indicators and Gravimetric analysis
	conditions for precipitation – co-precipitation and post precipitation - washing of precipitates
55.L-48	Doubt clearing session
	Entering Internal Test-III marks into University portal
56.L-49	Minimisation of errors and discussion of previous year University question paper
57.MT	Model Test
58.MT	Model Test
59.MT	Model Test
60.L-50	Model Test paper distribution and feedback of the course, analysis and report preparation
	Last working day on 31.10.2018.

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY-II”
CO1	Understand about clathrates
CO2	Deeper insight into lanthanide contraction
CO3	Gained knowledge about various catalysts
CO4	Applications of noble gases

CO5	Understanding the process of metallurgy
CO6	Acquired theoretical knowledge behind the practicals
Experimental Learning	
EL1	To do working model to explain ion exchange chromatography
EL2	Prepare Ni-DMG complex
Integrated Activity	
IA1	Prepare model for electrolysis and zone refining
IA2	Prepare model for different structures of fluorides of xenon

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	Allied Chemistry-II
Course Name	Inorganic Qualitative Analysis
Course Code	SACHP2
Class	I year (2018-2021) II year (2017-2020)
Semester	Even
Staff Name	Mrs. J. Betsy Ratnabai
Credits	1
L.Hours/P.Hours	2/WK
Total 30Hrs/sem Model Test 2 Hrs College Meeting 2 Hrs University Practical 2 Hrs Remaining 24 Hrs (12X2)Hrs	

Objectives:

- To make the students thorough in inorganic qualitative analysis.

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester -IV / Allied Practical - II INORGANIC QUALITATIVE ANALYSIS

1. Inorganic simple salt containing one acidic radical (interfering radical) and one basic radical

2. Acidic radical

Interfering acidic radicals: Borate, Fluoride, Oxalate and Phosphate.

3. Basic radicals

Group I : Lead

Group II : Copper, Cadmium

Group III : Ferric iron

Group IV : Cobalt, Nickel

Group V : Barium

Group VI : Magnesium, Ammonium.

Internal –50 marks

25 marks - Regularity

25 marks – Average of four experiments in regular class work

External -50 marks

10 marks – Record (atleast 4 experiments)*

10 marks – Procedure

30 marks – Result

*Experiments done in the class alone should be recorded (Students having a bonafide record only should be permitted to appear for the practical examination)

Course Calender

Hour Allotment	**Class Schedule**
	Even Semester begins on 03.12.2018
1.P-1	Introduction
2.P-2	Analyse the inorganic simple salt containing interfering acid radical
3.P-3	Analysis of group separation-Demonstration
4.P-4	Analyse the inorganic simple salt containing basic radical
5.P-5	Analysis of inorganic simple salt 1
6.P-6	Analysis of inorganic simple salt 2
7.P-7	Analysis of inorganic simple salt 3
8.P-8	Analysis of inorganic simple salt 4
9.P-1	College Meeting
10.P-9	Analysis of inorganic simple salt 5
11.P-10	Analysis of inorganic simple salt 6
12.P-11	Procedure writing
13.P-12	Overall view of the procedure for the analysis of simple salt Feedback of the course, analysis and report preparation
14.MT-1	Model Test
15.P-2	University Practical Exam Last working day on 23.04.2019

Course Outcomes

Learning Outcomes	Cos of the “Inorganic Qualitative analysis”
CO1	Analyse the simple salt containing one interfering acid radical
CO2	Analyse the simple salt containing one basic radical

HOD Signature Staff Signature

Principal

St.John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. J. Betsy Ratnabai)

Programme Name	B.Sc Chemistry
Course Name	In organic Chemistry I
Course Code	SMCH11
Class	I year (2018 -2021)
Semester	Odd
Staff Name	Mrs. J. Betsy Ratnabai
Credits	4
L.Hours / P.Hours	4/ WK
Total 60 Hrs/Sem Internal Test – 3 Hrs Model Test – 3 Hrs Dept.Meetings – 2 Hrs College Meetings – 2 Hrs Remaining 50 Hrs (5 units; 5 ×10=50; 10 Hrs/unit)	

Course Objectives

- To study the atomic structure from wave mechanical concept
- To know the arrangement of elements in the periodic table and the periodic properties
- To study the principles governing the occupancy of the electrons in various quantum levels
- To understand the different kinds of chemical forces in molecules
- To analyse geometry of molecules by VB theory
- To compare VBT and MOT
- To know the nature of compounds formed by s- and p- block elements

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – I / Core1
INORGANIC CHEMISTRY – I

Objectives

To study the atomic structure from wave mechanical concept

To know the arrangement of elements in the periodic table and the periodic properties.

To understand the different kinds of chemical forces in molecules.

To know the nature of compounds formed by s- and p-block elements.

UNIT I –ATOMIC STRUCTURE

Atom models –Bohr's atom model –orbit and orbital-Dual nature of matter – deBroglie equation (verification not required) - Schrodinger wave equation and its applications (no derivation)- Eigen value and Eigen function-significance of Ψ and $\Psi 2$ – quantum numbers and their significance-principles governing the occupancy of electrons in various quantum levels, probability distribution of electron around the nucleus – radial probability distribution, Pauli's exclusion principle-Hund's rule, Aufbau principle, Stability of half-filled and fully filled orbitals

UNIT II – PERIODIC PROPERTIES

Long form of periodic table- classification as s, p, d and f block elements -periodicity in properties- variation of atomic and ionic radii, electron affinity, ionisation energy and electronegativity along periods and groups – various scales of electronegativity – Pauling, Mullikan and Allred Rochow's scale of electronegativity – factors affecting the magnitude of electronegativity – applications of electronegativity

UNIT III – CHEMICAL BONDING

Properties of ionic compounds- Lattice energy- definition- Born-Lande equation (derivation not required), factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Covalent character in ionic compounds-polarization and Fajan'srule .

Valence bond theory – hybridization of atomic orbitals and geometry of molecules –sp, sp2, sp3, sp3d, sp3d2 and sp3d3 hybridisation with examples. VSEPR theory- shapes of simple inorganic molecules – MO theory- applications of MOT to O2, F2, HF and CO- - Paramagnetism of O2 , Comparison of VBT and MOT.

UNIT IV – s-BLOCK ELEMENTS

Occurrence, General characters of s block elements , Position of Hydrogen in the periodic table, Chemistry of Li and Be- their anomalous behaviour and diagonal relationship, Hydrides (classification, general methods of preparation and salient features), hydration energies, solvation and complexation tendencies of alkali and alkaline-earth metals.

UNIT V – p-BLOCK ELEMENTS

Occurence , General characterstics of p block elements, Group study of 13-18 group elements-anamolous behaviour and diagonal relationship. Compounds such as hydrides-, halides, oxides and oxyacids-. Preparation, properties, bonding and structure of diborane, borazine and alkali metal borohydrides. Preparation, properties and technical applications of carbides and fluorocarbons. Silicones and silicates (structures only)-.Interhalogen compounds,

Reference Books

1. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, ShobanLal Nagin Chand and Co., Delhi, 1996.
2. P. L. Soni, Text Book of Inorganic Chemistry, 20th edition, 2001.
3. R. D Madan, Modern Inorganic Chemistry, S. Chand and company, 13th edition, 2005.
4. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
5. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, Wiley India, 6th edition, 2008.

Course Calender

Hour Allotement	Class Schedule
	Odd Semester begins on 16-6-2018
1.L-1	UNIT I-ATOMIC STRUCTURE -Introduction
2.L-2	Explain Bohr's atom model
3.L-3	Compare orbit and orbital
4.L-4	Derive De-Broglie equation-Dual nature of matter
5.L-5	Schrodinger wave equation and its applications
6.L-6	Explain Eigen value and Eigen function- significance of Ψ and Ψ^2
7.L-7	Discuss quantum numbers and their significance
8.L-8	Principles governing the occupancy of electrons in various quantum levels
9.L-9	Probability distribution of electrons around the nucleus
10.P1	**Inauguration of Chemistry Association and welcoming first year students**
11.L-10	Explain stability of half-filled and fully filled orbitals
12.L-11	UNIT II-PERIODIC PROPERTIES –Introduction
13.L-12	Explain the periodic classification of the elements
14.L-13	Discuss the periods and groups in the long form of periodic table
15.L-14	Classification of elements on the basis of electronic configuration as s,p,d and f-block elements
16.L-15	Explain periodicity in properties- variation of atomic and ionic radii along periods and groups
	Allotting portion for Internal Test-I
17.L-16	Discuss variation of electron affinity, ionisation energy and electronegativity along periods and groups
18.IT-1	**INTERNAL TEST-I**
19.L-17	Various scales of electronegativity- Pauling's scale
20.L-18	Mulliken and Allred Rochow's scale of electronegativity
21.L-19	**Test paper distribution and result analysis** –Factors affecting the magnitude of electronegativity
	Entering Internal Test-I marks into University portal
22.L-20	Discuss the applications of electronegativity
23.P2	**College level meeting/cell function**
24.L-21	UNIT III- CHEMICAL BONDING -Introduction
25.L-22	Explain the properties of ionic compounds
26.L-23	Define Lattice energy-Born Lande equation
27.L-24	Factors affecting Lattice energy
28.L-25	Discuss Born-Haber cycle and its applications
29.L-26	Explain stability of ionic compounds by enthalpy of formation values
30.P3	**Department meeting**
31.L-27	Covalent character in ionic compounds-polarisation and Fajan's rule
32.L-28	Valance bond theory – Hybridisation and geometry of molecules
33.L-29	VSEPR theory and geometry of molecules
	Allotting portion for Internal Test-II
34.L-30	MO theory- application of MOT to O_2,F_2,HF and CO –paramagnetism of O_2
35.L-31	Compare VBT and MOT
	Allotting portion for Assignment/Seminar

36.IT-II	**INTERNAL TEST - II**
37.L-32	UNIT-IV S-BLOCK ELEMENTS – Introduction
38.L-33	General characteristics of S-Block elements
39.L-34	Position of Hydrogen in the periodic table
40.L-35	Chemistry of Li and Be
41.L-36	**Test paper distribution and result analysis.** Anomalous behaviour and diagonal relationship of Li and Be
	Entering Internal Test-II marks into University portal
42.L-37	Classification of hydrides
43.P4	**College level meeting /function**
44.L-38	General methods of preparation and salient features of hydrides
45.L-39	Define hydration energies
	Submission of Assignment/taken seminar
46.L-40	Solvation and complexation tendencies of alkali and alkaline earth metals
47.L-41	UNIT V – P BLOCK ELEMENTS – Introduction
48.L-42	General characteristics of p-block elements
	Allotting portion for Internal Test-III
49.L-43	Anomalous behaviour and diagonal relationship of group 13-18 elements
50.L-44	Discuss compounds such as hydrides, halides, oxides and oxyacids
51.IT-III	**INTERNAL TEST-III**
52.L-45	Preparation, properties, bonding and structure of diborane, borazine and alkali metal borohydrides
53.L-46	Preparation, properties and technical applications of carbides and fluorocarbons. **Test paper distribution and result analysis**
54.L-47	Discuss silicones and silicates. Interhalogen compounds
	Announcement of Model Test
55.L-48	Doubt clearing session
	Entering Internal Test-III marks into University portal
56.L-49	Discuss previous year University question paper
57.MT	Model Test
58.MT	Model Test
59.MT	Model Test
60.L-50	Model Test paper distribution and feedback of the course, analysis and report preparation
	Last working day on 31.10.2018.

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY-I”
CO1	Derive the de Broglie equation and solve the problems
CO2	Differentiate between an orbit and an orbital
CO3	Explain the classification of elements on the basis of their electronic configuration
CO4	Applications of electronegativity concept
CO5	Draw MO diagrams for F_2,O_2,HF,CO molecules
CO6	Discuss the anomalous behaviour of Li and Be
CO7	Discuss the diagonal relationship of Li and Mg
CO8	Discuss the structure of silicates

Experimental Learning	
EL1	To do working model to explain electronic configuration of elements
EL2	Prepare periodic table of elements
Integrated Activity	
IA1	Prepare model for molecules based on different hybridisation
IA2	Prepare model for different types of silicates

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	Allied Chemistry-II
Course Name	Inorganic Qualitative Analysis
Course Code	SACHP2
Class	I year (2018-2021) II year (2017-2020)
Semester	Even
Staff Name	Mrs. J. Betsy Ratnabai
Credits	1
L.Hours/P.Hours	2/WK
Total 30Hrs/sem Model Test 2 Hrs College Meeting 2 Hrs University Practical 2 Hrs Remaining 24 Hrs (12X2)Hrs	

Objectives:

- To make the students thorough in inorganic qualitative analysis.

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester -IV / Allied Practical - II INORGANIC QUALITATIVE ANALYSIS

1. Inorganic simple salt containing one acidic radical (interfering radical) and one basic radical

2. Acidic radical

Interfering acidic radicals: Borate, Fluoride, Oxalate and Phosphate.

3. Basic radicals

Group I : Lead

Group II : Copper, Cadmium

Group III : Ferric iron

Group IV : Cobalt, Nickel

Group V : Barium

Group VI : Magnesium, Ammonium.

Internal –50 marks

25 marks - Regularity

25 marks – Average of four experiments in regular class work

External -50 marks

10 marks – Record (atleast 4 experiments)*

10 marks – Procedure

30 marks – Result

*Experiments done in the class alone should be recorded (Students having a bonafide record only should be permitted to appear for the practical examination)

Course Calender

Hour Allotment	**Class Schedule**
	Even Semester begins on 03.12.2018
1.P-1	Introduction
2.P-2	Analyse the inorganic simple salt containing interfering acid radical
3.P-3	Analysis of group separation-Demonstration
4.P-4	Analyse the inorganic simple salt containing basic radical
5.P-5	Analysis of inorganic simple salt 1
6.P-6	Analysis of inorganic simple salt 2
7.P-7	Analysis of inorganic simple salt 3
8.P-8	Analysis of inorganic simple salt 4
9.P-1	College Meeting
10.P-9	Analysis of inorganic simple salt 5
11.P-10	Analysis of inorganic simple salt 6
12.P-11	Procedure writing
13.P-12	Overall view of the procedure for the analysis of simple salt Feedback of the course, analysis and report preparation
14.MT-1	Model Test
15.P-2	University Practical Exam Last working day on 23.04.2019

Course Outcomes

Learning Outcomes	Cos of the “Inorganic Qualitative analysis”
CO1	Analyse the simple salt containing one interfering acid radical
CO2	Analyse the simple salt containing one basic radical

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	Major practical-II
Course Code	SMCHP2
Class	I year (2018-2021)
Semester	Even
Staff Name	Mrs.T.P.EvangelineMaribah
Credits	2
L. Hours /P. Hours	2 / WK
Total 30 Hrs/Sem Internal Test-4 Hrs Model Test-6 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 16 Hrs	

Course Objectives

- To enable the students to acquire the quantitative skills in volumetric analysis.

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester -II / Major Practical - II
INORGANIC QUANTITATIVE ANALYSIS -II (VOLUMETRIC)

Iodometry
1. Estimation of copper – Std. copper sulphate
2. Estimation of K2Cr2O7 – Std. K2Cr2O7
Dichrometry
3.Estimation of ferrous iron – Std. ferrous ammonium sulphate
4. Estimation of K2Cr2O7 – Std. K2Cr2O7
Complexometry
5. Estimation of Zn – Std. ZnSO4

6. Estimation of Pb – Std. ZnSO4
7. Estimation of Mg – Std. ZnSO4
Internal –50 marks
25 marks - Regularity
25 marks – Average of best four estimations in regular class work
External -50 marks
10 marks – Record (atleast 4 volumetric estimations)*
10 marks – Procedure
30 marks – Result
*Experiments done in the class alone should be recorded
(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denny 'Vogel's Text book of
Quantitative Chemical Analaysis' 5th Edition ELBS.
2. I.M.Kolthoff and E.A.Sanderson, Quantitative Chemical Analysis, S Chand
3. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc.
Students.S.Chand& Company Ltd reprint 2009.
4. V.K.Ahluwalia, SunithaDhingra, AdarshGulate College Practical Chemistry, Universities Press (India) Pvt Ltd 2008 (reprint)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-P1 (2 hrs)	Iodometry – INTRODUCTION
2-P2	Estimation of copper – std copper sulphate
3- P3	Estimation of $K_2Cr_2O_7$ – std $K_2Cr_2O_7$
4-P4	Dichrometry – Introduction
5-P5	Estimation of $K_2Cr_2O_7$ - std $K_2Cr_2O_7$
6-P6	Estimation of ferrous ion – std FAS
7-P7	Complexometry – Introduction
8-P8	Estimation of Zn – std $ZnSO_4$
9-P9	Estimation of Pb – std $ZnSO_4$
10-P10	Estimation of Mg – std $ZnSO_4$

11-P11	Model exam-1(3 hrs)
12-P12	Model exam-2(3 hrs)

Course Outcomes

Learning Outcomes	**COs** of the course "MAJOR PRACTICAL –II"
CO1	To estimate copper
CO2	To estimate potassium dichromate
CO3	To estimate FAS
CO4	To estimate Zn
CO5	To estimate Pb
CO6	To estimate Mg
Integrated Activity	
IA1	Maintain record notebook
IA2	Plan experimental projects and execute them

HOD Signature

Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	Major practical-I
Course Code	SMCHP1
Class	I year (2018-2021)
Semester	Odd
Staff Name	Mrs.T.P.EvangelineMaribah
Credits	2
L. Hours /P. Hours	2 / WK
Total 30 Hrs/Sem Internal Test-4 Hrs Model Test-6 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 16 Hrs	

Course Objectives

- To enable the students to acquire the quantitative skills in volumetric analysis.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – I / Major Practical –I

INORGANIC QUANTITATIVE ANALYSIS -I (VOLUMETRIC)

Objectives

1. To enable the students to acquire the quantitative skills in volumetric analysis.
2. At the end of the course, the students should be able to plan experimental projects and execute them.

Acidimetry and alkalimetry

1. Estimation of oxalic acid – Std. oxalic acid

2. Estimation of Na_2CO_3 – Std. Na_2CO_3

3. Estimation of hydrochloric acid – Std. oxalic acid

Permanganometry

4. Estimation of sodium oxalate – Std. oxalic acid

5. Estimation of ferrous ammonium sulphate – Std. ferrous ammonium sulphate

6. Estimation of ferrous sulphate – Std. oxalic acid

Internal –50 marks
25 marks - Regularity
25 marks – Average of best four estimations in regular class work
External -50 marks
10 marks – Record (atleast 4 volumetric estimations)*

10 marks – Procedure
30 marks – Result
*Experiments done in the class alone should be recorded
(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denny 'Vogel's Text book of Quantitative Chemical Analaysis' 5th Edition ELBS.
2. I.M.Kolthoff and E.A.Sanderson, Quantitative Chemical Analysis, S Chand
3. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students.S.Chand& Company Ltd reprint 2009.
4. V.K.Ahluwalia, SunithaDhingra, AdarshGulate College Practical Chemistry, Universities Press (India) Pvt Ltd 2008 (reprint)

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-6-2018
1-P1 (2 hrs)	Acidimetry and alkalimetry – INTRODUCTION
2-P2	Estimation of oxalic acid-Std oxalic acid
3- P3	Estimation of sodium carbonate-std sodium carbonate
4-P4	Estimation of hydrochloric acid-std oxalic acid
5-P5	Permanganometry-INTRODUCTION
6-P6	Estimation of FAS-std FAS
7-P7	Estimation of oxalic acid-std oxalic acid
8-P8	Estimation of FS-std oxalic acid
9-P9	Internal test-1
10-P10	Internal test-2
11-P11	Model exam-1(3 hrs)
12-P12	Model exam-2(3 hrs)

Course Outcomes

Learning Outcomes	**COs** of the course "MAJOR PRACTICAL–I"
CO1	To estimate oxalic acid
CO2	To estimate sodium carbonate
CO3	To estimate hydrochloric acid
CO4	To estimate FAS
CO5	To estimate oxalic acid
CO6	To estimate FS
Integrated Activity	
IA1	Maintain record notebook
IA2	Plan experimental projects and execute them

HOD Signature | Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	SMCH22
Class	I year (2018-2021)
Semester	Even
Staff Name	Mrs.T.P.EvangelineMaribah
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the classification of organic compounds.
- To discuss the fundamental concepts
- To explain hydrocarbons
- To describe halogen derivatives.
- To explain alcohols and ethers
- To distinguish between alcohols and ethers

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester – II / Core - 4
ORGANIC CHEMISTRY - I

UNIT- I CLASSIFICATION AND NOMENCLATURE

Classification of organic compounds - based on the nature of carbon skeleton – functional groups – classification of C and H atoms of organic compounds.(primary, secondary, tertiary)

IUPAC system of nomenclature of common organic compounds (upto C-10) – alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes with and without bridges and aromatic compounds.

Naming of organic compounds with one functional group - halogen compounds, alcohols , phenol, aldehydes, ketones, carboxylic acids and its derivatives, cyano compounds, amines and nitro compounds (Both aliphatic and aromatic)

Naming of compounds with two functional groups - naming of compounds with more than one carbon chain.

Naming of heterocyclic compounds containing one and two hetero atoms present in five and six membered rings. Structural isomerism – types with examples

UNIT-II FUNDAMENTAL CONCEPTS

Hybridisation and geometry
Electronic effects - inductive effect, resonance effect – resonance structures–conditions for
resonance –stability of resonance structures, hyper conjugation ,electromeric effect.
Steric effect – steric overcrowding – steric inhibition– stericrelief(with examples).
Dissociation of bonds – homolysis and heterolysis- radicals – carbocations – carbanions – electrophiles and nucleophiles Influence of electronic effets - dipole moment – relative strengths of acids and bases – stability of olefins – stability of radicals, carbocations and carbanions14

UNIT-III HYDROCARBONS

Addition to unsymmetrical olefins (Markownikoff's rule and peroxide effect), hydroboration, ozonolysis, dihydroxylation with $KMnO_4$, allylicbromination by NBS (mechanisms not required).

Classification of alkadienes, stability of conjugate dienes- Mechanism of 1, 2 and 1,4-addition- Diels-Alder reaction. Acidity of alkynes and formation of metal acetylides

UNIT -IV HALOGEN DERIVATIVES

Type of reactions - substitution, addition, elimination and polymerisation reactions S_N1 and S_N2 mechanisms - E_1 and E_2 mechanisms- Hoffmann's and Saytzeffs rule- preparation, properties and uses of chloroform, carbon tetrachloride, vinyl chloride and allyl chloride- preparation and uses of westron, westrosol, freon and chloroprene

UNIT-V ALCOHOLS & ETHERS

Distinction between primary, secondary and tertiary alcohols – nitroglycerol, dynamite- estimation of hydroxyl groups- mechanism of dehydration of alcohols- preparation and properties of allyl alcohol

Preparation and uses of oxirane and dioxan –Estimation of number of methoxy groups- Zeisel's method

Distinction between ethers and alcohols.

Course Calendar

Hour allotment	Class Schedule
	EVEN Semester Begins on 03-12-2018
1-L1	UNIT I–CLASSIFICATION AND NOMENCLATURE -Introduction
2-L2	Classification based on carbon skeleton and functional groups
3- L3	Nomenclature of aliphatic compounds
4-L4	Nomenclature of cycloalkanes
5-L5	Nomenclature of carbonyl compounds
6-L6	Nomenclature of nitrogen compounds
7-L7	Naming of compounds with two functional groups
8-L8	Naming of heterocyclic compounds
9-L9	Structural isomerism
10-P1	**Welcoming of First year and Inauguration of Chemistry Association**
11-L10	Revision
12-L11	Class test
13-L12	UNIT - II FUNDAMENTAL CONCEPTS – General introduction
14-L13	Hybridisation and geometry
15-L14	Electromeric and inductive effects- **Allotting portion for Internal Test-I**
16-L15	Resonance and steric effect
17-IT-1	**Internal Test-I**
18-L16	Hyper conjucation
19-L17	**Test Paper distribution and result analysis**- homolysis and heterolysis
	Entering Internal Test-I Marks into University portal
20-L18	Reaction intermediates
21-P2	**College level meeting/Cell function**
22-L19	Relative strengths of acids and bases
23-L20	Stability of reaction intermediates
24-L21	UNIT-II- over view- PPT
25-L22	Class test

26-L23	UNIT - III HYDRO CARBONS- Introduction
27-L24	Addition to unsymmetrical olefins
28-L25	Hydroboration and ozonolysis
29-L26	Dihydroxylation
30-L27	Allylicbromination
31-L28	Classification of alkadienes
32-L29	Stability of conjugated dienes
33-L30	Diels – Alder reaction **Allotting portion for Internal Test-II**
34- P3	**Department Seminar**
35-L31	Acidity of alkynes and revision
36-L32	Class test **Allotting portion for Assignment/seminar**
37-IT-II	**Internal Test-II**
38-L33	UNIT - IV HALOGEN DERIVATIVES-Introduction
39-L34	Types of reactions
40-L35	S_N1 and S_N2 mechanisms
41-L36	**Test Paper distribution and result analysis**- E1 & E2 mechanisms
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L37	Hoffmann's and Saytzeffs rule
44-L38	Preparation and uses of organic compounds
45-L39	Revision **Submission ofAssignment/take the seminar**
46-L40	Class test
47-L41	UNIT - V ALCOHOLS AND ETHERSIntroduction
48-L42	Distinction between alcohols **Allotting portion for Internal Test-III**
49-L43	Nitroglycerol and dynamite
50-L44	Mechanism of dehydration of alcohols
51-IT-III	**Internal Test-III**
52-L45	Preparation and reaction of allyl alcohol- **Test Paper distribution and result analysis**
53-L46	Preparation and uses of oxirane and dioxan **Model Test Announcement**
54-L47	Over all view of the course by PPT
55-L48	**Entering Internal Test-III Marks into University portal**
56-L49	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –I"

CO1	Naming of bicyclic compounds
CO2	Describe steric inhibition and sterric relief
CO3	Formation of metal acetylides
CO4	Defects of Freon
CO5	Distinction between eters and alcohols
Experimental Learning	
EL1	Analysis of alcohols
EL2	Analysis of ethers
EL3	Determination of methoxy groups
EL4	Determination of hydroxyl groups

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	Physical Chemistry-I
Course Code	SMCH12
Class	I year (2018-2021)
Semester	Odd
Staff Name	1.Dr. P. Rajesh AnanthaSelvan 2. Mrs.EvangaleinMaribah
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand different types of velocities and its relation, Maxwell distribution of molecular velocities.
- To discus how viscosity of gases varies with T and P
- To explain basic principle of photochemistry
- To describe the application of luminance types.
- To analyse the stability of radioactive elements
- To illustrate nuclear reactor and its application
- To differentiate crystalline and amorphous solids
- Explain types of crystal defects
- To derive expression for depression of freezing point
- To define osmotic pressure and application

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – I / Core-2

PHYSICAL CHEMISTRY -I

UNIT I–GASEOUS STATE

Concept of ideal and real gases, gas laws postulates of kinetic theory of gases (no derivation) Types of molecular velocities and their inter relations - mean, rms, most probable velocities - Calculation of most probable velocity, average velocity and root mean square velocity Maxwell's distribution of molecular velocities, statement of equation and explanation (no derivation) – graphic representation - effect of temperature on velocity distribution. Collision diameter - collision number - collision freqeuency - mean free path – Degrees of freedom of gaseous molecules - principle of equipartition of energy - heat capacity and molecular basis. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity.

UNIT - II PHOTO CHEMISTRY

Difference between thermal and photochemical reactions, primary and secondary reactions - Laws of photochemistry – Beer Lambert law, Grotthus - Draper law, Stark-Einstein law - Quantum efficiency – experimental determination of quantum yield. Energy transfer in photochemical reactions – Jablonski diagram - radiative and non radiative transition - internal conversion, intersystem crossing - qualitative description of fluorescence, phosphorescence - chemiluminescence, bioluminescence, thermoluminescence, photosensitization and quenching - photochemical reactions - kinetics of hydrogen-chlorine, reaction and decomposition of HI. Lasers – principle, types and uses.

UNIT - III NUCLEAR CHEMISTRY

Natural radioactivity - detection and measurement of radioactivity – Geiger Nuttal rule - rate of disintegration and half life period - average life period - nuclear stability, n/p ratio, magic number, mass defect and binding energy - liquid drop model - shell model - isotopes, isobars, isotones and isomers. Artificial radioactivity - nuclear fission and nuclear fusion – mechanisms – applications - differences – Stellar energy - nuclear reactors - hazards of radiations - fertile and fissile isotopes. Applications of radioisotopes – C 14 dating, rock dating, neutron activation analysis and isotope as tracers - study of reaction mechanism.

UNIT - IV SOLID STATE

Difference between crystalline and amorphous solids - isotropy and anisotropy - crystal lattices – Lattice energy –Born equation and its derivatives laws of crystallography - elements 6 of symmetry of crystals - crystal systems - unit cell - space lattice - Bravais lattices - Miller indices - cubic and hexagonal packing – radius ratio rule – tetrahedral and octahedral voids Bragg’s equation, derivation and applications - determination of structure of crystals by Xray diffraction methods - rotating crystal and powder method, structure of NaCl, KCl and ZnS. Imperfections in a crystal - Schottky defects, Frenkel defects, Nonstoichiometric defects - use of crystallographic data for the determination of Avogadro number and molecular mass

UNIT - V DILUTE SOLUTIONS

Colligative properties of dilute solutions: relative lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure,EbullioscopicconstantCryoscopic constant- Relation between colligative properties and Molecular mass –Osmosisosmotic pressure-.laws of osmotic pressure -osmotic pressure and concentration of soluteExperimental methods for determining various colligative properties, degree of dissociation and association of solutes Abnormal molecular mass – Van’t Hoff factor.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-6-2018
1-L1	UNIT I–GASEOUS STATE -Introduction -basic principles of gas laws, Concept of ideal and real gases
2-L2	Explain the postulates of kinetic theory of gases. Types of molecular velocities and their inter relations - mean, rms, most probable velocities
3- L3	Calculation of most probable velocity, average velocity and root mean square velocity.
4-L4	To solve the Problems. H. W given.
5-L5	Maxwell's distribution of molecular velocities, statement of equation and explanation
6-L6	graphic representation of velocity- effect of temperature on velocity distribution. Collision diameter
7-L7	Gaseous state –over view -PPT
8-L8	Derivation of collision number - collision frequency - mean free path
9-L9	Degrees of freedom of gaseous molecules - principle of equipartition of energy
10-P1	**Welcoming of First year and Inauguration of Chemistry Association**
11-L10	heat capacity and molecular basis for different gases
12-L11	Viscosity of gases and effect of temperature and pressure on coefficient of viscosity.
13-L12	UNIT - III NUCLEAR CHEMISTRY – General introduction
14-L13	History of Natural radioactivity - detection and measurement of radioactivity
15-L14	Geiger Nuttal rule - rate of disintegration and half life period - average life period- **Allotting portion for Internal Test-I**
16-L15	Discuss nuclear stability, n/p ratio, magic number, Problem H.W
17-IT-1	**Internal Test-I**
18-L16	mass defect and binding energy - liquid drop model -explain with expt
19-L17	**Test Paper distribution and result analysis**- shell model - isotopes, isobars, isotones and isomers.
	Entering Internal Test-I Marks into University portal
20-L18	Artificial radioactivity - nuclear fission and nuclear fusion mechanism
21-P2	**College level meeting/Cell function**
22-L19	applications - differences – Stellar energy - nuclear reactors hazards of radiations - fertile and fissile isotopes.
23-L20	NUCLEAR CHEMISTRY- over view- PPT
24-L21	Applications of radioisotopes – C 14 dating, rock dating, neutron activation analysis and isotope as tracers - study of reaction mechanism.
25-L22	GD- about advantages and disadvantages of nuclear power plant
26-L23	UNIT - II PHOTO CHEMISTRY- Introduction
27-L24	Difference between thermal and photochemical reactions, primary and secondary reactions
28-L25	Laws of photochemistry – Beer Lambert law, Grotthus - Draper law, Stark-Einstein law - Quantum efficiency
29-L26	experimental determination of quantum yield. Energy transfer in photochemical reactions – Jablonski diagram - radiative and non radiative transition - internal conversion, intersystem crossing

30-L27	Video form MOOC – Nuclear Chemistry
31-L28	qualitative description of fluorescence, phosphorescence - chemiluminescence, bioluminescence, thermoluminescence,
32-L29	photosensitization and quenching - photochemical reactions
33-L30	kinetics of hydrogen-chlorine, reaction and decomposition of HI. **Allotting portion for Internal Test-II**
34- P3	**Department Seminar**
35-L31	Lasers – principle, types and uses.
36-L32	Discussion on Photochemical laws –from video uploaded **Allotting portion for Assignment/seminar**
37-IT-II	**Internal Test-II**
38-L33	UNIT - IV SOLID STATE-Introduction Difference between crystalline and amorphous solids - isotropy and anisotropy
39-L34	crystal lattices – Lattice energy –Born equation and its derivatives laws of crystallography
40-L35	elements 6 of symmetry of crystals - crystal systems - unit cell - space lattice - Bravais lattices- Motivating student to make crystallographic models
41-L36	**Test Paper distribution and result analysis**- Miller indices - cubic and hexagonal packing – radius ratio rule-Solve problems
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L37	tetrahedral and octahedral voids Bragg's equation, derivation and applications - determination of structure of crystals by Xray diffraction methods
44-L38	rotating crystal and powder method, structure of NaCl, KCl and ZnS.from different solid model- Imperfections in a crystal
45-L39	Schottky defects, Frenkel defects, Nonstoichiometric defects **Submission ofAssignment/take the seminar**
46-L40	use of crystallographic data for the determination of Avogadro number and molecular mass –conclusion of Unit IV
47-L41	UNIT - V DILUTE SOLUTIONS Introduction- Motivate to study general properties of solution
48-L42	Colligative properties of dilute solutions: relative lowering of vapour pressure application in day-today life **Allotting portion for Internal Test-II**
49-L43	Derive elevation of boiling point, depression of freezing point and osmotic pressure
50-L44	EbullioscopicconstantCryoscopic constant Relation between colligative properties and Molecular mass –Osmosisosmotic pressure-.laws of osmotic pressure
51-IT-III	**Internal Test-III**
52-L45	osmotic pressure and concentration of soluteExperimental methods for determining various colligative properties,- **Test Paper distribution and result analysis**
53-L46	degree of dissociation and association of solutes Abnormal molecular mass – Van't Hoff factor.Conclusion and motivate to study the application in daily life **Model Test Announcement**
54-L47	Over all view of the course by PPT
55-L48	**Entering Internal Test-III Marks into University portal**
56-L49	**Model Test**

57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –I”
CO1	Calculation of different types of velocities and solve the problems
CO2	Describe the principle of equipartion of energy
CO3	Difference between thermal and photochemical reactions
CO4	Draw Jablonski diagram - radiative and non radiative transition
CO5	Explain the nuclear stabilities
CO6	Application of radioactivity in various fields
CO7	Determination of structure of crystal by different methods
CO8	Illustrate crystal decects.
CO9	Derive the expression for elevation of boiling point and depression of freezing point
Experimental Learning	
EL1	To do working models to explain gas laws
EL2	To categories and collect different luminescence objects
EL3	GD on merit and demerit of radioactivity
EL4	Collect different crystals
Integrated Activity	
IA1	Prepare model of atomic reactor
IA2	How colligative property used in day-today life.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

1. Questionnaires for Course Feedback from Students

Name of the student	
Programme Name	
Course Name	
Course code	
Year of Joining	
Semester	
Date	

Put a tick in the best represents your response to each statement.

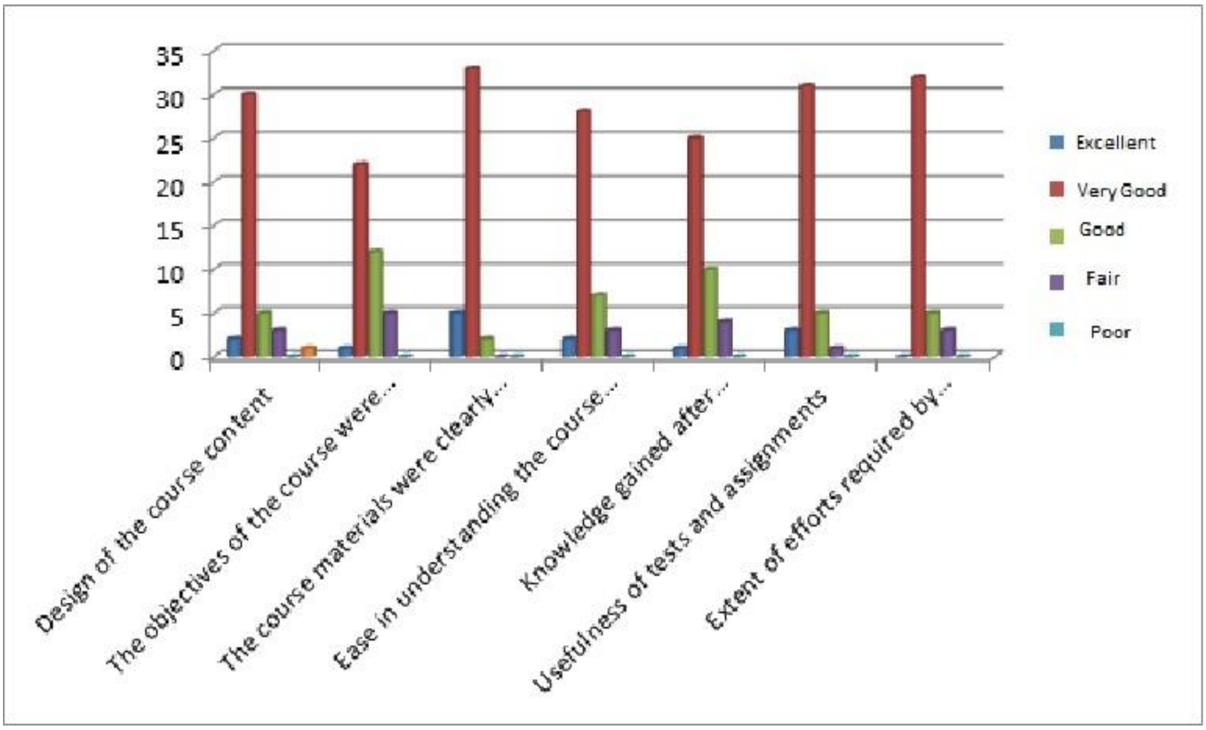
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Knowledge gained after completion of the course.	A	B	C	D	E
6	Usefulness of tests and assignments	A	B	C	D	E
7	Extent of efforts required by students.	A	B	C	D	E

Course Feedback Analysis and Report Preparation

Number of responses : 40

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	30	5	3	0
2	The objectives of the course were clearly stated.	1	22	12	5	0
3	The course materials were clearly explained.	5	33	2	0	0
4	Ease in understanding the course content.	2	28	7	3	0
5	Knowledge gained after completion of the course.	1	25	10	4	0
6	Usefulness of tests and assignments	3	31	5	1	0
7	Extent of efforts required by students.	0	32	5	3	0

Chart Preparation



Report Preparation

During the year 2017-2018 a high score has been provided by the students for curriculum and teaching quality were analysed, it was noted that the curriculum and the usefulness was adequate. The overall impression was also good.

St. John's College, Palayamkottai

Department of Chemistry

2. Questionnaires for Course Feedback from Teachers

Name of the Teacher	
Programme Name	
Course Name	
Course code	
Semester/Year	
Date	

Put a tick in the best represents your response to each statement.

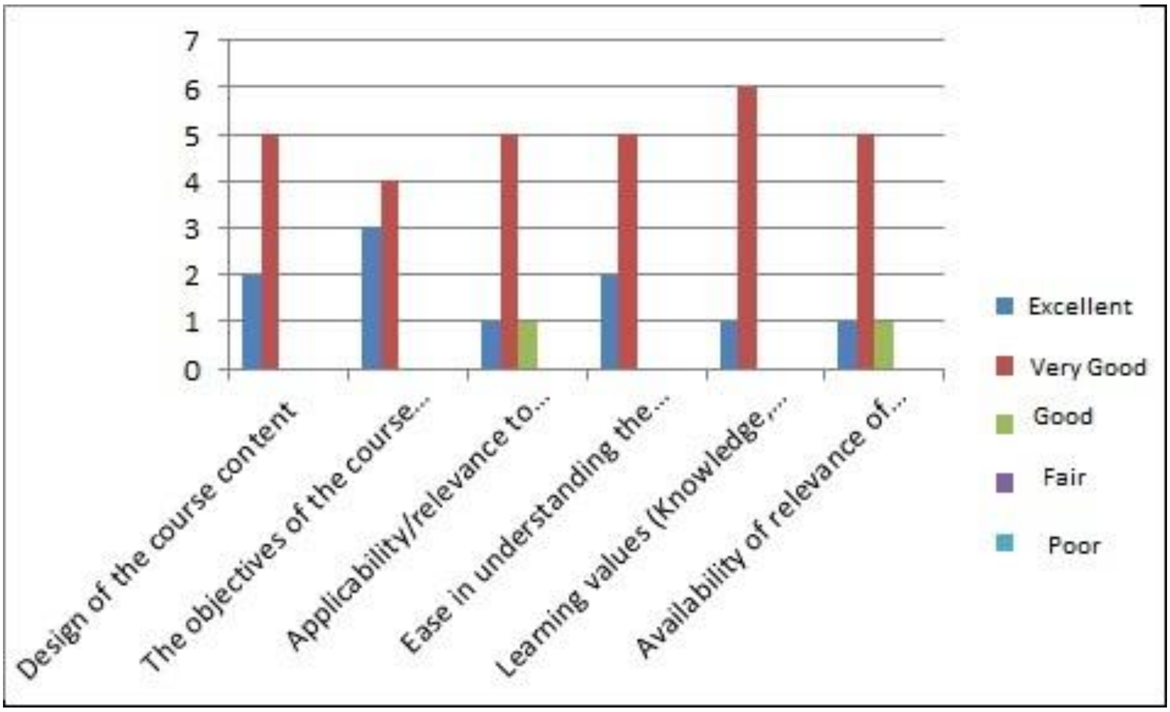
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses: 7

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	5	0	0	0
2	The objectives of the course were clearly stated.	3	4	0	0	0
3	Applicability/relevance to real life or job related.	1	5	1	0	0
4	Ease in understanding the course content.	2	5	0	0	0
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and	1	6	0	0	0

	broadening skills)					
6	Availability of relevance of additional source materials	1	5	1	0	0

Chart preparation



St. John’s College, Palayamkottai

Department of Chemistry

3. Questionnaires for Course Feedback from Alumni

Name of the Alumni	
Programme Name	
Course Name	
Contact No/Mail id	
Semester and year	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses:

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content					
2	The objectives of the course were clearly stated.					
3	Applicability/relevance to real life or job related.					
4	Ease in understanding the course content.					
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)					
6	Availability of relevance of					

	additional source materials					

4. Questionnaires for Course Feedback from Parents

Name of the Parent	
Name of the Student	
Programme Name	
Course Name	
Contact Number/Mail id	
Year of Joining/Semester	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Academic Procedure	A	B	C	D	E
2	Course materials available in Library.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Improvement in soft skills, knowledge, observed by you in your ward.	A	B	C	D	E
5	Usefulness of the course for getting job.	A	B	C	D	E
6	Execution of teaching methods	A	B	C	D	E

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	Food Chemistry
Course Code	
Class	II year (2017-2020)
Semester	Odd
Staff Name	1.Dr. P. Rajesh AnanthaSelvan 2. Mrs.T.P.Evangeline Maribah
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To acquire knowledge about food chemistry
- To discuss food adulterations
- To explain food quality control
- To describe the constituents of food
- To analyse the food sample quality

MSU/ MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester – III / Skill Based Core SKILL BASED COURSE - FOOD CHEMISTRY

UNIT - I CONSTITUTION OF FOOD (11 Hrs) Food - definition - classification of food - energy requirements of individuals - source, classification and function of carbohydrates, proteins, lipids, vitamins and minerals - calorific values of food - rice, wheat, milk, fish, vegetables, fruits and cereals.

UNIT - II FOOD ADDITIVES AND PRESERVATIVES (13 Hrs) Food additives: Definition - permitted food additives, characteristics and their role: antioxidants, stabilizers, flavours, sweeteners, emulsifiers, thickeners, food colourants. Preservatives: Definition – methods of food preservation - heat, cold, deep-freezing, radiation.

UNIT - III FOOD ADULTERATIONS (12 Hrs) Definition - adulterant, adulteration - types of adulterants - common adulterants and their determination in milk, oils, ghee, honey, chilly powder, coriander powder, turmeric powder, coffee powder, tea dust, asafoetida - food poisoning and its prevention – Prevention of Food Adulteration Act- food laboratories and their functions.

UNIT - IV QUALITY STANDARDS (11 Hrs) Quality control - specification and standards - FA, FDA, WHO standards - ISI specifications, packing and labeling of foods - Essential Commodities Act, Consumer Protection Act - AGMARK.

UNIT - V LABORATORY WORK (13 Hrs) 1. Determination of fat, protein and carbohydrate in food stuff. 2. Analysis of fats and oils - iodine value, acid value and RM value. 3. Estimation of glucose by Bertranel method 4. Analysis of starch in foods 5. Isolation of casein from milk

2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – I / Core-2

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-6-2018
1-L1	UNIT I-CONSTITUTION OF FOOD-Food-definition
2-L2	Classification of food
3- L3	Energy requirements of individuals
4-L4	Sourse ,Classification and function of carbohydrates
5-L5	Sourse ,Classification and function of proteins
6-L6	Sourse ,Classification and function of lipids
7-L7	Vitamins and minerals
8-L8	Calorific values of rice and wheat
9-L9	Calorific values of fish and milk
10-P1	**Welcoming of First year and Inauguration of Chemistry Association**
11-L10	Calorific values of vegetables and fruits
12-L11	Calorific values of cereals
13-L12	UNIT - II FOOD ADDITIVES AND PRESERVATIVES-Introduction
14-L13	Permited food additives
15-L14	Characteristics and role of food additives- **Allotting portion for Internal Test-I**
16-L15	Antioxidants
17-IT-1	Stabilizers
18-L16	**Internal Test-I**
19-L17	**Test paper distribution and result analysis**.
	Entering Internal Test-I Marks into University portal
20-L18	Flavours,sweeteners
21-P2	**College level meeting/Cell function**
22-L19	Methods of food preservation
23-L20	Emulsifiers and thickeners
24-L21	Food colourants and preservatives
25-L22	UNIT-II REVISION
26-L23	UNIT - III FOOD ADULTEARATIONS- Introduction
27-L24	Types of adulterants
28-L25	Determination of adulterants in milk and oils
29-L26	Determination of adulterants in ghee and honey
30-L27	Determination of adulterants in chilly, coriander and turmeric powder
31-L28	Determination of adulterants in coffee powder ,tea dust and asafoetida
32-L29	Food poisoning and its prevention
33-L30	FAA **Allotting portion for Internal Test-II**

34- P3	**Department Seminar**
35-L31	Food laboratories and their function
36-L32	**Allotting portion for Assignment/seminar**
37-IT-II	**Internal Test-II**
38-L33	UNIT - IV QUALITY STANDARDS-Introduction
39-L34	Quality control
40-L35	FA,FDA standards
41-L36	**Test Paper distribution and result analysis**
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L37	WHO standards
44-L38	ISI specifications,AGMARK
45-L39	Packing and labelling of food **Submission ofAssignment/take the seminar**
46-L40	ECA ,CPA –conclusion of Unit IV
47-L41	UNIT – V LABORATORY WORK Introduction
48-L42	Determination of fat,protein and carbohydrate in food stuff **Allotting portion for Internal Test-III**
49-L43	Analysis of fats and oils
50-L44	Analysis of starch and glucose
51-IT-III	**Internal Test-III**
52-L45	Isolation of casein from milk- **Test Paper distribution and result analysis**
53-L46	UNIT-V-REVISION **Model Test Announcement**
54-L47	Over all view of the course by PPT
55-L48	**Entering Internal Test-III Marks into University portal**
56-L49	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course “FOOD CHEMISTRY”
CO1	Explain the methods of food preservation
CO2	Determine the calorific values of food
CO3	Explain PFA act
CO4	Discuss ECA
CO5	Estimate Glucose
Experimental Learning	
EL1	Collect food samples and find out the adulterants
EL2	Collect milk samples and isolate casein
Integrated Activity	

IA1	How food analysis used in day to day life
IA2	Perpare model for Bertranal method.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	Major Practical-III
Course Name	Inorganic Qualitative Analysis
Course Code	SMCHP2
Class	II year (2017-2020)
Semester	Odd
Staff Name	Mr. D.Jim Livingston
Credits	1
L. Hours/P. Hours	2/WK
Total 30Hrs/sem Model Test 2 Hrs College Meeting 2 Hrs University Practical 2 Hrs Remaining 24 Hrs (12X2)Hrs	

Objectives:

- To make the students thorough in inorganic qualitative analysis.

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester -III / Major Practical - III INORGANIC QUALITATIVE ANALYSIS

Objectives:

- ❖ To enable the students to understand various procedures in the salt analysis.
- ❖ To create an awareness on eco-friendly approach in salt analysis.

1. Inorganic salt mixture containing two acidic radicals (one interfering radical) and two basic radicals.

2. Acidic radicals:

Simle acid radicals: carbonate,nitrate, sulphate and chloride.

Interfering acidic radicals: Borate, Fluoride, Oxalate and Phosphate.

3. Basic radicals

Group I : Lead

Group II : Copper, Cadmium, bismuth

Group IV : Cobalt, Nickel, manganese

Group V : Barium, strontium

Group VI : Magnesium, Ammonium.

Internal –50 marks

25 marks - Regularity

25 marks – Average of four experiments in regular class work

External -50 marks

10 marks – Record (atleast 4 experiments)*

10 marks – Procedure

30 marks – Result

Course Calender

Hour Allotment	**Class Schedule**
	Odd Semester begins on **18.06.2018**
1.P-1	Introduction
2.P-2	Analysis of the inorganic simple salt containing interfering acid radical
3.P-3	Analysis of group separation-Demonstration
4.P-4	Analysis of the inorganic salt mixture containing basic radicals
5.P-5	Analysis of the inorganic salt mixture 1
6.P-6	Analysis of the inorganic salt mixture 2
7.P-7	**College Meeting**
8.P-8	Analysis of the inorganic salt mixture 4
9.P-1	Analysis of the inorganic salt mixture 3
10.P-9	Analysis of the inorganic salt mixture 5
11.P-10	Analysis of the inorganic salt mixture 6
12.P-11	Procedure writing
13.P-12	Overall view of the procedure for the analysis of simple salt Feedback of the course, analysis and report preparation
14.MT-1	Model Test
15.P-2	University Practical Exam Last working day on **23.04.2019**

Course Outcomes

Learning Outcomes	Cos of the “Inorganic Qualitative analysis”
CO1	Analyse the salt mixture containing one interfering acid radical
CO2	Analyse the salt mixture containing two basic radicals

HOD Signature   Staff Signature

Principal

St. JOHN'S COLLEGE, PALAYAMKOTTAI

DEPARTMENT OF CHEMISTRY

Course Academic Plan

(Prepared by the staff members handling the course)

Programme Name	B.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	
Class	II year (2017-2018)
Semester	Odd
Staff Name	Mrs. S. Hilda Mabel
Credits	
L. Hours/P. Hours	
Total hrs/Sem Internal Test- Model Test- Dept. Meetings- College Meetings-2 Remaining-	

Course calendar:

Hour allotment	Class Schedule
	Semester begins on
1-L1	**Unit 1:** Introduction of Aldehyde and ketones
2-L2	Structure of carbonyl groups
3-L3	Reactivity of carbonyl groups
4-L4	Mechanism of nucleophilic addition reactions
5-L5	Aldol condensation and crossed aldol condensation
6-L6	Knoevenagal reaction, Reformatsky reaction
7-L7	Meerwein reduction, Wolf-kishner reduction
8-L8	Preparation and properties of chloral
9-L9	Preparation and properties of acrolein
10-L10	Preparation and properties of reactions of double bond
11-L11	Reactions of aldehyde group, Reactivity of aldehyde and ketones
12-L12	Crotonaldehyde, Succinaldehyde
13-L13	**Summarize unit-1 and general discussion about the topic and clarification of doubts in the topic of students**
14-L14	**Unit-2:** Introduction about carboxylic acid and acid derivatives
15-L15	Structure of carboxylic acid and carboxylate anion, acidity
16-L16	Effect of substituent on acidity of carboxylic acid, HVZ reaction
17-L17	Lactic acid-preparation, optical activity and uses.
18-L18	Citric acid- preparation, properties and uses
19-L19	Action of heat on dicarboxylic acid
20-L20	**Internal test-1 conducted**
21-L21	Succinic acid- preparation, properties and uses
22-L22	Acid derivatives, Urea- preparation and properties
23-L23	Structure of urea, Mechanism of esterification and Mechanism of ester hydrolysis
24-L24	Evidences and support of acidic hydrolysis of ester
25-L25	Saponification, Evidence and support of alkaline hydrolysis of ester
26-L26	**Unit-3:** Introduction about organometallic compounds and organo sulphur compounds
27-L27	General method of preparation of amine
28-L28	General chemical properties of amine
29-L29	**Department meeting**
30-L30	Reaction given by primary amines only (carbylamines, hofmann reaction, mustard oil reaction)
31-L31	Isomerism, Stereochemistry
32-L32	Distinguish between 1, 2, 3 amines
33-L33	Quarternary ammonium compounds,
34-L34	Aliphatic diazo compounds
35-L35	Ethyl diazoacetate- preparation properties uses. (Synthetic application)
36-L36	**College Meeting**
37-L37	**Unit-4:** Introduction about reactive methylene compounds and tautomerism
38-L38	Active methylene group, Reactivity of methylene hydrogen
39-L39	Aceto acetic ester preparation, Synthetic application, Malonic ester

	preparation
40-L40	**Internal Test-2 is conducted**
41-L41	Malonic ester synthetic application
42-L42	Ethyl cyano acetate
43-L43	Keto-enol tautomerism, Stability of keto-enol form in tautomeric mixture
44-L44	Nitro-oxi nitro tautomerism and its mechanism,
45-L45	Nitroso oxime tautomerism
46-L46	Amido-imido tautomerism
47-L47	**Unit-5:** Introduction about alicyclic compounds-Cyclo alkane definition (nomenclature)
48-L48	General method of preparation, Spectroscopic and chemical properties
49-L49	Relative stability of cyclohexane
50-L50	**College Meeting**
51-L51	**Internal Test-3 is conducted**
52-L52	Bayer strain theory(BST), Evidences and support of BST, Modification of BST
53-L53	Coulson-moffit constant, Confirmation analysis of cyclohexane
54-L54	Energy diagram and relative stability of different confirmation of cyclohexane
55-L55	Axial and equatorial form in cyclohexane (1,3 diaxial, Preparation of large ring system (ketones)
56-L56	Preparation, properties and uses of civetone and muscone
57-L57	**Model exam**
58-L58	**Model exam**
59-L59	**Model exam**
60-L60	**Model exam paper distribution and previous year university question paper discussion.** Feedback and preparation of the report
	Last working day

Course outcomes:

Learning outcomes	CO of the course “Organic chemistry-III
CO1	Understand functional group
CO2	Acquire knowledge about organometallic compounds
CO3	Gain the knowledge of writing mechanism
CO4	Understand the preparation of reactive methylene compounds
Experimental Learning	EL of the course “Organic chemistry-III
EL1	Preparation of lactic acid
EL2	PPT for reaction mechanism
EL3	Tautomerism learning
Integrated activity	IE of the course “Organic chemistry-III
IA1	Prepare aldehyde in your laboratory
IA2	Prepare amine compunds
IA3	Active methylene compounds

Blended Learning: using library resources, E-Learning resources, study tour, etc

Advanced Learner: Use library books, E-books, Motivating the students for research Programme.

For slow learner: Individual care in taken

#**Extenstion activity:** Encourage students to use Google for learning various concept and experiments in chemistry.

HOD Signature **Staff Signature**

Principal

St. John’s College, Palayamkottai

Department of Computer Science

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B.Sc. Chemistry
Course Name	Physical chemistry II
Course Code	SMCH41
Class	II year (2017-2020)
Semester	Even
Staff Name	T.P.Evangeline Maribah
Credits	4
L. Hours /P. Hours	4 / WK
Total 60Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To learn about basic concepts and I and II law of thermodynamics
- To understand chemical equilibrium
- To gain knowledge about electro chemistry
- To study solutions

Syllabus

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester – IV /Core -6 PHYSICAL CHEMISTRY –II L T P C 4 0 0 4 Objectives To learn about basic concepts and I and II law of thermodynamics To understand chemical equilibrium and electrochemistry To study solutions **UNIT -I THERMODYNAMICS-I (12 Hrs)** Basic concepts - system, surroundings - types of systems - extensive and intensive properties - state functions and path functions - types of processes - . Exact and inexact differentials -Zeroth law of thermodynamics. Statements of first law - definition of internal energy and enthalpy - heat capacities at constant volume (Cv) and at constant pressure (Cp), relationship between Cp and Cv - calculation of work, heat, internal energy change and enthalpy change for the expansion of an ideal gas under reversible isothermal and adiabatic conditions. Joule-Thomson effect – Joule-Thomson coefficient and its significance - derivation of the expression for Joule-Thomson coefficient - inversion temperature. Kirchoff‘s equation and its applications - numerical problems. **UNIT II: THERMODYNAMICS-II (12 Hrs)** Introduction to second law of thermodynamics - spontaneous processes - statement of second law of thermodynamics. Entropy: Definition –entropy a state function - Trouton‘s rule. -entropy change in reversible and irreversible processes- Clausius inequality- entropy as function of T and V - entropy as a function of T and P - entropy change in isothermal transformation - entropy change accompanying change of phase-– entropy of mixing of ideal gases - physical significance of entropy. Free energy: Work and free energy functions – definition-general conditions of equilibrium and spontaneity – -physical significance of dA and dG. Temperature and pressure dependence of G - variation of G during isothermal change -Gibbs Helmholtz equation

UNIT III: CHEMICAL EQUILIBRIUM (11 Hrs) Reversible and irreversible reactions-nature of chemical equilibrium-Law of mass action-equilibrium constants- Kp, and Kc Thermodynamic derivations- -Relations between Kp & Kc Temperature dependence of equilibrium constant-properties of equilibrium constant –-Pressure dependence of equilibrium constant- Application of law of mass action to homogenous and Heterogenous equilibrium-Le-Chatelier principle-application of Le-Chatelier principle to homogenous equilibrium and heterogenous equilibrium –effect of inert gas on equilibrium **UNIT IV : SOLUTIONS (12 Hrs)** Kinds of solutions –- methods for expressing concentration – Molarity, molality, mole fraction, normality, mass fraction, parts per million -solutions of gases in liquid -Solubility of gases in liquids – Henry's law – statement and limitations. Solutions of liquid in liquid– Binary liquid mixture - Ideal and non ideal solutions – Raoult's law. - deviation from ideal behavior – pressure – composition and temperature – Composition diagrams for completely miscible binary solutions-Fractional distillation – Azeotropic distillation—nature of azeotropic mixtures-partially miscible liquids—consolute temperature- critical solution temperature-system with upper CST, lower CST and upper and lower CST –Liquid crystals, Nematic,Semetic and cholestic types and their applications **UNIT-V ELECTROCHEMISTRY-I (13 Hrs)** Metallic and electrolytic conductance – Definitions of specific, equivalent and molar conductances – Relations between them – measurement of conductance and cell constant. Variation of conductance with dilution – Qualitative explanation– Strong and weak electrolytes. Migration of ions – transport number – determination by Hittorf and moving boundary methods – Kohlrausch‗s law – applications – calculation of equivalent conductance for weak electrolytes and determination of transport number. Ionic mobilities and Ionic conductances. Diffusion and ionic mobility- molar ionic conductance and viscosity- Walden rule-Applications of conductance measurements – Degree of dissociation of weak electrolytes – Determination of Ionic product of water – Determination of solubility of sparingly soluble salts – conductometric titrations- Theory of strong electrolytes – Debye – Huckel – Onsager theory-verification of Onsager equation – Wein and Debye –Falkenhagen effect.

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Text books: 1. Principles of physical chemistry - Puri, Sharma and Pathania, Millennium Edition, Vishal Publishing Co 2. Text Book of physical chemistry - P.L. Soni - Sultan Chand. **Reference books:** 1. Atkins' Physical chemistry, 9th Edition, Oxford University Press. 2. Advanced Physical Chemistry - Gurdeep Raj, Goel Publishing House. 3. Physical Chemistry, G.M.Barrow, Tata McGraw Hill. 4. Thermodynamics for chemist S.Glasstor 5. Physical chemistry P.K.Sharma and L.K.Sharma.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03.12.2018
1-L1	Basic concepts of TD
2-L2	Extensive and intensive properties
3- L3	Exact and inexact differentials
4-L4	Zeroth and I law of TD
5-L5	Cp and Cb relation
6-L6	W , Q , E , H change for reversible process
7-L7	Joule Thompson effect
8- P1	**Welcoming of First year and Inauguration of Chemistry Association**
9- L8	Inversion temperature and kirchoff's equation
10- L9	Revision
11-L10	II law of TD
12-L11	Spontaneous and reversible process
13-L12	Entropy change in reversible and irreversible process
14-L13	Entropy change in isothermal transformation
15-L14	**____ - Allotting portion for Internal Test-I**
	Internal Test I begins
16-L15	Entropy change in phase transition
17-IT-1	**Internal Test-I**
18-L16	Work and free energy functions
19-L17	**____ - Test Paper distribution and result analysis**
	Entering Internal Test-I Marks into University portal
20-L18	Significance of dA and dG
21- L19	T and P dependence of G
22- P2	**College level meeting/Cell function**
23-L20	Gibbs Helmholtz equation
24-L21	Chemical equilibrium- introduction
25-L22	Law of mass action
26-L23	Relation between Kp and Kc
27-L24	T and P dependence of equilibrium constant
28-L25	Application of law of mass action
29-L26	Le-Chatelier principle
30-L27	Effect of inert gas on equilibrium
31-L28	Solutions-methods of expressing concentration
32-L29	Soluablity of gasses in liquids
33-L30	Henry's law
34- P3	**Department Seminar**

35-L31	Ideal and non ideal solutions
36-L32	**____ - Allotting portion for Internal Test-II**
	Internal Test II begins
37- L33	Raoult's law
38- IT-II	**Internal Test-II**
39-L34	Deviation from ideal behaviour
40-L35	**____ - Test Paper distribution and result analysis**
	Entering Internal Test-II Marks into University portal
41-L36	Fractional and azeotropic distillation
42- L37	Nature of azeotropic mixtures
43- L38	System with upper , lower , upper and lower CST
44- P4	**College level meeting/ function**
45-L39	Liquid crystals
46-L40	Electro chemistry introduction
47-L41	Metallic and electrolytic conductance
48-L42	Measurement of conductance and cell constant
49-L43	Strong and weak electrolytes
50-L44	**____ - Allotting portion for Internal Test-III**
	Internal Test III begins
51 L45	Transport number
52- L46	Kohlrausch's law and equivalent conductance
53-IT-III	**Internal Test-III**
54-L47	Debye-Huckel-Onsager theory and Wein and Deby-Falkenhagen effect
55-L48	**____ - Test Paper distribution and result analysis**
	Entering Internal Test-III Marks into University portal
56- MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59- L49	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23.04.2019

Course Outcomes

Learning Outcomes	**COs** of the course "<course name>"Physical chemistry II
CO1	Explain Joule Thompson effect
CO2	Derive Kirchoff's equation

CO3	Arrive at Gibbs – Helmholtz equation
CO4	Explain Henry's law
CO5	Write a note on Kohlrausch's law
Experimental Learning	
EL1	Systems with upper and lower CST
EL2	Measurement of conductance
EL3	Measurement of cell constant
Integrated Activity	
IA1	Study about migration of ions
IA2	Give examples of spontaneous process(natural process)

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

For slow learner : special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

Lesson plan

Allied chemistry – II

S.No	Topics to be covered	Lecture class no
	Error and data analysis	
1	Definition and explanation with examples of the terms – mean median, mode range deviation mean deviation and relative mean deviation and standard deviation	1
2	Coefficient of variation and variance accuracy and precision	2
3	Types of errors – random error	3
4	Systematic error	4
5	Methods of detection and elimination of systematic errors	5
6	Student's t-test	6
7	Confidence levels, Q test for rejection of results	7
8	Curve fitting	8
9	Methods of least squares	9
10	Significant figures and computational rules	10
11	Internal test	11
12	Seminar / test	12
	Water analysis	
13	Sampling and prevention of water sample	13
14	Physical examination of water – color – odour – turbidity	14
15	Taste and electrical conductivity	15
16	Chemical characterization : pH, acidity	16
17	Alkalinity TDs	17
18	Total, temporary and permanent calcium and magnesium hardness	18
19	Chloride, fluoride and BOD	19
20	COD, detergents and pesticides,	20
21	Residual chloride and chlorine demand	21
22	Bacterial examination, total and faecal coliforms	22
23	Internal test 2	23
24	Seminar / test	24
	Fuel analysis	
25	Solid fuels: coal, classification – proximate analysis, moisture content	25
26	ash content, volatile matter and fixed carbon	26
27	Ultimate analysis, carbon, hydrogen, Sulphur and oxygen	27
28	Heating values	28
29	Grading of coals	29
30	Comparison of coal and coke	30
31	Liquid fuels: flash points, aniline point	31
32	Octane number and carbon residues	32
33	Gaseous fuel: producer gas and water gas	33
34	Calorific values	34
35	Internal test 3	35
36	Seminar / test	36
	Electrochemical techniques	
37	Electrogravimetry : Principle, instrumentation and applications	37

38	Colorimetry, constant current coulometry	38
39	Coulometric titrations	39
40	Applications	40
41	Potentiometric coulometry	41
42	Polarography: principle – experimental assembly	42
43	Working advantages and disadvantages of DME	43
44	Applications of qualitative and quantitative analysis	44
45	Amperometric titrations: theory and apparatus	45
46	General procedures – applications and advantages	46
47	Model exam	47
48	Seminar / test	48
	Spectro-analytical and thermo analytical methods	
49	Spectro-analytical methods – principle, instrumentation	49
50	Applications of colorimetry	50
51	Spectrophotometry	51
52	Fluorimetry	52
53	Light scattering techniques: nephelometry and turbidimetry	53
54	Thermoanlytical methods: principle, instrumentation	54
55	Applications of TGA	55
56	DTA, characteristic features of TGA and DTA curves	56
57	Factors affecting TGA and DTA curves	57
58	Simultaneous DTA and TGA curves – thermometric titrations	58
59	Class test	59
60	Revision	60

St. JOHN'S COLLEGE, PALAYAMKOTTAI

DEPARTMENT OF CHEMISTRY

Course Academic Plan

(Prepared by the staff members handling the course)

Programme Name	B.Sc. Chemistry
Course Name	Organic Chemistry-III
Course Code	
Class	II year (2017-2020)
Semester	Even
Staff Name	Mrs. S. Hilda Mabel
Credits	
L. Hours/P. Hours	
Total hrs/Sem Internal Test- Model Test- Dept. Meetings- College Meetings-2 Remaining-	

Course calendar:

Hour allotment	Class Schedule
	Semester begins on 02-01-2019
1-L1	Stereo Isomerism & Elements of Symmetry
2-L2	Dissymmetry, Optical activity
3-L3	Enatiomer, Diastereomers
4-L4	Optical activity of compounds containing asymmetric Carbon atom
5-L5	Difference between racemic &mesoform, Resolution, Walden inversion
6-L6	Assymmetric Synthesis, Racemisation, Configuration
7-L7	Transformation of Fischer to Newnon&Sagar Formulas
8-L8	R-S notation of absolute configuration
9-L9	Optical Activity substituted biphenyl, Stirane
10-L10	Geometrical Isomerism, Geometrical Isomerism of Oximes
11-L11	Configuration of ketoximes
12-L12	Confirmation Analysis
13-L13	Factors affecting the stability of confirmation
14-L14	**Unit 2: Aromaticity& Aromatic substitution**
15-L15	General characteristics of aromatic compounds
16-L16	Theory of aromaticity
17-L17	Non-benzenoid aromatic compound
18-L18	Anti-aromatic compound
19-L19	Aromatic electrophilic substitution
20-L20	**Internal test-1 conducted**
21-L21	**Department meeting**
22-L22	Difference between nitration &sulphonation
23-L23	Mechanism of Friedal Crafts alkylation
24-L24	Aromatic Disubstitution
25-L25	Directive influence of substituents
26-L26	Rules of AromticTrisubstitution
27-L27	**College Meeting**
28-L28	**Unit-3: Derivatives of benzene**
29-L29	Hydrocarbons, Preparation, Properties & Uses of Xylene
30-L30	Preparation, Properties & Uses of Mesitylene
31-L31	Preparation, Properties & Uses of Styrene
32-L32	Preparation, Properties & Uses of Halogen Compounds
33-L33	Preparation, Properties & Uses of 1,3,5 Tri bromobenzene
34-L34	Hydroxy Compounds, Acid Characteristics of Compounds of Phenol
35-L35	Mechanism of Reimer Tiemar reaction
36-L36	Catechol, Reaction of Aromatic amines
37-L37	Benzene diazonium chloride
38-L38	**Internal Test-2is conducted**
39-L39	**Unit-4: Aromatic Carbonyl Compound**
40-L40	Aldehydes & Ketones
41-L41	Cinnamaldehyde, Quinone-Oximetautomerism
42-L42	**College Meeting**
43-L43	Perkin’s Reaction, Claisen reaction, Cannizaro Reaction

44-L44	Benzoin condensation, Gattermann Reaction
45-L45	Aromatic Ortho effect, Mandelic Acid, Cinnamic Acid
46-L46	Phthalic Acid, Trephthalic Acid
47-L47	**Internal Test-3 is conducted**
48-L48	**Unit-5: Polynuclear Hydrocarbon**
49-L49	Isolated System, Biphenyl Preparation & Properties
50-L50	Atrop Isomerism, Preparation of triphenyl methane
51-L51	Preparation of stilbene, Haworth Synthesis
52-L52	Reaction of Naphthalene, Structure of Naphthalene
53-L53	Synthesis of Anthracene, Structure of Anthracene
54-L54	Alizarin structure, Phenanthrene structure
55-L55	Naphthol
56-L56	**Model exam**
57-L57	**Model exam**
58-L58	**Model exam**
59-L59	**Model exam paper distribution and previous year university question paper discussion.** Feedback and preparation of the report
60-L60	Last working day

Course outcomes:

Learning outcomes	CO of the course "Organic chemistry-III
CO1	Understand structures of aromatic compounds
CO2	Acquire knowledge about naming reaction
CO3	Gain the knowledge of writing mechanism
CO4	Understand the preparation of aromatic compounds
Experimental Learning	EL of the course organic chemistry
EL1	Preparation of glucose
EL2	Naming reaction
EL3	Conformational analysis

Blended Learning: using library resources, E-Learning resources, study tour, etc

Advanced Learner: Use library books, E-books, Motivating the students for research Programme.

For slow learner: Individual care in taken

#**Extenstion activity:** Encourage students to use Google for learning various concept and experiments in chemistry.

HOD Signature **Staff Signature**

Principal

Lesson plan

Allied chemistry – II

S.No	Topics to be covered	Lecture class no
	Spectroscopy – II	
1	Molecular weight determination by Rast's macro method	1
2	Determination of transition temperature	2
3	Two component phase diagram-simple eutectic system	3
4	Kinetic study-hydrolysis of ester	4
5	Critical solution temperature-phenol-water system	5
6	Conductometric titrations	6
7	Conductometric precipitation titration	7
8	Potentiometric titrations Fe II Vs $KMnO_4$	8
9	Potentiometric titrations potassium dichroamate Vs FAS	9

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. Jim Livingston)

Programme Name	B. ScCemistry
Course Name	Polymer Chemistry
Course Code	JMCHB1
Class	III year (2016-2019)
Semester	Odd
Staff Name	1.Mr. D. Jim Livingston 2. Dr. P.Rajesh Ananthaselvan
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To know the concept of polymerization and types of polymers
- To understand the characteristics of polymers
- To acquire knowledge about the polymerization techniques and polymer processing
- To know the chemistry of individual polymers
- To have an idea about the recent advances in polymer sciences

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) /Semester–I /Major Elective-I

POLYMER CHEMISTRY

UNIT I - INTRODUCTION TO POLYMERS

Definition - Monomer, polymer and polymerisation - classification of polymers on the basis of (i) origin - Natural, semi synthetic, synthetic, (ii) Physical properties and applications - Rubbers, plastic, fibres (iii) Thermal response - thermoplastics, thermosetting (iv) Structure - Homopolymers (linear, branched, cross link or network), Copolymers (Random, Alternate, Block, Graft) (v) Crystallinity - non-crystalline (amorphous), semi-crystalline (vi) Mode of formation - Addition, Condensation Polymerisation (definition and examples only) (vii) Methods of polymerization - Bulk, Solution, Suspension Polymerisation (definition and examples only) Chemistry of polymerization: Chain polymerization, free radical, ionic, coordination, step polymerization, polyaddition and polycondensaion, miscellaneous ring opening and group transfer polymerizations.

UNIT II - CHARACTERISTICS OF POLYMERS

Glass transition temperature (Tg) - definition – Factors affecting Tg – relationships between Tg and molecular weight and melting point. Importance of Tg. Molecular weight of polymers. Number average, weight average (problems), sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerization - chemical reaction - hydrolysis - hydrogenation - addition - substitution – cross-linking, vulcanisation andcyclisation reactions.Polymer degradation - basic idea of thermal, photo and oxidative degradation of polymers.

UNIT III - POLYMERIZATION TECHNIQUES AND PROCESSING

Bulk, solution, suspension, emulsion, melt condensation and interfacial poly condensation polymerizations. polymer processing - calendaring - die-casting, rotational casting - compression moulding - injection moulding - blow moulding - extrusion moulding and reinforcing.

UNIT IV - CHEMISTRY OF SOME COMMERCIAL POLYMERS

Preparation, properties and uses of the following polymers.Thermoplastics, polyethylene, polypropylene, polystyrene, polyacrylonitrile, polyvinyl chloride, nylon, polyester. Thermosetting plastics: Phenol formaldehyde resin, urea formaldehyde resin, melamine formaldehyde, epoxy resin, polycarbonate. Elastomers: Natural rubber and synthetic rubber, Styrene and neoprene rubber.

UNIT V - ADVANCES IN POLYMER

Biopolymers - Biomedical polymers - contact lens, dental polymers, artificial heart, kidney, skin and blood cells - High temperature and fire resistant polymers - silicones – conductingpolymers - (elementary idea) - polysulphur nitrile, polyphenylene, polypyrrole and polyacetylene. Polymer industry in India.

Course Calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 06-12-2018
1-L1	UNIT I–INTRODUCTION TO POLYMERS -Introduction – Definition about polymers
2-L2	Classification of polymers on the basis of origin, physical property, thermal response and structure.
3- L3	Classification of polymers on the basis ofcrystallinity, mode of formation and method of polymerization.
4-L4	Chain polymerization- Examples given
5-L5	Mechanism of free radical polymerization

6-L6	Mechanism of ionic and coordination polymerisation.
7-L7	Step polymerization, polyaddition and polycondensaion
8-L8	Mechanism of step polymerisation
9-L9	Ring opening polymerisation, examples, mechanism
10-P1	**Chemistry Association Meeting**
11-L10	Group transfer polymerizations. – Unit overview
12-L11	UNIT II - CHARACTERISTICS OF POLYMERS - Introduction
13-L12	Glass transition temperature (Tg) and Factors affecting Tg
14-L13	Relationships between Tg and molecular weight and melting point.
15-L14	Importance of Tg. Molecular weight of polymers.
16-L15	Number average, weight average molecular weight of polymers **Allotting portion for Internal Test-I**
17-L16	Problems based on Number average, weight average molecular weight of polymers.
18- IT-1	**Internal Test-I**
19-L17	Sedimentation and viscosity average molecular weights.Chemical reactions of polymers - hydrolysis - hydrogenation - addition - substitution
20-L18	**Test Paper distribution and result analysis**- Molecular weights and degree of polymerization
21-L19	Chemical reactions of polymers -cross-linking, vulcanisation andcyclisation reactions
22-L20	Polymer degradation- Thermal, photo and oxidative degradation of polymers.
23-P2	**College level meeting/Cell function**
24-L21	UNIT III - POLYMERIZATION TECHNIQUES AND PROCESSING - Introduction
25-L22	Bulk, solution polymerisation
26-L23	suspension, emulsionpolymerisation
27-L24	Melt condensation and interfacial poly condensation polymerizations
28-L25	polymer processing - calendaring - die-casting
29-L26	Rotational casting - compression moulding
30-L27	Injection moulding - blow moulding
31-L28	extrusion moulding and reinforcing.
32-L29	Video form MOOC – Polymerisation techniques
33-L30	PPT of Polymer Processing - overview
34- L31	UNIT IV - CHEMISTRY OF SOME COMMERCIAL POLYMERS – Introduction-thermoplastic, thermosetting and rubbers
35-L32	Differnces between thermoplastic and thermosetting plastic **Allotting portion for Internal Test-II**
36-P3	**Department Seminar**
37-L33	GD about merits and demerits of commercial polymers
38-L34	Preparation, properties and uses of polyethylene, polypropylene, polystyrene **Allotting portion for Assignment/seminar**
39-IT2	**Internal Test-II**
40-L35	Preparation, properties and uses ofpolyacrylonitrile, polyvinyl chloride, nylon, polyester
41-L36	Preparation, properties and uses of Phenol formaldehyde resin
42-L37	Preparation, properties and uses of urea formaldehyde resin, epoxy resin
43-L38	**Test Paper distribution and result analysis**- melamine formaldehyde resin and poly carbonates

44-L39	Natural rubber and synthetic rubber - PPT
45- P4	**College level meeting/ function**
46-L40	Preparation, properties and uses of Styrene and neoprene rubber.
47-L41	UNIT V - ADVANCES IN POLYMER – Biopolymers -Introduction
48-L42	Bio medical polymers used in Contact lens. PPT **Submission ofAssignment**
49-L43	Bio medical polymers used in dental treatment PPT
50-L44	Bio medical polymers used in artificial heart PPT
51-L45	Bio medical polymers used inartificial kidney and blood cells PPT**Allotting portion for Internal Test-III**
52-L46	High temperature and fire resistant polymers
53-IT3	**Internal Test-III**
54-L47	Silicones – classification, properties and uses PPT **Test Paper distribution and result analysis**
55-L48	Conducting polymers **Model Test Announcement**
56-L49	Polymer industry in India and Over all view of the course by PPT
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model Test**
60-L50	**Model test paper distribution and Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "POLYMER CHEMISTRY"
CO1	Classification of polymers based on different criteria
CO2	Mechanism of polymerization
CO3	Differences between molecular weight, number average and weight average methods
CO4	Understanding knowledge about glass transition temperature and its importance
CO5	Gains idea about different polymerisation techniques
CO6	Uses and manufacture of thermosetting and thermoplastics
CO7	Acquires realization of rubbers and their uses
CO8	Develop an idea about biopolymers
CO9	Knowledge about conducting polymers
Experimental Learning	
EL1	To prepare nylon using polymerization technique
EL2	GD on merit and demerit of using plastics
Integrated Activity	
IA1	Prepare model of artificial heart and artificial kidney
IA2	Creating awareness about non degradable plastics to the public

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, etc.,

# For Advanced Learners	: use library books, E- books, motivate students to prepare for higher study.
# Forslow learners	: special care has been taken to make them understand the concepts easily. To attend the remedial classes.
# Extension activity	: Motivate students to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

1. Questionnaires for Course Feedback from Students

Name of the student	
Programme Name	
Course Name	
Course code	
Year of Joining	
Semester	
Date	

Put a tick in the best represents your response to each statement.

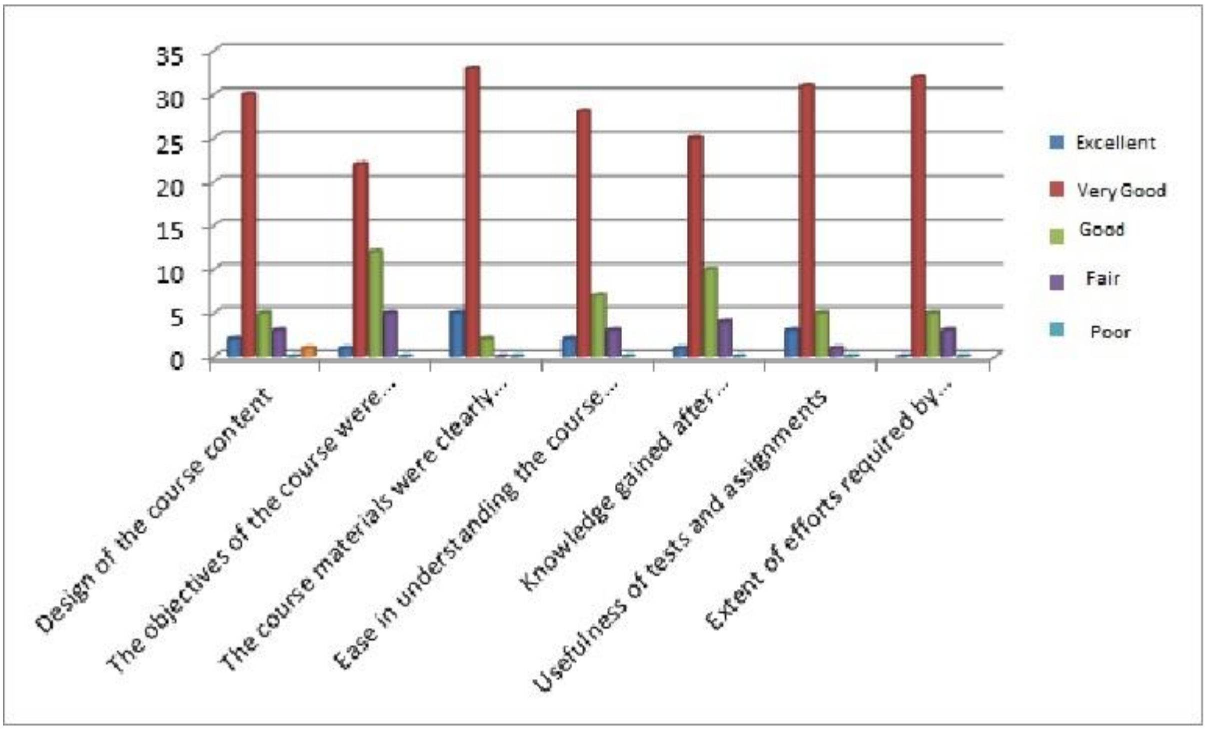
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Knowledge gained after completion of the course.	A	B	C	D	E
6	Usefulness of tests and assignments	A	B	C	D	E
7	Extent of efforts required by students.	A	B	C	D	E

Course Feedback Analysis and Report Preparation

Number of responses : 40

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	30	5	3	0
2	The objectives of the course were clearly stated.	1	22	12	5	0
3	The course materials were clearly explained.	5	33	2	0	0
4	Ease in understanding the course content.	2	28	7	3	0
5	Knowledge gained after completion of the course.	1	25	10	4	0
6	Usefulness of tests and assignments	3	31	5	1	0
7	Extent of efforts required by students.	0	32	5	3	0

Chart Preparation



Report Preparation

During the year 2017-2018 a high score has been provided by the students for curriculum and teaching quality were analysed, it was noted that the curriculum and the usefulness was adequate. The overall impression was also good.

St. John's College, Palayamkottai

Department of Chemistry

2. Questionnaires for Course Feedback from Teachers

Name of the Teacher	
Programme Name	
Course Name	
Course code	
Semester/Year	
Date	

Put a tick in the best represents your response to each statement.

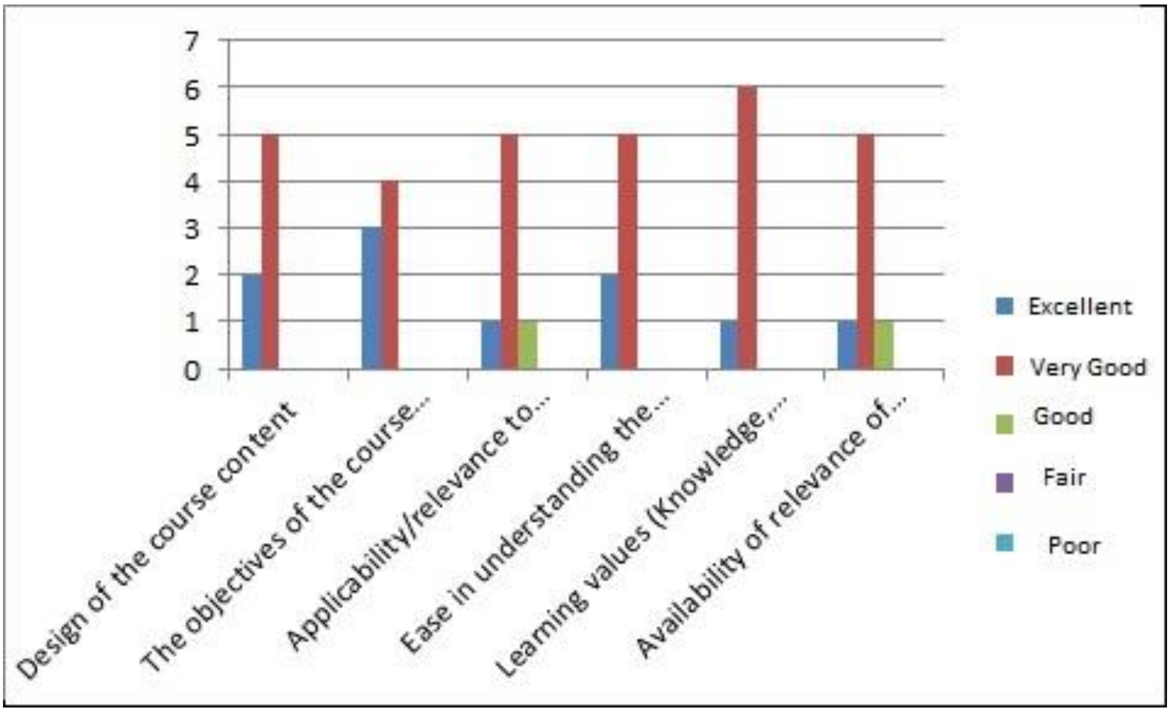
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real	A	B	C	D	E

	life or job related.					
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses: 7

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	5	0	0	0
2	The objectives of the course were clearly stated.	3	4	0	0	0
3	Applicability/relevance to real life or job related.	1	5	1	0	0
4	Ease in understanding the course content.	2	5	0	0	0
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	1	6	0	0	0
6	Availability of relevance of additional source materials	1	5	1	0	0

Chart preparation



St. John's College, Palayamkottai

Department of Chemistry

3. Questionnaires for Course Feedback from Alumni

Name of the Alumni	
Programme Name	

Course Name	
Contact No/Mail id	
Semester and year	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses:

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content					
2	The objectives of the course were clearly stated.					
3	Applicability/relevance to real life or job related.					
4	Ease in understanding the course content.					
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)					
6	Availability of relevance of additional source materials					

4. Questionnaires for Course Feedback from Parents

Name of the Parent	
Name of the Student	
Programme Name	
Course Name	

Contact Number/Mail id	
Year of Joining/Semester	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Academic Procedure	A	B	C	D	E
2	Course materials available in Library.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Improvement in soft skills, knowledge, observed by you in your ward.	A	B	C	D	E
5	Usefulness of the course for getting job.	A	B	C	D	E
6	Execution of teaching methods	A	B	C	D	E

St. JOHN'S COLLEGE, PALAYAMKOTTAI

DEPARTMENT OF CHEMISTRY

Course Academic Plan

(Prepared by the staff members handling the course)

Programme Name	B.Sc. Chemistry
Course Name	Practical
Course Code	
Class	II year (2017-2020)
Semester	Odd
Staff Name	Mrs. S. Hilda Mabel
Credits	
L. Hours/P. Hours	
Total hrs/Sem Internal Test- Model Test- Dept. Meetings- College Meetings-2 Remaining-	

- To develop the ability to think the concept which they learnt.
- To facilitate the students in research pursuit.

Course calendar:

Hour allotment	Class Schedule
	Semester begins on 02-01-2019
1-L1	Gravimetric Analysis – Demo
2-L2	Apparatus Distribution
3-L3	Estimation of Barium
4-L4	Estimation of Lead
5-L5	Estimation of Calcium
6-L6	Estimation of Nickel
7-L7	Estimation of Copper
8-L8	Estimation of Zinc
9-L9	Record correction
10-L10	**Model Exam**
11-L11	Organic Preparation-picric acid from Phenol
12-L12	P-bromoacetanilide from acetanilide
13-L13	Benzoic acid from ethyl benzoate
14-L14	Benzoic acid from benzamide
15-L15	Benzoic acid from benzaldehyde
16-L16	Record correction
17-L17	**Model exam**
18-L18	Glucosazone from glucose
19-L19	Acetanilide from aniline
20-L20	Phenyl benzoate from phenol
21-L21	Record correction
22-L22	**Model exam**
23-L23	Last working day

Blended Learning: using library resources, E-Learning resources, study tour, etc

Advanced Learner: Use library books, E-books, Motivating the students for research Programme.

For slow learner: Individual care in taken

#**Extenstion activity:** Encourage students to use Google for learning various concept and experiments in chemistry.

HOD Signature **Staff Signature**

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff member handling the course)

Programme Name	B. Sc Chemistry
Course Name	INORGANIC CHEMISTRY-III
Course Code	JMCH61
Class	III year (2016-2019)
Semester	Even
Staff Name	Mrs.J. Betsy Ratnabai
Credits	4
L. Hours /P. Hours	6 / WK
Total 90 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-4 Hrs College Meetings-5 Hrs Remaining 75 Hrs (5 units; 5×15=75; 15Hrs /unit)	

Course Objectives

- To understand structural and stereoisomerism in different complexes
- To study the theories in coordination chemistry
- To understand the mechanism of substitution reactions
- To study the chemistry of metal carbonyls
- To understand the role of metal ions in biological systems
- To study the catalysts used in different reactions
- To study the basic principles of photo inorganic chemistry
- To study the photo redox reactions of Cr(III) and Co(III) complexes

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc. Chemistry) /Semester -VI / Core -9

INORGANIC CHEMISTRY – III L T P C 5 0 0 4

Objectives

To study the theories in coordination chemistry

To study the chemistry of metal carbonyls

To understand the role of metal ions in biological systems

To study the basic principles of photoinorganic chemistry

UNIT - I COORDINATION CHEMISTRY-I (15 Hrs)

Introduction: IUPAC nomenclature, Ligands- monodentate, bidentate, and polydentate ligands; coordination sphere; coordination number; nomenclature of mononuclear and dinuclear complexes. Structural and stereoisomerism in tetrahedral, square planar and octahedral complexes.Valance Bond theory – applications of valance bond theory to tetrahedral, square planar and octahedral complexes- Merits and limitations of VB theory.

UNIT – II COORDINATION CHEMISTRY II (16 Hrs)

Crystal field theory - splitting of d-orbitals in octahedral and tetrahedral complexes - factors affecting the magnitude of crystal field splitting - effects of crystal field splitting - spectrochemical series - applications of CFT - magnetic properties and spectra of transition metal complexes - crystal field stabilization energy and their uses - limitations of CFT - effective atomic number rule - stability of complexes - step-wise and overall stability constants - factors affecting the stability of complexes - determination of stability constants.

UNIT – III CO-ORDINATION CHEMISTRY III (14 Hrs)

Labile and inert complexes - ligand substitution reactions in octahadral complexes: aquation, base hydrolysis and anation reactions - substitution reactions in square planner complexes - Trans effect - theories of trans effect - mechanism of substitution reactions - redox reactions: inner-sphere and outer-sphere electron transfer reactions.

UNIT - IV ORGANOMETALLIC CHEMISTRY (14 Hrs)
Introduction–History, Nomenclature of organometallic compounds, EAN rule and 18 electron rule. Structure and nature of M-L bond in metal carbonyls - metal nitrosyls. preparation of organo metallic compounds of Mg, Zn, Li, Cu, P, B, Ti, Fe and Co Wilkinson‘s catalyst and alkene hydrogenation, hydroformylation, Mansanto acetic acid process, Ziegler – Natta catalyst and polymerization of olefins. **UNIT - V Inorganic photochemistry (16 Hrs)**
Electronic transitions in metal complexes : selection rules - metal-centered and charge-transfer transitions - properties of excited states - bimolecular quenching and energy transfer - photochemical pathways : substitutional, reduction-oxidation and isomerisation processes - photosubsitution reactions of Cr(III) complexes - Adamson's rules - photoredox reactions of Co(III) complexes - photoismerisation in Pt(II) complexes. Photochemical conversion and storage of solar energy : photolytic cleavage of water into H2 and O2 - photoelectrochemical devices : photogalvanic cells and semiconductor based photovoltaic cells.

Text books :

1. J.D. Lee, *Concise Inorganic Chemistry* 5th Ed., Blackwell Science Ltd.,

2. James E. Huheey, Elien A. Keiter and Richard L. Keiter, *Inorganic Chemistry : Principles Structure and Reactivity,* 4th Ed., Harper College Publisher.

Reference books :

1.F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Marilo and Manfred Bochman, *Advanced Inorganic Chemistry*, 6th Ed., Wiley Interscience Publication.
2.FredBasolo and Ralph G. Pearson, *Mechanisms of Inorganic Reactions : A study of metal complexes in solution,* 2nd Ed., John wiley and sons, Inc.,
3. David E. Fenton, *Biocoordination Chemistry,* Ist Ed., Oxford Science Publications.

4. IvanoBertini, Harry B Gray, Stephen J Lippard, Joan Selverstone Valentine, *Bioinorganic Chemistry*, 1st Ed., Viva Books Pvt. Ltd.,

5. J.K. Rohatgi - Mukherjee, *Fundamentals of Photochemistry* - Wiley Eastern Revised Ed.,

6. *Journal of Chemical Education,* Vol.60, No.10, October 1983.

7. A.W. Adamson and P.D. Fleischauer, (Editors) *Concepts of Inorganic photochemistry,* John wiley and sons, New York, 1975.

Course Calender

Hour Allotement	**Class Schedule**
	Even Semester begins on 03-12-2018
1.L-1	UNIT I-COORDINATION CHEMISTRY-I–Introduction
2.L-2	Explain basic rules for systematic IUPAC nomenclature of complexes
3.L-3	Write the formula and names of different ligands
4.L-4	Explain different types of complexes cationic, anionic and neutral complexes
5.L-5	Explain coordination sphere and to calculate coordination number to give some examples
6.L-6	Calculation of oxidation number of metal ions by giving some examples
7.P1	Department Meeting
8.L-7	Explain the rules for naming mononuclear complexes.Naming of complex cations and complex anions
9.L-8	Explain the rules for naming dinuclear complexes
10.L-9	Explain how to write the structure of the coordination complexes according to IUPAC rules
11.L-10	Overall view of IUPAC nomenclature
12.L-11	Isomerism in complexes-Structural isomerism and stereoisomerism
13.L-12	Discuss structural isomerism with suitable examples
14.P2	College level meeting/cell function
15.L-13	Discuss optical and geometrical isomers in tetrahedral, square planar and octahedral complexes
16.L-14	Valance bond theory-applications of valance bond theory to tetrahedral, square planar and octahedral complexes
17.L-15	Merits and limitations of VB theory **Allotting portion for Internal Test-I**
18.P3	**College level meeting/cell function**
19.L-16	UNIT II COORDINATION CHEMISTRY II –Introduction
20.L-17	Explain the postulates of crystal field theory
21.IT-I	**Internal Test –I**
22.L-18	Splitting of d orbitals in octahedral geometry
23.L-19	Splitting of d orbitals in tetrahedral geometry
24.L-20	**Test paper distribution and result analysis** –Factors affecting the magnitude of crystal field splitting energy **Entering Internal Test-I marks into University portal**
25.P4	**Department Meeting**
26.L-21	Spectrochemical series-crystal field stabilization energy

27.L-22	Calculation of CFSE in a strong field and in a weak field
28.L-23	Explanation of stability of complexes using CFSE values
29.L-24	Application of crystal field theory-magnetic properties and spectra of transition metal complexes
30.L-25	Limitations of CFT
31.L-26	Overview of crystal field theory
32.L-27	Effective atomic number rule (EAN) EAN rule applied to metal carbonyls
33.L-28	Discuss EAN of metal carbonyls given as HW
34.P5	**College level meeting/cell function**
35.L-29	Stability of complexes in solution –Stepwise formation constants and overall formation constants
36.L-30	Factors affecting stability of complexes
37.L-31	Methods of determination of stability constants
38.L-32	UNIT-III COORDINATION CHEMISTRY-III – Introduction
39.L-33	Labile and inert complexes
40.L-34	VBT explanation of labile and inert complexes **Allotting portion for Internal Test-II**
41.L-35	Taube's explanation of labile and inert complexes
42.IT-II	**Internal Test-II**
43.L-36	Ligandsubstitution reaction-aquation in octahedral complexes
44.L-37	Ligand substitution reaction – Base hydrolysis in octahedral complexes **Test paper distribution and result analysis** **Entering Internal Test -II marks into University Portal**
45.P-6	**Department Seminar**
46.L-38	Ligand substitution reaction -Anation in octahedral complexes
47.L-39	Substitution reactions in square planar complexes-Trans effect
48.L-40	Over all view of substitution reactions
	Allotting portion for Assignment /Seminar
49.L-41	Theories of trans effect
50.L-42	Mechanism of substitution reactions
51.L-43	Redox reactions-inner sphere electron transfer reactions
52.L-44	Redox reactions-outer sphere electron transfer reactions
53.L-45	Explain redox reactions by suitable electron transfer reactions
54.L-46	Over all view of Redox reactions
55.L-47	UNIT -IV ORGANOMETTALIC CHEMISTRY-Introduction
56.L-48	History of organometallic compounds **Submission of Assignment/Taken seminar**
57.L-49	Nomenclature of simple organometallic compounds
58.P-7	**College function**
59.L-50	Nomenclature of simple carbonyls,polynuclear carbonyls
60.L-51	Nomenclature of metal-olefin complexes
61.L-52	Effective atomic number rule applied to metal carbonyls
62.L-53	18-electron rule applied to organometallic compounds.Significance and applications
63.L-54	Structure and nature of metal-ligand bond in metal carbonyls
64.P-8	**Department meeting**
65.L-55	Metal nitrosyls.EAN rule applied to metal nitrosyls
66.L-56	Preparation of organometallic compounds of Mg,Zn,Li and Cu
67.L-57	Preparation of organometallic compounds of P,B,Ti,Fe and Co

68.L-58	Hydrogenation of olefins by Wilkinson's catalyst **Allotting portion for Internal Test III**
69.L-59	Hydroformylation of olefins by $Co_2(co)_8$
70.L-60	Monsanto Acetic acid process
71.L-61	Ziegler-Natta catalyst and polymerisation of olefins
72.L-62	UNIT V PHOTOINORGANIC CHEMISTRY –Introduction
73.L-63	Electronic transitions in metal complexes.Selectionrules-metal-centred and charge transfer transitions
74.IT-III	**Internal Test - III**
75.L-64	Properties of exited states
76.L-65	Bimolecular quenching and energy transfer
77.L-66	**Test paper distribution and result analysis** **Entering Internal Test III marks into University portal**
78.L-67	Photochemical pathways -photosubstitution reaction
79.L-68	Photoredox reaction-photoisomerisation reaction
80.L-69	Over all view of photochemical pathways
81.P-9	**College function**
82.L-70	Photosubstitution reactions of Cr(III) complexes
83.L-71	Photoredox reactions of Co(III) complexes Adamson's rules
84.L-72	Photoisomerism of Pt(II) complexes
85.L-73	Photochemical conversion and storage of solar energy
86.L-74	Photolytic cleavage of water into H_2 and O_2 **Model Test Announcement** Photoelectrochemical devices: Photogalvanic cells and semiconductor based photovoltaic cells
87.MT	Model Test
88.MT	Model Test
89.MT	Model Test
90.L-75	Model Test paper distribution and feedback of the course, analysis and report preparation
	Last working day on 22.04.2019

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY-III"
CO1	Naming different types of complexes
CO2	Write the structure of the coordination complexes according to IUPAC rules
CO3	Calculation of oxidation number of metal ions
CO4	Calculation of CFSE in a strong and weak field
CO5	Discuss EAN rule of metal carbonyls
CO6	Explain labile and inert complexes by VBT
CO7	Naming metal-olefin complexes
CO8	Applications of CFT
Experimental Learning	
EL1	Prepare metal complexes

EL2	Construct and working of photogalvanic cell and photovoltaic cell
Integrated Activity	
IA1	Prepare model of metal carbonyls and metal nitrosyls
IA2	Prepare model of cis-trans isomers

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, study tour, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher study.

Forslow learner : special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by staff members handling the course)

Programme Name	B. Sc Chemistry
Course Name	Inorganic preparations and determination of physical constants
Course Code	SMCHP4
Class	II year (2017-2020)
Semester	Even
Staff Name	Mrs. J. Betsy Ratnabai
Credits	1
P. Hours	2/WK
Total 30 Hrs/Sem Model Test-2 Hrs College Meeting-2 Hrs University Practical-2 Hrs Remaining 24 Hrs (12X2=24)Hrs	

Objectives

- To make the students thorough in inorganic complex preparations
- To determine the physical constants

MSU / 2017-18 / UG-Colleges / Part-III (B.Sc.Chemistry) /Semester –IV/Major Practical

INORGANIC PREPARATIONS & DETERMINATION OF PHYSICAL CONSTANTS

L T P C 0 0 2 1

Objectives

 To make the students thorough in inorganic complex preparations

Inorganic preparations

1. Preparation of potash alum

2. Preparation of chrome alum

3. Preparation of Prussian blue

4. Preparation of sodium ferrioxalate

5. Preparation of tetramminecopper(II) sulphate

6. Preparation of tristhiourea copper(I)chloridedihydrate

7. Preparation of potassium trisoxalatoferrate(III)

8. Preparation of hexathiourealead(II) nitrate

Internal – 50 marks

25 marks - Regularity

20 marks – Average of best (preparation-4) four experiments in regular class work

5 marks - Average of 2 physical constant determinations

External -50 marks

20 marks – Record (atleast four experiments preparation-3 and phy. cont. detmn.-2)*

20 marks – Procedure-5 and preparation-15)

10 marks – phy. cont. detmn

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.

2. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edi., ELBS/Longman England, 1989. 3. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand& Company Ltd reprint 2009.

4. V.K.Ahluwalia, Sunitha Dhingra, Adarsh Gulate College Practical Chemistry, Universities Press (India) Pvt Ltd 2008 (reprint)

Course Calender

Hour Allotment	**Class Schedule** Even Semester begins on 03.12.2018
1.P-1	Introduction
2.P-2	Preparation of complex no. 1
3.P-3	Preparation of complex no. 2
4.P-4	Preparation of complex no. 3
5.P-5	Preparation of complex no. 4
6.P-6	Preparation of complex no. 5
7.P-1	College Meeting
8.P-7	Preparation of complex no. 6
9.P-8	Preparation of complex no. 7

10.P-9	Preparation of complex no. 8
11.P-10	Determination of physical constant- Demonstration
12.P-11	Determination of physical constant 1
13.P-12	Determination of physical constant 2 Feedback of the course, analysis and report preparation
14.MT-1	Model Test
15.P-2	University Practical Last working day on 23.04.2019

Course Outcomes

Learning Outcomes	**COs** of the "Inorganic Preparation and determination of physical constants"
CO1	Prepare different complexes
CO2	Determine melting point of the substance
CO3	Determine boiling point of the substance

HOD Signature

Staff Signature

Principal

Lesson plan

Allied chemistry – II

S.No	Topics to be covered	Lecture class no
	Spectroscopy – II	
1	Raman spectroscopy: Principle – Raley scattering – stokes and anti stokes lines	1
2	Difference between IR and Raman spectroscopy – mutual exclusion principle	2
3	Selection rule – applications	3
4	NMR spectroscopy: theory of NMR, modes of nuclear spin – relaxation process	4
5	Shielding effect, hyperfine splitting, coupling constants – chemical shift	5
6	Factors affecting chemical shift, internal standard, delta and tow scale	6
7	Applications of NMR and limitations of NMR	7
8	ESR spectroscopy: principles – energy level splitting – presentation of ESR spectrum for methyl and benzene radicals and applications	8
9	Mass spectroscopy: basic principles of mass spectrum, molecular peak, base peak, isotropic peak, meta stable peak	9
10	Types of fragmentation, factors affecting the fragmentation, Mc-Lafferty rearrangement and applications	10
11	Internal test	11
12	Seminar / test	12
	Chemical kinetics	
13	Rate of reaction – measuring rates of reaction, expressing reaction rates – factors influencing rate constant	13
14	Rate laws, stoichiometry, order and molecularity of reactions, first order second order third order and zero order reactions and examples	14
15	Characteristics of I, II, III and zero order reactions	15
16	Determination of order of reactions, expression for rate constants of first and second order reaction – derivation	16
17	Effect of temperature on reaction rate, the activation energy	17
18	Determination of Arrhenius frequency factor and energy of activation	18
19	The collision theory or reaction rates and its limitations	19
20	Lindermann theory of unimolecular reactions	20
21	The theory of absolute reaction rates	21
22	Comparison of the collision theory with the Absolute reaction rate theory	22
23	Internal test 2	23
24	Seminar / test	24
	Ionic equilibria	
25	The Oswald's dilution law, experimental verification and limitations	25
26	Acids and bases – Lewis concept	26
27	Dissociation of weak acid and weak base	27
28	Dissociation of water, pH scale common ion effect	28
29	Its applications	29

30	Buffer solution, different types of buffer, calculation of pH value of buffer solution	30
31	Hydrolysis of salts, salts of weak acid and strong base, salts of weak base and strong acids, salts of weak acids and weak base	31
32	Determination of degree of hydrolysis, acid base indicators	32
33	Acid base titration and use of indicators, solubility product -	33
34	Applications of solubility product	34
35	Internal test 3	35
36	Seminar / test	36
	Phase equilibria	
37	Phase rule - component, degree of freedom, thermodynamic derivation of phase rule	37
38	One component system, phase diagram of water and Sulphur system	38
39	Two component system – simple eutectic system: lead silver system	39
40	Potassium iodide – water system.	40
41	Formation of compounds with congruent melting point – magnesium – zinc system	41
42	Ferric chloride – water system	42
43	Distribution law – statement and thermodynamic deviation – association of the solute in one of the solvents	43
44	Dissociation of the solute in one of the solvents	44
45	Applications of the distribution law	45
46	Solvent extraction	46
47	Model exam	47
48	Seminar / test	48
	Nano chemistry	
49	Definition – size dependent properties, magnetic and electric and optical field	49
50	Quantum dots	50
51	Metal oxides and metal nano particles	51
52	Ceramic nano particles	52
53	Synthesis of nano particles – bottom up and top down approaches, tjhin film deposition	53
54	Catalytic assistent growth chemical vapour deposition	54
55	Sol gel method, chemical reduction fullerenes, carbon nano tubes,	55
56	single walled and multi walled nano tubes – structures	56
57	Carbon nanofibre, nano composite	57
58	Applications of nano science and nano technology	58
59	Class test	59
60	Revision	60

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. Jim Livingston)

Programme Name	B. Sc Mathematics
Course Name	Water management
Course Code	
Class	II year (2017-2020)
Semester	Odd
Staff Name	1.Mr. D. Jim Livingston 2. Mrs.J. Betsy Ratnabai
Credits	2
L. Hours /P. Hours	2 / WK
Total 30 Hrs/Sem Internal Test-3 Hrs Dept. Meetings-1Hrs College Meetings-1Hrs Remaining 25 Hrs (5 units; 5×5=25; 5 Hrs /unit)	

Course Objectives

- To realize the importance of quality water in day to day life
- To understand the various water quality parameters
- To study about water purification techniques
- To know about treatment of waste water
- To acquire knowledge about the management of water in India

MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Chemistry) Semester-III/Ppr.no.24 (B)/ Non Major Elective- I (B)

WATER MANAGEMENT

UNIT I - WATER POLLUTION

Definition-sources of water pollution-types of water pollutants: sewage and domestic wastes, industrial effluents, agricultural discharges, detergents, disease causing agents and radioactive materials. Eutrophication and its effects.

UNIT II - WATER QUALITY PARAMETERS

Physical, chemical and biological water quality parameters-water quality standards for drinking water –BIS and WHO. Determination of pH, Total hardness, DO, BOD and COD.
UNIT III - WATER PURIFICATION

Purification of water for drinking purposes: Sedimentation, filtration and disinfection-Desalination: reverse osmosis-Purification of water for industrial purposes: water softening-permutit process and ion-exchange process.

UNIT IV - WASTE WATER TREATMENT

Elementary ideas of waste water treatment: pre-treatment-primary treatment-secondary treatment: aerobic and anaerobic processes –tertiary treatment: evaporation adsorption –chemical precipitation.

UNIT V - RESTORATION AND MANAGEMENT

Importance of lakes and rivers-stresses on the Indian rivers and their effects –A restoration case study: Ganga Action Plan: objectives implementation and drawbacks. Rain water harvesting –water recycling- The water Prevention and control of Pollution Act 1974.

Reference books :

1. A. K. De, Environmental Chemistry, Wiley Eastern Ltd., New Delhi.

2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut.

3. R. K. Trivedy and P. K. Goel, Chemical and biological methods for water pollution studies, Environmental Publications, Karad, India.

4. BIS 1991, Specification for drinking water, Bureau of Indian Standards, New Delhi

5. WHO 1992, International standards for drinking water, World Health Organisation, Geneva.

Course Calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 06-12-2018
1-L1	UNIT I - WATER POLLUTION -Introduction – Definition-sources of water pollution
2-L2	types of water pollutants
3- L3	Detergents: Definition –various types with examples.
4-L4	disease causing agents and radioactive materials.
5-L5	Eutrophication and its effects.
6-L6	UNIT II - WATER QUALITY PARAMETERSIntroduction - Definition
7-L7	Physical, chemical and biological water quality parameters
8-IT-1	**Internal Test-I**
9-L8	quality standards for drinking water
10-L9	Determination of pH, Total hardness
11-L10	DO, BOD and COD.
12-P1	**Department Association Meeting**
13-L11	UNIT III - WATER PURIFICATIONintroduction -Purification of water for drinking purposes

14-L12	Sedimentation, filtration and disinfectionAllotting portion for Internal Test-II.
15-L13	reverse osmosis
16-L14	water softening-permutit process and ion-exchange process
17-IT-2	**Internal Test-II**
18-L15	UNIT IV - WASTE WATER TREATMENT - introduction
19-L16	pre-treatment-primary treatment
20-L17	secondary treatment: aerobic and anaerobic processes
21-P2	**College level meeting/Cell function**
22-L18	tertiary treatment: evaporation adsorption
23-L19	UNIT V - RESTORATION AND MANAGEMENT - Intoduction- Importance of lakes and rivers. Allotting portion for Internal Test-III.
24-L20	Ganga Action Plan
25-L21	Rain water harvesting
26-IT-3	**Internal Test-III**
27-L22	stresses on the Indian rivers and their effects
28-L23	The water Prevention and control of Pollution Act 1974
29-L24	Over all view of the course by PPT
30-L25	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course “WATER MANAGEMENT”
CO1	understand about waste water treatment
CO2	Gain knowledge about ill effects of detergent
CO3	Acquire idea about water quality parameters
CO4	Able to illustrate the treatment of waste water
CO5	describe the role of ion-exchangers in water softening process
Experimental Learning	
EL1	Determination of pH, Total hardness
EL2	reverse osmosis.
EL3	GD on merit and demerit of Rain water harvesting

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, etc.,

For Advanced Learners : use library books, E- books, motivate students to prepare for higher study.

Forslow learners : special care has been taken to make them understand the concepts easily. To attend the remedial classes.

Extension activity : Motivate students to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

1. Questionnaires for Course Feedback from Students

Name of the student	
Programme Name	
Course Name	
Course code	
Year of Joining	
Semester	
Date	

Put a tick in the best represents your response to each statement.

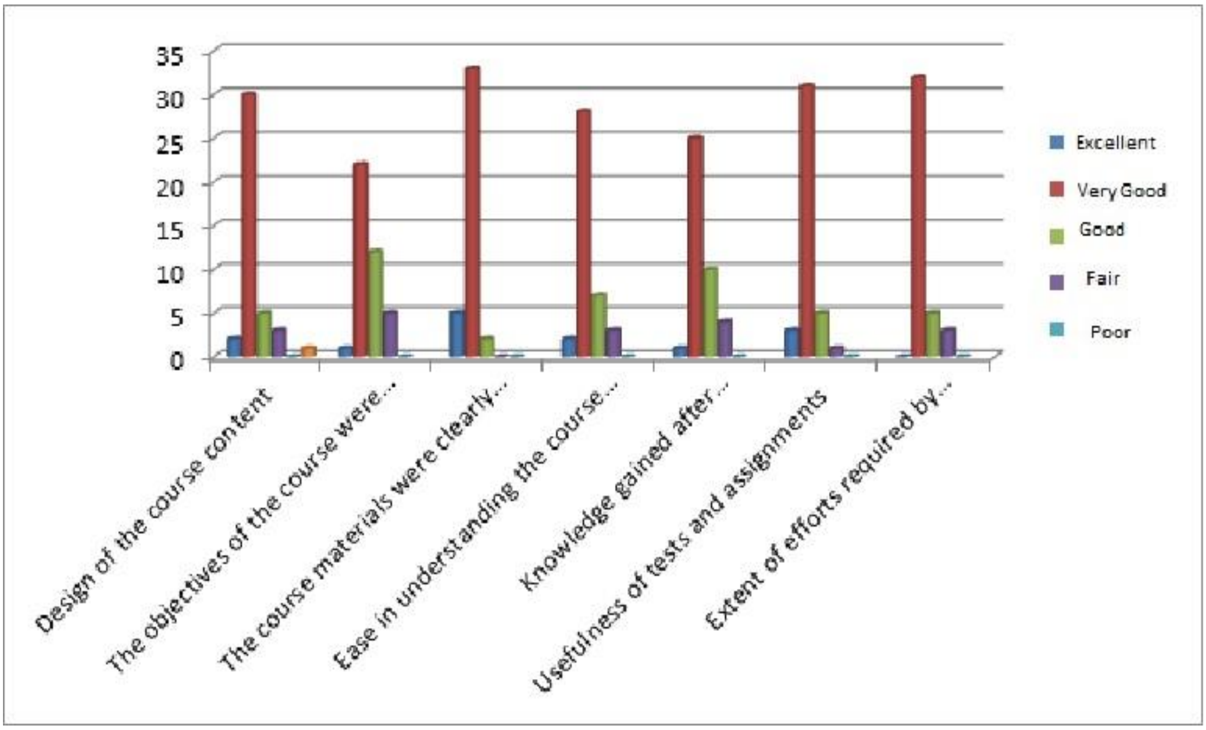
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Knowledge gained after completion of the course.	A	B	C	D	E
6	Usefulness of tests and assignments	A	B	C	D	E
7	Extent of efforts required by students.	A	B	C	D	E

Course Feedback Analysis and Report Preparation

Number of responses : 40

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	30	5	3	0
2	The objectives of the course were clearly stated.	1	22	12	5	0
3	The course materials were clearly explained.	5	33	2	0	0
4	Ease in understanding the course content.	2	28	7	3	0
5	Knowledge gained after completion of the course.	1	25	10	4	0
6	Usefulness of tests and assignments	3	31	5	1	0
7	Extent of efforts required by students.	0	32	5	3	0

Chart Preparation



Report Preparation

During the year 2017-2018 a high score has been provided by the students for curriculum and teaching quality were analysed, it was noted that the curriculum and the usefulness was adequate. The overall impression was also good.

St. John's College, Palayamkottai

Department of Chemistry

2. Questionnaires for Course Feedback from Teachers

Name of the Teacher	
Programme Name	
Course Name	
Course code	
Semester/Year	
Date	

Put a tick in the best represents your response to each statement.

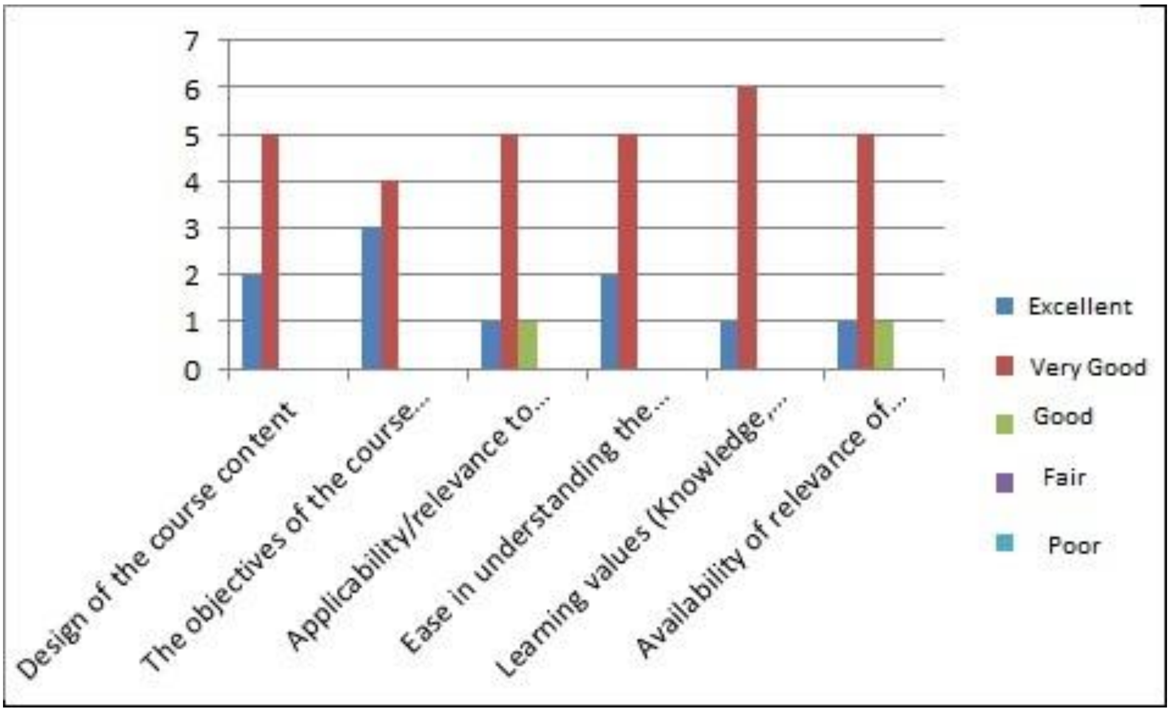
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses: 7

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	5	0	0	0
2	The objectives of the course were clearly stated.	3	4	0	0	0
3	Applicability/relevance to real	1	5	1	0	0

	life or job related.					
4	Ease in understanding the course content.	2	5	0	0	0
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	1	6	0	0	0
6	Availability of relevance of additional source materials	1	5	1	0	0

Chart preparation



St. John's College, Palayamkottai

Department of Chemistry

3. Questionnaires for Course Feedback from Alumni

Name of the Alumni	
Programme Name	
Course Name	
Contact No/Mail id	
Semester and year	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses:

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content					
2	The objectives of the course were clearly stated.					
3	Applicability/relevance to real life or job related.					
4	Ease in understanding the					

	course content.					
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)					
6	Availability of relevance of additional source materials					

4. Questionnaires for Course Feedback from Parents

Name of the Parent	
Name of the Student	
Programme Name	
Course Name	
Contact Number/Mail id	
Year of Joining/Semester	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Academic Procedure	A	B	C	D	E
2	Course materials available in Library.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Improvement in soft skills, knowledge, observed by you in your ward.	A	B	C	D	E
5	Usefulness of the course for getting job.	A	B	C	D	E
6	Execution of teaching methods	A	B	C	D	E

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. Jim Livingston)

Programme Name	B. Sc Mathematics
Course Name	Applied Chemistry
Course Code	
Class	II year (2017-2020)
Semester	Even
Staff Name	1.Mr. D. Jim Livingston 2. Mrs.J. Betsy Ratnabai
Credits	2
L. Hours /P. Hours	2 / WK
Total 30 Hrs/Sem Internal Test-3 Hrs Dept. Meetings-1Hrs College Meetings-1Hrs Remaining 25 Hrs (5 units; 5×5=25; 5 Hrs /unit)	

Course Objectives

- To learn the chemistry soaps and detergents
- To understand the characteristics and role of fertilizers
- To study about polymers and plastics
- To know about various chemicals used in pharmacy
- To acquire knowledge about the chemicals used in day to day life

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – IV / Non Major Elective –II (B)

APPLIED CHEMISTRY

UNIT I - SOAPS AND DETERGENTS

Soaps: Definition-classification-raw materials used in the manufacture of soap –manufacture of toilet soap. Detergents: Definition –various types with examples- advantages of detergents over soaps –cleansing action of soap.

UNIT II- FERTILIZERS

Definition-characteristics of a good fertilizer- role of nitrogen, potassium and phosphorous in plant growth – natural fertilizers- chemical fertilizers: urea, muriate of potash and triple superphosphate - mixed fertilizers - biofertilizers – advantages of biofertilizers.

UNIT III - POLYMERS Fibers: Classification –uses of terylene, nylon and orlon. Resins: Natural resins- synthetic resins-type-uses of fevicol, quick fix, araldite, glyptal and Bakelite. Plastics: classification- differences between thermoplasts and thermosets. Advantages of plastics-uses of polythene, PVC, polystyrene, Teflon and thermocole. Rubber: Types-defects in natural rubber-vulcanization-synthetic rubbers- uses of neoprene, thiocol, butyl rubber, silicone rubber and foam rubber.

UNIT IV - CHEMICALS IN PHARMACY

Definition and therapeutic uses of the following (an elementary study only) Antiseptics: alum, boric acid Mouth washes: Hydrogen peroxide Antacids: Aluminium hydroxide Analgesics: Aspirin, paracetamol Antibiotics: Penicillins, tetracyclines Haematinics: Ferrous fumerate, ferrous gluconate Laxatives: Epsom salt, milk of magnesia Sedatives: Diazepam

UNIT V - CHEMICALS IN DAY-TO-DAY LIFE

An outline of the preparation and uses of the following articles.Tooth powder, tooth paste, writing inks, gum paste, boot polish, talcum powder, chalk crayons, agar battis, phenyl and moth balls.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 06-12-2018
1-L1	UNIT I–SOAPS AND DETERGENTS -Introduction – Definition-classification of soaps
2-L2	Raw materials used in the manufacture of soap.
3- L3	Manufacture of toilet soap.
4-L4	Detergents: Definition –various types with examples.
5-L5	advantages of detergents over soaps –cleansing action of soap.Allotting portion for Internal Test-I.
6-L6	UNIT II- FERTILIZERS. Introduction - Definition-characteristics of a good fertilizer
7-L7	Role of nitrogen, potassium and phosphorous in plant growth
8-IT-1	**Internal Test-I**
9-L8	Natural fertilizers- chemical fertilizers:
10-L9	Properties and uses of urea, muriate of potash and triple superphosphate
11-L10	mixed fertilizers - biofertilizers – advantages of biofertilizers.
12-P1	**Chemistry Association Meeting**
13-L11	UNIT III – POLYMERS introduction -Fibers: Classification –uses of terylene, nylon and orlon.
14-L12	Resins: Natural resins- synthetic resins-type-usesAllotting portion for Internal Test-II.
15-L13	Plastics: classification- differences between thermoplasts and thermosets. Advantages of plastics
16-L14	Rubber: Types-defects in natural rubber-vulcanization
17-IT-2	**Internal Test-II**
18-L15	Uses of neoprene, thiocol, butyl rubber, silicone rubber and foam rubber.

19-L16	UNIT IV - CHEMICALS IN PHARMACY – Introduction – Elementary study of mouthwash, antacids, antiseptics
20-L17	Antibiotics, heamatinics and analgesics
21-P2	**College level meeting/Cell function**
22-L18	Laxatives and sedatives
23-L19	UNIT V - CHEMICALS IN DAY-TO-DAY LIFEIntoduction- Preparation of writing inks. Allotting portion for Internal Test-III.
24-L20	Preparation and uses of tooth powder, tooth paste
25-L21	gum paste, boot polish, talcum powder
26-IT-3	**Internal Test-III**
27-L22	chalk crayons, agar battis
28-L23	phenyl and moth balls.
29-L24	Over all view of the course by PPT
30-L25	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "APPLIED CHEMISTRY "
CO1	understand what is needed to achieve effective cleaning
CO2	Compare the effectiveness of cleansing action of soap and detergent
CO3	Characterize fertilizers on the basis of different properties.
CO4	Justify the need for biofertilizersand its benefits
CO5	describe the role of rubber-toughening in improving the mechanical properties of polymers
CO6	Distinguish between thermoplastic and thermosetting plastics
CO7	Able to illustrate the therapeutic uses of chemicals used as medicines.
CO8	Ingredients present in daily life chemical products
CO9	Prepare simple daily life products in home.
Experimental Learning	
EL1	Cleansing action of soap
EL2	To categorize and collect fertilizers.
EL3	GD on merit and demerit of plastics
EL4	To prepare simple daily life products like tooth powder, phenyl etc.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, etc.,

For Advanced Learners : use library books, E- books, motivate students to prepare for higher study.

Forslow learners : special care has been taken to make them understand the concepts easily. To attend the remedial classes.

Extension activity : Motivate students to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

1. Questionnaires for Course Feedback from Students

Name of the student	
Programme Name	
Course Name	
Course code	
Year of Joining	
Semester	
Date	

Put a tick in the best represents your response to each statement.

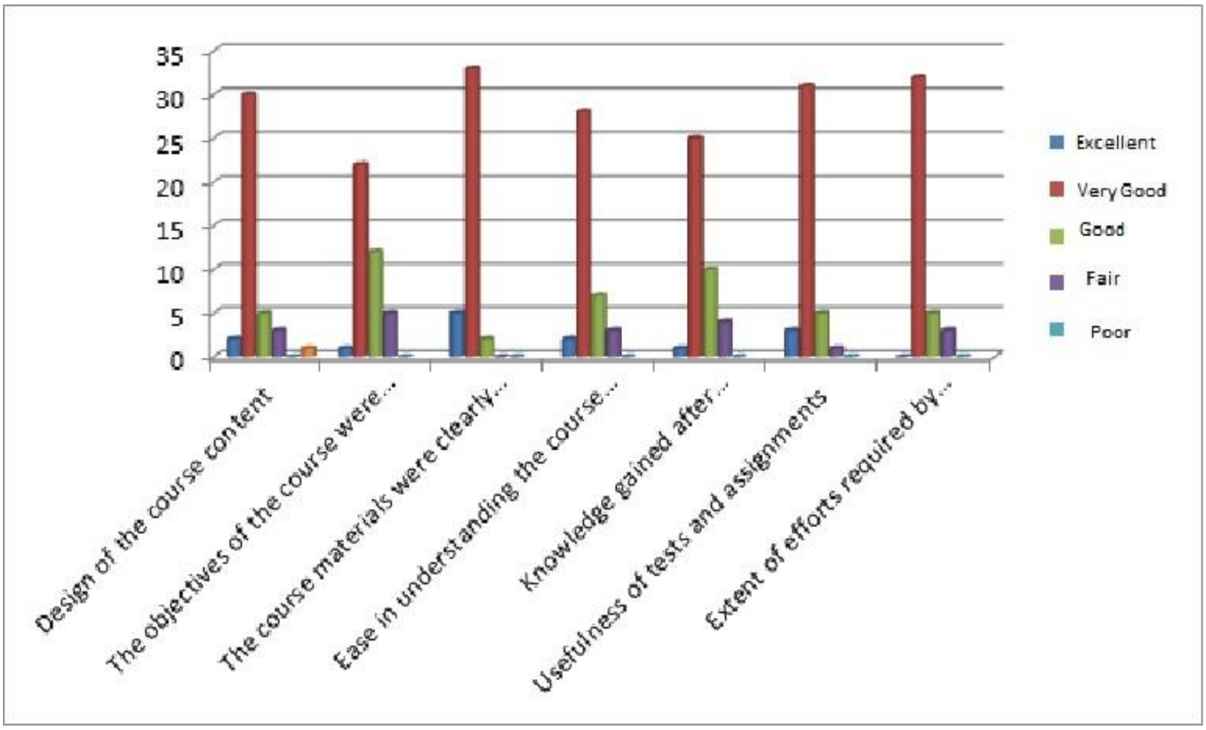
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Knowledge gained after completion of the course.	A	B	C	D	E
6	Usefulness of tests and assignments	A	B	C	D	E
7	Extent of efforts required by students.	A	B	C	D	E

Course Feedback Analysis and Report Preparation

Number of responses : 40

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	30	5	3	0
2	The objectives of the course were clearly stated.	1	22	12	5	0
3	The course materials were clearly explained.	5	33	2	0	0
4	Ease in understanding the course content.	2	28	7	3	0
5	Knowledge gained after completion of the course.	1	25	10	4	0
6	Usefulness of tests and assignments	3	31	5	1	0
7	Extent of efforts required by students.	0	32	5	3	0

Chart Preparation



Report Preparation

During the year 2017-2018 a high score has been provided by the students for curriculum and teaching quality were analysed, it was noted that the curriculum and the usefulness was adequate. The overall impression was also good.

St. John's College, Palayamkottai

Department of Chemistry

2. Questionnaires for Course Feedback from Teachers

Name of the Teacher	
Programme Name	
Course Name	
Course code	
Semester/Year	
Date	

Put a tick in the best represents your response to each statement.

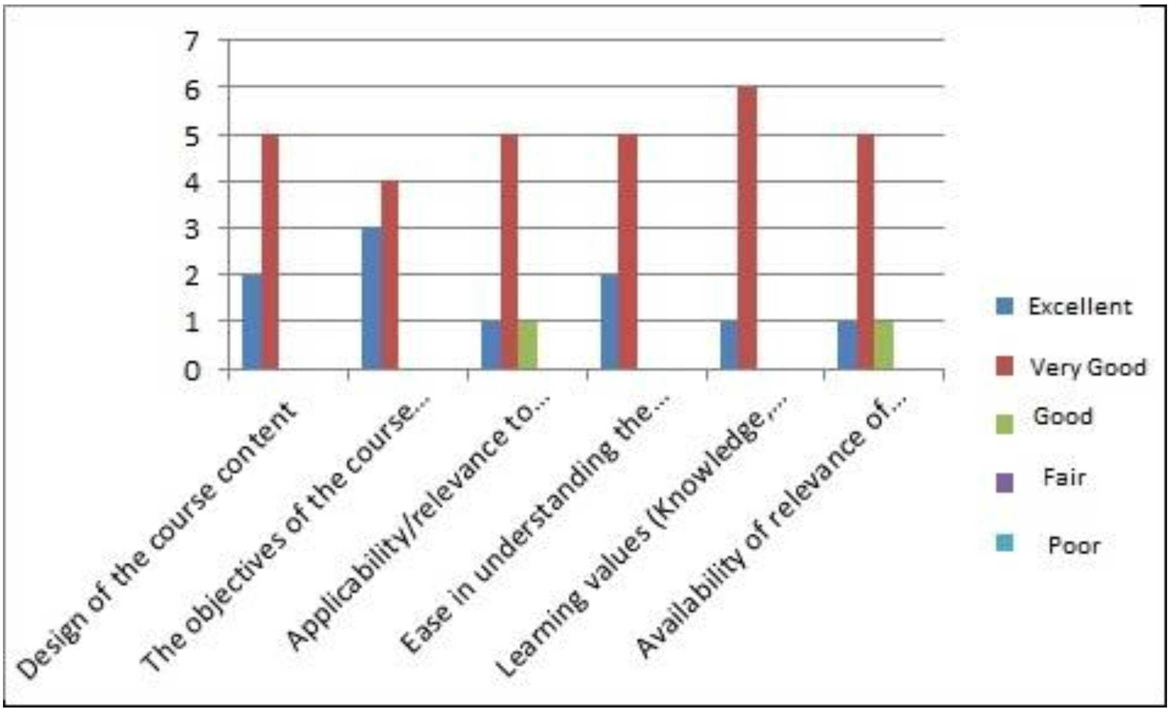
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real	A	B	C	D	E

	life or job related.					
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses: 7

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	5	0	0	0
2	The objectives of the course were clearly stated.	3	4	0	0	0
3	Applicability/relevance to real life or job related.	1	5	1	0	0
4	Ease in understanding the course content.	2	5	0	0	0
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	1	6	0	0	0
6	Availability of relevance of additional source materials	1	5	1	0	0

Chart preparation



St. John's College, Palayamkottai

Department of Chemistry

3. Questionnaires for Course Feedback from Alumni

Name of the Alumni	
Programme Name	

Course Name	
Contact No/Mail id	
Semester and year	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses:

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content					
2	The objectives of the course were clearly stated.					
3	Applicability/relevance to real life or job related.					
4	Ease in understanding the course content.					
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)					
6	Availability of relevance of additional source materials					

4. Questionnaires for Course Feedback from Parents

Name of the Parent	
Name of the Student	
Programme Name	
Course Name	

Contact Number/Mail id	
Year of Joining/Semester	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Academic Procedure	A	B	C	D	E
2	Course materials available in Library.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Improvement in soft skills, knowledge, observed by you in your ward.	A	B	C	D	E
5	Usefulness of the course for getting job.	A	B	C	D	E
6	Execution of teaching methods	A	B	C	D	E

Lesson plan

Allied chemistry – 1

S.No	Topics to be covered	Lecture class no
	Inorganic chemistry	
1	Atomic structure, electronic configuration	1
2	Aufbau principle, Pauli's exclusion principle	2
3	Hunds rule	3
4	Bonding, electrovalent	4
5	Covalent bonding hydrogen bonding	5
6	Orbitals overlap ss overlap	6
7	Sp overlap, Hybridization	7
8	VSEPR theory, CH_4, C_2H_6, C_2H_2	8
9	$BeCl_2$, BF_3, NH_3, H_2O	9
10	PCL_5, IF_5, IF_7	10
11	Internal test	11
12	Seminar / test	12
	Organic chemistry – Principles of reactions	
13	Heterolytic and homolytic cleavage	13
14	Nucleophiles and electrophiles	14
15	Reaction intermediates	15
16	Preparation and properties of carbonium ions	16
17	Preparation and properties of carbocation	17
18	Preparation and properties of free radicals	18
19	Types of reactions – substitution	19
20	Addition reaction	20
21	Elimination reaction	21
22	Polymerisation reaction	22
23	Internal test 2	23
24	Seminar / test	24
	Physical chemistry – Photo chemistry	
25	Definition – comparison between thermal and photochemical reactions	25
26	Laws of photo chemistry – Beer Lamberts law, GrothusDroper law	26
27	Einstein law, quantum yield	27
28	Low and high quantum yield	28
29	Determination of quantum yield	29
30	Fluorescence – definition with examples	30
31	Phosphorescence – definition with examples	31
32	Thermoluminescence – definition with examples	32
33	Chemiluminescence – definition with examples	33
34	Bioluminescence – definition with examples, photosensitization	34
35	internal test 3	35
36	seminar / test	36
	Polymer chemistry	
37	Definition, monomer, oligomers, polymers	37
38	Classification of polymers	38
39	Natural and synthetic polymers, cross linked polymers	39

40	Network polymers, fibres – homopolymers	40
41	Copolymers, thermoplastics – poly ethylene	41
42	Polystyrene, poly acrylonitrile and poly vinyl chloride	42
43	Nylon and polyester, Thermosetting plastics	43
44	phenol formaldehyde, Epoxide resins, elastomers,	44
45	Natural rubbers and synthetic rubbers	45
46	Buna N and Buna S rubbers and neoprene rubber	46
47	Model exam	47
48	Seminar / test	48
	Applied chemistry	
49	Lubricants, classification – criteria and good lubricating oils	49
50	Synthetic lubricating oils	50
51	Polly glycols, poly alkene oxide	51
52	Greases and semi lubricating oils – examples	52
53	Solid lubricants – grease	53
54	Preparation and uses of shampoo, nail polish	54
55	Preparation and uses of sunscreens, tooth powder	55
56	Preparation and uses of tooth paste, boot polish	56
57	Preparation and uses of moth balls	57
58	Preparation and uses of chalk piece	58
59	Class test	59
60	Revision	60

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. Jim Livingston)

Programme Name	B. Sc Physics
Course Name	Allied Chemistry-I
Course Code	SACH12
Class	I year (2018-2021)
Semester	Even
Staff Name	1.Mr. D. Jim Livingston 2. Mrs.S. Hilda Mabel
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To learn the chemistry of basic aromatic compounds..
- To understand the nuclear particles and few nuclear reactions
- To study about fuels, fertilizers, cement and glass.
- To know about carbohydrates, amino acids, proteins and nucleic acid.
- To know about some common diseases and the drugs used.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Chemistry) / Semester – II / Allied-2

ALLIED CHEMISTRY -I

UNIT 1: ORGANIC CHEMISTRY

Aromatic compounds General characteristics of aromatic compounds - aromaticity – Huckel's rule with examples- non – benzenoid aromatic compounds (definition and examples only) Preparation, properties and structure of benzene, anthracene and naphthalene.

UNIT 2 : PHYSICAL CHEMISTRY

Nuclear chemistry Nuclear stability – n/p ratio – packing fraction – mass defect – binding energy - isotopes, isobars, isotones with examples. Separation of isotopes by diffusion method – group displacement law - radioactive series - Nuclear fission, fusion - Application of radio isotopes (radio diagnosis and therapy, C-14 dating).

UNIT 3 : BIO CHEMISTRY

Carbohydrates –definition and classification – artificial synthetic sweeteners.Amino acids - classification – amphoteric nature – isoelectric point. Proteins - classification according to composition, solubility and shape - colour reactions - biological action . Nucleic acids – purines, pyrimidines, nucleocides, nucleotides – DNA – structure of DNA – RNA - different types of RNA

UNIT 4 : INDUSTRIAL CHEMISTRY

Fuel gases – Water gas, Producer gas, L.P.G, Gobar gas and Natural gas. Fertilizers – N.P.K and mixed fertilizers. Soaps and detergents – an elementary idea of soaps and detergents.Cleansing action of soaps and detergents. Cement and glass: Portland cement-manufacture only. Manufacture of glass- types and uses borosilicates -photochromic and safety glass.

UNIT-5: PHARMACEUTICAL CHEMISTRY

Common diseases – infective diseases – insect borne –air borne – water borne – hereditary diseases.Definition and examples of analgesics, antipyretics, sulpha drugs, antimalarials and, antibiotics. Diabetes – causes – hyper and hypoglycemic drugs. Indian medicinal plants – tulsi, neem, keezhanelli- their importance

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 06-12-2018
1-L1	UNIT I–AROMATIC COMPOUNDS -Introduction – classification of aliphatic and aromatic compounds.
2-L2	Explain the general characteristics of aromatic compounds and the concept of aromaticity.
3- L3	Huckel's rule of aromaticity and examples.
4-L4	To solve the Problems. H. W given.
5-L5	Non- benzenoid compounds and their characters.
6-L6	Preparation and structure of benzene.
7-L7	Orbital picture of benzene –over view -PPT
8-L8	Physical and chemical properties of benzene.
9-L9	Mechanism involved in nitration, sulphonation and alkylation
10-P1	**Chemistry Association Meeting**
11-L10	Structure and preparation of naphthalene using Haworth's method.
12-L11	Properties of naphthalene and structure of anthracene.
13-L12	Preparation and properties of anthracene.
14-L13	UNIT - II NUCLEAR CHEMISTRY – General introduction
15-L14	History of Natural radioactivity - detection and measurement of radioactivity
16-L15	Nuclear stability – n/p ratio – packing fraction**Allotting portion for Internal Test-I**

17-L16	Discuss mass defect – binding energy Problem H.W
18-IT-1	**Internal Test-I**
19-L17	isotopes, isobars, isotones with examples.
20-L18	**Test Paper distribution and result analysis-** Separation of isotopes by diffusion method
21-L19	group displacement law - radioactive series
22-L20	Artificial radioactivity - nuclear fission and nuclear fusion mechanism
23-P2	**College level meeting/Cell function**
24-L21	applications - differences – Stellar energy - nuclear reactors hazards of radiations - fertile and fissile isotopes.
25-L22	NUCLEAR CHEMISTRY- over view- PPT
26-L23	Applications of radioisotopes – C 14 dating, radio diagnosis and therapy,
27-L24	GD- about advantages and disadvantages of nuclear power plant
28-L25	UNIT - III BIO CHEMISTRY- Introduction
29-L26	Carbohydrates definition and classification.
30-L27	artificial synthetic sweeteners.
31-L28	Amino acids - classification – amphoteric nature – isoelectric point.
32-L29	Video form MOOC –BioChemistry
33-L30	Proteins - classification and their colour reactions
34- L31	Protein colour reaction - Experiments
35-L32	Nucleic acids – purines, pyrimidines, nucleocides, nucleotides**Allotting portion for Internal Test-II**
36-P3	**Department Seminar**
37-L33	DNA – structure of DNA
38-L34	RNA - different types of RNA and their role **Allotting portion for Assignment/seminar**
39-IT2	**Internal Test-II**
40-L35	UNIT - IV INDUSTRIAL CHEMISTRY-Introduction- Fuel gases
41-L36	Water gas, Producer gas, L.P.G, Gobar gas and Natural gas
42-L37	Fertilizers – N.P.K and mixed fertilizers.
43-L38	**Test Paper distribution and result analysis-** Soaps and detergents introduction
44-L39	Cleansing action of soaps and detergents.
45-P4	**College level meeting/ function**
46-L40	Portland cement-manufacture and uses
47-L41	Various types of glass and its manufacture
48-L42	uses of borosilicates -photochromic and safety glass.**SubmissionofAssignment**
49-L43	Asking stundents to bring various fertilizers available and to categorize them
50-L44	UNIT - V PHARMACEUTICAL CHEMISTRY Introduction- Motivate to collect different types of medicines
51-L45	insect borne –air borne**Allotting portion for Internal Test-III**
52-L46	water borne – hereditary diseases.Diabetes – causes – hyper and hypoglycemic drugs.
53-IT3	**Internal Test-III**
54-L47	Definition and examples of analgesics and antipyretics sulpha drugs, antimalarials and, antibiotics. - **Test Paper distribution and result analysis**
55-L48	Indian medicinal plants – tulsi, neem, keezhanelli- their importance **Model Test Announcement**
56-L49	Over all view of the course by PPT
57-MT	**Model Test**

58-MT	**Model Test**
59-MT	**Model Test**
60-L50	**Model test paper distribution and Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	Finding aromaticity of compounds using Huckel's rule and solve the problems.
CO2	Application of radioisotopes in various fields
CO3	Difference between isotopes, isotones and isobars.
CO4	Classification of aminoacids, proteins and carbohydrates
CO5	Understand the concept of cleansing action of soaps
CO6	Uses and manufacture of glasses and cements
CO7	Causes of various types of diseases and their remedy
CO8	Drugs and their action
CO9	Importance of indian medicinal plants
Experimental Learning	
EL1	To do colour reactions to find proteins
EL2	To categories and collect fertilizers.
EL3	GD on merit and demerit of radioactivity
EL4	To collect different medicinal plants
Integrated Activity	
IA1	Prepare model of nuclear reactor
IA2	Use of medicinal plants in our house.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, etc.,

For Advanced Learners : use library books, E- books, motivate students to prepare for higher study.

Forslow learners : special care has been taken to make them understand the concepts easily. To attend the remedial classes.

Extension activity : Motivate students to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

1. Questionnaires for Course Feedback from Students

Name of the student	
Programme Name	
Course Name	
Course code	
Year of Joining	
Semester	
Date	

Put a tick in the best represents your response to each statement.

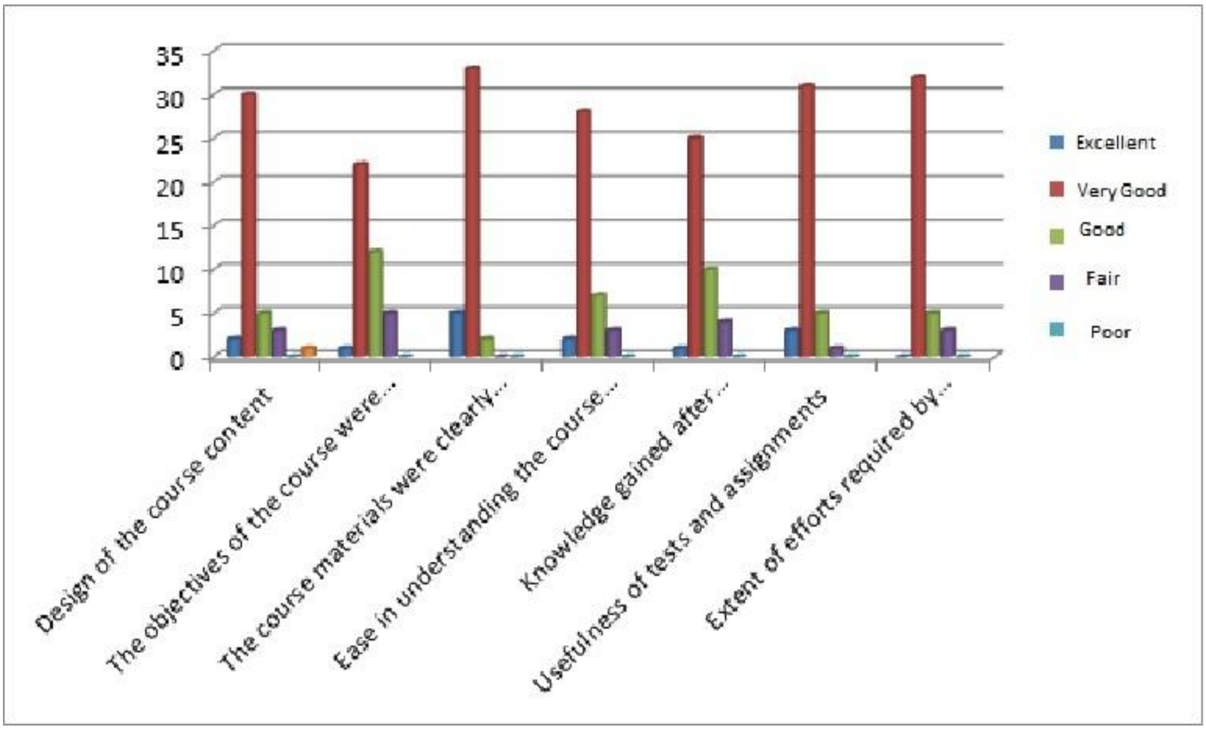
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Knowledge gained after completion of the course.	A	B	C	D	E
6	Usefulness of tests and assignments	A	B	C	D	E
7	Extent of efforts required by students.	A	B	C	D	E

Course Feedback Analysis and Report Preparation

Number of responses : 40

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	30	5	3	0
2	The objectives of the course were clearly stated.	1	22	12	5	0
3	The course materials were clearly explained.	5	33	2	0	0
4	Ease in understanding the course content.	2	28	7	3	0
5	Knowledge gained after completion of the course.	1	25	10	4	0
6	Usefulness of tests and assignments	3	31	5	1	0
7	Extent of efforts required by students.	0	32	5	3	0

Chart Preparation



Report Preparation

During the year 2017-2018 a high score has been provided by the students for curriculum and teaching quality were analysed, it was noted that the curriculum and the usefulness was adequate. The overall impression was also good.

St. John's College, Palayamkottai

Department of Chemistry

2. Questionnaires for Course Feedback from Teachers

Name of the Teacher	
Programme Name	
Course Name	
Course code	
Semester/Year	
Date	

Put a tick in the best represents your response to each statement.

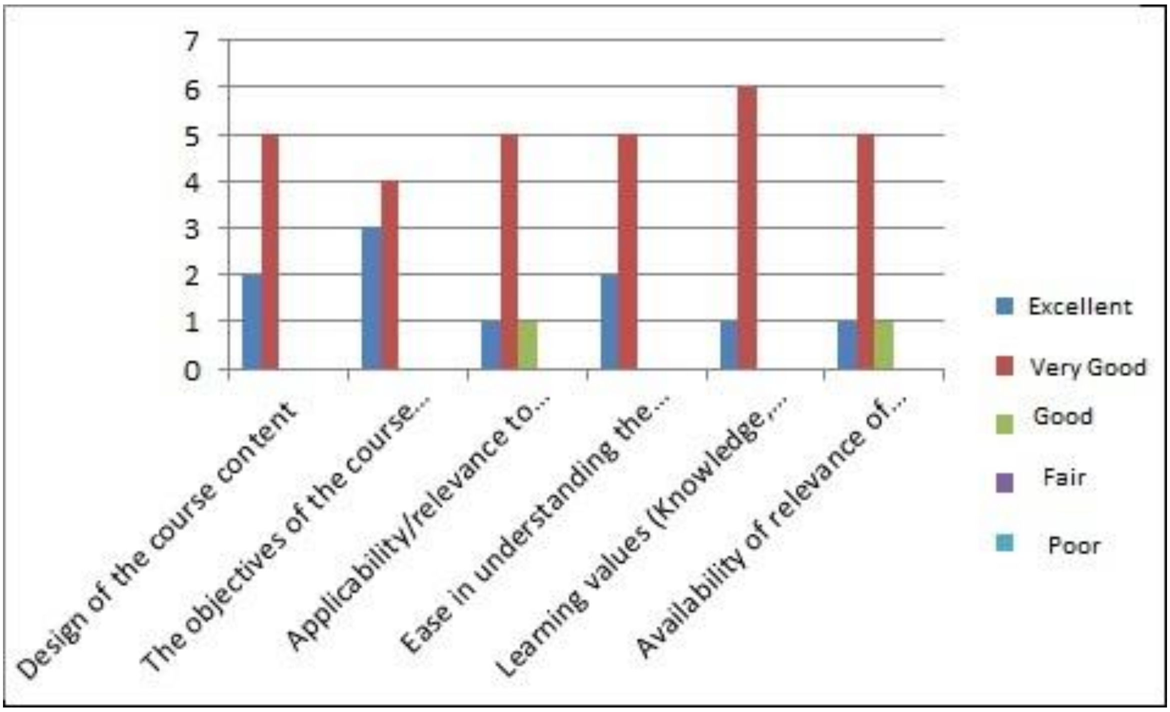
No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses: 7

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	2	5	0	0	0
2	The objectives of the course were clearly stated.	3	4	0	0	0
3	Applicability/relevance to real life or job related.	1	5	1	0	0
4	Ease in understanding the course content.	2	5	0	0	0
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and	1	6	0	0	0

	broadening skills)					
6	Availability of relevance of additional source materials	1	5	1	0	0

Chart preparation



St. John’s College, Palayamkottai

Department of Chemistry

3. Questionnaires for Course Feedback from Alumni

Name of the Alumni	
Programme Name	
Course Name	
Contact No/Mail id	
Semester and year	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content	A	B	C	D	E
2	The objectives of the course were clearly stated.	A	B	C	D	E
3	Applicability/relevance to real life or job related.	A	B	C	D	E
4	Ease in understanding the course content.	A	B	C	D	E
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)	A	B	C	D	E
6	Availability of relevance of additional source materials	A	B	C	D	E

Number of Responses:

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Design of the course content					
2	The objectives of the course were clearly stated.					
3	Applicability/relevance to real life or job related.					
4	Ease in understanding the course content.					
5	Learning values (Knowledge, concepts, analytical abilities, practical knowledge and broadening skills)					
6	Availability of relevance of					

	additional source materials					

4. Questionnaires for Course Feedback from Parents

Name of the Parent	
Name of the Student	
Programme Name	
Course Name	
Contact Number/Mail id	
Year of Joining/Semester	
Date	

Put a tick in the best represents your response to each statement.

No.	Parameters	A Excellent	B Very Good	C Good	D Fair	E Poor
1	Academic Procedure	A	B	C	D	E
2	Course materials available in Library.	A	B	C	D	E
3	The course materials were clearly explained.	A	B	C	D	E
4	Improvement in soft skills, knowledge, observed by you in your ward.	A	B	C	D	E
5	Usefulness of the course for getting job.	A	B	C	D	E
6	Execution of teaching methods	A	B	C	D	E

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. DANIEL ABRAHAM)

Programme Name	M. Sc Chemistry
Course Name	Research Methodology
Course Code	HCHE11
Class	I year (2014-2015)
Semester	Odd
Staff Name	Mr. S. DANIEL ABRAHAM
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand about literature survey.
- To study the spectroscopic techniques.
- To study the chromatographic techniques.
- To understand radiochemical methods.
- To learn the data analysis.

RESEARCH METHODOLOGY – I

Unit – I : Literature survey and Choosing a Research Problems

Survey of literature including patents – primary source – secondary source – including reviews, treatise and monographs- literature survey – abstraction of research papers – possible ways of getting oneself familiar with current literature.

Identification of research problems – assessing the status of the problem guidance from the supervisor – actual investigation and analysis of experimental results – Conclusions – Presenting scientific seminar – reporting the results in the form of communication, paper etc.- Writing thesis.

Unit – II : Spectroscopic Techniques

Types of atomic spectroscopy – emission methods – absorption methods – fluorescence methods – atomizers for atomic spectroscopy – flame atomizers – Electrothermal atomizers – inductively coupled plasma sources of radition – Applications of atomic emission spectroscopy. Principle instrumentation and data interpretation of TEM, SEM, EDAX and XRD analysis. Calculations of particle size of nanaoparticles from XRD spectra – Debye-Scherrer formula – lattice constant findings.

Unit – III : Chromatography

Gas chromatography: Theory of Chromatography – column efficiency and column equation – sample injection – sampling system for capillary columns and packed columns – detectors – gas flow control system – high resolution gas chromatography/ mass spectroscopy. HPLC: Principles of high performance liquid chromatography – the liquid chromatograph – the requirements of solvent pumping and different pumping systems – gradient elutions, isocratic elution , sampling- detectors for liquid chromatography – the mobile phase in HPLC- solvent degassing – column technology – column selection – quantitative analysis by HPLC.

Unit – IV Radiochemical Methods

General theoretical consideration – special precautions for radiochemical studies – equipment for measuring radio activity – G.M Counter – tracers and traces- determination of characteristics of GM Counter – Determination of dead time of GM Tube- determination of the absorption curve for ^{234}Th – ^{234}Pa sample. Isotope diltion analysis – verification of the principle of isotope dilution analysis – determination of equilibrium constant of a reaction by ion – exchange method using tracers.

Unit – V : Data Analysis and Article & Proposal Writings

Errors in chemical analysis – classification of errors – determination of accuracy of methods – improving accuracy of analysis – significant figures – mean , standard deviation – comparison of results : ‘’t’’ Test , ‘’f’’ Test – rejection of results – presentation of data. Idea of writing research articles – project proposal to the funding agency.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2014
1-L1	**Unit – I : Literature survey and Choosing a Research Problems** Survey of literature including patents – primary source – secondary source – including reviews, treatise and monographs-
2-L2	literature survey –
3- L3	abstraction of research papers –
4-L4	possible ways of getting oneself familiar with current literature.
5-L5	Identification of research problems –
6-L6	assessing the status of the problem guidance from the supervisor
7-L7	– actual investigation and analysis of experimental results
8-L8	– Conclusions – Presenting scientific seminar –
9-L9	reporting the results in the form of communication, paper etc.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**

11-L10	**Test Paper distribution and result analysis**- .- Writing thesis
12-P1	**Welcome function**
13-L11	**Unit – II : Spectroscopic Techniques** Types of atomic spectroscopy – emission methods –
14-L12	absorption methods – fluorescence methods
15-L13	– atomizers for atomic spectroscopy – flame atomizers –
16-L14	Electrothermal atomizers – inductively coupled plasma sources of radition –
17-L-15	Applications of atomic emission spectroscopy.
18-L16	Principle instrumentation and data interpretation of TEM, SEM,
19-L17	EDAX and XRD analysis.
	Entering Internal Test-I Marks into University portal
20-L18	Calculations of particle size of nanaoparticles from XRD spectra –
21-P2	**College level meeting/Cell function**
22-L19	Debye- Scherrer formula
23-L20	– lattice constant findings.
24-L21	**Allotting portion for Internal Test-II-** – lattice constant findings.
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**Test Paper distribution and result analysis- Unit – III : Chromatography** Gas chromatography: Theory of Chromatography – column efficiency and column equation –
27-L23	sample injection – sampling system for capillary columns and packed columns –
28-L24	detectors – gas flow control system – high resolution gas chromatography/ mass spectroscopy.
29-L25	HPLC: Principles of high performance liquid chromatography –
30-L26	the liquid chromatograph – the requirements of solvent pumping and different pumping systems
31-L27	– gradient elutions, isocratic elution ,
32-L28	sampling- detectors for liquid chromatography –
33-L29	the mobile phase in HPLC- solvent degassing
33-L30	– column technology –
35-L31	column selection – quantitative analysis by HPLC.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV Radiochemical Methods** General theoretical consideration – special precautions for radiochemical studies – equipment for measuring radio activity –
38-L34	G.M Counter – tracers and traces-
39-L35	determination of characteristics of GM Counter –
40-L36	Determination of dead time of GM Tube-
41-L37	determination of the absorption curve for ^{234}Th – ^{234}Pa sample.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Isotope diltion analysis
44-L39	– verification of the principle of isotope dilution analysis
45-L40	**Submission of Assignment/take the seminar**
46-L41	– determination of equilibrium constant of a reaction by ion
47-L42	– exchange method using tracers.
48-L43	– exchange method using tracers.
49-L44	**Unit – V : Data Analysis and Article & Proposal Writings**

	Errors in chemical analysis – classification of errors –
50-L45	determination of accuracy of methods –. **Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	improving accuracy of analysis – significant figures – mean , standard deviation – comparison of results : ‘’t’’ Test , ‘’f’’ Test **Test Paper distribution and result analysis**
53-L47	– rejection of results –
54-L48	presentation of data. Idea of writing research articles –
55-L49	project proposal to the funding agency.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course “RESEARCH METHODOLOGY”
CO1	Knowledge on literature searching and sources of literature
CO2	Knowledge of spectroscopic techniques
CO3	Knowledge of chromatographic techniques
CO4	Knowledge of radiochemical techniques
CO5	Understand data analysis and proposal writings
Experimental Learning	
EL1	Record UV spectra for the sample
EL2	Record IR spectra for the sample
Integrated Activity	
IA1	Calculate the particle size from the given XRD pattern
IA2	Search some journals to the given topic

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	HCHM11
Class	I year (2014-2015)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reagents.
- To learn the applications of rearrangements.
- To learn the reactions of rearrangements
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
UNIT – I: AROMATICITY AND NOVEL RING SYSTEM

Aromaticity: Benzenoid and non–benzenoid compounds – generations and reactions – sextet theory – MO theory – Huckel's rule – Annulenes and hetero annulenes – Anti and homo aromaticity – Fullerenes.

Novel ring system: Nomenclature of bicyclic and tricyclic systems – structure and synthesis of Adamantane – Congressane – Alternant and non – alternant – Azulene – and sydnones.

UNIT – II: ORGANIC REACTION MECHANISM AND METHODS

Reaction mechanism: Energy diagram of simple Organic reactions – Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions –Baldwin rules for ring closure -Hammond Postulate and microscopic reversibility.

Methods: Kinetic and Thermodynamic control of product formation. Kinetic methods of determination: Rate law – Primary and secondary isotope effect. Non-Kinetic methods of determination: Testing and Trapping of intermediates, isotopic labeling, Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.

UNIT – III: STEREOCHEMISTRY

Concept of chirality: – Enantiotopic, diastereotopic hydrogens and prochiral centres – axial and planar chirality – stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds. R/S notations of Spiranes, allenes and Biphenyl derivatives – E/Z notation of compounds containing one and two double bonds. Stereospecific and stereoselective synthesis – Methods of Asymmetric synthesis including enzymatic and catalytic process – Cram's rule and Prelog's rule – Cram chelation model and Felkin – Ahn model.

UNIT – IV: REARRANGEMENT REACTIONS

Types of rearrangements: Nucleophilic, electrophilic and Free radical and protrophic reactions. Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction.

Reactions: Carbon to carbon migration: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid, Arndt – Eistert synthesis, Demjanov and dienone-phenol rearrangements.

Carbon to oxygen migration: Baeyer–Villiger, and Dakin rearrangements.

Carbon to Nitrogen migration: Lossen, Neber and curtius rearrangements.

Miscellaneous: Von – Richter rearrangement and Fischer - Indole synthesis.

UNIT – V: REAGENTS IN ORGANIC SYNTHESIS

Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) – Tri-n-butyl tin hydride-Aluminium isopropoxide-chlorotrimethylsilane.. Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux- von rudloff reagent - Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Phase transfer catalysis, Merrifield resin – Vaskas catalyst – Wilkinson's catalyst - Zieglar Natta catalyst.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2014
1-L1	, **Aromaticity**: Benzenoid compounds
2-L2	and non–benzenoid compounds
3- L3	sextet theory
4-L4	MO theory
5-L5	Huckel's rule
6-L6	Annulenes and hetero annulenes
7-L7	Anti and homo aromaticity – Fullerenes.
8-L8	Nomenclature of bicyclic and tricyclic systems
9-L9	structure and synthesis of Adamantane – Congressane –. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Welcome**
13-L11	**MECHANISM AND METHODS UNIT – II: ORGANIC REACTION**
14-L12	**Reaction mechanism:** Energy diagram of simple Organic reactions
15-L13	Transition state and intermediate.
16-L14	Kinetic and Thermodynamic requirements of reactions
17-L-15	Baldwin rules for ring closure
18-L16	Hammond Postulate and microscopic reversibility.
19-L17	**Methods:** Kinetic and Thermodynamic control of product formation
	Entering Internal Test-I Marks into University portal
20-L18	Kinetic methods of determination: Rate law
21-P2	**College level meeting/Cell function**
22-L19	Primary and secondary isotope effect. Non-Kinetic methods of determination:
23-L20	and Trapping of intermediates, isotopic labeling
24-L21	**Allotting portion for Internal Test-II-** Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: STEREOCHEMISTRY** **Concept of chirality:** – Enantiotopic, diastereotopic hydrogens
27-L23	prochiral centres – axial and planar chirality
28-L24	stereochemistry of compounds containing two dissimilar asymmetric carbons
29-L25	ansa compounds.
30-L26	R/S notations of Spiranes, allenes
31-L27	R/S notations of Biphenyl derivatives – E/Z notation of compounds containing one and two double bonds

32-L28	Stereospecific and stereoselective synthesis
33-L29	Methods of Asymmetric synthesis including enzymatic and catalytic process
33-L30	Cram's rule and Prelog's rule
35-L31	Cram chelation model and Felkin – Ahn model.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: REARRANGEMENT REACTIONS** **Types of rearrangements:** Nucleophilic, electrophilic and Free radical and protrophic reactions.
38-L34	**Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements
39-L35	**Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone,
40-L36	Benzil – Benzilic acid, Arndt – Eistert synthesis
41-L37	Demjanov and dienone-phenol rearrangements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	**Carbon to oxygen migration:** Baeyer–Villiger, and Dakin rearrangements.
44-L39	**Carbon to Nitrogen migration:**
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lossen, Neber and curtius rearrangements
47-L42	**Miscellaneous:** Von – Richter rearrangement
48-L43	Fischer - Indole synthesis.
49-L44	**UNIT – V: REAGENTS IN ORGANIC SYNTHESIS** Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) –
50-L45	Tri-n-butyl tin hydride-Aluminium isopropoxide-chlorotrimethyl silane. **Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux- von rudloff reagent - **Test Paper distribution and result analysis**
53-L47	Lemieux–Johnson reagent – Woodward and prevost hydroxylation.
54-L48	Phase transfer catalysis, Merrifield resin – Vaskas catalyst
55-L49	– Wilkinson's catalyst - Zieglar Natta catalyst
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –I"
CO1	Explain the **Aromaticity**.
CO2	Write the Nomenclature of bicyclic and tricyclic systems
CO3	Understand the Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions
CO4	Write Hammett equation Physical significance of σ and ρ Applications and Limitations Taft equation.
CO5	Understand stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes.
CO6	Write the R/S notations of Spiranes, allenes.
CO7	Explain **Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid,
CO8	Write the Lossen, Neber and curtius rearrangements
CO9	Woodward and prevost hydroxylation. Merrifield resin
CO10	Know the Wilkinson's
Experimental Learning	
EL1	Write the Woodward and prevost hydroxylation. Merrifield resin
EL2	Write the Arndt Eistert synthesis, Demjanov and dienone-phenol rearrangements
EL3	Perform a Cram's rule and Prelog's rule Cram chelation model and Felkin – Ahn model.
EL4	Draw the structure Azulene and sydnones
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry-I
Course Code	HCHM12
Class	I year (2014-2015)
Semester	Odd
Staff Name	Mrs. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To understand chemical bonding and geometrical isomerism in complexes of coordination numbers 4 to 7 with examples.*
- *To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.*
- *To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.*
- *To introduce TGA, DTA and DSC and its principles.*
- *To study the extraction of lanthanides and actinides from ores and to understand their properties.*

INORGANIC CHEMISTRY -I

Unit – I: CHEMICAL BONDING AND STEREOCHEMISTRY

VSEPR theory – Concept of hybridization and structure of molecules – Walsh diagrams – Bent's rule – M.O theory – Symmetry and overlap – M.O diagrams of homo and hetero diatomic and BeH2

Geometrical isomerism in complexes of coordination numbers 4 to7 with examples – Fluxionality – Fluxional molecules and their characterization – Planar- Tetrahedral, Trigonal bipyramidal – Square pyramidal interconversions.

UNIT – II: CHEMICAL BONDING AND NON-AQUEOUS SOLVENTS

Bond order – bond energy – bond length – bond polarity – Fajan's rule – Partial ionic character – electro negativity and different scales of pauling. Mulliken, Aldrich and Rochow and sanderson scale – conversion to pauling scale – periodicity of electronegativity, electron affinity and ionic radius – lattice energy – Born Haber cycle and numerical problems involving it for the calculation of electron affinity or lattice energy – Covalent character in ionic compounds – different types of electrostatic interaction, hydrogen bonding.

General properties and classification of solvents. Self ionization and leveling effect. Reactions in non-aqueous solvents. Solute –solvent interaction. Liquid NH3 and liquid SO2.

UNIT –III: SOLID STATE CHEMISTRY – I

Electronic structure of solids – Free electron and band theory – Types of solids – conducts and insulators – intrinsic and extrinsic semiconductors – Band structure and applications. Crystal defect in solids – line and plane defects – Points defects – Schottky and Frenkel defects – Non-stoichiometric defects – Preparation and properties of nonstoichiometric compounds – Colour centres – Solid electrolytes and their applications.

Optical and electrical properties of semiconductors – Photovoltaic effect – Hall effect – p-n and n-p-n junctions and their applications as rectifier and transistor – Super conductivity – High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.

UNIT – IV: SOLID STATE CHEMISTRY – II

Efficiency of packing in crystals – Limiting radius ratio – Description of crystal structures – calcite, zinc blende, wurtzite, rutile, fluorite, antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite.

Principles of TGA, DTA and DSC – application to simple salts, oxy salts, carbonates and complex salts – thermometric titrations.

Principles and measurements of X-ray diffraction studies. Electron diffractions by gases – Principle and measurements – determination of structures – comparison between electron, neutron and X-ray diffraction.

UNIT –V: LANTHANIDES AND ACTINIDES

Correlation of electronic structures, occurrence, and properties of the elements - Chemistry of separation of Np, Pu and Am from U and fission products - Common and uncommon oxidation states - Comparison with transition elements - Lanthanide and actinide contractions – Spectral and magnetic characteristics of lanthanides and actinides – Similarities between actinides and lanthanides – Coordination compounds of lanthanides - Use of lanthanide complexes as shift reagents.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2014
1-L1	**Unit I – CHEMICAL BONDING AND STERROCHEMISTRY** VSEPR theory – Concept of hybridization and structure of molecules
2-L2	Walsh diagrams – Bent's rule
3- L3	M.O theory
4-L4	Symmetry and overlap – M.O diagrams of homo and hetero diatomic and BeH_2
5-L5	Geometrical isomerism in complexes of coordination numbers 4 to7 with examples
6-L6	Fluxionality
7-L7	Fluxional molecules and their characterization
8-L8	Planar- Tetrahedral, Trigonal bipyramidal – Square pyramidal interconversions.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2014)**
11-L10	**Test Paper distribution and result analysis- Unit II – CHEMICAL BONDING AND NON-AQUEOUS SOLVENTS** **Bond order – bond energy – bond length – bond polarity – Fajan's rule**
12-P1	**Department function**
13-L11	Partial ionic character – electro negativity and different scales of pauling. Mulliken, Aldrich and Rochow and sanderson scale
14-L12	conversion to pauling scale – periodicity of electronegativity
15-L13	electron affinity and ionic radius – lattice energy
16-L14	Born Haber cycle and numerical problems involving it for the calculation of electron affinity or lattice energy
17-L-15	Covalent character in ionic compounds – different types of electrostatic interaction, hydrogen bonding
18-L16	General properties and classification of solvents. Self ionization and leveling effect
19-L17	Reactions in non-aqueous solvents
	Entering Internal Test-I Marks into University portal
20-L18	Solute –solvent interaction
21-P2	**College level meeting/Cell function**
22-L19	reactions in liquid ammonia
23-L20	Liquid SO_2
24-L21	Quick review of the chapter -**Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (18.08.2014)**
26-L22	**Test Paper distribution and result analysis- SOLID STATE CHEMISTRY – I:** Electronic structure of solids
27-L23	Free electron and band theory
28-L24	Types of solids – conducts and insulators
29-L25	intrinsic and extrinsic semiconductors
30-L26	Band structure and applications
31-L27	Crystal defect in solids – line and plane defects – Points defects
32-L28	Schottky and Frenkel defects
33-L29	Non-stoichiometric defects – Preparation and properties of nonstoichiometric

	compounds – Colour centres – Solid electrolytes and their applications.
33-L30	Optical and electrical properties of semiconductors – Photovoltaic effect
35-L31	Hall effect – p-n and n-p-n junctions and their applications as rectifier and transistor
36-L32	**Allotting portion for Assignment/seminar -** Super conductivity – High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.
38-L33	**UNIT – IV: SOLID STATE CHEMISTRY – II** Efficiency of packing in crystals – Limiting radius ratio
38-L34	Description of crystal structures – calcite, zinc blende, wurtzite, rutile, fluorite,
39-L35	antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite.
40-L36	Principles of TGA, DTA and DSC.
41-L37	application to simple salts, oxy salts, carbonates and complex salts –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	–thermometric titrations
44-L39	Principles and measurements of X-ray diffraction studies.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Electron diffractions by gases – Principle and measurements
47-L42	– determination of structures
48-L43	– comparison between electron, neutron and X-ray diffraction.
49-L44	**UNIT –V: LANTHANIDES AND ACTINIDES** Correlation of electronic structures, occurrence, and properties of the elements -
50-L45	Chemistry of separation of Np, Pu and Am from U and fission products - Common and uncommon oxidation states -
51-IT-III	**Internal Test-III (15.09.2014)**
52-L46	Comparison with transition elements - Lanthanide and actinide contractions –
53-L47	Spectral and magnetic characteristics of lanthanides and actinides –
54-L48	Similarities between actinides and lanthanides –
55-L49	Coordination compounds of lanthanides - Use of lanthanide complexes as shift reagents.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24.10.2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –I"
CO1	To understand different type of bonds and to study different theories of bonding.
CO2	To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.
CO3	To study the crystal structures, defects in solid crystals, band

	theory of solids and superconductors.
CO4	To study the principles of TGA, DTA and DSC
CO5	To study the extraction of lanthanides and actinides from ores and to understand their properties.
Experimental Learning	
EL1	Electrochemical series was used to construct redox couple forming different Galvanic cells.
EL2	Qualitative analyses of selected Lanthanides and Actinides were performed
EL3	Synthesize Oxygen deficient ZnO to illustrate metal excess defect
Integrated Activity	
IA1	Prepare zinc blende phase of ZnS and characterize by XRD
IA2	Prepare a mini-model to illustrate Meissner effect (Magnetic Levitation)

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

Forslow learner :Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-I
Course Code	HCHM13
Class	I year (2014-2015)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of Partial molar properties, fugacity and activity

To apply phase rule for three component system

To understand the Principles of Thermodynamics of irreversible processes

To understand Statistical Thermodynamics

To understand the importance of macromolecules

PHYSICAL CHEMISTRY -I

UNIT-I Thermodynamics

Thermodynamics systems of variable composition: Partial molar quantities –chemical potential, partial molar volume and partial molar heat content. Gibbs-Duhem equation, Determination of partial molar quantities. Variation of Chemical Potential with temperature and pressure. Thermodynamics of real gases and real solutions. Fugacity; Methods of determination. Dependence on temperature, pressure and composition. Activity and activity coefficient: standard states, determination of activity and activity coefficient of non-electrolytes and electrolytes

UNIT-II Irreversible thermodynamics

Non equilibrium processes: General theory- convservation of mass and energy-Entropy production in open system by heat, matter and current flow. Onsager theory-Validity and Verification. Thermoelectricity-Electro kinetic and thermo mechanical effects. Application of irreversible thermodynamics to biological and non-linear systems.

UNIT-III Chemical and phase equilibria

Reaction free energy- reaction potential – reaction isotherm and direction of spontaniety – standard reaction free energy – its calculation from thermochemical, electrochemical and equilibrium data – temperature coefficient of reaction free energy and equilibrium constant.

Gibbs Phase rule – its thermodynamic derivation - Application of Phase rule to three components system. Formation of one pair, two pair and three pairs of partially miscible liquids – systems composed of two solids and a liquid.

UNIT-IV Statistical thermodynamics

Thermodynamic probability and entropy - Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics and applications. Partition functions and entropies for Translational, rotational, vibrational and electronic motions of monoatomic and diatomic molecules – Calculation of thermodynamic functions and equilibrium constants – specific heat of solids - Einstein and Debye theories.

Unit – V : Macromolecules

Polymerization in homogeneous and heterogeneous phases – Kinetics and Mechanism of polymerization (Addition and condensation) – Kinetic of copolymerization – Properties of polymers: Glass transition temperature , crystallinity of polymers. Molecular weights: Distribution, methods of determination – Light scattering , Ultracentrifuge, viscosity and Osmomerty - Gel permeation Chromatography. Conducting polymers- Factors affecting the conductivity of conducting polymers. – Doping of conducting polymers – Nature of charge carriers in conducting polymers – Solitions, polarons and bipolarons.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2014
1-L1	**UNIT-I Thermodynamics** Thermodynamics systems of variable composition: Partial molar quantities – chemical potential, partial molar volume and partial molar heat content.
2-L2	Gibbs-Duhem equation, Determination of partial molar quantities.
3- L3	Variation of Chemical Potential with temperature and pressure.
4-L4	Thermodynamics of real gases and real solutions.
5-L5	Fugacity; Methods of determination.
6-L6	Dependence on temperature, pressure and composition.
7-L7	Activity and activity coefficient:
8-L8	standard states, determination of activity and activity coefficient of non-electrolytes and electrolytes
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**
11-L10	**Test Paper distribution and result analysis- UNIT-II Irreversible thermodynamics** Non equilibrium processes:
12-P1	**Department function**
13-L11	General theory- convservation of mass and energy-
14-L12	Entropy production in open system by heat,
15-L13	Entropy production in open system by matter and current flow.
16-L14	Onsager theory-
17-L-15	Validity and Verification.
18-L16	Thermoelectricity-
19-L17	Electro kinetic effect
	Entering Internal Test-I Marks into University portal
20-L18	thermo mechanical effects.
21-P2	**College level meeting/Cell function**
22-L19	Application of irreversible thermodynamics to biological systems
23-L20	Application of irreversible thermodynamics to non-linear systems
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**Test Paper distribution and result analysis**- **UNIT-III Chemical and phase equilibria** Reaction free energy-
27-L23	reaction potential –
28-L24	reaction isotherm and direction of spontaniety

29-L25	– standard reaction free energy –– its calculation from thermochemical, electrochemical and equilibrium data
30-L26	temperature coefficient of reaction free energy and equilibrium constant.
31-L27	Gibbs Phase rule – its thermodynamic derivation -
32-L28	Application of Phase rule to three components system.
33-L29	Formation of one pair, two pair and three pairs of partially miscible liquids –
33-L30	Formation of one pair, two pair and three pairs of partially miscible liquids –
35-L31	systems composed of two solids and a liquid.
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV Statistical thermodynamics** Thermodynamic probability and entropy
38-L34	- Maxwell – Boltzmann statistics
39-L35	Bose-Einstein statistics
40-L36	Fermi-Dirac statistics
41-L37	Partition functions and entropies for Translational motions of monoatomic and diatomic molecules
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Partition functions and entropies for rotational motions of monoatomic and diatomic molecules
44-L39	Partition functions and entropies for vibrational and electronic motions of monoatomic and diatomic molecules
45-L40	**Submission of Assignment/ seminar**
46-L41	– Calculation of thermodynamic functions and equilibrium constants
47-L42	– specific heat of solids
48-L43	- Einstein and Debye theories.
49-L44	**Unit – V : Macromolecules** Polymerization in homogeneous and heterogeneous phases
50-L45	Kinetics and Mechanism of polymerization (Addition and condensation) –
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	Kinetic of copolymerization – Properties of polymers: Glass transition temperature , crystallinity of polymers.
53-L47	Molecular weights: Distribution, methods of determination –
54-L48	Light scattering , Ultracentrifuge, viscosity and Osmomerty - Gel permeation Chromatography.
55-L49	Conducting polymers- Factors affecting the conductivity of conducting polymers. – Doping of conducting polymers – Nature of charge carriers in conducting polymers – Solitions, polarons and bipolarons.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	To learn the concept of Partial molar properties, fugacity and activity
CO2	To apply phase rule for three component system
CO3	To understand the Principles of Thermodynamics of irreversible processes
CO4	To understand Statistical Thermodynamics
CO5	To understand the about macromolecules
Experimental Learning	
EL1	To prepare a conducting polymer
EL2	To determine the molecular weight of a polymer by viscosity method
Integrated Activity	
IA1	Phase diagram between water, acetone and ethanol is analysed
IA2	Prepare a mini-model to illustrate Thermoelectric effect.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-III
Course Code	HCHM31
Class	II year (2014-2015)
Semester	Odd
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
- To study the rearrangements.
- To calculate the delocalization energy through group theory
- To learn about the photochemistry and pericyclic reactions
- To learn about the reactions of heterocyclic and biomolecules

ORGANIC CHEMISTRY-III

Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:

Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions- Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution- Ambient nucleophile- NGP- Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only) Elimination reaction: E1, E2 and E1CB mechanisms- Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions.

Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms. Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich

reaction- Wittig reaction- Sharpless asymmetric epoxidation-addition of hydrogen and hydrogen halides to carbon-carbon double bonds-Michael addition (1,2 and 1,4).

Unit-III Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, reactions and stereochemistry of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications. **Nitrenes:** Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet Hauser and Favorski rearrangements. **Arynes :** Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit-IV Organic photochemistry and pericyclic reactions

Photosensitization- cis-trans isomerisation- photo oxidation and reductions- Norris type-I and II reactions- Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement. Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches: Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry. Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)- Sigmatropic rearrangements - [i,j] shift of C-H and C-C bonds (1+3 and 1+5system)

Unit-V Heterocyclic and biomolecules

Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids. Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A Detailed study on the structure of maltose, sucrose and lactose- A brief study on starch and cellulose. Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2014
1-L1	**Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:** Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions-
2-L2	Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution-
3- L3	Ambient nucleophile- NGP
4-L4	Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only)
5-L5	Elimination reaction: E1, E2 and E1CB mechanisms-

6-L6	Factors influencing elimination reactions
7-L7	- Hofmann and Satyzeff rules.
8-L8	- Pyrolytic elimination-
9-L9	Chugaev and cope reactions.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**
11-L10	**Test Paper distribution and result analysis**-
12-P1	**Inauguration meeting**
13-L11	**Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds** Aromatic nucleophilic substitution reaction:
14-L12	Unimolecular, Bimolecular and Benzyne mechanisms.
15-L13	Catalytic hydrogenation
16-L14	Dieckmann condensation-
17-L-15	Mannich reaction- Wittig reaction-
18-L16	Sharpless asymmetric epoxidation-
19-L17	addition of hydrogen and hydrogen halides to carbon-carbon double bonds-
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2).
21-P2	**College level meeting/Cell function**
22-L19	Michael addition (1,4).
23-L20	- Birch reduction-
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**Unit-III Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, reactions and stereochemistry of carbenes-
27-L23	Wolff rearrangement of acyl carbenes and its synthetic applications.
28-L24	**Nitrenes:** Generation, stability, reaction of nitrenes-
29-L25	Mechanism of rearranegements through Nitrene intermediate:
30-L26	Schmidt, Hoffmann, Beckmann rearrangements
31-L27	. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate:.
32-L28	Steven, Sommelet Hauser rearrangements
33-L29	Favorski rearrangements.
33-L30	**Arynes :** Generation, Structure, Stability, reactions and trapping of arynes-
35-L31	cine substitution
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Organic photochemistry and pericyclic reactions** Photosensitization-cis-trans isomerisation- photo oxidation and reductions-
38-L34	Norris type-I and II reactions-
39-L35	Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement.
40-L36	Atomic and molecular orbitals-Woodward-Hoffmann rules,

41-L37	FMO and correlation diagram approaches:
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)-
44-L39	Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)-
47-L42	Sigmatropic rearrangements - [i,j] shift of C-H
48-L43	C-C bonds (1+3 and 1+5system)
49-L44	**Unit-V Heterocyclic and biomolecules** Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-
50-L45	synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids.
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A
53-L47	Detailed study on the structure of maltose, sucrose and lactose-
54-L48	A brief study on starch and cellulose.
55-L49	Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –III"
CO1	Explain aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
CO2	Knowledge about catalytic hydrogenation
CO3	Knowledge about stability, structure, and reacions of carbenes, nitrenes, carbanions and arynes

CO4	Learns the pericyclic reactions
CO5	Knowledge about the synthesis of heterocyclic and biomolecules
Experimental Learning	
EL1	Synthesise an imidazole compound
EL2	Demonstration of photo oxidation reaction
Integrated Activity	
IA1	Discuss about the nucleic acids and modes of binding in them.
IA2	Discuss about Birch reduction.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. Joel)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-III
Course Code	HCHM32
Class	II year (2014-2015)
Semester	Odd
Staff Name	Mr. C. Joel
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand about nuclear fission and fusion.
- To know about radiation and nuclear reactors.
- To learn about cage and cluster compounds
- To learn about applications of IR and Raman spectra in Inorganic chemistry
- To learn about the role of bioinorganic molecules in living system

INORGANIC CHEMISTRY - III

UNIT – I : NUCLEAR CHEMISTRY- I

Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types , Q-value , threshold energy , cross sections and excitation functions – nuclear reaction models : optical and compound nucleus models . Direct nuclear reactions – transfer reactions: stripping and pick-up –high energy reactions: neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission.

UNIT – II : NUCLEAR CHEMISTRY - II

Nuclear reactors : classification , components , reproduction factor and design parameter – fuel materials and their production. Breeder reactor : fast breeder test reactor – reprocessing of spent fuels : aqueous and non-aqueous processes – disposal of gaseous , liquids and solid

radioactive wastes –radiation hazards and protection – India‘s nuclear reactors . Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations . Analytical applications : radio chromatography , neutron activation analysis , neutron absorptiometry and radiometric titrations – hot atom chemistry – synthesis of transuraniens .

UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS

Hetero catenation - silicates - classification and structure-property correlation . Polyacids – structures of isopoly and heteropoly anions - polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers - boranes and carboranes – structure and bonding in boranes. Metal-metal bonds and metal atom clusters - carbonyl type - anionic and hydrido clusters- non- carbonyl type – octahedral clusters and triangular clusters.

UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II

Application of IR and Raman spectra in the study of coordination compounds : Application to metal carbonyls and nitrosyls – geometrical and linkage isomerism – detection of inter and intramolecular hydrogen bonding – stretching mode analysis of metal carbonyls. Mossbauer spectroscopy : Principle – application of isomer shift , quadrupole interactions and magnetic hyperfine splitting in the study of iron and tin compounds .

UNIT-V : BIOINORGANIC CHEMISTRY –I

Essential and trace elements in biological system – biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system. Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers: iron-sulphur proteins , cytochromes and blue copper proteins – oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers . Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2014
1-L1	**UNIT – I : NUCLEAR CHEMISTRY- I** Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types ,
2-L2	Q-value , threshold energy , cross sections and excitation functions –
3- L3	nuclear reaction models :
4-L4	optical and compound nucleus models .
5-L5	Direct nuclear reactions – transfer reactions:
6-L6	stripping and pick-up –high energy reactions:
7-L7	neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.

8-L8	Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products –
9-L9	fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : NUCLEAR CHEMISTRY - II** Nuclear reactors : classification , components , reproduction factor and design parameter
14-L12	– fuel materials and their production. Breeder reactor :
15-L13	aqueous and non-aqueous processes – disposal of gaseous , liquids and solid radioactive wastes
16-L14	–radiation hazards and protection – India‘s nuclear reactors .
17-L-15	Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations .
18-L16	Analytical applications : radio chromatography ,
19-L17	neutron activation analysis ,
	Entering Internal Test-I Marks into University portal
20-L18	neutron absorptiometry and radiometric titrations –
21-P2	**College level meeting/Cell function**
22-L19	hot atom chemistry
23-L20	– synthesis of transuraniens
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS** Hetero catenation - silicates - classification and structure-
27-L23	property correlation . Polyacids – structures of isopoly and heteropoly anions -.
28-L24	polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers -
29-L25	boranes and carboranes – structure and bonding in boranes.
30-L26	Metal-metal bonds and metal atom clusters
31-L27	- carbonyl type -
32-L28	anionic and hydrido clusters-
33-L29	non- carbonyl type
33-L30	– octahedral clusters
35-L31	triangular clusters
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II** Application of IR and Raman spectra in the study of coordination compounds :
38-L34	Application to metal carbonyls and nitrosyls –

39-L35	geometrical and linkage isomerism –
40-L36	detection of intermolecular hydrogen bonding
41-L37	– stretching mode analysis of metal carbonyls.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Mossbauer spectroscopy : Principle – application of isomer shift ,
44-L39	quadrupole interactions
45-L40	**Submission of Assignment/take the seminar**
46-L41	detection of intramolecular hydrogen bonding
47-L42	magnetic hyperfine splitting in the study of iron and tin compounds .
48-L43	magnetic hyperfine splitting in the study of iron and tin compounds .
49-L44	**UNIT-V : BIOINORGANIC CHEMISTRY –I** Essential and trace elements in biological system
50-L45	– biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system.
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers:
53-L47	iron-sulphur proteins , cytochromes and blue copper proteins
54-L48	oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers .
55-L49	Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –III”
CO1	Explain the nuclear fission and fusion
CO2	Knowledge about nuclear reactors

CO3	Knowledge about silicates, boranes and carboranes
CO4	Learns the IR and Raman modes of metal carbonyls and nitrosyls
CO5	Knowledge about the bioinorganic molecules
Experimental Learning	
EL1	Visit a nuclear reactor
EL2	Record the IR of an inorganic compound
Integrated Activity	
IA1	Discuss about the structure of certain biomolecules.
IA2	Collect information about various nuclear reactors.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-III
Course Code	HCHM33
Class	II year (2014-2015)
Semester	Odd
Staff Name	Mrs. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of Group theory.
- To study the point groups of molecules.
- To calculate the delocalization energy through group theory
- To learn about the Principles of Electrochemistry
- To learn adsorption and adsorption isotherms

PHYSICAL CHEMISTRY –III

UNIT I: GROUP THEORY I

Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment, symmetry and optical activity, symmetry operations of a group, multiplication table. Classes of symmetry operations and matrix representations of operations. Reducible and irreducible representations, orthogonality theorem. Properties of irreducible representations. Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2). Explanations for the complete character table for a point group.

UNIT II: GROUP THEORY II

Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra. Standard reduction formula. Determination of representations of vibrational modes in non-linear molecules (H2O, NH3 and Trans N2F2). Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion. Electronic Spectra of Ethylene and formaldehyde molecules. Hybrid orbital in non-linear molecules (CH4, XeF4, BF3,and PF5). Projection operators and symmetry adapted linear combinations(SALC). Simplification of HMO calculations using group theory. Calculation of delocalization of energy in 1,3-butadiene and cyclopropenyl systems.

UNIT III: **ELECTROCHEMISTRY I**

Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction , Debye-Huckel-Onsagar equation and its validity. Debye-Falkenhagen and Wein effects. Debye-Huckel limiting law, its applications to concentrated solutions. Debye-Huckel Bronsted equation. Quantitative and qualitative verification of Debye Huckel limiting law. Electrode electrolyte interface, adsorption at electrified interface, electrical double layer, electrocapillary phenomenon-Lipmann equation.

UNIT IV: **ELECTROCHEMISTRY II**

Polarization and over potential, Butler-Volmer equation for one step and multistep electron transfer reactions, Tafel equation, significance of I_0 and transfer coefficient, polarizable and non-polarizable electrodes, mechanism of hydrogen and oxygen evolution reactions. Corrosion and polarization of metals - Pourbaix diagrams, Evan‘s diagram, Fuel cells, electrode deposition-principle and applications.

UNIT V: ADSORPTION AND SURFACE PHENOMENON

Physisorption and chemisorption, adsorption and desorption, adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination, surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance. Kinetics of unimolecular and bimolecular surface reactions. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces, Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2014
1-L1	**UNIT I: GROUP THEORY I**: Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment.
2-L2	symmetry and optical activity, symmetry operations of a group
3- L3	multiplication table
4-L4	Classes of symmetry operations
5-L5	matrix representations of operations
6-L6	Reducible and irreducible representations, orthogonality theorem
7-L7	Properties of irreducible representations
8-L8	Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2).
9-L9	Explanations for the complete character table for a point group.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30/07/2014)**

11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT II: GROUP THEORY II -** Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra.
14-L12	Standard reduction formula
15-L13	Determination of representations of vibrational modes in non-linear molecules (H_2O, NH_3 and Trans N_2F_2).
16-L14	Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion.
17-L-15	Electronic Spectra of Ethylene and formaldehyde molecules.
18-L16	Hybrid orbital in non-linear molecules (CH_4, XeF_4, BF_3, and PF_5).
19-L17	Projection operators and symmetry adapted linear combinations(SALC).
	Entering Internal Test-I Marks into University portal
20-L18	Simplification of HMO calculations using group theory.
21-P2	**College level meeting/Cell function**
22-L19	Simplification of HMO calculations using group theory.
23-L20	Calculation of delocalization of energy in 1,3-butadiene.
24-L21	**Allotting portion for Internal Test-II-** Calculation of delocalization of energy in cyclopropenyl systems.
25-IT-II	**Internal test – II (18/08/2014)**
26-L22	**UNIT III**: **ELECTROCHEMISTRY I -** Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction.
27-L23	Debye-Huckel-Onsagar equation and its validity.
28-L24	Debye-Falkenhagen and Wein effects
29-L25	Debye-Huckel limiting law, its applications to concentrated solutions
30-L26	Debye-Huckel Bronsted equation
31-L27	Quantitative and qualitative verification of Debye Huckel limiting law
32-L28	Electrode electrolyte interface,
33-L29	electrical double layer,
33-L30	electrocapillary phenomenon
35-L31	Lipmann equation
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT IV**: **ELECTROCHEMISTRY II -** Polarization and over potential
38-L34	Butler-Volmer equation for one step and multistep electron transfer reactions,
39-L35	Tafel equation, significance of I_0 and transfer coefficient
40-L36	polarizable and non-polarizable electrodes
41-L37	mechanism of hydrogen and oxygen evolution reactions
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Pourbaix diagrams
44-L39	Evan‘s diagram
45-L40	**Submission of Assignment/take the seminar**
46-L41	Fuel cells
47-L42	Fuel cells
48-L43	electrode deposition-principle and applications.
49-L44	**UNIT V: ADSORPTION AND SURFACE PHENOMENON -** Physisorption

	and chemisorption, adsorption and desorption
50-L45	adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination
51-IT-III	**Internal Test-III (15/09/2014)**
52-L46	surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance.
53-L47	Kinetics of unimolecular and bimolecular surface reactions.
54-L48	Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces,
55-L49	Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24/10/2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –III”
CO1	Explain basic principles of group theory
CO2	Identification of point group of molecules
CO3	Explain the vibrational modes of molecules using group theory
CO4	Determine the applications of group theory
CO5	Knowledge about the principles of Electrochemistry
CO6	Learning about fuel cells
Experimental Learning	
EL1	Find out vibrational modes for various molecules using group theory
EL2	Demonstration of Electroless deposition
Integrated Activity	
IA1	Write the point groups of various molecules
IA2	Finding the vibrational modes of certain molecules using group theory

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. Joel)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-I
Course Code	HCHL21
Class	I year (2014-2015)
Semester	Even
Staff Name	Mr. C. Joel
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand separation of two components in a mixture.*
- *To understand the analysis of organic compounds*

INORGANIC CHEMISTRY -I

A. Separation of Organic mixture:

(i) Separation of two component mixture and determination of their physical Constants.

(ii) Separation and analysis of at least **eight** two component mixture. The students are expected to determine the physical constants for both the components as well as their Derivatives.

(iii) Analysis may be performed in micro (or) macro scale depending upon the Conditions of the laboratory

B. List of single stage preparations

1. Preparation of benzal acetophenone from benzaldehyde

2. Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

3. Preparation of Resacetophenone from resorcinol

4. Preparation of dinitro diphenylamine from aniline

5. Preparation of benzoquinone from hydroquinone

C. For Class Work Only:

(1) Separation of Caffeine from Tea / Coffee.

(2) Interpretation of IR and NMR of any three simple organic compounds

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2014
1-E1	Separation and analysis of mixture I
2-E2	Separation and analysis of mixture I
3- E3	Separation and analysis of mixture II
4-E4	Separation and analysis of mixture II
5-E5	Separation and analysis of mixture II
6-E6	Separation and analysis of mixture III
7-E7	Separation and analysis of mixture III
8-E8	Separation and analysis of mixture III
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I**
11- IT-1	**Internal test – I**
12- IT-1	**Internal test – I**
13- IT-1	**Internal test – I**
14-P1	**Department function**
15-E10	Separation and analysis of mixture IV
16-E11	Separation and analysis of mixture IV
17-E-12	Separation and analysis of mixture V
18-E13	Separation and analysis of mixture V
19-E14	Separation and analysis of mixture V
20-E15	Separation and analysis of mixture VI
21-E16	Separation and analysis of mixture VI
22-E17	Separation and analysis of mixture VI
23-P2	**College level meeting/Cell function**
24-E18	Separation and analysis of mixture VII
25-E19	Separation and analysis of mixture VII
26-E20	Separation and analysis of mixture VII
27-E21	Separation and analysis of mixture VIII
28-E22	Separation and analysis of mixture VIII
29-E23	Separation and analysis of mixture VIII
30-E24	Preparation of benzal acetophenone from benzaldehyde
31-E25	Preparation of benzal acetophenone from benzaldehyde
32-E26	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

33-E27	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone
34-E28	Preparation of Resacetophenone from resorcinol
35-E29	Preparation of Resacetophenone from resorcinol
36-E30	Preparation of dinitro diphenylamine from aniline
37-E31	Preparation of dinitro diphenylamine from aniline
38-E32	Preparation of benzoquinone from hydroquinone
39-E33	Preparation of benzoquinone from hydroquinone
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Separation of Caffeine from Tea / Coffee
46-E35	Separation of Caffeine from Tea / Coffee
47-E36	Interpretation of IR and NMR of any three simple organic compounds
48-E37	Interpretation of IR and NMR of any three simple organic compounds
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand different methods of separation of organic compounds
CO2	To separate the components in a mixture
CO3	To analyse the separated organic compounds
CO4	To physical constants of the compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-I
Course Code	HCHL22
Class	I year (2014-2015)
Semester	EVEN
Staff Name	Mrs. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of different types of cations*
- *To understand the group separation*

INORGANIC CHEMISTRY -I

1. Qualitative analysis of inorganic mixture containing two familiar and two less familiar cations Pb, Cu, Bi, Cd, Sb, Zn, Co, Ni, Mn, Ca, Ba, Sr, W, Tl, Te, Se, Mo, Ce, Th, Zr, V, U, Ti and Li.

2. Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

3. Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

4. Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).

5. Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-E1	Qualitative analysis of mixture I
2-E2	Qualitative analysis of mixture I
3- E3	Qualitative analysis of mixture I
4-E4	Qualitative analysis of mixture I
5-E5	Qualitative analysis of mixture II
6-E6	Qualitative analysis of mixture II
7-E7	Qualitative analysis of mixture II
8-E8	Qualitative analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Qualitative analysis of mixture III
16-E11	Qualitative analysis of mixture III
17-E-12	Qualitative analysis of mixture III
18-E13	Qualitative analysis of mixture III
19-E14	Qualitative analysis of mixture IV
20-E15	Qualitative analysis of mixture IV
21-E16	Qualitative analysis of mixture IV
22-E17	Qualitative analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Qualitative analysis of mixture V
25-E19	Qualitative analysis of mixture V
26-E20	Qualitative analysis of mixture V
27-E21	Qualitative analysis of mixture V
28-E22	Qualitative analysis of mixture VI
29-E23	Qualitative analysis of mixture VI
30-E24	Qualitative analysis of mixture VI
31-E25	Qualitative analysis of mixture VI
32-E26	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
33-E27	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
34-E28	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
35-E29	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
36-E30	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
37-E31	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
38-E32	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
39-E33	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
46-E35	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
47-E36	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
48-E37	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand familiar cations
CO2	To understand less familiar cations
CO3	To study the group separation
CO4	To know the confirmatory tests of different cations
CO5	To study the reason behind the results of the experiment

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-I
Course Code	HCHL23
Class	I year (2014-2015)
Semester	Even
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric titrations*
- *To understand the enthalpy of reactions*

PHYSICAL CHEMISTRY -I

A. Distribution

1. Distribution of bezoic acid between benzene/toluene and water

B. Conductivity

2. Determination of solubility product of sparingly soluble salt
3. Determination of Ka by using Oswald distribution method.
4. Titrations
   1. HCl + AcOH vs NaOH
   2. HCl + NH_4Cl vs NaOH
   3. AcOH + AcONa vs NaOH
   4. AcOH + AcONa vs HCl

C. Kinetics

5. Study of primary salt effect on $K_2S_2O_8$
6. Kinetics of $K_2S_2O_8$ and KI reaction

II. Thermometry

7. Determination of Solution enthalpy of

i. oxalic acid-water
ii. ammonium oxalate-water
iii. Naphthalene-toluene

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2014
1-E1	Distribution of bezoic acid between benzene/toluene and water
2-E2	Distribution of bezoic acid between benzene/toluene and water
3- E3	Distribution of bezoic acid between benzene/toluene and water
4-E4	Determination of solubility product of sparingly soluble salt
5-E5	Determination of solubility product of sparingly soluble salt
6-E6	Determination of solubility product of sparingly soluble salt
7-E7	Determination of Ka by using Oswald distribution method
8-E8	Determination of Ka by using Oswald distribution method
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	HCl + AcOH vs NaOH
16-E11	HCl + AcOH vs NaOH
17-E-12	HCl + AcOH vs NaOH
18-E13	HCl + NH_4Cl vs NaOH
19-E14	HCl + NH_4Cl vs NaOH
20-E15	HCl + NH_4Cl vs NaOH
21-E16	AcOH + AcONa vs NaOH
22-E17	AcOH + AcONa vs NaOH
23-P2	**College level meeting/Cell function**
24-E18	AcOH + AcONa vs HCl
25-E19	AcOH + AcONa vs HCl
26-E20	AcOH + AcONa vs HCl
27-E21	Kinetics of $K_2S_2O_8$ and KI reaction
28-E22	Kinetics of $K_2S_2O_8$ and KI reaction
29-E23	Kinetics of $K_2S_2O_8$ and KI reaction
30-E24	Kinetics of $K_2S_2O_8$ and KI reaction
31-E25	oxalic acid-water
32-E26	oxalic acid-water
33-E27	oxalic acid-water
34-E28	oxalic acid-water
35-E29	ammonium oxalate-water
36-E30	ammonium oxalate-water
37-E31	ammonium oxalate-water
38-E32	ammonium oxalate-water
39-E33	ammonium oxalate-water
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Naphthalene-toluene
46-E35	Naphthalene-toluene
47-E36	Naphthalene-toluene
48-E37	Naphthalene-toluene
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS –I"
CO1	To understand the conductometric titrations
CO2	To understand the enthalpy of reactions
CO3	To study kinetics of acid hydrolysis of ester

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	HCHL41
Class	II year (2014-2015)
Semester	Even
Staff Name	Mrs. R. BIJU BENNIE
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimation of organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL - IV

A. List of Estimations

1. Ethyl methyl ketone
2. Glucose-Lane Eynon and method
3. Glucose-Bertrand"s method
4. Saponification value of oil
5. Iodine value of oil
6. Number of hydroxyl groups in a given compound.
7. Purity of Glucose

B. List of Two stage preparations

1. Asprin from Methylsalicylate
2. p-Bromoaniline from Acetanilide
3. m-Nitrobenzene from Acetanilide
4. p- Nitroaniline from Acetanilide
5. Benzpinacolone from Benzophenone
6. Benzanilide from Benzophenone
7. s-Benzylisothiuroniumbenzoate from Thiourea
8. 9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride

9. Phthalimide from Phthalic acid
10. s-Tribromobenzene from Aniline

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-E1	Estimation of Ethyl methyl ketone
2-E2	Estimation of Ethyl methyl ketone
3- E3	Estimation of Glucose-Lane Eynon and method
4-E4	Estimation of Glucose-Lane Eynon and method
5-E5	Estimation of Glucose-Bertrand‟s method
6-E6	Estimation of Glucose-Bertrand‟s method
7-E7	Saponification value of oil
8-E8	Saponification value of oil
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Iodine value of oil
16-E11	Iodine value of oil
17-E-12	Number of hydroxyl groups in a given compound
18-E13	Number of hydroxyl groups in a given compound
19-E14	Purity of Glucose
20-E15	Purity of Glucose
21-E16	Asprin from Methylsalicylate
22-E17	Asprin from Methylsalicylate
23-P2	**College level meeting/Cell function**
24-E18	p-Bromoaniline from Acetanilide
25-E19	p-Bromoaniline from Acetanilide
26-E20	p-Bromoaniline from Acetanilide
27-E21	p-Bromoaniline from Acetanilide
28-E22	m-Nitrobenzene from Acetanilide
29-E23	m-Nitrobenzene from Acetanilide
30-E24	p- Nitroaniline from Acetanilide
31-E25	p- Nitroaniline from Acetanilide
32-E26	Benzpinacolone from Benzophenone
33-E27	Benzpinacolone from Benzophenone
34-E28	Benzpinacolone from Benzophenone
35-E29	Benzpinacolone from Benzophenone
36-E30	Benzanilide from Benzophenone
37-E31	Benzanilide from Benzophenone
38-E32	s-Benzylisothiuroniumbenzoate from Thiourea
39-E33	s-Benzylisothiuroniumbenzoate from Thiourea
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**

42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
46-E35	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
47-E36	Phthalimide from Phthalic acid
48-E37	s-Tribromobenzene from Aniline
49-E38	s-Tribromobenzene from Aniline
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	HCHL42
Class	I year (2014-2015)
Semester	Even
Staff Name	Mrs. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand gravimetric estimations of Cations*
- *To understand the inorganic preparations*

INORGANIC CHEMISTRY PRACTICAL - II

I . Quantitative estimation of a mixture containing two metal ions (Volumetric and Gravimetric Estimations).

1. Estimation of Cu^{2+} and Ni^{2+} ions.
2 . Estimation of Cu^{2+} and Zn^{2+} ions.
3 . Estimation of Fe^{2+} and Cu^{2+} ions
4 . Estimation of Fe^{2+} and Ni^{2+} ions .
5. Estimation of Ca^{2+} and Mg^{2+} ions.
6. Estimation of Ca^{2+} and Ba^{2+} ions .
7. Analysis of ores and alloys (course work only)

Note: For examination, a mixture may be given from which one cation is to be estimated volumetrically and the other gravimetrically .

II . Preparation of single stage inorganic complexes (a minimum of 10 complexes).

Note : Characterisation of any two metal complex prepared during the practicals by UV or IR spectral techniques (course work only)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-E1	Estimation of Cu^{2+} and Ni^{2+} ions
2-E2	Estimation of Cu^{2+} and Ni^{2+} ions
3- E3	Estimation of Cu^{2+} and Ni^{2+} ions
4-E4	Estimation of Cu^{2+} and Ni^{2+} ions
5-E5	Estimation of Cu^{2+} and Zn^{2+} ions.
6-E6	Estimation of Cu^{2+} and Zn^{2+} ions.
7-E7	Estimation of Cu^{2+} and Zn^{2+} ions.
8-E8	Estimation of Cu^{2+} and Zn^{2+} ions.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	. Estimation of Fe^{2+} and Cu^{2+} ions
16-E11	. Estimation of Fe^{2+} and Cu^{2+} ions
17-E-12	. Estimation of Fe^{2+} and Cu^{2+} ions
18-E13	. Estimation of Fe^{2+} and Cu^{2+} ions
19-E14	Estimation of Fe^{2+} and Ni^{2+} ions
20-E15	Estimation of Fe^{2+} and Ni^{2+} ions
21-E16	Estimation of Fe^{2+} and Ni^{2+} ions
22-E17	Estimation of Fe^{2+} and Ni^{2+} ions
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Ca^{2+} and Mg^{2+} ions
25-E19	Estimation of Ca^{2+} and Mg^{2+} ions
26-E20	Estimation of Ca^{2+} and Mg^{2+} ions
27-E21	Estimation of Ca^{2+} and Mg^{2+} ions
28-E22	Estimation of Ca^{2+} and Ba^{2+} ions
29-E23	Estimation of Ca^{2+} and Ba^{2+} ions
30-E24	Estimation of Ca^{2+} and Ba^{2+} ions
31-E25	Estimation of Ca^{2+} and Ba^{2+} ions
32-E26	Analysis of ores and alloys
33-E27	Analysis of ores and alloys
34-E28	Analysis of ores and alloys
35-E29	Analysis of ores and alloys
36-E30	Preparation of single stage inorganic complexes
37-E31	Preparation of single stage inorganic complexes
38-E32	Preparation of single stage inorganic complexes
39-E33	Preparation of single stage inorganic complexes
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Preparation of single stage inorganic complexes
46-E35	Preparation of single stage inorganic complexes
47-E36	Preparation of single stage inorganic complexes
48-E37	Preparation of single stage inorganic complexes
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand gravimetric tirations
CO2	To understand inorganic preparations

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-II
Course Code	KCHL43
Class	II year (2014-2015)
Semester	Even
Staff Name	Mr. S. Daniel Abraham
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand potentiometric titrations.*
- *To understand the adsorption and kinetics of reactions.*

PHYSICAL CHEMISTRY PRACTICAL - II

I. Potentiometric titrations- (a) Acid alkali titrations.

b) Precipitation titrations (a) Mixture of Cland I vs Ag+

(c) Redox titrations

(a) Fe2+ vs Cr2O7 2-

(b) Fe2+ vs Ce4+

(c) I - vs KMnO4

(d) Determination of dissociation constant of weak acids

(e) Determination of solubility product of sparingly soluble silver salts.

(f) Determination of activity and activity coefficient of ions.

(g) Determination of pH of a buffer solution using a quin hydrone electrode.

II. Titration using pH meter

(a) Determination of dissociation constant of dibasic acid.

III. Freundlich Adsorption isotherm

(a) Determination of dissociation constant of dibasic acid.

IV. Kinetic studies

(a) Kinetics –acid hydrolysis of ester –comparison of strength of acids.

(b) Kinetics –Persulfate –Iodide –clock reaction-primary salt effect.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-E1	Potentiometric titrations- (a) Acid alkali titrations.
2-E2	Potentiometric titrations- (a) Acid alkali titrations.
3- E3	Potentiometric titrations- (a) Acid alkali titrations.
4-E4	Potentiometric titrations- (a) Acid alkali titrations.
5-E5	Precipitation titrations (a) Mixture of Cland I vs Ag+
6-E6	Precipitation titrations (a) Mixture of Cland I vs Ag+
7-E7	Precipitation titrations (a) Mixture of Cland I vs Ag+
8-E8	Precipitation titrations (a) Mixture of Cland I vs Ag+
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Fe2+ vs Cr2O7 2-
16-E11	Fe2+ vs Cr2O7 2-
17-E-12	Fe2+ vs Ce4+
18-E13	Fe2+ vs Ce4+
19-E14	I - vs KMnO4
20-E15	I - vs KMnO4
21-E16	Determination of dissociation constant of weak acids
22-E17	Determination of dissociation constant of weak acids
23-P2	**College level meeting/Cell function**
24-E18	Determination of solubility product of sparingly soluble silver salts
25-E19	Determination of solubility product of sparingly soluble silver salts
26-E20	Determination of activity and activity coefficient of ions
27-E21	Determination of activity and activity coefficient of ions
28-E22	Determination of pH of a buffer solution using a quin hydrone electrode
29-E23	Determination of pH of a buffer solution using a quin hydrone electrode
30-E24	Determination of pH of a buffer solution using a quin hydrone electrode
31-E25	Determination of pH of a buffer solution using a quin hydrone electrode
32-E26	Determination of dissociation constant of dibasic acid
33-E27	Determination of dissociation constant of dibasic acid
34-E28	Determination of dissociation constant of dibasic acid
35-E29	Determination of dissociation constant of dibasic acid
36-E30	Kinetics –acid hydrolysis of ester –comparison of strength of acids
37-E31	Kinetics –acid hydrolysis of ester –comparison of strength of acids
38-E32	Kinetics –acid hydrolysis of ester –comparison of strength of acids
39-E33	Kinetics –acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
46-E35	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
47-E36	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
48-E37	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–II"
CO1	To understand the potentiometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalahshmi)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	HCHM21
Class	I year (2014-2015)
Semester	Even
Staff Name	Mrs. M. Seethalahshmi
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the applications of UV and IR spectra in organic chemistry.*
- *To study the applications of NMR spectra.*
- *To study about mass spectra.*
- *To understand the structure and synthesis of alkaloids and antibiotics.*
- *To study about structural elucidation of vitamins.*

ORGANIC CHEMISTRY – II

Unit – I : Ultraviolet , Infra-Red Spectroscopy , ORD and CD

UV: The absorption laws – Types of electronic transitions – effects of solvent and Hydrogen bonding on λ_{max} values – Woodward – Fisher rules to calculate λ_{max} values of conjugated dienes and α,β – unsaturated ketones.

IR: Characteristic of IR absorptions of different functional groups – factors influencing absorption of carbonyl and hydroxyl groups – electronic effect, hydrogen bonding and Fermi resonance.

ORD: Octant rule – α – halo ketone rule and their applications – Circular Dichroism.

Unit – II: NMR SPECTROSCOPY

1H-NMR spectroscopy: Basic Principle – number of signals – chemical shift – Factors influencing chemical shift - spin–spin splitting–Proton exchange reactions - classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR.

C-13 spectroscopy: Principle of proton decoupled and OFF- resonance decoupled C-13 spectroscopy - comparison with H1NMR - chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds)

2D NMR spectroscopy: H1–H1COSY, H1–C13 COSY, NOESY, DEPT and INADEQUATE spectra.

Unit – III: MASS SPECTROSCOPY

Basic Principles– Base peak – molecular ion – nitrogen rule – metastable ions – isotopic peak - daughter ions – Mc–Lafferty rearrangement – RDA – General rules for fragmentation pattern – Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds .

Alternative electron impact ionization technique– CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF , ICP- MS. One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques is compulsory under section – c. Problems shall be based on the reference books.

Unit – IV: ALKALOIDS AND ANTIBIOTICS

Alkaloids: Degradation studies – HEM, Emde and Von – Braun – Structural elucidation and synthesis of Quinine, Morphine, Cocaine, Lysergic acid and Atropine. Synthesis of Reserpine and PaPaverine – Biosynthesis of tyrosine, tryptophan. **Antibioties:** Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.

Unit – V: VITAMINS AND TERPENOIDS

Vitamins: Structural elucidation, synthesis of vitamins – A1, B1 and C - synthesis of vitamins B2, B6, D and E.

Terpenoids: Structural elucidation, synthesis of α-Pinene, Camphor, α-Cadinene, Zingiberene and squalene - synthesis of α-Santonin and Gibberelic acid. Bio synthesis of mono and di terpenoids.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-L1	**Unit – I : Ultraviolet , Infra-Red Spectroscopy , ORD and CD** UV: The absorption laws – Types of electronic transitions – effects of solvent and
2-L2	Hydrogen bonding on λ_{max} values – Woodward – Fisher rules to calculate λ_{max} values of conjugated dienes and α,β – unsaturated ketones.
3- L3	IR: Characteristic of IR absorptions of different functional groups
4-L4	– factors influencing absorption of carbonyl and hydroxyl groups
5-L5	– electronic effect, hydrogen bonding
6-L6	Fermi resonance.
7-L7	ORD: Octant rule –
8-L8	α – halo ketone rule and their applications
9-L9	Circular Dichroism. **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19-01-2015)**
11-L10	**Test Paper distribution and result analysis- Unit – II: NMR SPECTROSCOPY** **1H-NMR spectroscopy**: Basic Principle – number of signals – chemical shift –
12-P1	**Department function**
13-L11	Factors influencing chemical shift - spin–spin splitting–
14-L12	Proton exchange reactions - classification of spin systems
15-L13	– analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–
16-L14	NOE in stereochemistry – FTNMR.
17-L-15	**C-13 spectroscopy**: Principle of proton decoupled and OFF- resonance decoupled C-13 spectroscopy -
18-L16	comparison with H1NMR - chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds)
19-L17	**2D NMR spectroscopy**: H1–H1COSY, H1–C13 COSY,
	Entering Internal Test-I Marks into University portal
20-L18	NOESY,
21-P2	**College level meeting/Cell function**
22-L19	DEPT
23-L20	INADEQUATE spectra.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (16-02-2015)**
26-L22	**Test Paper distribution and result analysis- Unit – III: MASS SPECTROSCOPY** Basic Principles– Base peak – molecular ion – nitrogen rule –

	metastable ions – isotopic peak - daughter ions –
27-L23	Mc–Lafferty rearrangement – RDA –
28-L24	General rules for fragmentation pattern
29-L25	Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds .
30-L26	Alternative electron impact ionization technique– CI,
31-L27	FAB, ESI – MS,
32-L28	MALDI –MS, MALDI-TOF ,
33-L29	ICP- MS.
33-L30	One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques
35-L31	One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: ALKALOIDS AND ANTIBIOTICS** **Alkaloids:** Degradation studies – HEM, Emde and Von – Braun –
38-L34	Structural elucidation and synthesis of Quinine,
39-L35	Morphine, Cocaine,
40-L36	Lysergic acid and Atropine.
41-L37	Synthesis of Reserpine and PaPaverine –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Biosynthesis of tyrosine, tryptophan.
44-L39	**Antibioties:** Structure and synthesis of penicillin,
45-L40	**Submission ofAssignment/take the seminar**
46-L41	cephalosporin – C,
47-L42	chloramphenicol
48-L43	Streptomycin
49-L44	**Unit – V: VITAMINS AND TERPENOIDS** **Vitamins:** Structural elucidation, synthesis of vitamins – A1, B1 and C -
50-L45	synthesis of vitamins B2, B6, D and E.
51-IT-III	**Internal Test-III (16-03-2015)**
52-L46	**Terpenoids:** Structural elucidation, synthesis of α-Pinene, Camphor, α-Cadinene,
53-L47	Zingiberene and squalene -
54-L48	synthesis of α-Santonin and Gibberelic acid.
55-L49	Bio synthesis of mono and di terpenoids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16-03-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper**

	discussion
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –II"
CO1	*To know the applications of UV and IR spectra in organic chemistry.*
CO2	*To study the applications of NMR spectra.*
CO3	*To study about mass spectra.*
CO4	*To understand the structure and synthesis of alkaloids and antibiotics.*
CO5	*To study about structural elucidation of vitamins.*
Experimental Learning	
EL1	Prepare an organic compound and record its UV
EL2	Prepare an organic compound and record its proton NMR
EL3	Prepare an organic compound and record its Mass spectra
Integrated Activity	
IA1	Elucidate the structure of vitamins
IA2	Collect information on terpenoids other than in syllabus

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. S. Asha Jebamary)

Programme Name	M.Sc. Chemistry
Course Name	Inorganic Chemistry-II
Course Code	HCHM22
Class	I year (2014-2015)
Semester	Even
Staff Name	Mrs. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the CFSE and MO theory.*
- *To study the EAN rule and about metal carbonyls.*
- *To study the homogeneous and heterogeneous catalysis.*
- *To understand the NMR and ESR spectra.*
- *To study about polarographic techniques.*

INORGANIC CHEMISTRY – II

UNIT – I: COORDINATION CHEMISTRY

Stability of complexes – stabilisation of unusual oxidation states - determination of stability constants by potentiometric and spectrophotometric methods – factors affecting stability – Chelate and template effects. VB theory and CFT – Splliting of d-orbitals under different geometries – CFSE –evidence for CFSE- structure of spinels – factors affecting CFSE – spectrochemical series – Jahn Teller fistortion- M.O. theory of bonding – Sigma and π bonding in coordination compounds.

Ligand substitution reactions of square planar complexes –trans effect and its theories – use of trans effect in synthesis of complexes – substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions. Electron transfer reactions – Inner sphere and outer sphere processes – outer sphere process in photochemical reactions.

UNIT – II: ORGANOMETALLIC CHEMISTRY - I

Introduction – History-EAN and its correlation to stability – Synthesis and structures of metal carbonyls – carbonylate anions, carbonyl hydride complexes and metal nitrosyls – Isolobal analogy – IR study of metal carbonyls – Synthesis, properties and structural features of metal complexes with carbine, alkene and arene. Hapticity – Metallocenes – synthesis, properties and bonding in ferrocene – covalent versus ionic bonding in beryllocene, clusters and catalysis, hydride and dihydrogen complexes, fluxionality.

UNIT – III: ORGANOMETALLIC CHEMISTRY - II

Oxidative addition and reductive elimination - insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands- Catalysis by organometallic compounds – Homogeneous catalysis – alkene hydrogenation - synthesis gas and water gas shift reactions – hydroformylation – Carbonylation of alcohols and oxygenation of olefins - Heterogeneous catalysis – Fischer Tropsch process and Ziegler-Natta polymerization – Immobilized homogeneous catalysis.

UNIT – IV: APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS II

NMR SPECTROSCOPY: ^{31}P, ^{19}F and ^{15}N – NMR – Introduction – applications in structural problems – evaluation of rate constants - monitoring the course of reaction – NMR of fluxional molecules – NMR of paramagnetic molecules – contact shifts and shift reagents.

ESR spectroscopy: Principles – presentation of the spectrum – hyperfine splitting - factors affecting the magnitude of g-values – zero –field splitting and Kramer’s degeneracy - anisotropy in the hyperfine coupling constant. Application of ESR in the study of transition metal complexes – J-T distortion: studies of Cu(II) complexes.

UNIT – V: ELECTROANALYTICAL METHODS

Voltammetry: Polarographic analysis – application, quantitative determination, determination of equilibrium constant for complex formation – organic polarography – advanced voltammetric techniques – rapid – scan techniques – pulse techniques – AC techniques – stripping techniques – coulometry – classification – controlled current coulometry – controlled potential coulometry – advantage of coulometric methods – amperometry – amperometric sensors – amperometric titrations – chronomethods – Chronopotentiometry – Chrono coulometry – cyclic voltammetry.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2014
1-L1	**UNIT – I: COORDINATION CHEMISTRY** Stability of complexes – stabilisation of unusual oxidation states
2-L2	determination of stability constants by potentiometric and spectrophotometric methods – factors affecting stability
3- L3	– Chelate and template effects. VB theory and CFT – Splliting of d-orbitals under different geometries
4-L4	CFSE –evidence for CFSE- structure of spinels – factors affecting CFSE – spectrochemical series
5-L5	Jahn Teller fistortion- M.O. theory of bonding – Sigma and π bonding in coordination compounds.
6-L6	Ligand substitution reactions of square planar complexes
7-L7	trans effect and its theories – use of trans effect in synthesis of complexes – substitution reactions in octahedral complexes
8-L8	acid hydrolysis, base hydrolysis and anation reactions.
9-L9	Electron transfer reactions – Inner sphere and outer sphere processes – outer sphere process in photochemical reactions. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19.01.2015)**
11-L10	**Test Paper distribution and result analysis**- **UNIT – II: ORGANOMETALLIC CHEMISTRY - I** Introduction – History-EAN and its correlation to stability –
12-P1	**Department function**
13-L11	Synthesis and structures of metal carbonyls – carbonylate anions, carbonyl hydride complexes and metal nitrosyls
14-L12	Isolobal analogy.
15-L13	IR study of metal carbonyls
16-L14	Synthesis, properties and structural features of metal complexes with carbine, alkene and arene
17-L-15	Hapticity
18-L16	Metallocenes – synthesis, properties and bonding in ferrocene –
19-L17	covalent versus ionic bonding in beryllocene,
	Entering Internal Test-I Marks into University portal
20-L18	clusters and catalysis,.
21-P2	**College level meeting/Cell function**
22-L19	hydride and dihydrogen complexes,
23-L20	fluxionality
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**

25-IT-II	**Internal test – II (16.02.2015)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: ORGANOMETALLIC CHEMISTRY - II** Oxidative addition and reductive elimination **-**
27-L23	insertion and elimination reactions
28-L24	– nucleophilic and electrophilic attack of coordinating ligands**-**
29-L25	Catalysis by organometallic compounds –
30-L26	Homogeneous catalysis – alkene hydrogenation **-**
31-L27	synthesis gas and water gas shift reactions – hydroformylation
32-L28	Carbonylation of alcohols and oxygenation of olefins
33-L29	Heterogeneous catalysis
33-L30	– Fischer Tropsch process
35-L31	Ziegler-Natta polymerization – Immobilized homogeneous catalysis.
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS II** NMR SPECTROSCOPY: ^{31}P, ^{19}F and ^{15}N – NMR – Introduction
38-L34	applications in structural problems – evaluation of rate constants **-** monitoring the course of reaction
39-L35	NMR of fluxional molecules – NMR of paramagnetic molecules
40-L36	– contact shifts and shift reagents.
41-L37	ESR spectroscopy: Principles – presentation of the spectrum
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	– hyperfine splitting **-** factors affecting the magnitude of g-values
44-L39	zero –field splitting and Kramer's degeneracy
45-L40	**Submission ofAssignment/take the seminar**
46-L41	anisotropy in the hyperfine coupling constant.
47-L42	Application of ESR in the study of transition metal complexes
48-L43	J-T distortion: studies of Cu(II) complexes.
49-L44	**UNIT – V: ELECTROANALYTICAL METHODS** Voltametry: Polarographic analysis – application, quantitative determination, determination of equilibrium constant for complex formation
50-L45	– organic polarography – advanced voltametric techniques – rapid – scan techniques
51-IT-III	**Internal Test-III (16.03.2015)**
52-L46	pulse techniques – AC techniques – stripping techniques – coulometry – classification – controlled current coulometry
53-L47	controlled potential coulometry – advantage of coulometric methods – amperometry
54-L48	amperometric sensors – amperometric titrations
55-L49	chronomethods – Chronopotentiometry – Chrono coulometry – cyclic voltametry.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.04.2015)**

57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –II”
CO1	To know the nature of metal-ligand bond in complexes
CO2	To study about metal carbonyls and metallocenes
CO3	To study the homogeneous and heterogeneous catalysis
CO4	To study the applications of NMR and ESR
CO5	To understand the voltammetric techniques
Experimental Learning	
EL1	Prepare a complex and record its cyclic voltammogram
EL2	Prepare a complex and record its NMR spectra
EL3	Prepare a complex and record its ESR spectra
Integrated Activity	
IA1	Find the hapticity of certain molecules
IA2	Study of IR spectra of metal carbonyls

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-II
Course Code	HCHM23
Class	I year (2014-2015)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of quantum mechanics

To know about approximation methods

To understand the Principles of chemical kinetics

To understand fast reactions

To understand the importance of photochemistry

PHYSICAL CHEMISTRY - II

Unit – I : Quantum Mechanics I

Inadequacy of classical mechanics – Plank's quantum theory – Compton effect – wave particle duality – uncertainity principle. Operators and their algebra, eigen value and eigen functions. Quantum mechanical postulates, Time-dependent and time-independent Schrödinger wave equations, Particle in a box (1D and 3D), Quantum mechanical tunnelling and transmission coefficient-rigid rotor and harmonic oscillator.

Unit – II : Quantum Mechanics II

The hydrogen atom – radial distribution and spherical harmonics functions - shapes of atomic orbitals. Approximation methods - The Variation theorem; Applications of Variation Method to hydrogen and Helium atoms. Perturbation Theory (First order) Application to helium atom. Pauli's exclusion principle – slater determinant and HF and SCF methods to helium atom. Hückel Theory: application to ethylene, butadiene and benzene. Calculation of electron density and bond order.

Unit – III : Chemical Kinetics

Collision theory of reaction rate – steric factor – theory of absolute reaction rates – thermodynamic treatment. Unimolecular reactions - Lindemann, Hinshelwood, RRK, RRKM and Slater theories. Chain reactions – study of Kinetics of chain reactions like H_2-Br_2 reaction, Decomposition of acetaldehyde and N_2O_4 – explosive reactions – study of H_2-O_2 reaction- ionic reactions in solution – Factors influencing the reaction rate – salt effect – influence of pressure – kinetic isotope effect.

UNIT-IV : Chemical Dynamics

Study of fast reactions – General features - Reactions in Flow systems – continuous and stopped flow, chemical Relaxation methods, Temperature and Pressure jump methods, Shock-Tube techniques, Flash photolysis and pulse radiolysis. Concept of linear free energy relationship – derivation of Hammett equation – significance of substituent and reaction constants – Taft equation – thermodynamic implications of LFER.

Unit – V : Photochemistry and Radiation Chemistry

Absorption of light by molecules – Reaction paths of electronically excited molecules: Fluorescence and phosphorescence - Jablonski diagram – Physical properties of electronically excited molecules: excited state dipole moment, excited state Pk_a and redox potentials- Stern-Volmer equation and its applications – excimers and exciplex - Photosensitisation – chemiluminescence.

Radiation Chemistry**: S**ources of high energy - radiolysis of water– Dosimetry and G-value- primary and secondary processes – linear energy transfer – the hydrated electron and its reaction.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-L1	**Unit – I : Quantum Mechanics I** Inadequacy of classical mechanics – Plank's quantum theory –
2-L2	Compton effect – wave particle duality – uncertainity principle.
3- L3	Operators and their algebra, eigen value and eigen functions.
4-L4	Quantum mechanical postulates,
5-L5	Time-dependent Schrödinger wave equations,
6-L6	time-independent Schrödinger wave equations,
7-L7	Particle in a box (1D and 3D),
8-L8	Quantum mechanical tunnelling and transmission coefficient-rigid rotor and harmonic oscillator.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19-01-2015)**
11-L10	**Test Paper distribution and result analysis- Unit – II : Quantum Mechanics II** The hydrogen atom – radial distribution and spherical harmonics functions -
12-P1	**Department function**
13-L11	shapes of atomic orbitals.
14-L12	Approximation methods - The Variation theorem;
15-L13	Applications of Variation Method to hydrogen and Helium atoms.
16-L14	Perturbation Theory (First order) Application to helium atom.
17-L-15	Pauli's exclusion principle
18-L16	– slater determinant and HF and SCF methods to helium atom.
19-L17	Hückel Theory: application to ethylene,
	Entering Internal Test-I Marks into University portal
20-L18	butadiene
21-P2	**College level meeting/Cell function**
22-L19	and benzene.
23-L20	Calculation of electron density and bond order.
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (16-02-2015)**
26-L22	**Test Paper distribution and result analysis- Unit – III : Chemical Kinetics** Collision theory of reaction rate – steric factor
27-L23	– theory of absolute reaction rates – thermodynamic treatment.
28-L24	Unimolecular reactions - Lindemann,

29-L25	Hinshelwood, RRK,
30-L26	RRKM and Slater theories.
31-L27	Chain reactions – study of Kinetics of chain reactions like H_2-Br_2 reaction,
32-L28	Decomposition of acetaldehyde and N_2O_4
33-L29	– explosive reactions – study of H_2-O_2 reaction-
33-L30	ionic reactions in solution
35-L31	– Factors influencing the reaction rate – salt effect – influence of pressure – kinetic isotope effect.
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV : Chemical Dynamics** Study of fast reactions – General features -
38-L34	Reactions in Flow systems – continuous and stopped flow,
39-L35	chemical Relaxation methods, Temperature and Pressure jump methods,
40-L36	Shock-Tube techniques, Flash photolysis and pulse radiolysis.
41-L37	Concept of linear free energy relationship
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	– derivation of Hammett equation
44-L39	– significance of substituent and reaction constants
45-L40	**Submission of Assignment/ seminar**
46-L41	– Taft equation
47-L42	– thermodynamic implications of LFER.
48-L43	– thermodynamic implications of LFER.
49-L44	**Unit – V : Photochemistry and Radiation Chemistry** Absorption of light by molecules – Reaction paths of electronically excited molecules: Fluorescence and phosphorescence - Jablonski diagram –
50-L45	Kinetics and Mechanism of polymerization (Addition and condensation) –
51-IT-III	**Internal Test-III (16-03-2015)**
52-L46	Physical properties of electronically excited molecules: excited state dipole moment, excited state Pk_a and redox potentials-
53-L47	Stern-Volmer equation and its applications – excimers and exciplex -
54-L48	Photosensitisation – chemiluminescence.
55-L49	Radiation Chemistry**: S**ources of high energy - radiolysis of water– Dosimetry and G-value- primary and secondary processes – linear energy transfer – the hydrated electron and its reaction.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16-04-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –II"
CO1	To learn the wave equations
CO2	To apply approximation methods to hydrogen and helium systems
CO3	To understand the Principles of chemical kinetics
CO4	To understand about fast reactions
CO5	To understand photochemistry
Experimental Learning	
EL1	Interpretation of fluorescence spectra
EL2	Demonstration of quenching experiment
Integrated Activity	
IA1	Study of effect of solvent on reaction rate
IA2	Derive kinetics for certain reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-IV
Course Code	HCHM41
Class	II year (2014-2015)
Semester	Even
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the reactions of carbanions and carbocation intermediates.
- To understand the conformations of cyclic compounds.
- To understand the reterosynthetic analysis
- To study the uses of reagents
- To study the structure of steroids

ORGANIC CHEMISTRY –IV

Unit-I Reaction under Intermediate chemistry

Reaction Under Carbanion Intermediate : Clasien, Knoevenegal, Stobbe, Darzen, acyloic condensation Shapiro reaction and Julia olifination. Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions Carbocation intermediate : Oxymercuration, halolactonisation. Reaction following Radical intermediate: Mc Murray coupling, Gomberg-

Pechmann and Pschorr reactions. Reaction involving Ylide intermediate: Wittig reaction and Peterson olifination.

Unit-II Conformational analysis

Conformations of mono and disubstituted cyclohexanes-effect of hydrogen bonding, dipole and steric effects on the disubstituted cyclohexanes- conformation and reactivity of acyclic

and cyclic compounds (6members)- conformation of decalin and perhydrophenanthrene-curtin-Hammett principle.

Unit-III Reterosynthetic analysis

Synthon-synthetic equivalent-Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds- use of activating and blocking groups-Robinson annulations reaction-carbon skeletal complexity-Role of key intermediates in organic synthesis. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine, Baclofan, Brufen, Trihexyl phenydyl, Bisabolene, α-onocerin, Isonootkatone, cascarillic acid, camphor and 2,4dihydroxy pentanoic acid.

Unit-IV Reagents in organic synthesis

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), DMSO, Super hydrides- K and L selectrides -Dess-martin-periodinane- Baker‘s yeast –Quaternary ammonium salt and crown ethers. Introductory treatment of the application of silicon, boron (organoboranes), phosphorus, palladium, samarium, ruthenium and indium reagents in organic synthesis.

Unit-V Steroids

Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol- structural elucidation of androsterone, testosterone, progesterone, Oestrone. Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid. Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane.

Course calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-L1	**Unit-I Reaction under Intermediate chemistry** Reaction Under Carbanion Intermediate : Clasien, Knoevenegal,
2-L2	Stobbe, Darzen, acyloic condensation
3- L3	Shapiro reaction and Julia olifination.
4-L4	Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions
5-L5	Carbocation intermediate : Oxymercuration, halolactonisation
6-L6	. Reaction following Radical intermediate: Mc Murray coupling,
7-L7	Gomberg- Pechmann and Pschorr reactions.

8-L8	Reaction involving Ylide intermediate: Wittig reaction
9-L9	Peterson olifination.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19-01-2015)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**Unit-II Conformational analysis** Conformations of mono and disubstituted cyclohexanes-
14-L12	effect of hydrogen bonding,
15-L13	dipole and steric effects on the disubstituted cyclohexanes
16-L14	- conformation of acyclic compounds (6members)-.
17-L-15	reactivity of acyclic compounds (6members)-.
18-L16	- conformation of cyclic compounds (6members)-.
19-L17	- conformation of cyclic compounds (6members)-.
	Entering Internal Test-I Marks into University portal
20-L18	conformation of decalin
21-P2	**College level meeting/Cell function**
22-L19	conformation of perhydrophenanthrene
23-L20	-curtin-Hammett principle
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (16-02-2015)**
26-L22	**Unit-III Reterosynthetic analysis** Synthon-synthetic equivalent-
27-L23	Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds-
28-L24	use of activating and blocking groups-
29-L25	Robinson annulations reaction-carbon skeletal complexity-
30-L26	Role of key intermediates in organic synthesis
31-L27	. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine,
32-L28	Baclofan, Brufen, Trihexyl phenydyl,
33-L29	Bisabolene, α-onocerin,
33-L30	Isonootkatone, cascarillic acid,
35-L31	camphor and 2,4dihydroxy pentanoic acid.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Reagents in organic synthesis** 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ),
38-L34	DMSO, Super hydrides- -
39-L35	Dess-martin-periodinane- Baker‘s yeast –

40-L36	Quaternary ammonium salt and crown ethers.
41-L37	Introductory treatment of the application of silicon,
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	boron (organoboranes), phosphorus,
44-L39	palladium, samarium,
45-L40	**Submission of Assignment/take the seminar**
46-L41	ruthenium reagents in organic synthesis
47-L42	indium reagents in organic synthesis
48-L43	K and L selectrides
49-L44	**Unit-V Steroids** Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol-
50-L45	structural elucidation of androsterone, testosterone,.
51-IT-III	**Internal Test-III (16-03-2015)**
52-L46	progesterone, Oestrone.
53-L47	Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid.
54-L48	Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural
55-L49	elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16-04-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –IV"
CO1	Understand the reactions of intermediates
CO2	Explain the conformations of cyclohexane and decalin
CO3	Understand the reterosynthesis of certain compounds
CO4	Explain the role of reagents in organic synthesis
CO5	Explain the structure and synthesis of steroids
Experimental Learning	
EL1	Make models of various conformers of cyclohexane
EL2	Synthesise a compound involving DMSO as reagent
Integrated Activity	
IA1	Discuss on different reagents and their uses
IA2	Elucidate the structure of cholesterol

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-IV
Course Code	HCHM42
Class	II year (2014-2015)
Semester	Even
Staff Name	Mr. C. JOEL
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the spectroscopy of inorganic compounds.
- To understand the theory and principle of thermoanalytical techniques.
- To understand the synthetic reactions of intercalation compounds
- To understand the photophysical properties of certain metal complexes
- To understand the chemistry of enzymes

INORGANIC CHEMISTRY –IV

UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III

Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states , Hund‘s rule and term symbols . Selection rules for electronic transition and hole formalism – splitting of terms – Orgel and Tanabe Sugano diagrams – Evaluation of 10 Dq and B for octahedral d 2 and d8 systems. Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes . Photo electron spectroscopy : Koopman‘s theorem , PES – XPES(ESCA) – chemical shifts in XPES – application of ESCA to inorganic systems – Auger electron spectroscopy.

UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS

Theory and principles of thermogravimetric analysis , differential thermal analysis and differential scanning colorimetry–characteristic features of TGA and DTA curves-factors affecting TGA and DTA curves- complementary nature of TGA and DTA – applications of thermal methods in analytical chemistry- thermometric titrations- the study of minerals and polymers. Principle and applications of colorimetry,spectrophotometry, nephelometry, turbidimetry , fluorimetry and atomic absorption spectroscopy.

UNIT – III : CHEMISTRY OF INORGANIC MATERIALS

Synthesis of inorganic materials – high temperature reactions and experimental methods – precipitation, gel, solution and hydrothermal methods , synthesis in sealed tubes and special atmospheres . Low temperature methods. Insertion compounds of metal oxides – Intercalation compounds of graphite and transition metal disulphides . Zeolites : structures and properties – pillared clays – fullerenes and fullerides.

UNIT -IV : INORGANIC PHOTOCHEMISTRY

Properties of excited states of metal complexes – charge transfer excitation – bimolecular deactivation(quenching) and energy transfer – photochemical path ways : oxidation-reduction, isomerisation and substitutional processes – photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –photophysical and photochemical properties of ruthenium polypyridyls – applications of inorganic photochemistry : photochemical conversion and storage of solar energy – inorganic photochemistry at semi-conductor electrodes.

UNIT – V : BIOINORGANIC CHEMISTRY – II

Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases – zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations . Chelate therapy - therapeutic chelating agents and their uses – anti - cancer platinum complexes and their interaction with nucleic acids, gold compounds and anti-arthritic agents – metal complexes as probes of nucleic acids.

Course calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2014
1-L1	**UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III** Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states ,
2-L2	Hund‘s rule and term symbols .
3- L3	Selection rules for electronic transition and hole formalism
4-L4	– splitting of terms – Orgel and Tanabe Sugano diagrams.

5-L5	– Evaluation of 10 Dq and B for octahedral d 2 and d8 systems.
6-L6	Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes.
7-L7	Photo electron spectroscopy : Koopman's theorem ,
8-L8	PES – XPES(ESCA) – chemical shifts in XPES –
9-L9	application of ESCA to inorganic systems – Auger electron spectroscopy.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19-01-2015)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS** Theory and principles of thermogravimetric analysis ,
14-L12	differential thermal analysis and differential scanning colorimetry–
15-L13	characteristic features of TGA and DTA curves-
16-L14	factors affecting TGA and DTA curves-
17-L-15	complementary nature of TGA and DTA –
18-L16	applications of thermal methods in analytical chemistry
19-L17	- thermometric titrations- the study of minerals and polymers.
	Entering Internal Test-I Marks into University portal
20-L18	Principle and applications of colorimetry,spectrophotometry,
21-P2	**College level meeting/Cell function**
22-L19	nephelometry,
23-L20	turbidimetry ,.
24-L21	**Allotting portion for Internal Test-II-** fluorimetry and atomic absorption spectroscopy
25-IT-II	**Internal test – II (16-02-2015)**
26-L22	**UNIT – III : CHEMISTRY OF INORGANIC MATERIALS** Synthesis of inorganic materials –
27-L23	high temperature reactions and experimental methods –
28-L24	precipitation, gel, solution and hydrothermal methods ,
29-L25	synthesis in sealed tubes and special atmospheres .
30-L26	Low temperature methods.
31-L27	Insertion compounds of metal oxides –
32-L28	Intercalation compounds of graphite and transition metal disulphides .
33-L29	Zeolites : structures and properties –.
33-L30	pillared clays
35-L31	– fullerenes and fullerides
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT -IV : INORGANIC PHOTOCHEMISTRY** Properties of excited states of metal complexes –
38-L34	charge transfer excitation –
39-L35	bimolecular deactivation(quenching) and energy transfer
40-L36	photochemical path ways:oxidation-reduction, isomerisation and substitutional

41-L37	– photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	photophysical and photochemical properties of ruthenium polypyridyls –
44-L39	applications of inorganic photochemistry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	: photochemical conversion
47-L42	– inorganic photochemistry at semi-conductor electrodes
48-L43	storage of solar energy
49-L44	**UNIT – V : BIOINORGANIC CHEMISTRY – II** Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases –
50-L45	zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations .
51-IT-III	**Internal Test-III (16-03-2015)**
52-L46	Chelate therapy - therapeutic chelating agents and their uses
53-L47	– anti - cancer platinum complexes and their interaction with nucleic acids ,
54-L48	gold compounds and anti-arthritic agents –
55-L49	metal complexes as probes of nucleic acids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16-04-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –IV”
CO1	Learn the application of spectroscopy of inorganic compounds
CO2	Learn the principles and applications of thermoanalytical techniques
CO3	Explain the properties of zeolites and fullerenes
CO4	Learn the photophysical properties of metal complexes
CO5	Learn the role of metal ions in enzymes
Experimental Learning	
EL1	Record the TGA of any copper compound
EL2	Record the fluorescence of any chromium complex
Integrated Activity	
IA1	Analyse the TG-DTA curve of the given compound
IA2	Discuss the chelate therapy

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-IV
Course Code	HCHM43
Class	II year (2014-2015)
Semester	Even
Staff Name	Mrs. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of rotational spectroscopy.
- To understand the principle of IR spectroscopy.
- To understand the principle of electronic spectroscopy
- To understand the principle of NMR and ESR spectroscopy
- To understand the principle of NQR and Mossbauer spectroscopy

PHYSICAL CHEMISTRY –IV

UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA

Characterization of electromagnetic radiation. Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and nonrigid diatomic molecules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic and symmetric top molecules. The stark effect.

UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY

Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect. The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules-Fundamental vibrations and their symmetry, overtone and combination frequencies, concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy: Rayleigh scattering . Raman Scattering, classical and quantum theories of Raman effect.

Rotational Raman Spectra for linear and symmetric top molecules. Vibrational Raman Spectra , rotational fine structure. Polarization of light and the Raman effect. Technique and instrumentation- Laser Raman spectrometer. Structure determination from Raman and Infra-red spectroscopy.

UNIT – III: ELECTRONIC SPECTROSCOPY

Electronic spectroscopy of diatomic molecules. Born – oppenheimer approximation. Sequences and progressions, the vibrational course structure and rotational fine structure of electronic band. The Franck-Condon principle, dissociation energy and dissociation products. Birje-Sponer extrapolation. The fortrat diagram. Predissociation, Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.

UNIT - IV: NMR AND ESR

Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions. NMR of simple AX and AMX type molecules. Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy. C, F and P NMR spectra-principle and applications. Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting . Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p- benzosemiquinone radicals, calculation of electron density-McConnel equation, Fine structure in ESR- Zero field shifting and Kramer‘s degeneracy. Double resonance-ELDOR and ENDOR, study of unstable paramagnetic species, spin labeling studies of bio-molecules.

UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY

(a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter, Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character. (b) Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift. Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds, (ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination, (iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).

Course calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2014
1-L1	**UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA** Characterization of electromagnetic radiation.
2-L2	Regions of Spectrum, transition probability
3- L3	the width and intensity of spectral transitions
4-L4	Classification of molecules according to their moment of inertia.
5-L5	The effect of isotopic substitution
6-L6	Rotational spectra of rigid and nonrigid diatomic molecules
7-L7	The intensities of spectral lines
8-L8	Polyatomic and symmetric top molecules.

9-L9	The stark effect.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (19-01-2015)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY** Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect.
14-L12	The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules
15-L13	Fundamental vibrations and their symmetry, overtone and combination frequencies,
16-L14	concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy
17-L-15	Rayleigh scattering . Raman Scattering,
18-L16	Rotational Raman Spectra for linear and symmetric top molecules
19-L17	Vibrational Raman Spectra , rotational fine structure.
	Entering Internal Test-I Marks into University portal
20-L18	Polarization of light and the Raman effect
21-P2	**College level meeting/Cell function**
22-L19	Technique and instrumentation- Laser Raman spectrometer
23-L20	classical and quantum theories of Raman effect
24-L21	**Allotting portion for Internal Test-II-** Structure determination from Raman and Infra-red spectroscopy.
25-IT-II	**Internal test – II (16-02-2015)**
26-L22	**UNIT – III: ELECTRONIC SPECTROSCOPY**
27-L23	Electronic spectroscopy of diatomic molecules
28-L24	Born – oppenheimer approximation
29-L25	Sequences and progressions
30-L26	the vibrational course structure and rotational fine structure of electronic band.
31-L27	The Franck-Condon principle
32-L28	dissociation energy and dissociation products
33-L29	Birje-Sponer extrapolation
33-L30	The fortrat diagram
35-L31	Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT - IV: NMR AND ESR** Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions.
38-L34	NMR of simple AX and AMX type molecules.
39-L35	Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy.
40-L36	C, F and P NMR spectra-principle and applications.
41-L37	Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting
	Entering Internal Test-II Marks into University portal

42-P4	**College level meeting/ function**
43-L38	Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p-benzosemiquinone radicals,
44-L39	calculation of electron density- McConnel equation, Fine structure in ESR
45-L40	**Submission of Assignment/take the seminar**
46-L41	Zero field shifting and Kramer's degeneracy
47-L42	Double resonance-ELDOR and ENDOR,
48-L43	study of unstable paramagnetic species, spin labeling studies of bio-molecules.
49-L44	**UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY** (a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter,
50-L45	Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character.
51-IT-III	**Internal Test-III (16-03-2015)**
52-L46	Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift.
53-L47	Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds
54-L48	(ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination
55-L49	(iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16-04-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2015

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –IV"
CO1	Explain basic principles of rotational spectra
CO2	Explain basic principles of IR and Raman spectra
CO3	Explain basic principles of electronic spectra
CO4	Explain basic principles of NMR and ESR spectra
CO5	Explain basic principles of NQR and Mossbauer spectra
Experimental Learning	
EL1	Interpret NMR spectra for certain compounds
EL2	Interpret EPR spectra for certain compounds
Integrated Activity	
IA1	Prepare a compound and determine its structure through NMR spectra.
IA2	Record the electronic spectra for a given compound

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Course Work
Course Code	KCHC12
Class	I year (2014-2015)
Semester	Odd
Staff Name	
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the **Absorption Spectroscopy**
- To understand the Basic principles of two-dimensional NMR spectroscopy
- To know about the Nuclear Quadruple Resonance Spectroscopy
- To get an idea analytical techniques in chemistry
- To understand the Principles and applications of XRD, Neutron and electron diffraction

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

Paper-II

COURSE WORK

No. of Hrs – 4 / Week Credits - 4

Objectives

Unit –I : Retrosynthetic Analysis : Introduction to disconnections – one group disconnections – two group disconnections – pericyclic reactions – small rings: three membered , four membered, and five membered.

Unit II: Applications of Advanced Organic Spectroscopy (12hrs.) NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications. Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M + 1 and M + 2 ions – calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV, IR, 1H-NMR, 13C-NMR and mass spectral data.

Unit-III: Metals in Medicine: Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic – biological defense mechanisms – chelation therapy – metals used for diagnosis and chemotherapy – platinum complexes as anticancer drugs, Pt-DNA binding ,complexes of gold ,copper, zinc , mercury, arsenic and antimony as drugs – Bioorganomentallic Chemistry.

Unit IV: Nano Science and Technology:

Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials - zero dimensional nanostructures – one dimentional nanostructures – nanowires and nanorods – two dimensional nanostructures – films , nanotubes and biopolymers- three dimensional nanostructures – fullerenes and dendrimers – quantum dots and their properties . Basic instrumentation and imaging techniques.

Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles – water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs.

Unit V: Advanced Photochemistry : Artificial photosynthesis and solar energy conversion – photoelectrochemical cells – dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts ; Fluorescence sensing – mechanism and applications ; Radioactive decay engineering – metal – enhanced fluorescence and surface plasmon – coupled emission.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2014
1-L1	**Unit –I : Retrosynthetic Analysis**
2-L2	Introduction to disconnections
3- L3	one group disconnections
4-L4	two group disconnections
5-L5	pericyclic reactions
6-L6	small rings
7-L7	three membered
8-L8	four membered
9-L9	five membered
10-IT-1	**Internal test – I (30-07-2014)**
11-L10	**Unit II: Applications of Advanced Organic Spectroscopy**
12-P1	NMR
13-L11	Basic principles of two-dimensional NMR spectroscopy
14-L12	HOMOCOSY, HETCOSY and NOESY spectra and their applications
15-L13	use of INEPT and DEPT methods and their applications
16-L14	Mass: Molecular ions, isotope peaks, fragmentation pattern
17-L-15	McLafferty rearrangement
18-L16	measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI)
19-L17	M + 1 and M + 2 ions
	Entering Internal Test-I Marks into University portal
20-L18	calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV
21-P2	**College level meeting/Cell function**
22-L19	IR, 1H-NMR
23-L20	13C-NMR and mass spectral data.
24-L21	Quick review of the chapter -**Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (18-08-2014)**

26-L22	**Unit-III: Metals in Medicine**
27-L23	Beneficial, essential ,and toxic elements
28-L24	Metal deficiency and disease
29-L25	toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic
30-L26	biological defense mechanisms
31-L27	chelation therapy
32-L28	metals used for diagnosis and chemotherapy
33-L29	platinum complexes as anticancer drugs, Pt-DNA binding
33-L30	complexes of gold ,copper, zinc , mercury,
35-L31	arsenic and antimony as drugs
36-L32	Bioorganomentallic Chemistry
38-L33	**Unit IV: Nano Science and Technology:**
38-L34	Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials
39-L35	zero dimensional nanostructures – one dimentional nanostructures
40-L36	nanowires and nanorods – two dimensional nanostructures
41-L37	films , nanotubes and biopolymers- three dimensional nanostructures
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	fullerenes and dendrimers – quantum dots and their properties
44-L39	Basic instrumentation and imaging techniques
45-L40	**Submission of Assignment/take the seminar**
46-L41	Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles
47-L42	water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs
48-L43	Overview of the chapter
49-L44	**Unit V: Advanced Photochemistry**
50-L45	Artificial photosynthesis and solar energy conversion – photoelectrochemical cells
51-IT-III	**Internal Test-III (15-09-2014)**
52-L46	dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles
53-L47	reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts
54-L48	Fluorescence sensing – mechanism and applications ; Radioactive decay engineering
55-L49	metal – enhanced fluorescence and surface plasmon – coupled emission
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (24-10-2014)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2014

Course Outcomes

Learning Outcomes	**COs** of the course “ADVANCED TOPICS IN CHEMISTRY –I”
CO1	To understand the **Retrosynthetic Analysis**
CO2	To understand the Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the sonochemical methods and microwave methods .CNTs and CNFs.
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	sonochemical methods and microwave methods .CNTs and CNFs.
IA2	Microwave mediated synthesis of CdO

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# Forslow learner	:Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc Chemistry
Course Name	Research Methodology
Course Code	HCHE11
Class	I year (2015-2016)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand about literature survey.
- To study the spectroscopic techniques.
- To study the chromatographic techniques.
- To understand radiochemical methods.
- To learn the data analysis.

RESEARCH METHODOLOGY – I

Unit – I : Literature survey and Choosing a Research Problems

Survey of literature including patents – primary source – secondary source – including reviews, treatise and monographs- literature survey – abstraction of research papers – possible ways of getting oneself familiar with current literature.

Identification of research problems – assessing the status of the problem guidance from the supervisor – actual investigation and analysis of experimental results – Conclusions – Presenting scientific seminar – reporting the results in the form of communication, paper etc.- Writing thesis.

Unit – II : Spectroscopic Techniques

Types of atomic spectroscopy – emission methods – absorption methods – fluorescence methods – atomizers for atomic spectroscopy – flame atomizers – Electrothermal atomizers – inductively coupled plasma sources of radition – Applications of atomic emission spectroscopy. Principle instrumentation and data interpretation of TEM, SEM, EDAX and XRD analysis. Calculations of particle size of nanaoparticles from XRD spectra – Debye-Scherrer formula – lattice constant findings.

Unit – III : Chromatography

Gas chromatography: Theory of Chromatography – column efficiency and column equation – sample injection – sampling system for capillary columns and packed columns – detectors – gas flow control system – high resolution gas chromatography/ mass spectroscopy. HPLC: Principles of high performance liquid chromatography – the liquid chromatograph – the requirements of solvent pumping and different pumping systems – gradient elutions, isocratic elution , sampling- detectors for liquid chromatography – the mobile phase in HPLC- solvent degassing – column technology – column selection – quantitative analysis by HPLC.

Unit – IV Radiochemical Methods

General theoretical consideration – special precautions for radiochemical studies – equipment for measuring radio activity – G.M Counter – tracers and traces- determination of characteristics of GM Counter – Determination of dead time of GM Tube- determination of the absorption curve for ^{234}Th – ^{234}Pa sample. Isotope diltion analysis – verification of the principle of isotope dilution analysis – determination of equilibrium constant of a reaction by ion – exchange method using tracers.

Unit – V : Data Analysis and Article & Proposal Writings

Errors in chemical analysis – classification of errors – determination of accuracy of methods – improving accuracy of analysis – significant figures – mean , standard deviation – comparison of results : ‘’t’’ Test , ‘’f’’ Test – rejection of results – presentation of data. Idea of writing research articles – project proposal to the funding agency.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2015
1-L1	**Unit – I : Literature survey and Choosing a Research Problems** Survey of literature including patents – primary source – secondary source – including reviews, treatise and monographs-
2-L2	literature survey –
3- L3	abstraction of research papers –
4-L4	possible ways of getting oneself familiar with current literature.
5-L5	Identification of research problems –
6-L6	assessing the status of the problem guidance from the supervisor
7-L7	– actual investigation and analysis of experimental results
8-L8	– Conclusions – Presenting scientific seminar –
9-L9	reporting the results in the form of communication, paper etc.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**

11-L10	**Test Paper distribution and result analysis**- .- Writing thesis
12-P1	**Welcome function**
13-L11	**Unit – II : Spectroscopic Techniques** Types of atomic spectroscopy – emission methods –
14-L12	absorption methods – fluorescence methods
15-L13	– atomizers for atomic spectroscopy – flame atomizers –
16-L14	Electrothermal atomizers – inductively coupled plasma sources of radition –
17-L-15	Applications of atomic emission spectroscopy.
18-L16	Principle instrumentation and data interpretation of TEM, SEM,
19-L17	EDAX and XRD analysis.
	Entering Internal Test-I Marks into University portal
20-L18	Calculations of particle size of nanaoparticles from XRD spectra –
21-P2	**College level meeting/Cell function**
22-L19	Debye- Scherrer formula
23-L20	– lattice constant findings.
24-L21	**Allotting portion for Internal Test-II-** – lattice constant findings.
25-IT-II	**Internal test – II (31.08.2015)**
26-L22	**Test Paper distribution and result analysis- Unit – III : Chromatography** Gas chromatography: Theory of Chromatography – column efficiency and column equation –
27-L23	sample injection – sampling system for capillary columns and packed columns –
28-L24	detectors – gas flow control system – high resolution gas chromatography/ mass spectroscopy.
29-L25	HPLC: Principles of high performance liquid chromatography –
30-L26	the liquid chromatograph – the requirements of solvent pumping and different pumping systems
31-L27	– gradient elutions, isocratic elution ,
32-L28	sampling- detectors for liquid chromatography –
33-L29	the mobile phase in HPLC- solvent degassing
33-L30	– column technology –
35-L31	column selection – quantitative analysis by HPLC.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV Radiochemical Methods** General theoretical consideration – special precautions for radiochemical studies – equipment for measuring radio activity –
38-L34	G.M Counter – tracers and traces-
39-L35	determination of characteristics of GM Counter –
40-L36	Determination of dead time of GM Tube-
41-L37	determination of the absorption curve for ^{234}Th – ^{234}Pa sample.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Isotope diltion analysis
44-L39	– verification of the principle of isotope dilution analysis
45-L40	**Submission of Assignment/take the seminar**
46-L41	– determination of equilibrium constant of a reaction by ion
47-L42	– exchange method using tracers.
48-L43	– exchange method using tracers.
49-L44	**Unit – V : Data Analysis and Article & Proposal Writings**

	Errors in chemical analysis – classification of errors –
50-L45	determination of accuracy of methods –. **Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (05.10.2015)**
52-L46	improving accuracy of analysis – significant figures – mean , standard deviation – comparison of results : ‘’t’’ Test , ‘’f’’ Test **Test Paper distribution and result analysis**
53-L47	– rejection of results –
54-L48	presentation of data. Idea of writing research articles –
55-L49	project proposal to the funding agency.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course “RESEARCH METHODOLOGY”
CO1	Knowledge on literature searching and sources of literature
CO2	Knowledge of spectroscopic techniques
CO3	Knowledge of chromatographic techniques
CO4	Knowledge of radiochemical techniques
CO5	Understand data analysis and proposal writings
Experimental Learning	
EL1	Record UV spectra for the sample
EL2	Record IR spectra for the sample
Integrated Activity	
IA1	Calculate the particle size from the given XRD pattern
IA2	Search some journals to the given topic

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	HCHM11
Class	I year (2015-2016)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reagents.
- To learn the applications of rearrangements.
- To learn the reactions of rearrangements
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
UNIT – I: AROMATICITY AND NOVEL RING SYSTEM

Aromaticity: Benzenoid and non–benzenoid compounds – generations and reactions – sextet theory – MO theory – Huckel’s rule – Annulenes and hetero annulenes – Anti and homo aromaticity – Fullerenes.

Novel ring system: Nomenclature of bicyclic and tricyclic systems – structure and synthesis of Adamantane – Congressane – Alternant and non – alternant – Azulene – and sydnones.

UNIT – II: ORGANIC REACTION MECHANISM AND METHODS

Reaction mechanism: Energy diagram of simple Organic reactions – Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions –Baldwin rules for ring closure -Hammond Postulate and microscopic reversibility.

Methods: Kinetic and Thermodynamic control of product formation. Kinetic methods of determination: Rate law – Primary and secondary isotope effect. Non-Kinetic methods of determination: Testing and Trapping of intermediates, isotopic labeling, Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.

UNIT – III: STEREOCHEMISTRY

Concept of chirality: – Enantiotopic, diastereotopic hydrogens and prochiral centres – axial and planar chirality – stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds. R/S notations of Spiranes, allenes and Biphenyl derivatives – E/Z notation of compounds containing one and two double bonds. Stereospecific and stereoselective synthesis – Methods of Asymmetric synthesis including enzymatic and catalytic process – Cram's rule and Prelog's rule – Cram chelation model and Felkin – Ahn model.

UNIT – IV: REARRANGEMENT REACTIONS

Types of rearrangements: Nucleophilic, electrophilic and Free radical and protrophic reactions. Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction.

Reactions: Carbon to carbon migration: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid, Arndt – Eistert synthesis, Demjanov and dienone-phenol rearrangements.

Carbon to oxygen migration: Baeyer–Villiger, and Dakin rearrangements.

Carbon to Nitrogen migration: Lossen, Neber and curtius rearrangements.

Miscellaneous: Von – Richter rearrangement and Fischer - Indole synthesis.

UNIT – V: REAGENTS IN ORGANIC SYNTHESIS

Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) – Tri-n-butyl tin hydride-Aluminium isopropoxide-chlorotrimethylsilane.. Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux- von rudloff reagent - Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Phase transfer catalysis, Merrifield resin – Vaskas catalyst – Wilkinson's catalyst - Zieglar Natta catalyst.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2015
1-L1	, **Aromaticity**: Benzenoid compounds
2-L2	and non–benzenoid compounds
3- L3	sextet theory
4-L4	MO theory
5-L5	Huckel's rule
6-L6	Annulenes and hetero annulenes
7-L7	Anti and homo aromaticity – Fullerenes.
8-L8	Nomenclature of bicyclic and tricyclic systems
9-L9	structure and synthesis of Adamantane – Congressane –. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Welcome**
13-L11	**MECHANISM AND METHODS UNIT – II: ORGANIC REACTION**
14-L12	**Reaction mechanism:** Energy diagram of simple Organic reactions
15-L13	Transition state and intermediate.
16-L14	Kinetic and Thermodynamic requirements of reactions
17-L-15	Baldwin rules for ring closure
18-L16	Hammond Postulate and microscopic reversibility.
19-L17	**Methods:** Kinetic and Thermodynamic control of product formation
	Entering Internal Test-I Marks into University portal
20-L18	Kinetic methods of determination: Rate law
21-P2	**College level meeting/Cell function**
22-L19	Primary and secondary isotope effect. Non-Kinetic methods of determination:
23-L20	and Trapping of intermediates, isotopic labeling
24-L21	**Allotting portion for Internal Test-II-** Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.
25-IT-II	**Internal test – II (31.08.2015)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: STEREOCHEMISTRY** **Concept of chirality:** – Enantiotopic, diastereotopic hydrogens
27-L23	prochiral centres – axial and planar chirality
28-L24	stereochemistry of compounds containing two dissimilar asymmetric carbons
29-L25	ansa compounds.
30-L26	R/S notations of Spiranes, allenes

31-L27	R/S notations of Biphenyl derivatives – E/Z notation of compounds containing one and two double bonds
32-L28	Stereospecific and stereoselective synthesis
33-L29	Methods of Asymmetric synthesis including enzymatic and catalytic process
33-L30	Cram’s rule and Prelog’s rule
35-L31	Cram chelation model and Felkin – Ahn model.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: REARRANGEMENT REACTIONS** **Types of rearrangements:** Nucleophilic, electrophilic and Free radical and protrophic reactions.
38-L34	**Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements
39-L35	**Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone,
40-L36	Benzil – Benzilic acid, Arndt – Eistert synthesis
41-L37	Demjanov and dienone-phenol rearrangements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	**Carbon to oxygen migration:** Baeyer–Villiger, and Dakin rearrangements.
44-L39	**Carbon to Nitrogen migration:**
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lossen, Neber and curtius rearrangements
47-L42	**Miscellaneous:** Von – Richter rearrangement
48-L43	Fischer - Indole synthesis.
49-L44	**UNIT – V: REAGENTS IN ORGANIC SYNTHESIS** Gilman’s reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) –
50-L45	Tri-n-butyl tin hydride-Aluminium isopropoxide-chlorotrimethyl silane. **Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (5.10.2015)**
52-L46	Fetizon’s reagent – Lemieux – Von Rudloff reagent – Lemieux- von rudloff reagent - **Test Paper distribution and result analysis**
53-L47	Lemieux–Johnson reagent – Woodward and prevost hydroxylation.
54-L48	Phase transfer catalysis, Merrifield resin – Vaskas catalyst
55-L49	– Wilkinson’s catalyst - Zieglar Natta catalyst
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (15.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –I”
CO1	Explain the **Aromaticity**.
CO2	Write the Nomenclature of bicyclic and tricyclic systems
CO3	Understand the Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions
CO4	Write Hammett equation Physical significance of σ and ρ Applications and Limitations Taft equation.
CO5	Understand stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes.
CO6	Write the R/S notations of Spiranes, allenes.
CO7	Explain **Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid,
CO8	Write the Lossen, Neber and curtius rearrangements
CO9	Woodward and prevost hydroxylation. Merrifield resin
CO10	Know the Wilkinson’s
Experimental Learning	
EL1	Write the Woodward and prevost hydroxylation. Merrifield resin
EL2	Write the Arndt Eistert synthesis, Demjanov and dienone-phenol rearrangements
EL3	Perform a Cram’s rule and Prelog’s rule Cram chelation model and Felkin – Ahn model.
EL4	Draw the structure Azulene and sydnones
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr.S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry-I
Course Code	HCHM12
Class	I year (2015-2016)
Semester	Odd
Staff Name	Dr. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To understand chemical bonding and geometrical isomerism in complexes of coordination numbers 4 to 7 with examples.*
- *To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.*
- *To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.*
- *To introduce TGA, DTA and DSC and its principles.*
- *To study the extraction of lanthanides and actinides from ores and to understand their properties.*

INORGANIC CHEMISTRY -I

Unit – I: CHEMICAL BONDING AND STEREOCHEMISTRY

VSEPR theory – Concept of hybridization and structure of molecules – Walsh diagrams – Bent’s rule – M.O theory – Symmetry and overlap – M.O diagrams of homo and hetero diatomic and BeH2

Geometrical isomerism in complexes of coordination numbers 4 to7 with examples – Fluxionality – Fluxional molecules and their characterization – Planar- Tetrahedral, Trigonal bipyramidal – Square pyramidal interconversions.

UNIT – II: CHEMICAL BONDING AND NON-AQUEOUS SOLVENTS

Bond order – bond energy – bond length – bond polarity – Fajan's rule – Partial ionic character – electro negativity and different scales of pauling. Mulliken, Aldrich and Rochow and sanderson scale – conversion to pauling scale – periodicity of electronegativity, electron affinity and ionic radius – lattice energy – Born Haber cycle and numerical problems involving it for the calculation of electron affinity or lattice energy – Covalent character in ionic compounds – different types of electrostatic interaction, hydrogen bonding.

General properties and classification of solvents. Self ionization and leveling effect. Reactions in non-aqueous solvents. Solute –solvent interaction. Liquid NH3 and liquid SO2.

UNIT –III: SOLID STATE CHEMISTRY – I

Electronic structure of solids – Free electron and band theory – Types of solids – conducts and insulators – intrinsic and extrinsic semiconductors – Band structure and applications. Crystal defect in solids – line and plane defects – Points defects – Schottky and Frenkel defects – Non-stoichiometric defects – Preparation and properties of nonstoichiometric compounds – Colour centres – Solid electrolytes and their applications.

Optical and electrical properties of semiconductors – Photovoltaic effect – Hall effect – p-n and n-p-n junctions and their applications as rectifier and transistor – Super conductivity – High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.

UNIT – IV: SOLID STATE CHEMISTRY – II

Efficiency of packing in crystals – Limiting radius ratio – Description of crystal structures – calcite, zinc blende, wurtzite, rutile, fluorite, antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite.

Principles of TGA, DTA and DSC – application to simple salts, oxy salts, carbonates and complex salts – thermometric titrations.

Principles and measurements of X-ray diffraction studies. Electron diffractions by gases – Principle and measurements – determination of structures – comparison between electron, neutron and X-ray diffraction.

UNIT –V: LANTHANIDES AND ACTINIDES

Correlation of electronic structures, occurrence, and properties of the elements - Chemistry of separation of Np, Pu and Am from U and fission products - Common and uncommon oxidation states - Comparison with transition elements - Lanthanide and actinide contractions – Spectral and magnetic characteristics of lanthanides and actinides – Similarities between actinides and lanthanides – Coordination compounds of lanthanides - Use of lanthanide complexes as shift reagents.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2015
1-L1	**Unit I – CHEMICAL BONDING AND STERROCHEMISTRY** VSEPR theory – Concept of hybridization and structure of molecules
2-L2	Walsh diagrams – Bent's rule
3- L3	M.O theory
4-L4	Symmetry and overlap – M.O diagrams of homo and hetero diatomic and BeH_2
5-L5	Geometrical isomerism in complexes of coordination numbers 4 to7 with examples
6-L6	Fluxionality
7-L7	Fluxional molecules and their characterization
8-L8	Planar- Tetrahedral, Trigonal bipyramidal – Square pyramidal interconversions.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**
11-L10	**Test Paper distribution and result analysis- Unit II – CHEMICAL BONDING AND NON-AQUEOUS SOLVENTS** **Bond order – bond energy – bond length – bond polarity – Fajan's rule**
12-P1	**Department function**
13-L11	Partial ionic character – electro negativity and different scales of pauling. Mulliken, Aldrich and Rochow and sanderson scale
14-L12	conversion to pauling scale – periodicity of electronegativity
15-L13	electron affinity and ionic radius – lattice energy
16-L14	Born Haber cycle and numerical problems involving it for the calculation of electron affinity or lattice energy
17-L-15	Covalent character in ionic compounds – different types of electrostatic interaction, hydrogen bonding
18-L16	General properties and classification of solvents. Self ionization and leveling effect
19-L17	Reactions in non-aqueous solvents
	Entering Internal Test-I Marks into University portal
20-L18	Solute –solvent interaction
21-P2	**College level meeting/Cell function**
22-L19	reactions in liquid ammonia
23-L20	Liquid SO_2
24-L21	Quick review of the chapter **-Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (31.08.2015)**
26-L22	**Test Paper distribution and result analysis- SOLID STATE CHEMISTRY – I:** Electronic structure of solids
27-L23	Free electron and band theory
28-L24	Types of solids – conducts and insulators
29-L25	intrinsic and extrinsic semiconductors
30-L26	Band structure and applications
31-L27	Crystal defect in solids – line and plane defects – Points defects
32-L28	Schottky and Frenkel defects
33-L29	Non-stoichiometric defects – Preparation and properties of nonstoichiometric

	compounds – Colour centres – Solid electrolytes and their applications.
33-L30	Optical and electrical properties of semiconductors – Photovoltaic effect
35-L31	Hall effect – p-n and n-p-n junctions and their applications as rectifier and transistor
36-L32	**Allotting portion for Assignment/seminar -** Super conductivity – High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.
38-L33	**UNIT – IV: SOLID STATE CHEMISTRY – II** Efficiency of packing in crystals – Limiting radius ratio
38-L34	Description of crystal structures – calcite, zinc blende, wurtzite, rutile, fluorite,
39-L35	antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite.
40-L36	Principles of TGA, DTA and DSC.
41-L37	application to simple salts, oxy salts, carbonates and complex salts –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	–thermometric titrations
44-L39	Principles and measurements of X-ray diffraction studies.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Electron diffractions by gases – Principle and measurements
47-L42	– determination of structures
48-L43	– comparison between electron, neutron and X-ray diffraction.
49-L44	**UNIT –V: LANTHANIDES AND ACTINIDES** Correlation of electronic structures, occurrence, and properties of the elements -
50-L45	Chemistry of separation of Np, Pu and Am from U and fission products - Common and uncommon oxidation states -
51-IT-III	**Internal Test-III (05.10.2015)**
52-L46	Comparison with transition elements - Lanthanide and actinide contractions –
53-L47	Spectral and magnetic characteristics of lanthanides and actinides –
54-L48	Similarities between actinides and lanthanides –
55-L49	Coordination compounds of lanthanides - Use of lanthanide complexes as shift reagents.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –I"
CO1	To understand different type of bonds and to study different theories of bonding.
CO2	To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.
CO3	To study the crystal structures, defects in solid crystals, band

	theory of solids and superconductors.
CO4	To study the principles of TGA, DTA and DSC
CO5	To study the extraction of lanthanides and actinides from ores and to understand their properties.
Experimental Learning	
EL1	Electrochemical series was used to construct redox couple forming different Galvanic cells.
EL2	Qualitative analyses of selected Lanthanides and Actinides were performed
EL3	Synthesize Oxygen deficient ZnO to illustrate metal excess defect
Integrated Activity	
IA1	Prepare zinc blende phase of ZnS and characterize by XRD
IA2	Prepare a mini-model to illustrate Meissner effect (Magnetic Levitation)

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

Forslow learner :Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-I
Course Code	HCHM13
Class	I year (2015-2016)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of Partial molar properties, fugacity and activity

To apply phase rule for three component system

To understand the Principles of Thermodynamics of irreversible processes

To understand Statistical Thermodynamics

To understand the importance of macromolecules

PHYSICAL CHEMISTRY -I

UNIT-I Thermodynamics

Thermodynamics systems of variable composition: Partial molar quantities –chemical potential, partial molar volume and partial molar heat content. Gibbs-Duhem equation, Determination of partial molar quantities. Variation of Chemical Potential with temperature and pressure. Thermodynamics of real gases and real solutions. Fugacity; Methods of determination. Dependence on temperature, pressure and composition. Activity and activity coefficient: standard states, determination of activity and activity coefficient of non-electrolytes and electrolytes

UNIT-II Irreversible thermodynamics

Non equilibrium processes: General theory- convservation of mass and energy-Entropy production in open system by heat, matter and current flow. Onsager theory-Validity and Verification. Thermoelectricity-Electro kinetic and thermo mechanical effects. Application of irreversible thermodynamics to biological and non-linear systems.

UNIT-III Chemical and phase equilibria

Reaction free energy- reaction potential – reaction isotherm and direction of spontaniety – standard reaction free energy – its calculation from thermochemical, electrochemical and equilibrium data – temperature coefficient of reaction free energy and equilibrium constant.

Gibbs Phase rule – its thermodynamic derivation - Application of Phase rule to three components system. Formation of one pair, two pair and three pairs of partially miscible liquids – systems composed of two solids and a liquid.

UNIT-IV Statistical thermodynamics

Thermodynamic probability and entropy - Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics and applications. Partition functions and entropies for Translational, rotational, vibrational and electronic motions of monoatomic and diatomic molecules – Calculation of thermodynamic functions and equilibrium constants – specific heat of solids - Einstein and Debye theories.

Unit – V : Macromolecules

Polymerization in homogeneous and heterogeneous phases – Kinetics and Mechanism of polymerization (Addition and condensation) – Kinetic of copolymerization – Properties of polymers: Glass transition temperature , crystallinity of polymers. Molecular weights: Distribution, methods of determination – Light scattering , Ultracentrifuge, viscosity and Osmomerty - Gel permeation Chromatography. Conducting polymers- Factors affecting the conductivity of conducting polymers. – Doping of conducting polymers – Nature of charge carriers in conducting polymers – Solitions, polarons and bipolarons.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2015
1-L1	**UNIT-I Thermodynamics** Thermodynamics systems of variable composition: Partial molar quantities – chemical potential, partial molar volume and partial molar heat content.
2-L2	Gibbs-Duhem equation, Determination of partial molar quantities.
3- L3	Variation of Chemical Potential with temperature and pressure.
4-L4	Thermodynamics of real gases and real solutions.
5-L5	Fugacity; Methods of determination.
6-L6	Dependence on temperature, pressure and composition.
7-L7	Activity and activity coefficient:
8-L8	standard states, determination of activity and activity coefficient of non-electrolytes and electrolytes
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**
11-L10	**Test Paper distribution and result analysis- UNIT-II Irreversible thermodynamics** Non equilibrium processes:
12-P1	**Department function**
13-L11	General theory- convservation of mass and energy-
14-L12	Entropy production in open system by heat,
15-L13	Entropy production in open system by matter and current flow.
16-L14	Onsager theory-
17-L-15	Validity and Verification.
18-L16	Thermoelectricity-
19-L17	Electro kinetic effect
	Entering Internal Test-I Marks into University portal
20-L18	thermo mechanical effects.
21-P2	**College level meeting/Cell function**
22-L19	Application of irreversible thermodynamics to biological systems
23-L20	Application of irreversible thermodynamics to non-linear systems
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (30.08.2015)**
26-L22	**Test Paper distribution and result analysis- UNIT-III Chemical and phase equilibria** Reaction free energy-
27-L23	reaction potential –
28-L24	reaction isotherm and direction of spontaniety

29-L25	– standard reaction free energy –– its calculation from thermochemical, electrochemical and equilibrium data
30-L26	temperature coefficient of reaction free energy and equilibrium constant.
31-L27	Gibbs Phase rule – its thermodynamic derivation -
32-L28	Application of Phase rule to three components system.
33-L29	Formation of one pair, two pair and three pairs of partially miscible liquids –
33-L30	Formation of one pair, two pair and three pairs of partially miscible liquids –
35-L31	systems composed of two solids and a liquid.
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV Statistical thermodynamics** Thermodynamic probability and entropy
38-L34	- Maxwell – Boltzmann statistics
39-L35	Bose-Einstein statistics
40-L36	Fermi-Dirac statistics
41-L37	Partition functions and entropies for Translational motions of monoatomic and diatomic molecules
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Partition functions and entropies for rotational motions of monoatomic and diatomic molecules
44-L39	Partition functions and entropies for vibrational and electronic motions of monoatomic and diatomic molecules
45-L40	**Submission of Assignment/ seminar**
46-L41	– Calculation of thermodynamic functions and equilibrium constants
47-L42	– specific heat of solids
48-L43	- Einstein and Debye theories.
49-L44	**Unit – V : Macromolecules** Polymerization in homogeneous and heterogeneous phases
50-L45	Kinetics and Mechanism of polymerization (Addition and condensation) –
51-IT-III	**Internal Test-III (05.10.2015)**
52-L46	Kinetic of copolymerization – Properties of polymers: Glass transition temperature , crystallinity of polymers.
53-L47	Molecular weights: Distribution, methods of determination –
54-L48	Light scattering , Ultracentrifuge, viscosity and Osmomerty - Gel permeation Chromatography.
55-L49	Conducting polymers- Factors affecting the conductivity of conducting polymers. – Doping of conducting polymers – Nature of charge carriers in conducting polymers – Solitions, polarons and bipolarons.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	To learn the concept of Partial molar properties, fugacity and activity
CO2	To apply phase rule for three component system
CO3	To understand the Principles of Thermodynamics of irreversible processes
CO4	To understand Statistical Thermodynamics
CO5	To understand the about macromolecules
Experimental Learning	
EL1	To prepare a conducting polymer
EL2	To determine the molecular weight of a polymer by viscosity method
Integrated Activity	
IA1	Phase diagram between water, acetone and ethanol is analysed
IA2	Prepare a mini-model to illustrate Thermoelectric effect.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-III
Course Code	HCHM31
Class	II year (2015-2016)
Semester	Odd
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
- To study the rearrangements.
- To calculate the delocalization energy through group theory
- To learn about the photochemistry and pericyclic reactions
- To learn about the reactions of heterocyclic and biomolecules

ORGANIC CHEMISTRY-III

Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:

Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions- Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution- Ambient nucleophile- NGP- Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only) Elimination reaction: E1, E2 and E1CB mechanisms- Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions.

Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms. Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich

reaction- Wittig reaction- Sharpless asymmetric epoxidation-addition of hydrogen and hydrogen halides to carbon-carbon double bonds-Michael addition (1,2 and 1,4).

Unit-III Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, reactions and stereochemistry of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications. **Nitrenes:** Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet Hauser and Favorski rearrangements. **Arynes :** Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit-IV Organic photochemistry and pericyclic reactions

Photosensitization- cis-trans isomerisation- photo oxidation and reductions- Norris type-I and II reactions- Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement. Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches: Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry. Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)- Sigmatropic rearrangements - [i,j] shift of C-H and C-C bonds (1+3 and 1+5system)

Unit-V Heterocyclic and biomolecules

Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids. Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A Detailed study on the structure of maltose, sucrose and lactose- A brief study on starch and cellulose. Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2015
1-L1	**Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:** Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions-
2-L2	Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution-
3- L3	Ambient nucleophile- NGP
4-L4	Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only)
5-L5	Elimination reaction: E1, E2 and E1CB mechanisms-

6-L6	Factors influencing elimination reactions
7-L7	- Hofmann and Satyzeff rules.
8-L8	- Pyrolytic elimination-
9-L9	Chugaev and cope reactions.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds** Aromatic nucleophilic substitution reaction:
14-L12	Unimolecular, Bimolecular and Benzyne mechanisms.
15-L13	Catalytic hydrogenation
16-L14	Dieckmann condensation-
17-L-15	Mannich reaction- Wittig reaction-
18-L16	Sharpless asymmetric epoxidation-
19-L17	addition of hydrogen and hydrogen halides to carbon-carbon double bonds-
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2).
21-P2	**College level meeting/Cell function**
22-L19	Michael addition (1,4).
23-L20	- Birch reduction-
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (31.08.2015)**
26-L22	**Unit-III Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, reactions and stereochemistry of carbenes-
27-L23	Wolff rearrangement of acyl carbenes and its synthetic applications.
28-L24	**Nitrenes:** Generation, stability, reaction of nitrenes-
29-L25	Mechanism of rearranegements through Nitrene intermediate:
30-L26	Schmidt, Hoffmann, Beckmann rearrangements
31-L27	. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate:.
32-L28	Steven, Sommelet Hauser rearrangements
33-L29	Favorski rearrangements.
33-L30	**Arynes :** Generation, Structure, Stability, reactions and trapping of arynes-
35-L31	cine substitution
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Organic photochemistry and pericyclic reactions** Photosensitization-cis-trans isomerisation- photo oxidation and reductions-
38-L34	Norris type-I and II reactions-
39-L35	Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement.
40-L36	Atomic and molecular orbitals-Woodward-Hoffmann rules,

41-L37	FMO and correlation diagram approaches:
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)-
44-L39	Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)-
47-L42	Sigmatropic rearrangements - [i,j] shift of C-H
48-L43	C-C bonds (1+3 and 1+5system)
49-L44	**Unit-V Heterocyclic and biomolecules** Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-
50-L45	synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids.
51-IT-III	**Internal Test-III (05.10.2015)**
52-L46	Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A
53-L47	Detailed study on the structure of maltose, sucrose and lactose-
54-L48	A brief study on starch and cellulose.
55-L49	Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –III"
CO1	Explain aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
CO2	Knowledge about catalytic hydrogenation
CO3	Knowledge about stability, structure, and reacions of carbenes, nitrenes, carbanions and arynes

CO4	Learns the pericyclic reactions
CO5	Knowledge about the synthesis of heterocyclic and biomolecules
Experimental Learning	
EL1	Synthesise an imidazole compound
EL2	Demonstration of photo oxidation reaction
Integrated Activity	
IA1	Discuss about the nucleic acids and modes of binding in them.
IA2	Discuss about Birch reduction.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. Joel)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-III
Course Code	HCHM32
Class	II year (2015-2016)
Semester	Odd
Staff Name	Mr. C. Joel
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand about nuclear fission and fusion.
- To know about radiation and nuclear reactors.
- To learn about cage and cluster compounds
- To learn about applications of IR and Raman spectra in Inorganic chemistry
- To learn about the role of bioinorganic molecules in living system

INORGANIC CHEMISTRY - III

UNIT – I : NUCLEAR CHEMISTRY- I

Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types , Q-value , threshold energy , cross sections and excitation functions – nuclear reaction models : optical and compound nucleus models . Direct nuclear reactions – transfer reactions: stripping and pick-up –high energy reactions: neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission.

UNIT – II : NUCLEAR CHEMISTRY - II

Nuclear reactors : classification , components , reproduction factor and design parameter – fuel materials and their production. Breeder reactor : fast breeder test reactor – reprocessing of spent fuels : aqueous and non-aqueous processes – disposal of gaseous , liquids and solid

radioactive wastes –radiation hazards and protection – India‘s nuclear reactors . Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations . Analytical applications : radio chromatography , neutron activation analysis , neutron absorptiometry and radiometric titrations – hot atom chemistry – synthesis of transuraniens .

UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS

Hetero catenation - silicates - classification and structure-property correlation . Polyacids – structures of isopoly and heteropoly anions - polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers - boranes and carboranes – structure and bonding in boranes. Metal-metal bonds and metal atom clusters - carbonyl type - anionic and hydrido clusters- non- carbonyl type – octahedral clusters and triangular clusters.

UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II

Application of IR and Raman spectra in the study of coordination compounds : Application to metal carbonyls and nitrosyls – geometrical and linkage isomerism – detection of inter and intramolecular hydrogen bonding – stretching mode analysis of metal carbonyls. Mossbauer spectroscopy : Principle – application of isomer shift , quadrupole interactions and magnetic hyperfine splitting in the study of iron and tin compounds .

UNIT-V : BIOINORGANIC CHEMISTRY –I

Essential and trace elements in biological system – biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system. Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers: iron-sulphur proteins , cytochromes and blue copper proteins – oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers . Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2015
1-L1	**UNIT – I : NUCLEAR CHEMISTRY- I** Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types ,
2-L2	Q-value , threshold energy , cross sections and excitation functions –
3- L3	nuclear reaction models :
4-L4	optical and compound nucleus models .
5-L5	Direct nuclear reactions – transfer reactions:
6-L6	stripping and pick-up –high energy reactions:
7-L7	neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.

8-L8	Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products –
9-L9	fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : NUCLEAR CHEMISTRY - II** Nuclear reactors : classification , components , reproduction factor and design parameter
14-L12	– fuel materials and their production. Breeder reactor :
15-L13	aqueous and non-aqueous processes – disposal of gaseous , liquids and solid radioactive wastes
16-L14	–radiation hazards and protection – India‘s nuclear reactors .
17-L-15	Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations .
18-L16	Analytical applications : radio chromatography ,
19-L17	neutron activation analysis ,
	Entering Internal Test-I Marks into University portal
20-L18	neutron absorptiometry and radiometric titrations –
21-P2	**College level meeting/Cell function**
22-L19	hot atom chemistry
23-L20	– synthesis of transuraniens
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (20.07.2015)**
26-L22	**UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS** Hetero catenation - silicates - classification and structure-
27-L23	property correlation . Polyacids – structures of isopoly and heteropoly anions -.
28-L24	polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers -
29-L25	boranes and carboranes – structure and bonding in boranes.
30-L26	Metal-metal bonds and metal atom clusters
31-L27	- carbonyl type -
32-L28	anionic and hydrido clusters-
33-L29	non- carbonyl type
33-L30	– octahedral clusters
35-L31	triangular clusters
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II** Application of IR and Raman spectra in the study of coordination compounds :
38-L34	Application to metal carbonyls and nitrosyls –

39-L35	geometrical and linkage isomerism –
40-L36	detection of intermolecular hydrogen bonding
41-L37	– stretching mode analysis of metal carbonyls.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Mossbauer spectroscopy : Principle – application of isomer shift ,
44-L39	quadrupole interactions
45-L40	**Submission of Assignment/take the seminar**
46-L41	detection of intramolecular hydrogen bonding
47-L42	magnetic hyperfine splitting in the study of iron and tin compounds .
48-L43	magnetic hyperfine splitting in the study of iron and tin compounds .
49-L44	**UNIT-V : BIOINORGANIC CHEMISTRY –I** Essential and trace elements in biological system
50-L45	– biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system.
51-IT-III	**Internal Test-III (05.10.2015)**
52-L46	Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers:
53-L47	iron-sulphur proteins , cytochromes and blue copper proteins
54-L48	oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers .
55-L49	Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.10.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –III”
CO1	Explain the nuclear fission and fusion
CO2	Knowledge about nuclear reactors

CO3	Knowledge about silicates, boranes and carboranes
CO4	Learns the IR and Raman modes of metal carbonyls and nitrosyls
CO5	Knowledge about the bioinorganic molecules
Experimental Learning	
EL1	Visit a nuclear reactor
EL2	Record the IR of an inorganic compound
Integrated Activity	
IA1	Discuss about the structure of certain biomolecules.
IA2	Collect information about various nuclear reactors.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-III
Course Code	HCHM33
Class	II year (2015-2016)
Semester	Odd
Staff Name	Mrs. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of Group theory.
- To study the point groups of molecules.
- To calculate the delocalization energy through group theory
- To learn about the Principles of Electrochemistry
- To learn adsorption and adsorption isotherms

PHYSICAL CHEMISTRY –III

UNIT I: GROUP THEORY I

Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment, symmetry and optical activity, symmetry operations of a group, multiplication table. Classes of symmetry operations and matrix representations of operations. Reducible and irreducible representations, orthogonality theorem. Properties of irreducible representations. Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2). Explanations for the complete character table for a point group.

UNIT II: GROUP THEORY II

Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra. Standard reduction formula. Determination of representations of vibrational modes in non-linear molecules (H_2O, NH_3 and Trans N_2F_2). Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion. Electronic Spectra of Ethylene and formaldehyde molecules. Hybrid orbital in non-linear molecules (CH_4, XeF_4, BF_3,and PF_5). Projection operators and symmetry adapted linear combinations(SALC). Simplification of HMO calculations using group theory. Calculation of delocalization of energy in 1,3-butadiene and cyclopropenyl systems.

UNIT III: **ELECTROCHEMISTRY I**

Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction , Debye-Huckel-Onsagar equation and its validity. Debye-Falkenhagen and Wein effects. Debye-Huckel limiting law, its applications to concentrated solutions. Debye-Huckel Bronsted equation. Quantitative and qualitative verification of Debye Huckel limiting law. Electrode electrolyte interface, adsorption at electrified interface, electrical double layer, electrocapillary phenomenon-Lipmann equation.

UNIT IV: **ELECTROCHEMISTRY II**

Polarization and over potential, Butler-Volmer equation for one step and multistep electron transfer reactions, Tafel equation, significance of I_0 and transfer coefficient, polarizable and non-polarizable electrodes, mechanism of hydrogen and oxygen evolution reactions. Corrosion and polarization of metals - Pourbaix diagrams, Evan‘s diagram, Fuel cells, electrode deposition-principle and applications.

UNIT V: ADSORPTION AND SURFACE PHENOMENON

Physisorption and chemisorption, adsorption and desorption, adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination, surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance. Kinetics of unimolecular and bimolecular surface reactions. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces, Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 18-06-2015
1-L1	**UNIT I: GROUP THEORY I**: Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment.
2-L2	symmetry and optical activity, symmetry operations of a group
3- L3	multiplication table
4-L4	Classes of symmetry operations
5-L5	matrix representations of operations
6-L6	Reducible and irreducible representations, orthogonality theorem
7-L7	Properties of irreducible representations
8-L8	Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2).
9-L9	Explanations for the complete character table for a point group.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (20.07.2015)**

11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT II: GROUP THEORY II -** Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra.
14-L12	Standard reduction formula
15-L13	Determination of representations of vibrational modes in non-linear molecules (H_2O, NH_3 and Trans N_2F_2).
16-L14	Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion.
17-L-15	Electronic Spectra of Ethylene and formaldehyde molecules.
18-L16	Hybrid orbital in non-linear molecules (CH_4, XeF_4, BF_3, and PF_5).
19-L17	Projection operators and symmetry adapted linear combinations(SALC).
	Entering Internal Test-I Marks into University portal
20-L18	Simplification of HMO calculations using group theory.
21-P2	**College level meeting/Cell function**
22-L19	Simplification of HMO calculations using group theory.
23-L20	Calculation of delocalization of energy in 1,3-butadiene.
24-L21	**Allotting portion for Internal Test-II-** Calculation of delocalization of energy in cyclopropenyl systems.
25-IT-II	**Internal test – II (31.08.2015)**
26-L22	**UNIT III**: **ELECTROCHEMISTRY I -** Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction.
27-L23	Debye-Huckel-Onsagar equation and its validity.
28-L24	Debye-Falkenhagen and Wein effects
29-L25	Debye-Huckel limiting law, its applications to concentrated solutions
30-L26	Debye-Huckel Bronsted equation
31-L27	Quantitative and qualitative verification of Debye Huckel limiting law
32-L28	Electrode electrolyte interface,
33-L29	electrical double layer,
33-L30	electrocapillary phenomenon
35-L31	Lipmann equation
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT IV**: **ELECTROCHEMISTRY II -** Polarization and over potential
38-L34	Butler-Volmer equation for one step and multistep electron transfer reactions,
39-L35	Tafel equation, significance of I_0 and transfer coefficient
40-L36	polarizable and non-polarizable electrodes
41-L37	mechanism of hydrogen and oxygen evolution reactions
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Pourbaix diagrams
44-L39	Evan's diagram
45-L40	**Submission of Assignment/take the seminar**
46-L41	Fuel cells
47-L42	Fuel cells
48-L43	electrode deposition-principle and applications.
49-L44	**UNIT V: ADSORPTION AND SURFACE PHENOMENON -** Physisorption

	and chemisorption, adsorption and desorption
50-L45	adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination
51-IT-III	**Internal Test-III (5.10.2015)**
52-L46	surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance.
53-L47	Kinetics of unimolecular and bimolecular surface reactions.
54-L48	Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces,
55-L49	Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (16.07.2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –III”
CO1	Explain basic principles of group theory
CO2	Identification of point group of molecules
CO3	Explain the vibrational modes of molecules using group theory
CO4	Determine the applications of group theory
CO5	Knowledge about the principles of Electrochemistry
CO6	Learning about fuel cells
Experimental Learning	
EL1	Find out vibrational modes for various molecules using group theory
EL2	Demonstration of Electroless deposition
Integrated Activity	
IA1	Write the point groups of various molecules
IA2	Finding the vibrational modes of certain molecules using group theory

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. Joel)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-I
Course Code	HCHL21
Class	I year (2015-2016)
Semester	Even
Staff Name	Mr. C. Joel
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand separation of two components in a mixture.*
- *To understand the analysis of organic compounds*

INORGANIC CHEMISTRY -I

A. Separation of Organic mixture:

(i) Separation of two component mixture and determination of their physical Constants.

(ii) Separation and analysis of at least **eight** two component mixture. The students are expected to determine the physical constants for both the components as well as their Derivatives.

(iii) Analysis may be performed in micro (or) macro scale depending upon the Conditions of the laboratory

B. List of single stage preparations

1. Preparation of benzal acetophenone from benzaldehyde

2. Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

3. Preparation of Resacetophenone from resorcinol

4. Preparation of dinitro diphenylamine from aniline

5. Preparation of benzoquinone from hydroquinone

C. For Class Work Only:

(1) Separation of Caffeine from Tea / Coffee.

(2) Interpretation of IR and NMR of any three simple organic compounds

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-E1	Separation and analysis of mixture I
2-E2	Separation and analysis of mixture I
3- E3	Separation and analysis of mixture II
4-E4	Separation and analysis of mixture II
5-E5	Separation and analysis of mixture II
6-E6	Separation and analysis of mixture III
7-E7	Separation and analysis of mixture III
8-E8	Separation and analysis of mixture III
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Separation and analysis of mixture IV
16-E11	Separation and analysis of mixture IV
17-E-12	Separation and analysis of mixture V
18-E13	Separation and analysis of mixture V
19-E14	Separation and analysis of mixture V
20-E15	Separation and analysis of mixture VI
21-E16	Separation and analysis of mixture VI
22-E17	Separation and analysis of mixture VI
23-P2	**College level meeting/Cell function**
24-E18	Separation and analysis of mixture VII
25-E19	Separation and analysis of mixture VII
26-E20	Separation and analysis of mixture VII
27-E21	Separation and analysis of mixture VIII
28-E22	Separation and analysis of mixture VIII
29-E23	Separation and analysis of mixture VIII
30-E24	Preparation of benzal acetophenone from benzaldehyde
31-E25	Preparation of benzal acetophenone from benzaldehyde
32-E26	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

33-E27	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone
34-E28	Preparation of Resacetophenone from resorcinol
35-E29	Preparation of Resacetophenone from resorcinol
36-E30	Preparation of dinitro diphenylamine from aniline
37-E31	Preparation of dinitro diphenylamine from aniline
38-E32	Preparation of benzoquinone from hydroquinone
39-E33	Preparation of benzoquinone from hydroquinone
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Separation of Caffeine from Tea / Coffee
46-E35	Separation of Caffeine from Tea / Coffee
47-E36	Interpretation of IR and NMR of any three simple organic compounds
48-E37	Interpretation of IR and NMR of any three simple organic compounds
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY PRACTICALS–I”
CO1	To understand different methods of separation of organic compounds
CO2	To separate the components in a mixture
CO3	To analyse the separated organic compounds
CO4	To physical constants of the compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-I
Course Code	HCHL22
Class	I year (2015-2016)
Semester	EVEN
Staff Name	Dr. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of different types of cations*
- *To understand the group separation*

INORGANIC CHEMISTRY -I

1. Qualitative analysis of inorganic mixture containing two familiar and two less familiar cations Pb, Cu, Bi, Cd, Sb, Zn, Co, Ni, Mn, Ca, Ba, Sr, W, Tl, Te, Se, Mo, Ce, Th, Zr, V, U, Ti and Li.

2. Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

3. Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

4. Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).

5. Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-E1	Qualitative analysis of mixture I
2-E2	Qualitative analysis of mixture I
3- E3	Qualitative analysis of mixture I
4-E4	Qualitative analysis of mixture I
5-E5	Qualitative analysis of mixture II
6-E6	Qualitative analysis of mixture II
7-E7	Qualitative analysis of mixture II
8-E8	Qualitative analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Qualitative analysis of mixture III
16-E11	Qualitative analysis of mixture III
17-E-12	Qualitative analysis of mixture III
18-E13	Qualitative analysis of mixture III
19-E14	Qualitative analysis of mixture IV
20-E15	Qualitative analysis of mixture IV
21-E16	Qualitative analysis of mixture IV
22-E17	Qualitative analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Qualitative analysis of mixture V
25-E19	Qualitative analysis of mixture V
26-E20	Qualitative analysis of mixture V
27-E21	Qualitative analysis of mixture V
28-E22	Qualitative analysis of mixture VI
29-E23	Qualitative analysis of mixture VI
30-E24	Qualitative analysis of mixture VI
31-E25	Qualitative analysis of mixture VI
32-E26	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
33-E27	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
34-E28	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
35-E29	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
36-E30	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
37-E31	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
38-E32	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
39-E33	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
46-E35	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
47-E36	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
48-E37	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand familiar cations
CO2	To understand less familiar cations
CO3	To study the group separation
CO4	To know the confirmatory tests of different cations
CO5	To study the reason behind the results of the experiment

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-I
Course Code	HCHL23
Class	I year (2015-2016)
Semester	Even
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric titrations*
- *To understand the enthalpy of reactions*

PHYSICAL CHEMISTRY -I

A. Distribution

1. Distribution of bezoic acid between benzene/toluene and water

B. Conductivity

2. Determination of solubility product of sparingly soluble salt
3. Determination of Ka by using Oswald distribution method.
4. Titrations
   1. HCl + AcOH vs NaOH
   2. HCl + NH_4Cl vs NaOH
   3. AcOH + AcONa vs NaOH
   4. AcOH + AcONa vs HCl

C. Kinetics

5. Study of primary salt effect on $K_2S_2O_8$
6. Kinetics of $K_2S_2O_8$ and KI reaction

II. Thermometry

7. Determination of Solution enthalpy of

i. oxalic acid-water
ii. ammonium oxalate-water
iii. Naphthalene-toluene

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2015
1-E1	Distribution of bezoic acid between benzene/toluene and water
2-E2	Distribution of bezoic acid between benzene/toluene and water
3- E3	Distribution of bezoic acid between benzene/toluene and water
4-E4	Determination of solubility product of sparingly soluble salt
5-E5	Determination of solubility product of sparingly soluble salt
6-E6	Determination of solubility product of sparingly soluble salt
7-E7	Determination of Ka by using Oswald distribution method
8-E8	Determination of Ka by using Oswald distribution method
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	HCl + AcOH vs NaOH
16-E11	HCl + AcOH vs NaOH
17-E-12	HCl + AcOH vs NaOH
18-E13	HCl + NH_4Cl vs NaOH
19-E14	HCl + NH_4Cl vs NaOH
20-E15	HCl + NH_4Cl vs NaOH
21-E16	AcOH + AcONa vs NaOH
22-E17	AcOH + AcONa vs NaOH
23-P2	**College level meeting/Cell function**
24-E18	AcOH + AcONa vs HCl
25-E19	AcOH + AcONa vs HCl
26-E20	AcOH + AcONa vs HCl
27-E21	Kinetics of $K_2S_2O_8$ and KI reaction
28-E22	Kinetics of $K_2S_2O_8$ and KI reaction
29-E23	Kinetics of $K_2S_2O_8$ and KI reaction
30-E24	Kinetics of $K_2S_2O_8$ and KI reaction
31-E25	oxalic acid-water
32-E26	oxalic acid-water
33-E27	oxalic acid-water
34-E28	oxalic acid-water
35-E29	ammonium oxalate-water
36-E30	ammonium oxalate-water
37-E31	ammonium oxalate-water
38-E32	ammonium oxalate-water
39-E33	ammonium oxalate-water
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Naphthalene-toluene
46-E35	Naphthalene-toluene
47-E36	Naphthalene-toluene
48-E37	Naphthalene-toluene
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS –I"
CO1	To understand the conductometric titrations
CO2	To understand the enthalpy of reactions
CO3	To study kinetics of acid hydrolysis of ester

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	HCHL41
Class	II year (2015-2016)
Semester	Even
Staff Name	Mrs. R. BIJU BENNIE
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimation of organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL - IV

A. List of Estimations

1. Ethyl methyl ketone
2. Glucose-Lane Eynon and method
3. Glucose-Bertrand"s method
4. Saponification value of oil
5. Iodine value of oil
6. Number of hydroxyl groups in a given compound.
7. Purity of Glucose

B. List of Two stage preparations

1. Asprin from Methylsalicylate
2. p-Bromoaniline from Acetanilide
3. m-Nitrobenzene from Acetanilide
4. p- Nitroaniline from Acetanilide
5. Benzpinacolone from Benzophenone
6. Benzanilide from Benzophenone
7. s-Benzylisothiuroniumbenzoate from Thiourea
8. 9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride

9. Phthalimide from Phthalic acid
10. s-Tribromobenzene from Aniline

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-E1	Estimation of Ethyl methyl ketone
2-E2	Estimation of Ethyl methyl ketone
3- E3	Estimation of Glucose-Lane Eynon and method
4-E4	Estimation of Glucose-Lane Eynon and method
5-E5	Estimation of Glucose-Bertrand‟s method
6-E6	Estimation of Glucose-Bertrand‟s method
7-E7	Saponification value of oil
8-E8	Saponification value of oil
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Iodine value of oil
16-E11	Iodine value of oil
17-E-12	Number of hydroxyl groups in a given compound
18-E13	Number of hydroxyl groups in a given compound
19-E14	Purity of Glucose
20-E15	Purity of Glucose
21-E16	Asprin from Methylsalicylate
22-E17	Asprin from Methylsalicylate
23-P2	**College level meeting/Cell function**
24-E18	p-Bromoaniline from Acetanilide
25-E19	p-Bromoaniline from Acetanilide
26-E20	p-Bromoaniline from Acetanilide
27-E21	p-Bromoaniline from Acetanilide
28-E22	m-Nitrobenzene from Acetanilide
29-E23	m-Nitrobenzene from Acetanilide
30-E24	p- Nitroaniline from Acetanilide
31-E25	p- Nitroaniline from Acetanilide
32-E26	Benzpinacolone from Benzophenone
33-E27	Benzpinacolone from Benzophenone
34-E28	Benzpinacolone from Benzophenone
35-E29	Benzpinacolone from Benzophenone
36-E30	Benzanilide from Benzophenone
37-E31	Benzanilide from Benzophenone
38-E32	s-Benzylisothiuroniumbenzoate from Thiourea
39-E33	s-Benzylisothiuroniumbenzoate from Thiourea
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**

42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
46-E35	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
47-E36	Phthalimide from Phthalic acid
48-E37	s-Tribromobenzene from Aniline
49-E38	s-Tribromobenzene from Aniline
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	HCHL42
Class	I year (2015-2016)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand gravimetric estimations of Cations*
- *To understand the inorganic preparations*

INORGANIC CHEMISTRY PRACTICAL - II

I . Quantitative estimation of a mixture containing two metal ions (Volumetric and Gravimetric Estimations).

1. Estimation of Cu2+ and Ni2+ ions.
2 . Estimation of Cu2+ and Zn2+ ions.
3 . Estimation of Fe2+ and Cu2+ ions
4 . Estimation of Fe2+ and Ni2+ ions .
5. Estimation of Ca2+ and Mg2+ ions.
6. Estimation of Ca2+ and Ba2+ ions .
7. Analysis of ores and alloys (course work only)

Note: For examination, a mixture may be given from which one cation is to be estimated volumetrically and the other gravimetrically .

II . Preparation of single stage inorganic complexes (a minimum of 10 complexes).

Note : Characterisation of any two metal complex prepared during the practicals by UV or IR spectral techniques (course work only)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-E1	Estimation of Cu^{2+} and Ni^{2+} ions
2-E2	Estimation of Cu^{2+} and Ni^{2+} ions
3- E3	Estimation of Cu^{2+} and Ni^{2+} ions
4-E4	Estimation of Cu^{2+} and Ni^{2+} ions
5-E5	Estimation of Cu^{2+} and Zn^{2+} ions.
6-E6	Estimation of Cu^{2+} and Zn^{2+} ions.
7-E7	Estimation of Cu^{2+} and Zn^{2+} ions.
8-E8	Estimation of Cu^{2+} and Zn^{2+} ions.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	. Estimation of Fe^{2+} and Cu^{2+} ions
16-E11	. Estimation of Fe^{2+} and Cu^{2+} ions
17-E-12	. Estimation of Fe^{2+} and Cu^{2+} ions
18-E13	. Estimation of Fe^{2+} and Cu^{2+} ions
19-E14	Estimation of Fe^{2+} and Ni^{2+} ions
20-E15	Estimation of Fe^{2+} and Ni^{2+} ions
21-E16	Estimation of Fe^{2+} and Ni^{2+} ions
22-E17	Estimation of Fe^{2+} and Ni^{2+} ions
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Ca^{2+} and Mg^{2+} ions
25-E19	Estimation of Ca^{2+} and Mg^{2+} ions
26-E20	Estimation of Ca^{2+} and Mg^{2+} ions
27-E21	Estimation of Ca^{2+} and Mg^{2+} ions
28-E22	Estimation of Ca^{2+} and Ba^{2+} ions
29-E23	Estimation of Ca^{2+} and Ba^{2+} ions
30-E24	Estimation of Ca^{2+} and Ba^{2+} ions
31-E25	Estimation of Ca^{2+} and Ba^{2+} ions
32-E26	Analysis of ores and alloys
33-E27	Analysis of ores and alloys
34-E28	Analysis of ores and alloys
35-E29	Analysis of ores and alloys
36-E30	Preparation of single stage inorganic complexes
37-E31	Preparation of single stage inorganic complexes
38-E32	Preparation of single stage inorganic complexes
39-E33	Preparation of single stage inorganic complexes
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Preparation of single stage inorganic complexes
46-E35	Preparation of single stage inorganic complexes
47-E36	Preparation of single stage inorganic complexes
48-E37	Preparation of single stage inorganic complexes
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY PRACTICALS–II”
CO1	To understand gravimetric tirations
CO2	To understand inorganic preparations

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-II
Course Code	KCHL43
Class	II year (2015-2016)
Semester	Even
Staff Name	Mr. S. Daniel Abraham
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand potentiometric titrations.*
- *To understand the adsorption and kinetics of reactions.*

PHYSICAL CHEMISTRY PRACTICAL - II

I. Potentiometric titrations- (a) Acid alkali titrations.

b) Precipitation titrations (a) Mixture of Cland I vs Ag+

(c) Redox titrations

(a) Fe2+ vs Cr2O7 2-

(b) Fe2+ vs Ce4+

(c) I - vs KMnO4

(d) Determination of dissociation constant of weak acids

(e) Determination of solubility product of sparingly soluble silver salts.

(f) Determination of activity and activity coefficient of ions.

(g) Determination of pH of a buffer solution using a quin hydrone electrode.

II. Titration using pH meter

(a) Determination of dissociation constant of dibasic acid.

III. Freundlich Adsorption isotherm

(a) Determination of dissociation constant of dibasic acid.

IV. Kinetic studies

(a) Kinetics –acid hydrolysis of ester –comparison of strength of acids.

(b) Kinetics –Persulfate –Iodide –clock reaction-primary salt effect.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 02-12-2015
1-E1	Potentiometric titrations- (a) Acid alkali titrations.
2-E2	Potentiometric titrations- (a) Acid alkali titrations.
3- E3	Potentiometric titrations- (a) Acid alkali titrations.
4-E4	Potentiometric titrations- (a) Acid alkali titrations.
5-E5	Precipitation titrations (a) Mixture of Cland I vs Ag+
6-E6	Precipitation titrations (a) Mixture of Cland I vs Ag+
7-E7	Precipitation titrations (a) Mixture of Cland I vs Ag+
8-E8	Precipitation titrations (a) Mixture of Cland I vs Ag+
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Fe2+ vs Cr2O7 2-
16-E11	Fe2+ vs Cr2O7 2-
17-E-12	Fe2+ vs Ce4+
18-E13	Fe2+ vs Ce4+
19-E14	I - vs KMnO4
20-E15	I - vs KMnO4
21-E16	Determination of dissociation constant of weak acids
22-E17	Determination of dissociation constant of weak acids
23-P2	**College level meeting/Cell function**
24-E18	Determination of solubility product of sparingly soluble silver salts
25-E19	Determination of solubility product of sparingly soluble silver salts
26-E20	Determination of activity and activity coefficient of ions
27-E21	Determination of activity and activity coefficient of ions
28-E22	Determination of pH of a buffer solution using a quin hydrone electrode
29-E23	Determination of pH of a buffer solution using a quin hydrone electrode
30-E24	Determination of pH of a buffer solution using a quin hydrone electrode
31-E25	Determination of pH of a buffer solution using a quin hydrone electrode
32-E26	Determination of dissociation constant of dibasic acid
33-E27	Determination of dissociation constant of dibasic acid
34-E28	Determination of dissociation constant of dibasic acid
35-E29	Determination of dissociation constant of dibasic acid
36-E30	Kinetics –acid hydrolysis of ester –comparison of strength of acids
37-E31	Kinetics –acid hydrolysis of ester –comparison of strength of acids
38-E32	Kinetics –acid hydrolysis of ester –comparison of strength of acids
39-E33	Kinetics –acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
46-E35	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
47-E36	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
48-E37	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–II"
CO1	To understand the potentiometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	HCHM21
Class	I year (2015-2016)
Semester	Even
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the applications of UV and IR spectra in organic chemistry.*
- *To study the applications of NMR spectra.*
- *To study about mass spectra.*
- *To understand the structure and synthesis of alkaloids and antibiotics.*
- *To study about structural elucidation of vitamins.*

ORGANIC CHEMISTRY – II

Unit – I : Ultraviolet , Infra-Red Spectroscopy , ORD and CD

UV: The absorption laws – Types of electronic transitions – effects of solvent and Hydrogen bonding on λ_{max} values – Woodward – Fisher rules to calculate λ_{max} values of conjugated dienes and α,β – unsaturated ketones.

IR: Characteristic of IR absorptions of different functional groups – factors influencing absorption of carbonyl and hydroxyl groups – electronic effect, hydrogen bonding and Fermi resonance.

ORD: Octant rule – α – halo ketone rule and their applications – Circular Dichroism.

Unit – II: NMR SPECTROSCOPY

1H-NMR spectroscopy: Basic Principle – number of signals – chemical shift – Factors influencing chemical shift - spin–spin splitting–Proton exchange reactions - classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR.

C-13 spectroscopy: Principle of proton decoupled and OFF- resonance decoupled C-13 spectroscopy - comparison with H1NMR - chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds)

2D NMR spectroscopy: H1–H1COSY, H1–C13 COSY, NOESY, DEPT and INADEQUATE spectra.

Unit – III: MASS SPECTROSCOPY

Basic Principles– Base peak – molecular ion – nitrogen rule – metastable ions – isotopic peak - daughter ions – Mc–Lafferty rearrangement – RDA – General rules for fragmentation pattern – Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds .

Alternative electron impact ionization technique– CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF , ICP- MS. One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques is compulsory under section – c. Problems shall be based on the reference books.

Unit – IV: ALKALOIDS AND ANTIBIOTICS

Alkaloids: Degradation studies – HEM, Emde and Von – Braun – Structural elucidation and synthesis of Quinine, Morphine, Cocaine, Lysergic acid and Atropine. Synthesis of Reserpine and PaPaverine – Biosynthesis of tyrosine, tryptophan. **Antibioties:** Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.

Unit – V: VITAMINS AND TERPENOIDS

Vitamins: Structural elucidation, synthesis of vitamins – A1, B1 and C - synthesis of vitamins B2, B6, D and E.

Terpenoids: Structural elucidation, synthesis of α-Pinene, Camphor, α-Cadinene, Zingiberene and squalene - synthesis of α-Santonin and Gibberelic acid. Bio synthesis of mono and di terpenoids.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-L1	**Unit – I : Ultraviolet , Infra-Red Spectroscopy , ORD and CD** UV: The absorption laws – Types of electronic transitions – effects of solvent and
2-L2	Hydrogen bonding on λ_{max} values – Woodward – Fisher rules to calculate λ_{max} values of conjugated dienes and α,β – unsaturated ketones.
3- L3	IR: Characteristic of IR absorptions of different functional groups
4-L4	– factors influencing absorption of carbonyl and hydroxyl groups
5-L5	– electronic effect, hydrogen bonding
6-L6	Fermi resonance.
7-L7	ORD: Octant rule –
8-L8	α – halo ketone rule and their applications
9-L9	Circular Dichroism. **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis- Unit – II: NMR SPECTROSCOPY** **1H-NMR spectroscopy**: Basic Principle – number of signals – chemical shift –
12-P1	**Department function**
13-L11	Factors influencing chemical shift - spin–spin splitting–
14-L12	Proton exchange reactions - classification of spin systems
15-L13	– analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–
16-L14	NOE in stereochemistry – FTNMR.
17-L-15	**C-13 spectroscopy**: Principle of proton decoupled and OFF- resonance decoupled C-13 spectroscopy -
18-L16	comparison with H1NMR - chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds)
19-L17	**2D NMR spectroscopy**: H1–H1COSY, H1–C13 COSY,
	Entering Internal Test-I Marks into University portal
20-L18	NOESY,
21-P2	**College level meeting/Cell function**
22-L19	DEPT
23-L20	INADEQUATE spectra.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**Test Paper distribution and result analysis- Unit – III: MASS SPECTROSCOPY** Basic Principles– Base peak – molecular ion – nitrogen rule –

	metastable ions – isotopic peak - daughter ions –
27-L23	Mc–Lafferty rearrangement – RDA –
28-L24	General rules for fragmentation pattern
29-L25	Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds .
30-L26	Alternative electron impact ionization technique– CI,
31-L27	FAB, ESI – MS,
32-L28	MALDI –MS, MALDI-TOF ,
33-L29	ICP- MS.
33-L30	One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques
35-L31	One conjunction problem based on UV, IR, H1 NMR, 13C NMR and Mass spectroscopic techniques
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: ALKALOIDS AND ANTIBIOTICS** **Alkaloids:** Degradation studies – HEM, Emde and Von – Braun –
38-L34	Structural elucidation and synthesis of Quinine,
39-L35	Morphine, Cocaine,
40-L36	Lysergic acid and Atropine.
41-L37	Synthesis of Reserpine and PaPaverine –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Biosynthesis of tyrosine, tryptophan.
44-L39	**Antibioties:** Structure and synthesis of penicillin,
45-L40	**Submission ofAssignment/take the seminar**
46-L41	cephalosporin – C,
47-L42	chloramphenicol
48-L43	Streptomycin
49-L44	**Unit – V: VITAMINS AND TERPENOIDS** **Vitamins:** Structural elucidation, synthesis of vitamins – A1, B1 and C -
50-L45	synthesis of vitamins B2, B6, D and E.
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	**Terpenoids:** Structural elucidation, synthesis of α-Pinene, Camphor, α-Cadinene,
53-L47	Zingiberene and squalene -
54-L48	synthesis of α-Santonin and Gibberelic acid.
55-L49	Bio synthesis of mono and di terpenoids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper**

	discussion
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –II"
CO1	*To know the applications of UV and IR spectra in organic chemistry.*
CO2	*To study the applications of NMR spectra.*
CO3	*To study about mass spectra.*
CO4	*To understand the structure and synthesis of alkaloids and antibiotics.*
CO5	*To study about structural elucidation of vitamins.*
Experimental Learning	
EL1	Prepare an organic compound and record its UV
EL2	Prepare an organic compound and record its proton NMR
EL3	Prepare an organic compound and record its Mass spectra
Integrated Activity	
IA1	Elucidate the structure of vitamins
IA2	Collect information on terpenoids other than in syllabus

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M.Sc. Chemistry
Course Name	Inorganic Chemistry-II
Course Code	HCHM22
Class	I year (2015-2016)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the CFSE and MO theory.*
- *To study the EAN rule and about metal carbonyls.*
- *To study the homogeneous and heterogeneous catalysis.*
- *To understand the NMR and ESR spectra.*
- *To study about polarographic techniques.*

INORGANIC CHEMISTRY – II

UNIT – I: COORDINATION CHEMISTRY

Stability of complexes – stabilisation of unusual oxidation states - determination of stability constants by potentiometric and spectrophotometric methods – factors affecting stability – Chelate and template effects. VB theory and CFT – Splliting of d-orbitals under different geometries – CFSE –evidence for CFSE-structure of spinels – factors affecting CFSE – spectrochemical series – Jahn Teller fistortion- M.O. theory of bonding – Sigma and π bonding in coordination compounds.

Ligand substitution reactions of square planar complexes –trans effect and its theories – use of trans effect in synthesis of complexes – substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions. Electron transfer reactions – Inner sphere and outer sphere processes – outer sphere process in photochemical reactions.

UNIT – II: ORGANOMETALLIC CHEMISTRY - I

Introduction – History-EAN and its correlation to stability – Synthesis and structures of metal carbonyls – carbonylate anions, carbonyl hydride complexes and metal nitrosyls – Isolobal analogy – IR study of metal carbonyls – Synthesis, properties and structural features of metal complexes with carbine, alkene and arene. Hapticity – Metallocenes – synthesis, properties and bonding in ferrocene – covalent versus ionic bonding in beryllocene, clusters and catalysis, hydride and dihydrogen complexes, fluxionality.

UNIT – III: ORGANOMETALLIC CHEMISTRY - II

Oxidative addition and reductive elimination - insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands- Catalysis by organometallic compounds – Homogeneous catalysis – alkene hydrogenation - synthesis gas and water gas shift reactions – hydroformylation – Carbonylation of alcohols and oxygenation of olefins - Heterogeneous catalysis – Fischer Tropsch process and Ziegler-Natta polymerization – Immobilized homogeneous catalysis.

UNIT – IV: APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS II

NMR SPECTROSCOPY: ^{31}P, ^{19}F and ^{15}N – NMR – Introduction – applications in structural problems – evaluation of rate constants - monitoring the course of reaction – NMR of fluxional molecules – NMR of paramagnetic molecules – contact shifts and shift reagents.

ESR spectroscopy: Principles – presentation of the spectrum – hyperfine splitting - factors affecting the magnitude of g-values – zero –field splitting and Kramer's degeneracy - anisotropy in the hyperfine coupling constant. Application of ESR in the study of transition metal complexes – J-T distortion: studies of Cu(II) complexes.

UNIT – V: ELECTROANALYTICAL METHODS

Voltammetry: Polarographic analysis – application, quantitative determination, determination of equilibrium constant for complex formation – organic polarography – advanced voltammetric techniques – rapid – scan techniques – pulse techniques – AC techniques – stripping techniques – coulometry – classification – controlled current coulometry – controlled potential coulometry – advantage of coulometric methods – amperometry – amperometric sensors – amperometric titrations – chronomethods – Chronopotentiometry – Chrono coulometry – cyclic voltammetry.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 02-12-2015
1-L1	**UNIT – I: COORDINATION CHEMISTRY** Stability of complexes – stabilisation of unusual oxidation states
2-L2	determination of stability constants by potentiometric and spectrophotometric methods – factors affecting stability
3- L3	– Chelate and template effects. VB theory and CFT – Splliting of d-orbitals under different geometries
4-L4	CFSE –evidence for CFSE- structure of spinels – factors affecting CFSE – spectrochemical series
5-L5	Jahn Teller fistortion- M.O. theory of bonding – Sigma and π bonding in coordination compounds.
6-L6	Ligand substitution reactions of square planar complexes
7-L7	trans effect and its theories – use of trans effect in synthesis of complexes – substitution reactions in octahedral complexes
8-L8	acid hydrolysis, base hydrolysis and anation reactions.
9-L9	Electron transfer reactions – Inner sphere and outer sphere processes – outer sphere process in photochemical reactions. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis**- **UNIT – II: ORGANOMETALLIC CHEMISTRY - I** Introduction – History-EAN and its correlation to stability –
12-P1	**Department function**
13-L11	Synthesis and structures of metal carbonyls – carbonylate anions, carbonyl hydride complexes and metal nitrosyls
14-L12	Isolobal analogy.
15-L13	IR study of metal carbonyls
16-L14	Synthesis, properties and structural features of metal complexes with carbine, alkene and arene
17-L-15	Hapticity
18-L16	Metallocenes – synthesis, properties and bonding in ferrocene –
19-L17	covalent versus ionic bonding in beryllocene,
	Entering Internal Test-I Marks into University portal
20-L18	clusters and catalysis,.
21-P2	**College level meeting/Cell function**
22-L19	hydride and dihydrogen complexes,
23-L20	fluxionality
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**

25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: ORGANOMETALLIC CHEMISTRY - II** Oxidative addition and reductive elimination **-**
27-L23	insertion and elimination reactions
28-L24	– nucleophilic and electrophilic attack of coordinating ligands-
29-L25	Catalysis by organometallic compounds –
30-L26	Homogeneous catalysis – alkene hydrogenation **-**
31-L27	synthesis gas and water gas shift reactions – hydroformylation
32-L28	Carbonylation of alcohols and oxygenation of olefins
33-L29	Heterogeneous catalysis
33-L30	– Fischer Tropsch process
35-L31	Ziegler-Natta polymerization – Immobilized homogeneous catalysis.
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS II** NMR SPECTROSCOPY: ^{31}P, ^{19}F and ^{15}N – NMR – Introduction
38-L34	applications in structural problems – evaluation of rate constants **-** monitoring the course of reaction
39-L35	NMR of fluxional molecules – NMR of paramagnetic molecules
40-L36	– contact shifts and shift reagents.
41-L37	ESR spectroscopy: Principles – presentation of the spectrum
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	– hyperfine splitting **-** factors affecting the magnitude of g-values
44-L39	zero –field splitting and Kramer’s degeneracy
45-L40	**Submission ofAssignment/take the seminar**
46-L41	anisotropy in the hyperfine coupling constant.
47-L42	Application of ESR in the study of transition metal complexes
48-L43	J-T distortion: studies of Cu(II) complexes.
49-L44	**UNIT – V: ELECTROANALYTICAL METHODS** Voltametry: Polarographic analysis – application, quantitative determination, determination of equilibrium constant for complex formation
50-L45	– organic polarography – advanced voltametric techniques – rapid – scan techniques
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	pulse techniques – AC techniques – stripping techniques – coulometry – classification – controlled current coulometry
53-L47	controlled potential coulometry – advantage of coulometric methods – amperometry
54-L48	amperometric sensors – amperometric titrations
55-L49	chronomethods – Chronopotentiometry – Chrono coulometry – cyclic voltametry.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**

57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –II”
CO1	To know the nature of metal-ligand bond in complexes
CO2	To study about metal carbonyls and metallocenes
CO3	To study the homogeneous and heterogeneous catalysis
CO4	To study the applications of NMR and ESR
CO5	To understand the voltammetric techniques
Experimental Learning	
EL1	Prepare a complex and record its cyclic voltammogram
EL2	Prepare a complex and record its NMR spectra
EL3	Prepare a complex and record its ESR spectra
Integrated Activity	
IA1	Find the hapticity of certain molecules
IA2	Study of IR spectra of metal carbonyls

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-II
Course Code	HCHM23
Class	I year (2015-2016)
Semester	Odd
Staff Name	Mr. S. Daniel Abraham
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of quantum mechanics

To know about approximation methods

To understand the Principles of chemical kinetics

To understand fast reactions

To understand the importance of photochemistry

PHYSICAL CHEMISTRY - II

Unit – I : Quantum Mechanics I

Inadequacy of classical mechanics – Plank's quantum theory – Compton effect – wave particle duality – uncertainity principle. Operators and their algebra, eigen value and eigen functions. Quantum mechanical postulates, Time-dependent and time-independent Schrödinger wave equations, Particle in a box (1D and 3D), Quantum mechanical tunnelling and transmission coefficient-rigid rotor and harmonic oscillator.

Unit – II : Quantum Mechanics II

The hydrogen atom – radial distribution and spherical harmonics functions - shapes of atomic orbitals. Approximation methods - The Variation theorem; Applications of Variation Method to hydrogen and Helium atoms. Perturbation Theory (First order) Application to helium atom. Pauli's exclusion principle – slater determinant and HF and SCF methods to helium atom. Hückel Theory: application to ethylene, butadiene and benzene. Calculation of electron density and bond order.

Unit – III : Chemical Kinetics

Collision theory of reaction rate – steric factor – theory of absolute reaction rates – thermodynamic treatment. Unimolecular reactions - Lindemann, Hinshelwood, RRK, RRKM and Slater theories. Chain reactions – study of Kinetics of chain reactions like H_2-Br_2 reaction, Decomposition of acetaldehyde and N_2O_4 – explosive reactions – study of H_2-O_2 reaction- ionic reactions in solution – Factors influencing the reaction rate – salt effect – influence of pressure – kinetic isotope effect.

UNIT-IV : Chemical Dynamics

Study of fast reactions – General features - Reactions in Flow systems – continuous and stopped flow, chemical Relaxation methods, Temperature and Pressure jump methods, Shock-Tube techniques, Flash photolysis and pulse radiolysis. Concept of linear free energy relationship – derivation of Hammett equation – significance of substituent and reaction constants – Taft equation – thermodynamic implications of LFER.

Unit – V : Photochemistry and Radiation Chemistry

Absorption of light by molecules – Reaction paths of electronically excited molecules: Fluorescence and phosphorescence - Jablonski diagram – Physical properties of electronically excited molecules: excited state dipole moment, excited state Pk_a and redox potentials- Stern-Volmer equation and its applications – excimers and exciplex - Photosensitisation – chemiluminescence.

Radiation Chemistry**: S**ources of high energy - radiolysis of water– Dosimetry and G-value-primary and secondary processes – linear energy transfer – the hydrated electron and its reaction.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-L1	**Unit – I : Quantum Mechanics I** Inadequacy of classical mechanics – Plank's quantum theory –
2-L2	Compton effect – wave particle duality – uncertainity principle.
3- L3	Operators and their algebra, eigen value and eigen functions.
4-L4	Quantum mechanical postulates,
5-L5	Time-dependent Schrödinger wave equations,
6-L6	time-independent Schrödinger wave equations,
7-L7	Particle in a box (1D and 3D),
8-L8	Quantum mechanical tunnelling and transmission coefficient-rigid rotor and harmonic oscillator.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis- Unit – II : Quantum Mechanics II** The hydrogen atom – radial distribution and spherical harmonics functions -
12-P1	**Department function**
13-L11	shapes of atomic orbitals.
14-L12	Approximation methods - The Variation theorem;
15-L13	Applications of Variation Method to hydrogen and Helium atoms.
16-L14	Perturbation Theory (First order) Application to helium atom.
17-L-15	Pauli's exclusion principle
18-L16	– slater determinant and HF and SCF methods to helium atom.
19-L17	Hückel Theory: application to ethylene,
	Entering Internal Test-I Marks into University portal
20-L18	butadiene
21-P2	**College level meeting/Cell function**
22-L19	and benzene.
23-L20	Calculation of electron density and bond order.
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**Test Paper distribution and result analysis- Unit – III : Chemical Kinetics** Collision theory of reaction rate – steric factor
27-L23	– theory of absolute reaction rates – thermodynamic treatment.
28-L24	Unimolecular reactions - Lindemann,

29-L25	Hinshelwood, RRK,
30-L26	RRKM and Slater theories.
31-L27	Chain reactions – study of Kinetics of chain reactions like H_2-Br_2 reaction,
32-L28	Decomposition of acetaldehyde and N_2O_4
33-L29	– explosive reactions – study of H_2-O_2 reaction-
33-L30	ionic reactions in solution
35-L31	– Factors influencing the reaction rate – salt effect – influence of pressure – kinetic isotope effect.
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV : Chemical Dynamics** Study of fast reactions – General features -
38-L34	Reactions in Flow systems – continuous and stopped flow,
39-L35	chemical Relaxation methods, Temperature and Pressure jump methods,
40-L36	Shock-Tube techniques, Flash photolysis and pulse radiolysis.
41-L37	Concept of linear free energy relationship
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	– derivation of Hammett equation
44-L39	– significance of substituent and reaction constants
45-L40	**Submission of Assignment/ seminar**
46-L41	– Taft equation
47-L42	– thermodynamic implications of LFER.
48-L43	– thermodynamic implications of LFER.
49-L44	**Unit – V : Photochemistry and Radiation Chemistry** Absorption of light by molecules – Reaction paths of electronically excited molecules: Fluorescence and phosphorescence - Jablonski diagram –
50-L45	Kinetics and Mechanism of polymerization (Addition and condensation) –
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	Physical properties of electronically excited molecules: excited state dipole moment, excited state Pk_a and redox potentials-
53-L47	Stern-Volmer equation and its applications – excimers and exciplex -
54-L48	Photosensitisation – chemiluminescence.
55-L49	Radiation Chemistry**: S**ources of high energy - radiolysis of water– Dosimetry and G-value- primary and secondary processes – linear energy transfer – the hydrated electron and its reaction.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –II"
CO1	To learn the wave equations
CO2	To apply approximation methods to hydrogen and helium systems
CO3	To understand the Principles of chemical kinetics
CO4	To understand about fast reactions
CO5	To understand photochemistry
Experimental Learning	
EL1	Interpretation of fluorescence spectra
EL2	Demonstration of quenching experiment
Integrated Activity	
IA1	Study of effect of solvent on reaction rate
IA2	Derive kinetics for certain reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-IV
Course Code	HCHM41
Class	II year (2015-2016)
Semester	Even
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the reactions of carbanions and carbocation intermediates.
- To understand the conformations of cyclic compounds.
- To understand the reterosynthetic analysis
- To study the uses of reagents
- To study the structure of steroids

ORGANIC CHEMISTRY –IV

Unit-I Reaction under Intermediate chemistry

Reaction Under Carbanion Intermediate : Clasien, Knoevenegal, Stobbe, Darzen, acyloic condensation Shapiro reaction and Julia olifination. Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions Carbocation intermediate : Oxymercuration, halolactonisation. Reaction following Radical intermediate: Mc Murray coupling, Gomberg-

Pechmann and Pschorr reactions. Reaction involving Ylide intermediate: Wittig reaction and Peterson olifination.

Unit-II Conformational analysis

Conformations of mono and disubstituted cyclohexanes-effect of hydrogen bonding, dipole and steric effects on the disubstituted cyclohexanes- conformation and reactivity of acyclic

and cyclic compounds (6members)- conformation of decalin and perhydrophenanthrene-curtin-Hammett principle.

Unit-III Reterosynthetic analysis

Synthon-synthetic equivalent-Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds- use of activating and blocking groups-Robinson annulations reaction-carbon skeletal complexity-Role of key intermediates in organic synthesis. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine, Baclofan, Brufen, Trihexyl phenydyl, Bisabolene, α-onocerin, Isonootkatone, cascarillic acid, camphor and 2,4dihydroxy pentanoic acid.

Unit-IV Reagents in organic synthesis

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), DMSO, Super hydrides- K and L selectrides -Dess-martin-periodinane- Baker‘s yeast –Quaternary ammonium salt and crown ethers. Introductory treatment of the application of silicon, boron (organoboranes), phosphorus, palladium, samarium, ruthenium and indium reagents in organic synthesis.

Unit-V Steroids

Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol- structural elucidation of androsterone, testosterone, progesterone, Oestrone. Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid. Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane.

Course calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 02-12-2015
1-L1	**Unit-I Reaction under Intermediate chemistry** Reaction Under Carbanion Intermediate : Clasien, Knoevenegal,
2-L2	Stobbe, Darzen, acyloic condensation
3- L3	Shapiro reaction and Julia olifination.
4-L4	Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions
5-L5	Carbocation intermediate : Oxymercuration, halolactonisation
6-L6	. Reaction following Radical intermediate: Mc Murray coupling,
7-L7	Gomberg- Pechmann and Pschorr reactions.

8-L8	Reaction involving Ylide intermediate: Wittig reaction
9-L9	Peterson olifination.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**Unit-II Conformational analysis** Conformations of mono and disubstituted cyclohexanes-
14-L12	effect of hydrogen bonding,
15-L13	dipole and steric effects on the disubstituted cyclohexanes
16-L14	- conformation of acyclic compounds (6members)-.
17-L-15	reactivity of acyclic compounds (6members)-.
18-L16	- conformation of cyclic compounds (6members)-.
19-L17	- conformation of cyclic compounds (6members)-.
	Entering Internal Test-I Marks into University portal
20-L18	conformation of decalin
21-P2	**College level meeting/Cell function**
22-L19	conformation of perhydrophenanthrene
23-L20	-curtin-Hammett principle
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**Unit-III Reterosynthetic analysis** Synthon-synthetic equivalent-
27-L23	Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds-
28-L24	use of activating and blocking groups-
29-L25	Robinson annulations reaction-carbon skeletal complexity-
30-L26	Role of key intermediates in organic synthesis
31-L27	. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine,
32-L28	Baclofan, Brufen, Trihexyl phenydyl,
33-L29	Bisabolene, α-onocerin,
33-L30	Isonootkatone, cascarillic acid,
35-L31	camphor and 2,4dihydroxy pentanoic acid.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Reagents in organic synthesis** 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ),
38-L34	DMSO, Super hydrides- -
39-L35	Dess-martin-periodinane- Baker‘s yeast –

40-L36	Quaternary ammonium salt and crown ethers.
41-L37	Introductory treatment of the application of silicon,
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	boron (organoboranes), phosphorus,
44-L39	palladium, samarium,
45-L40	**Submission of Assignment/take the seminar**
46-L41	ruthenium reagents in organic synthesis
47-L42	indium reagents in organic synthesis
48-L43	K and L selectrides
49-L44	**Unit-V Steroids** Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol-
50-L45	structural elucidation of androsterone, testosterone,.
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	progesterone, Oestrone.
53-L47	Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid.
54-L48	Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural
55-L49	elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –IV”
CO1	Understand the reactions of intermediates
CO2	Explain the conformations of cyclohexane and decalin
CO3	Understand the reterosynthesis of certain compounds
CO4	Explain the role of reagents in organic synthesis
CO5	Explain the structure and synthesis of steroids
Experimental Learning	
EL1	Make models of various conformers of cyclohexane
EL2	Synthesise a compound involving DMSO as reagent
Integrated Activity	
IA1	Discuss on different reagents and their uses
IA2	Elucidate the structure of cholesterol

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-IV
Course Code	HCHM42
Class	II year (2015-2016)
Semester	Even
Staff Name	Mr. C. JOEL
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the spectroscopy of inorganic compounds.
- To understand the theory and principle of thermoanalytical techniques.
- To understand the synthetic reactions of intercalation compounds
- To understand the photophysical properties of certain metal complexes
- To understand the chemistry of enzymes

INORGANIC CHEMISTRY –IV

UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III

Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states , Hund's rule and term symbols . Selection rules for electronic transition and hole formalism – splitting of terms – Orgel and Tanabe Sugano diagrams – Evaluation of 10 Dq and B for octahedral d 2 and d8 systems. Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes . Photo electron spectroscopy : Koopman's theorem , PES – XPES(ESCA) – chemical shifts in XPES – application of ESCA to inorganic systems – Auger electron spectroscopy.

UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS

Theory and principles of thermogravimetric analysis , differential thermal analysis and differential scanning colorimetry–characteristic features of TGA and DTA curves-factors affecting TGA and DTA curves- complementary nature of TGA and DTA – applications of thermal methods in analytical chemistry- thermometric titrations- the study of minerals and polymers. Principle and applications of colorimetry,spectrophotometry, nephelometry, turbidimetry , fluorimetry and atomic absorption spectroscopy.

UNIT – III : CHEMISTRY OF INORGANIC MATERIALS

Synthesis of inorganic materials – high temperature reactions and experimental methods – precipitation, gel, solution and hydrothermal methods , synthesis in sealed tubes and special atmospheres . Low temperature methods. Insertion compounds of metal oxides – Intercalation compounds of graphite and transition metal disulphides . Zeolites : structures and properties – pillared clays – fullerenes and fullerides.

UNIT -IV : INORGANIC PHOTOCHEMISTRY

Properties of excited states of metal complexes – charge transfer excitation – bimolecular deactivation(quenching) and energy transfer – photochemical path ways : oxidation-reduction, isomerisation and substitutional processes – photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –photophysical and photochemical properties of ruthenium polypyridyls – applications of inorganic photochemistry : photochemical conversion and storage of solar energy – inorganic photochemistry at semi-conductor electrodes.

UNIT – V : BIOINORGANIC CHEMISTRY – II

Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases – zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations . Chelate therapy - therapeutic chelating agents and their uses – anti - cancer platinum complexes and their interaction with nucleic acids, gold compounds and anti-arthritic agents – metal complexes as probes of nucleic acids.

Course calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 02-12-2015
1-L1	**UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III** Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states ,
2-L2	Hund‘s rule and term symbols .
3- L3	Selection rules for electronic transition and hole formalism
4-L4	– splitting of terms – Orgel and Tanabe Sugano diagrams.

5-L5	– Evaluation of 10 Dq and B for octahedral d 2 and d8 systems.
6-L6	Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes.
7-L7	Photo electron spectroscopy : Koopman's theorem ,
8-L8	PES – XPES(ESCA) – chemical shifts in XPES –
9-L9	application of ESCA to inorganic systems – Auger electron spectroscopy.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS** Theory and principles of thermogravimetric analysis ,
14-L12	differential thermal analysis and differential scanning colorimetry–
15-L13	characteristic features of TGA and DTA curves-
16-L14	factors affecting TGA and DTA curves-
17-L-15	complementary nature of TGA and DTA –
18-L16	applications of thermal methods in analytical chemistry
19-L17	- thermometric titrations- the study of minerals and polymers.
	Entering Internal Test-I Marks into University portal
20-L18	Principle and applications of colorimetry,spectrophotometry,
21-P2	**College level meeting/Cell function**
22-L19	nephelometry,
23-L20	turbidimetry ,.
24-L21	**Allotting portion for Internal Test-II-** fluorimetry and atomic absorption spectroscopy
25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**UNIT – III : CHEMISTRY OF INORGANIC MATERIALS** Synthesis of inorganic materials –
27-L23	high temperature reactions and experimental methods –
28-L24	precipitation, gel, solution and hydrothermal methods ,
29-L25	synthesis in sealed tubes and special atmospheres .
30-L26	Low temperature methods.
31-L27	Insertion compounds of metal oxides –
32-L28	Intercalation compounds of graphite and transition metal disulphides .
33-L29	Zeolites : structures and properties –.
33-L30	pillared clays
35-L31	– fullerenes and fullerides
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT -IV : INORGANIC PHOTOCHEMISTRY** Properties of excited states of metal complexes –
38-L34	charge transfer excitation –
39-L35	bimolecular deactivation(quenching) and energy transfer
40-L36	photochemical path ways:oxidation-reduction, isomerisation and substitutional

41-L37	– photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	photophysical and photochemical properties of ruthenium polypyridyls –
44-L39	applications of inorganic photochemistry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	: photochemical conversion
47-L42	– inorganic photochemistry at semi-conductor electrodes
48-L43	storage of solar energy
49-L44	**UNIT – V : BIOINORGANIC CHEMISTRY – II** Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases –
50-L45	zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations .
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	Chelate therapy - therapeutic chelating agents and their uses
53-L47	– anti - cancer platinum complexes and their interaction with nucleic acids ,
54-L48	gold compounds and anti-arthritic agents –
55-L49	metal complexes as probes of nucleic acids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –IV"
CO1	Learn the application of spectroscopy of inorganic compounds
CO2	Learn the principles and applications of thermoanalytical techniques
CO3	Explain the properties of zeolites and fullerenes
CO4	Learn the photophysical properties of metal complexes
CO5	Learn the role of metal ions in enzymes
Experimental Learning	
EL1	Record the TGA of any copper compound
EL2	Record the fluorescence of any chromium complex
Integrated Activity	
IA1	Analyse the TG-DTA curve of the given compound
IA2	Discuss the chelate therapy

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-IV
Course Code	HCHM43
Class	II year (2015-2016)
Semester	Even
Staff Name	Mrs. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of rotational spectroscopy.
- To understand the principle of IR spectroscopy.
- To understand the principle of electronic spectroscopy
- To understand the principle of NMR and ESR spectroscopy
- To understand the principle of NQR and Mossbauer spectroscopy

PHYSICAL CHEMISTRY –IV

UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA

Characterization of electromagnetic radiation. Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and nonrigid diatomic molecules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic and symmetric top molecules. The stark effect.

UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY

Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect. The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules-Fundamental vibrations and their symmetry, overtone and combination frequencies, concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy: Rayleigh scattering . Raman Scattering, classical and quantum theories of Raman effect.

Rotational Raman Spectra for linear and symmetric top molecules. Vibrational Raman Spectra , rotational fine structure. Polarization of light and the Raman effect. Technique and instrumentation- Laser Raman spectrometer. Structure determination from Raman and Infra-red spectroscopy.

UNIT – III: ELECTRONIC SPECTROSCOPY

Electronic spectroscopy of diatomic molecules. Born – oppenheimer approximation. Sequences and progressions, the vibrational course structure and rotational fine structure of electronic band. The Franck-Condon principle, dissociation energy and dissociation products. Birje-Sponer extrapolation. The fortrat diagram. Predissociation, Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.

UNIT - IV: NMR AND ESR

Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions. NMR of simple AX and AMX type molecules. Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy. C, F and P NMR spectra-principle and applications. Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting . Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p- benzosemiquinone radicals, calculation of electron density-McConnel equation, Fine structure in ESR- Zero field shifting and Kramer‟s degeneracy. Double resonance-ELDOR and ENDOR, study of unstable paramagnetic species, spin labeling studies of bio-molecules.

UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY

(a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter, Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character. (b) Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift. Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds, (ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination, (iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).

Course calendar

Hour allotment	Class Schedule
	Even Semester Begin on 02-12-2015
1-L1	**UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA** Characterization of electromagnetic radiation.
2-L2	Regions of Spectrum, transition probability
3- L3	the width and intensity of spectral transitions
4-L4	Classification of molecules according to their moment of inertia.
5-L5	The effect of isotopic substitution
6-L6	Rotational spectra of rigid and nonrigid diatomic molecules
7-L7	The intensities of spectral lines
8-L8	Polyatomic and symmetric top molecules.

9-L9	The stark effect.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.01.2016)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY** Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect.
14-L12	The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules
15-L13	Fundamental vibrations and their symmetry, overtone and combination frequencies,
16-L14	concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy
17-L-15	Rayleigh scattering . Raman Scattering,
18-L16	Rotational Raman Spectra for linear and symmetric top molecules
19-L17	Vibrational Raman Spectra , rotational fine structure.
	Entering Internal Test-I Marks into University portal
20-L18	Polarization of light and the Raman effect
21-P2	**College level meeting/Cell function**
22-L19	Technique and instrumentation- Laser Raman spectrometer
23-L20	classical and quantum theories of Raman effect
24-L21	**Allotting portion for Internal Test-II-** Structure determination from Raman and Infra-red spectroscopy.
25-IT-II	**Internal test – II (22.02.2016)**
26-L22	**UNIT – III: ELECTRONIC SPECTROSCOPY**
27-L23	Electronic spectroscopy of diatomic molecules
28-L24	Born – oppenheimer approximation
29-L25	Sequences and progressions
30-L26	the vibrational course structure and rotational fine structure of electronic band.
31-L27	The Franck-Condon principle
32-L28	dissociation energy and dissociation products
33-L29	Birje-Sponer extrapolation
33-L30	The fortrat diagram
35-L31	Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT - IV: NMR AND ESR** Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions.
38-L34	NMR of simple AX and AMX type molecules.
39-L35	Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy.
40-L36	C, F and P NMR spectra-principle and applications.
41-L37	Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting
	Entering Internal Test-II Marks into University portal

42-P4	**College level meeting/ function**
43-L38	Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p-benzosemiquinone radicals,
44-L39	calculation of electron density- McConnel equation, Fine structure in ESR
45-L40	**Submission of Assignment/take the seminar**
46-L41	Zero field shifting and Kramer‘s degeneracy
47-L42	Double resonance-ELDOR and ENDOR,
48-L43	study of unstable paramagnetic species, spin labeling studies of bio-molecules.
49-L44	**UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY** (a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter,
50-L45	Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character.
51-IT-III	**Internal Test-III (28.03.2016)**
52-L46	Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift.
53-L47	Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds
54-L48	(ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination
55-L49	(iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (11.04.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 22-04-2016

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –IV”
CO1	Explain basic principles of rotational spectra
CO2	Explain basic principles of IR and Raman spectra
CO3	Explain basic principles of electronic spectra
CO4	Explain basic principles of NMR and ESR spectra
CO5	Explain basic principles of NQR and Mossbauer spectra
Experimental Learning	
EL1	Interpret NMR spectra for certain compounds
EL2	Interpret EPR spectra for certain compounds
Integrated Activity	
IA1	Prepare a compound and determine its structure through NMR spectra.
IA2	Record the electronic spectra for a given compound

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Course Work
Course Code	KCHC12
Class	I year (2015-2016)
Semester	Odd
Staff Name	
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the **Absorption Spectroscopy**
- To understand the Basic principles of two-dimensional NMR spectroscopy
- To know about the Nuclear Quadruple Resonance Spectroscopy
- To get an idea analytical techniques in chemistry
- To understand the Principles and applications of XRD, Neutron and electron diffraction

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

Paper-II

COURSE WORK

No. of Hrs – 4 / Week Credits - 4

Objectives

Unit –I : Retrosynthetic Analysis : Introduction to disconnections – one group disconnections – two group disconnections – pericyclic reactions – small rings: three membered , four membered, and five membered.

Unit II: Applications of Advanced Organic Spectroscopy (12hrs.) NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications. Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M + 1 and M + 2 ions – calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV, IR, 1H-NMR, 13C-NMR and mass spectral data.

Unit-III: Metals in Medicine: Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic – biological defense mechanisms – chelation therapy – metals used for diagnosis and chemotherapy – platinum complexes as anticancer drugs, Pt-DNA binding ,complexes of gold ,copper, zinc , mercury, arsenic and antimony as drugs – Bioorganomentallic Chemistry.

Unit IV: Nano Science and Technology:

Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials - zero dimensional nanostructures – one dimentional nanostructures – nanowires and nanorods – two dimensional nanostructures – films , nanotubes and biopolymers- three dimensional nanostructures – fullerenes and dendrimers – quantum dots and their properties . Basic instrumentation and imaging techniques.

Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles – water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs.

Unit V: Advanced Photochemistry : Artificial photosynthesis and solar energy conversion – photoelectrochemical cells – dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts ; Fluorescence sensing – mechanism and applications ; Radioactive decay engineering – metal – enhanced fluorescence and surface plasmon – coupled emission.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2015
1-L1	**Unit –I : Retrosynthetic Analysis**
2-L2	Introduction to disconnections
3- L3	one group disconnections
4-L4	two group disconnections
5-L5	pericyclic reactions
6-L6	small rings
7-L7	three membered
8-L8	four membered
9-L9	five membered
10-IT-1	**Internal test – I (20-07-2015)**
11-L10	**Unit II: Applications of Advanced Organic Spectroscopy**
12-P1	NMR
13-L11	Basic principles of two-dimensional NMR spectroscopy
14-L12	HOMOCOSY, HETCOSY and NOESY spectra and their applications
15-L13	use of INEPT and DEPT methods and their applications
16-L14	Mass: Molecular ions, isotope peaks, fragmentation pattern
17-L-15	McLafferty rearrangement
18-L16	measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI)
19-L17	M + 1 and M + 2 ions
	Entering Internal Test-I Marks into University portal
20-L18	calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV
21-P2	**College level meeting/Cell function**
22-L19	IR, 1H-NMR
23-L20	13C-NMR and mass spectral data.
24-L21	Quick review of the chapter -**Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (31-08-2015)**

26-L22	**Unit-III: Metals in Medicine**
27-L23	Beneficial, essential ,and toxic elements
28-L24	Metal deficiency and disease
29-L25	toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic
30-L26	biological defense mechanisms
31-L27	chelation therapy
32-L28	metals used for diagnosis and chemotherapy
33-L29	platinum complexes as anticancer drugs, Pt-DNA binding
33-L30	complexes of gold ,copper, zinc , mercury,
35-L31	arsenic and antimony as drugs
36-L32	Bioorganomentallic Chemistry
38-L33	**Unit IV: Nano Science and Technology:**
38-L34	Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials
39-L35	zero dimensional nanostructures – one dimentional nanostructures
40-L36	nanowires and nanorods – two dimensional nanostructures
41-L37	films , nanotubes and biopolymers- three dimensional nanostructures
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	fullerenes and dendrimers – quantum dots and their properties
44-L39	Basic instrumentation and imaging techniques
45-L40	**Submission of Assignment/take the seminar**
46-L41	Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles
47-L42	water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs
48-L43	Overview of the chapter
49-L44	**Unit V: Advanced Photochemistry**
50-L45	Artificial photosynthesis and solar energy conversion – photoelectrochemical cells
51-IT-III	**Internal Test-III (05-10-2015)**
52-L46	dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles
53-L47	reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts
54-L48	Fluorescence sensing – mechanism and applications ; Radioactive decay engineering
55-L49	metal – enhanced fluorescence and surface plasmon – coupled emission
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (14-10-2015)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 29-10-2015

Course Outcomes

Learning Outcomes	**COs** of the course "ADVANCED TOPICS IN CHEMISTRY –I"
CO1	To understand the **Retrosynthetic Analysis**
CO2	To understand the Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the sonochemical methods and microwave methods .CNTs and CNFs.
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	sonochemical methods and microwave methods .CNTs and CNFs.
IA2	Microwave mediated synthesis of CdO

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# Forslow learner	:Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-III
Course Code	HCHM31
Class	II year (2016-2017)
Semester	Odd
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
- To study the rearrangements.
- To calculate the delocalization energy through group theory
- To learn about the photochemistry and pericyclic reactions
- To learn about the reactions of heterocyclic and biomolecules

ORGANIC CHEMISTRY-III

Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:

Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions- Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution- Ambient nucleophile- NGP- Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only) Elimination reaction: E1, E2 and E1CB mechanisms- Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions.

Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms. Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich

reaction- Wittig reaction- Sharpless asymmetric epoxidation-addition of hydrogen and hydrogen halides to carbon-carbon double bonds-Michael addition (1,2 and 1,4).

Unit-III Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, reactions and stereochemistry of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications. **Nitrenes:** Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet Hauser and Favorski rearrangements. **Arynes :** Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit-IV Organic photochemistry and pericyclic reactions

Photosensitization- cis-trans isomerisation- photo oxidation and reductions- Norris type-I and II reactions- Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement. Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches: Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry. Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)- Sigmatropic rearrangements - [i,j] shift of C-H and C-C bonds (1+3 and 1+5system)

Unit-V Heterocyclic and biomolecules

Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids. Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A Detailed study on the structure of maltose, sucrose and lactose- A brief study on starch and cellulose. Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 16-06-2016
1-L1	**Unit-I Aliphatic nucleophilic substitution and Elimination Reactions:** Aliphatic nucleophilic substitution: Mechanism of SN1, SN2, SNi, SN1‘, SN2‘ and SNi reactions-
2-L2	Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution-
3- L3	Ambient nucleophile- NGP
4-L4	Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only)
5-L5	Elimination reaction: E1, E2 and E1CB mechanisms-

6-L6	Factors influencing elimination reactions
7-L7	- Hofmann and Satyzeff rules.
8-L8	- Pyrolytic elimination-
9-L9	Chugaev and cope reactions.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**Unit-II Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds** Aromatic nucleophilic substitution reaction:
14-L12	Unimolecular, Bimolecular and Benzyne mechanisms.
15-L13	Catalytic hydrogenation
16-L14	Dieckmann condensation-
17-L-15	Mannich reaction- Wittig reaction-
18-L16	Sharpless asymmetric epoxidation-
19-L17	addition of hydrogen and hydrogen halides to carbon-carbon double bonds-
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2).
21-P2	**College level meeting/Cell function**
22-L19	Michael addition (1,4).
23-L20	- Birch reduction-
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**Unit-III Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, reactions and stereochemistry of carbenes-
27-L23	Wolff rearrangement of acyl carbenes and its synthetic applications.
28-L24	**Nitrenes:** Generation, stability, reaction of nitrenes-
29-L25	Mechanism of rearranegements through Nitrene intermediate:
30-L26	Schmidt, Hoffmann, Beckmann rearrangements
31-L27	. **Carbanion:** Mechanism of rearrangements involving carbanion as intermediate:.
32-L28	Steven, Sommelet Hauser rearrangements
33-L29	Favorski rearrangements.
33-L30	**Arynes :** Generation, Structure, Stability, reactions and trapping of arynes-
35-L31	cine substitution
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Organic photochemistry and pericyclic reactions** Photosensitization-cis-trans isomerisation- photo oxidation and reductions-
38-L34	Norris type-I and II reactions-
39-L35	Paterno-Buchi reaction- Barton reaction- Di-π methane rearrangement.
40-L36	Atomic and molecular orbitals-Woodward-Hoffmann rules,

41-L37	FMO and correlation diagram approaches:
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Electrocyclic reaction- con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatriene)-
44-L39	Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Cycloaddiation- suprafacial and antarafacial additions, [2+2] and [4+2] reactions (ethylene and butadiene)-
47-L42	Sigmatropic rearrangements - [i,j] shift of C-H
48-L43	C-C bonds (1+3 and 1+5system)
49-L44	**Unit-V Heterocyclic and biomolecules** Synthesis and reactions of oxazole, imidazole, thiazole, coumarins benzopyrones and anthocyanins-
50-L45	synthesis of flavones, flavonol and quercetin- Biosynthesis of flavonoids.
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A
53-L47	Detailed study on the structure of maltose, sucrose and lactose-
54-L48	A brief study on starch and cellulose.
55-L49	Nucleoproteins and nucleic acid-chemistry and Heredity- genetic code.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 26-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –III”
CO1	Explain aliphatic and aromatic nucleophilic substitution and Elimination Reactions.
CO2	Knowledge about catalytic hydrogenation
CO3	Knowledge about stability, structure, and reacions of carbenes, nitrenes, carbanions and arynes

CO4	Learns the pericyclic reactions
CO5	Knowledge about the synthesis of heterocyclic and biomolecules
Experimental Learning	
EL1	Synthesise an imidazole compound
EL2	Demonstration of photo oxidation reaction
Integrated Activity	
IA1	Discuss about the nucleic acids and modes of binding in them.
IA2	Discuss about Birch reduction.

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-III
Course Code	HCHM32
Class	II year (2016-2017)
Semester	Odd
Staff Name	Dr. C. Joel
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand about nuclear fission and fusion.
- To know about radiation and nuclear reactors.
- To learn about cage and cluster compounds
- To learn about applications of IR and Raman spectra in Inorganic chemistry
- To learn about the role of bioinorganic molecules in living system

INORGANIC CHEMISTRY - III

UNIT – I : NUCLEAR CHEMISTRY- I

Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types , Q-value , threshold energy , cross sections and excitation functions – nuclear reaction models : optical and compound nucleus models . Direct nuclear reactions – transfer reactions: stripping and pick-up –high energy reactions: neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission.

UNIT – II : NUCLEAR CHEMISTRY - II

Nuclear reactors : classification , components , reproduction factor and design parameter – fuel materials and their production. Breeder reactor : fast breeder test reactor – reprocessing of spent fuels : aqueous and non-aqueous processes – disposal of gaseous , liquids and solid

radioactive wastes –radiation hazards and protection – India‘s nuclear reactors . Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations . Analytical applications : radio chromatography , neutron activation analysis , neutron absorptiometry and radiometric titrations – hot atom chemistry – synthesis of transuraniens .

UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS

Hetero catenation - silicates - classification and structure-property correlation . Polyacids – structures of isopoly and heteropoly anions - polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers - boranes and carboranes – structure and bonding in boranes. Metal-metal bonds and metal atom clusters - carbonyl type - anionic and hydrido clusters- non- carbonyl type – octahedral clusters and triangular clusters.

UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II

Application of IR and Raman spectra in the study of coordination compounds : Application to metal carbonyls and nitrosyls – geometrical and linkage isomerism – detection of inter and intramolecular hydrogen bonding – stretching mode analysis of metal carbonyls. Mossbauer spectroscopy : Principle – application of isomer shift , quadrupole interactions and magnetic hyperfine splitting in the study of iron and tin compounds .

UNIT-V : BIOINORGANIC CHEMISTRY –I

Essential and trace elements in biological system – biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system. Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers: iron-sulphur proteins , cytochromes and blue copper proteins – oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers . Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 16-06-2016
1-L1	**UNIT – I : NUCLEAR CHEMISTRY- I** Atomic nuclei : classification , composition and stability – nuclear shell structure – nuclear reactions : types ,
2-L2	Q-value , threshold energy , cross sections and excitation functions –
3- L3	nuclear reaction models :
4-L4	optical and compound nucleus models .
5-L5	Direct nuclear reactions – transfer reactions:
6-L6	stripping and pick-up –high energy reactions:
7-L7	neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.

8-L8	Nuclear fusion and stellar energy – nuclear fission: mass and charge distribution of fission products –
9-L9	fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : NUCLEAR CHEMISTRY - II** Nuclear reactors : classification , components , reproduction factor and design parameter
14-L12	– fuel materials and their production. Breeder reactor :
15-L13	aqueous and non-aqueous processes – disposal of gaseous , liquids and solid radioactive wastes
16-L14	–radiation hazards and protection – India‘s nuclear reactors .
17-L-15	Radio isotopes : preparation, application of radio isotopes in elucidating reaction mechanisms and structural determinations .
18-L16	Analytical applications : radio chromatography ,
19-L17	neutron activation analysis ,
	Entering Internal Test-I Marks into University portal
20-L18	neutron absorptiometry and radiometric titrations –
21-P2	**College level meeting/Cell function**
22-L19	hot atom chemistry
23-L20	– synthesis of transuraniens
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**UNIT – III : INORGANIC CHAINS , RINGS , CAGES AND CLUSTERS** Hetero catenation - silicates - classification and structure-
27-L23	property correlation . Polyacids – structures of isopoly and heteropoly anions -.
28-L24	polymeric sulphur nitride - borazines – phosphazenes - phosphazene polymers -
29-L25	boranes and carboranes – structure and bonding in boranes.
30-L26	Metal-metal bonds and metal atom clusters
31-L27	- carbonyl type -
32-L28	anionic and hydrido clusters-
33-L29	non- carbonyl type
33-L30	– octahedral clusters
35-L31	triangular clusters
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS – II** Application of IR and Raman spectra in the study of coordination compounds :
38-L34	Application to metal carbonyls and nitrosyls –

39-L35	geometrical and linkage isomerism –
40-L36	detection of intermolecular hydrogen bonding
41-L37	– stretching mode analysis of metal carbonyls.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Mossbauer spectroscopy : Principle – application of isomer shift ,
44-L39	quadrupole interactions
45-L40	**Submission of Assignment/take the seminar**
46-L41	detection of intramolecular hydrogen bonding
47-L42	magnetic hyperfine splitting in the study of iron and tin compounds .
48-L43	magnetic hyperfine splitting in the study of iron and tin compounds .
49-L44	**UNIT-V : BIOINORGANIC CHEMISTRY –I** Essential and trace elements in biological system
50-L45	– biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system.
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	Metallo porphyrins – chlorophyll – photosynthetic electron transport sequence – biological electron carriers:
53-L47	iron-sulphur proteins , cytochromes and blue copper proteins
54-L48	oxygen carriers: haemoglobin and myoglobin - Haemoglobin modelling : synthetic oxygen carriers .
55-L49	Corrin ring system - vitamin B12 , Fixation of nitrogen – *in vitro* and *in vivo.*
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 26-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –III”
CO1	Explain the nuclear fission and fusion
CO2	Knowledge about nuclear reactors

CO3	Knowledge about silicates, boranes and carboranes
CO4	Learns the IR and Raman modes of metal carbonyls and nitrosyls
CO5	Knowledge about the bioinorganic molecules
Experimental Learning	
EL1	Visit a nuclear reactor
EL2	Record the IR of an inorganic compound
Integrated Activity	
IA1	Discuss about the structure of certain biomolecules.
IA2	Collect information about various nuclear reactors.

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-III
Course Code	HCHM33
Class	II year (2016-2017)
Semester	Odd
Staff Name	Dr. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of Group theory.
- To study the point groups of molecules.
- To calculate the delocalization energy through group theory
- To learn about the Principles of Electrochemistry
- To learn adsorption and adsorption isotherms

PHYSICAL CHEMISTRY –III

UNIT I: GROUP THEORY I

Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment, symmetry and optical activity, symmetry operations of a group, multiplication table. Classes of symmetry operations and matrix representations of operations. Reducible and irreducible representations, orthogonality theorem. Properties of irreducible representations. Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2). Explanations for the complete character table for a point group.

UNIT II: GROUP THEORY II

Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra. Standard reduction formula. Determination of representations of vibrational modes in non-linear molecules (H2O, NH3 and Trans N2F2). Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion. Electronic Spectra of Ethylene and formaldehyde molecules. Hybrid orbital in non-linear molecules (CH4, XeF4, BF3,and PF5). Projection operators and symmetry adapted linear combinations(SALC). Simplification of HMO calculations using group theory. Calculation of delocalization of energy in 1,3-butadiene and cyclopropenyl systems.

UNIT III: **ELECTROCHEMISTRY I**

Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction , Debye-Huckel-Onsagar equation and its validity. Debye-Falkenhagen and Wein effects. Debye-Huckel limiting law, its applications to concentrated solutions. Debye-Huckel Bronsted equation. Quantitative and qualitative verification of Debye Huckel limiting law. Electrode electrolyte interface, adsorption at electrified interface, electrical double layer, electrocapillary phenomenon-Lipmann equation.

UNIT IV: **ELECTROCHEMISTRY II**

Polarization and over potential, Butler-Volmer equation for one step and multistep electron transfer reactions, Tafel equation, significance of I_0 and transfer coefficient, polarizable and non-polarizable electrodes, mechanism of hydrogen and oxygen evolution reactions. Corrosion and polarization of metals - Pourbaix diagrams, Evan‘s diagram, Fuel cells, electrode deposition-principle and applications.

UNIT V: ADSORPTION AND SURFACE PHENOMENON

Physisorption and chemisorption, adsorption and desorption, adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination, surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance. Kinetics of unimolecular and bimolecular surface reactions. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces, Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.

Course calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 16-06-2016
1-L1	**UNIT I: GROUP THEORY I**: Symmetry properties of molecules and group theory: Symmetry elements, symmetry operations and point groups, properties of group, symmetry and dipole moment.
2-L2	symmetry and optical activity, symmetry operations of a group
3- L3	multiplication table
4-L4	Classes of symmetry operations
5-L5	matrix representations of operations
6-L6	Reducible and irreducible representations, orthogonality theorem
7-L7	Properties of irreducible representations
8-L8	Constructions of character table for point groups (C2v, C3v, C2h, C4v and D2).
9-L9	Explanations for the complete character table for a point group.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**

11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT II: GROUP THEORY II -** Application of group theory: Symmetry selection rules for infrared, Raman and electronic Spectra.
14-L12	Standard reduction formula
15-L13	Determination of representations of vibrational modes in non-linear molecules (H_2O, NH_3 and Trans N_2F_2).
16-L14	Infrared and Raman activities of normal modes of vibrations. Rule of mutual exclusion.
17-L-15	Electronic Spectra of Ethylene and formaldehyde molecules.
18-L16	Hybrid orbital in non-linear molecules (CH_4, XeF_4, BF_3, and PF_5).
19-L17	Projection operators and symmetry adapted linear combinations(SALC).
	Entering Internal Test-I Marks into University portal
20-L18	Simplification of HMO calculations using group theory.
21-P2	**College level meeting/Cell function**
22-L19	Simplification of HMO calculations using group theory.
23-L20	Calculation of delocalization of energy in 1,3-butadiene.
24-L21	**Allotting portion for Internal Test-II-** Calculation of delocalization of energy in cyclopropenyl systems.
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**UNIT III**: **ELECTROCHEMISTRY I -** Electrolytic conductance: Debye - Huckel theory of inter-ionic attraction.
27-L23	Debye-Huckel-Onsagar equation and its validity.
28-L24	Debye-Falkenhagen and Wein effects
29-L25	Debye-Huckel limiting law, its applications to concentrated solutions
30-L26	Debye-Huckel Bronsted equation
31-L27	Quantitative and qualitative verification of Debye Huckel limiting law
32-L28	Electrode electrolyte interface,
33-L29	electrical double layer,
33-L30	electrocapillary phenomenon
35-L31	Lipmann equation
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT IV**: **ELECTROCHEMISTRY II -** Polarization and over potential
38-L34	Butler-Volmer equation for one step and multistep electron transfer reactions,
39-L35	Tafel equation, significance of I_0 and transfer coefficient
40-L36	polarizable and non-polarizable electrodes
41-L37	mechanism of hydrogen and oxygen evolution reactions
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Pourbaix diagrams
44-L39	Evan‘s diagram
45-L40	**Submission of Assignment/take the seminar**
46-L41	Fuel cells
47-L42	Fuel cells
48-L43	electrode deposition-principle and applications.
49-L44	**UNIT V: ADSORPTION AND SURFACE PHENOMENON -** Physisorption

	and chemisorption, adsorption and desorption
50-L45	adsorption isotherms-Langmuir and B. E. T. equation and significance in surface area determination
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	surface films, adsorption from solution, Gibb's adsorption equation: derivation, significance.
53-L47	Kinetics of unimolecular and bimolecular surface reactions.
54-L48	Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces,
55-L49	Surface activity, surface active agents and their classification, micellisation, critical micelle concentration (cmc), thermodynamics of micellisation , factors affecting cmc, methods of determination of cmc , use of surfactants in oil recovery.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 26-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –III"
CO1	Explain basic principles of group theory
CO2	Identification of point group of molecules
CO3	Explain the vibrational modes of molecules using group theory
CO4	Determine the applications of group theory
CO5	Knowledge about the principles of Electrochemistry
CO6	Learning about fuel cells
Experimental Learning	
EL1	Find out vibrational modes for various molecules using group theory
EL2	Demonstration of Electroless deposition
Integrated Activity	
IA1	Write the point groups of various molecules
IA2	Finding the vibrational modes of certain molecules using group theory

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mrs. M. Seethalakshmi)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	KCHM11
Class	I year (2016-2017)
Semester	Odd
Staff Name	Mrs. M. Seethalakshmi
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reagents.
- To learn the applications of rearrangements.
- To learn the reactions of rearrangements
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
UNIT – I: AROMATICITY AND NOVEL RING SYSTEM

Aromaticity: Benzenoid and non–benzenoid compounds – generations and reactions – sextet theory – MO theory – Huckel's rule – Annulenes and hetero annulenes – Anti and homo aromaticity – Fullerenes.

Novel ring system: Nomenclature of bicyclic and tricyclic systems – structure and synthesis of Adamantane – Congressane – Alternant and non – alternant – Azulene – and sydnones.

UNIT – II: ORGANIC REACTION MECHANISM AND METHODS

Reaction mechanism: Energy diagram of simple Organic reactions – Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions –Baldwin rules for ring closure -Hammond Postulate and microscopic reversibility.

Methods: Kinetic and Thermodynamic control of product formation. Kinetic methods of determination: Rate law – Primary and secondary isotope effect. Non-Kinetic methods of determination: Testing and Trapping of intermediates, isotopic labeling, Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.

UNIT – III: STEREOCHEMISTRY

Concept of chirality: – Enantiotopic, diastereotopic hydrogens and prochiral centres – axial and planar chirality – stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes. R/S notations of Spiranes, allenes and Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds. Stereospecific and stereoselective synthesis – Methods of Asymmetric synthesis including enzymatic and catalytic process – Cram's rule and Prelog's rule – Cram chelation model and Felkin – Ahn model.

UNIT – IV: REARRANGEMENT REACTIONS

Types of rearrangements: Nucleophilic, electrophilic and Free radical and protrophic reactions. **Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements.

Reactions: Carbon to carbon migration: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid, Arndt – Eistert synthesis, Demjanov and dienone-phenol rearrangements.

Carbon to oxygen migration: Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.

Carbon to Nitrogen migration: Lossen, Neber and curtius rearrangements.

Miscellaneous: Von – Richter rearrangement and Fischer - Indole synthesis.

UNIT – V: REAGENTS IN ORGANIC SYNTHESIS

Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) – Selenium dioxide. Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2016
1-L1	, **Aromaticity**: Benzenoid compounds
2-L2	and non–benzenoid compounds
3- L3	sextet theory
4-L4	MO theory
5-L5	Huckel's rule
6-L6	Annulenes and hetero annulenes
7-L7	Anti and homo aromaticity – Fullerenes.
8-L8	Nomenclature of bicyclic and tricyclic systems
9-L9	structure and synthesis of Adamantane – Congressane –. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Welcome**
13-L11	**MECHANISM AND METHODS UNIT – II: ORGANIC REACTION**
14-L12	**Reaction mechanism:** Energy diagram of simple Organic reactions
15-L13	Transition state and intermediate.
16-L14	Kinetic and Thermodynamic requirements of reactions
17-L-15	Baldwin rules for ring closure
18-L16	Hammond Postulate and microscopic reversibility.
19-L17	**Methods:** Kinetic and Thermodynamic control of product formation
	Entering Internal Test-I Marks into University portal
20-L18	Kinetic methods of determination: Rate law
21-P2	**College level meeting/Cell function**
22-L19	Primary and secondary isotope effect. Non-Kinetic methods of determination:
23-L20	and Trapping of intermediates, isotopic labeling
24-L21	**Allotting portion for Internal Test-II-** Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: STEREOCHEMISTRY** **Concept of chirality:** – Enantiotopic, diastereotopic hydrogens
27-L23	prochiral centres – axial and planar chirality
28-L24	stereochemistry of compounds containing two dissimilar asymmetric carbons
29-L25	ansa compounds and para cyclophanes.
30-L26	R/S notations of Spiranes, allenes
31-L27	R/S notations of Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds

32-L28	Stereospecific and stereoselective synthesis
33-L29	Methods of Asymmetric synthesis including enzymatic and catalytic process
33-L30	Cram's rule and Prelog's rule
35-L31	Cram chelation model and Felkin – Ahn model.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: REARRANGEMENT REACTIONS** **Types of rearrangements:** Nucleophilic, electrophilic and Free radical and protrophic reactions.
38-L34	**Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements
39-L35	**Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone,
40-L36	Benzil – Benzilic acid, Arndt – Eistert synthesis
41-L37	Demjanov and dienone-phenol rearrangements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	**Carbon to oxygen migration:** Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.
44-L39	**Carbon to Nitrogen migration:**
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lossen, Neber and curtius rearrangements
47-L42	**Miscellaneous:** Von – Richter rearrangement
48-L43	Fischer - Indole synthesis.
49-L44	**UNIT – V: REAGENTS IN ORGANIC SYNTHESIS**
50-L45	Gilman's reagent – LDA**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	DCC – 1,3 – dithane (umpolung synthesis) **Test Paper distribution and result analysis**
53-L47	Selenium dioxide. Fetizon's reagent
54-L48	Lemieux – Von Rudloff reagent
55-L49	Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 26-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –I”
CO1	Explain the **Aromaticity**.
CO2	Write the Nomenclature of bicyclic and tricyclic systems
CO3	Understand the Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions
CO4	Write Hammett equation Physical significance of σ and ρ Applications and Limitations Taft equation.
CO5	Understand stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes.
CO6	Write the R/S notations of Spiranes, allenes.
CO7	Explain **Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid,
CO8	Write the Lossen, Neber and curtius rearrangements
CO9	Woodward and prevost hydroxylation. Merrifield resin
CO10	Know the Wilkinson’s
Experimental Learning	
EL1	Write the Woodward and prevost hydroxylation. Merrifield resin
EL2	Write the Arndt Eistert synthesis, Demjanov and dienone-phenol rearrangements
EL3	Perform a Cram’s rule and Prelog’s rule Cram chelation model and Felkin – Ahn model.
EL4	Draw the structure Azulene and sydnones
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry-I
Course Code	KCHM12
Class	I year (2016-2017)
Semester	Odd
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To understand different type of bonds and to study different theories of bonding.*
- *To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.*
- *To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.*
- *To introduce nuclear chemistry and to study the applications of radio isotopes.*
- *To study the extraction of lanthanides and actinides from ores and to understand their properties.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-2/

INORGANIC CHEMISTRY -I

Unit – I: CHEMICAL BONDING

Valence Bond theory: Linear combination of A.O's in hybridization –stereochemistry of the hybrid orbitals –Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory –Walsh diagrams – Bent's rule.

Molecular Orbital theory: symmetry and overlap in M.O's,– σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation) – M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2).

Ionic Bond: Lattice energy –Born-Lande equation, Born Haber cycle –problems involving of calculation of electron affinity and lattice energy–Kapustinskii equation.

Unit – II: REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS

Redox potential: Applications of redox potential to inorganic reactions - factors affecting redox potential.

Acid-Base: Concept of acids and bases, Hard Soft Acid Base (HSAB) concept, symbiosis in hardening or softening a centre - levelling effect - acid-base strength verses HSAB principle.

Non-aqueous solvents: Classification of protic and aprotic solvents. Self ionization and leveling effect.Reactions in non-aqueous solvents - acid-base reactions, complex formation solvolysis, solvation - reactions in liquid ammonia and liquid SO_2.Use of ionic liquids in synthesis.

Unit – III: SOLID STATE CHEMISTRY

Description of crystal structures: calcite, zinc blende, wurtzite, rutile, fluorite, antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite. Crystal defects in solids – line and plane defects – Point defects - Schottky and Frenkel defects – Non-stoichiometric defects – Colour centres – Solid electrolytes and their applications.**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors. **Super conductivity**:High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.

Unit – IV: LANTHANIDES AND ACTINIDES

Correlation of electronic structures, occurrence, extraction from ores and separation methods (Ion exchange and solvent extraction method) and properties of the elements – Chemistry of separation of Pu from U and fission products – Common and uncommon oxidation states – Comparison with transition elements – Lanthanide and actinide contractions – magnetic characteristics of lanthanides and actinides – Similarities between actinides and lanthanides - Use of lanthanide complexes as shift reagents.

UNIT –V: NUCLEAR CHEMISTRY

Atomic nuclei : Nuclear shell structure – nuclear reactions : types, Q-value, threshold energy, cross sections and excitation functions. Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions : neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India.

Radio isotopes: Preparation - Analytical applications - radio chromatography, neutron activation analysis, neutron absorptiometry and radiometric titrations.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2016
1-L1	**Unit I – CHEMICAL BONDING** Linear combination of A.O's in hybridization – stereochemistry of the hybrid orbitals
2-L2	Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory
3- L3	Walsh diagrams – Bent's rule
4-L4	symmetry and overlap in M.O's – σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation)
5-L5	M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2)
6-L6	Lattice energy –Born-Lande equation
7-L7	Born Haber cycle –problems involving of calculation of electron affinity and lattice energy
8-L8	Kapustinskii equation.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**
11-L10	**Test Paper distribution and result analysis- Unit II – REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS** **Redox potential:** Applications of redox potential to inorganic reactions
12-P1	**Department function**
13-L11	Concept of acids and bases, Hard Soft Acid Base (HSAB) concept
14-L12	symbiosis in hardening or softening a centre - levelling effect
15-L13	acid-base strength verses HSAB principle
16-L14	**Heterogeneous catalysis:** synthesis gas and water gas shift reactions;
17-L-15	Classification of protic and aprotic solvents
18-L16	Self ionization and leveling effect
19-L17	Reactions in non-aqueous solvents
	Entering Internal Test-I Marks into University portal
20-L18	acid-base reactions, complex formation solvolysis, solvation
21-P2	**College level meeting/Cell function**
22-L19	reactions in liquid ammonia and liquid SO_2
23-L20	Use of ionic liquids in synthesis
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**Test Paper distribution and result analysis- UNIT-III: SOLID STATE CHEMISTRY**: **Description of crystal structures**: calcite, zinc blende, wurtzite
27-L23	rutile, fluorite, antifluorite
28-L24	CsCl, CdI_2, K_2NiF_4
29-L25	spinels and perovskite
30-L26	Crystal defects in solids – line and plane defects
31-L27	Point defects - Schottky and Frenkel defects
32-L28	Non-stoichiometric defects – Colour centres
33-L29	Solid electrolytes and their applications
33-L30	**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors

35-L31	**Super conductivity**:High temperature super conductors, properties and applications
36-L32	**Allotting portion for Assignment/seminar -** BCS theory – Cooper electrons – Meissner effect and levitation
38-L33	**UNIT – IV: LANTHANIDES AND ACTINIDES** Correlation of electronic structures, occurrence, extraction from ores
38-L34	separation methods (Ion exchange and solvent extraction method) and properties of the elements
39-L35	Chemistry of separation of Pu from U and fission products
40-L36	Common and uncommon oxidation states
41-L37	Comparison with transition elements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Lanthanide and actinide contractions
44-L39	magnetic characteristics of lanthanides and actinides
45-L40	**Submission of Assignment/take the seminar**
46-L41	Similarities between actinides and lanthanides
47-L42	Use of lanthanide complexes as shift reagents
48-L43	Overview of the chapter
49-L44	**UNIT -V : NUCLEAR CHEMISTRY** **Atomic nuclei** : Nuclear shell structure
50-L45	Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions - neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	Nuclear fusion and stellar energy - nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons
53-L47	Theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India
54-L48	Preparation - Analytical applications - radio chromatography
55-L49	neutron activation analysis, neutron absorptiometry and radiometric titrations.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-11-2016

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –I"
CO1	To understand different type of bonds and to study different theories of bonding.
CO2	To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.
CO3	To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.
CO4	To introduce nuclear chemistry and to study the applications of radio isotopes.
CO5	To study the extraction of lanthanides and actinides from ores and to understand their properties.
Experimental Learning	
EL1	Electrochemical series was used to construct redox couple forming different Galvanic cells.
EL2	Qualitative analyses of selected Lanthanides and Actinides were performed
EL3	Synthesize Oxygen deficient ZnO to illustrate metal excess defect
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Prepare zinc blende phase of ZnS and characterize by XRD
IA2	Prepare a mini-model to illustrate Meissner effect (Magnetic Levitation)

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Daniel Abraham)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-I
Course Code	KCHM13
Class	I year (2016-2017)
Semester	Odd
Staff Name	Dr. S. Daniel Abraham
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of Partial molar properties, fugacity and activity

To apply phase rule for three component system

To understand the Principles of Thermodynamics of irreversible processes

To understand Quantum mechanics and Statistical Thermodynamics

To understand the importance of rotational spectroscopy

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-3/

PHYSICAL CHEMISTRY -I

UNIT-I

Thermodynamics

Concepts of Partial molar properties – Partial molar free energy, chemical potential, partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature and Variation

of Chemical Potentialwith pressure. Determination of partial molar volume: Graphical method, intercept method and Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method, Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity. Activity and activity coefficient: Defi nition of activity and activity coefficient, determination of activity coefficient by EMF and solubility method. Thermodynamics of non ideal system-Excess thermodynamic function, GE, SE, HE etc.

UNIT-II

Phase Rule & Thermodynamics of irreversible processes:

Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule, Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system. Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.

Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance.Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility, the Onsager reciprocal relations- Validity and Verification. Thermal osmosis,Thermoelectric phenomena-Electro kinetic and thermo mechanical effects. Application of irreversible thermodynamics to biological and non-linear systems.

UNIT-III

Quantum Chemistry

Inadequacy of classical mechanics, Black body radiation, Planck's quantum theory, Photoelectric effect. Bohr's theory of hydrogen atom :Hydrogen spectra, wave particle duality – uncertainty principle. Operators- Linear, differential, Laplacian, Hermitian and Hamiltonian operators angular momentum operator. Eigen functions and Eigen values. commutation relations, related theorems,simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and (Lx, $L_{y)}$] and their significance. Commutation relations, related theorems.Time-dependent and time-independent Schrödinger wave equations – Postulates of quantum mechanics.

UNIT-IV Statistical thermodynamics

Concept of thermodynamics and mathematical probabilities – Micro and macro state - phase space – Maxwell – Boltzmann, Bose – Einstein statistics and Fermi –

Dirac statistics – comparison and applications – modes of contribution to energy. Partition functions. Separation of partition functions. Translational, rotational, vibrational and electronic partition functions. Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure, Gibbs function, residual entropy, equilibrium constant, average energies. Equipartition theorem.Statistical approach to Heat capacity of mono and diatomic gases.Heat capacity of solids- Einstein and Debye models.

UNIT-V: MOLECULAR SPECTROSCOPY

Introduction and Rotational Spectroscopy

Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio; width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle; intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients, Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines, select ion rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2016
1-L1	**UNIT-I Thermodynamics:** Concepts of Partial molar properties – Partial molar free energy, chemical potential
2-L2	partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature
3- L3	Variation of Chemical Potentialwith pressure
4-L4	Determination of partial molar volume: Graphical method, intercept method
5-L5	Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method
6-L6	Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity
7-L7	. Activity and activity coefficient: Defi nition of activity and activity coefficient,
8-L8	Determination of activity coefficient by EMF and solubility method. Thermodynamics of non- ideal system-Excess thermodynamic function, GE, SE, HE etc.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (25.07.2016)**
11-L10	**Test Paper distribution and result analysis- Unit II – Phase Rule & Thermodynamics of irreversible processes**: Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule
12-P1	**Department function**
13-L11	Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system.
14-L12	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
15-L13	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
16-L14	Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance
17-L-15	Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility
18-L16	the Onsager reciprocal relations- Validity and Verification
19-L17	Thermal osmosis,Thermoelectric phenomena-
	Entering Internal Test-I Marks into University portal
20-L18	Electro kinetic and thermo mechanical effects
21-P2	**College level meeting/Cell function**
22-L19	Application of irreversible thermodynamics to biological systems
23-L20	Application of irreversible thermodynamics to non-linear systems
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (22.08.2016)**
26-L22	**Test Paper distribution and result analysis- UNIT-III Quantum Chemistry** Inadequacy of classical mechanics, Black body radiation, Planck’s quantum theory
27-L23	Photoelectric effect. Bohr’s theory of hydrogen atom

28-L24	Hydrogen spectra, wave particle duality – uncertainty principle.
29-L25	Operators- Linear, differential, Laplacian
30-L26	Hermitian and Hamiltonian operators angular momentum operator
31-L27	Eigen functions and Eigen values. commutation relations
32-L28	simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and their significance
33-L29	simultaneous measurement of several properties : evaluation of commutators such (Lx, $L_{y)}$] and their significance
33-L30	Commutation relations, related theorems.
35-L31	Time-dependent and time-independent Schrödinger wave equations
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV Statistical thermodynamics**
38-L34	Concept of thermodynamics and mathematical probabilities – Micro and macro state
39-L35	phase space – Maxwell – Boltzmann statistics
40-L36	Bose-Einstein statistics
41-L37	Fermi-Dirac statistics
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Comparison and applications – modes of contribution to energy
44-L39	Partition functions. Separation of partition functions
45-L40	**Submission of Assignment/ seminar**
46-L41	Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure
47-L42	Gibbs function, residual entropy, equilibrium constant, average energies
48-L43	Equipartition theorem. Statistical approach to Heat capacity of mono and diatomic gases. Heat capacity of solids- Einstein and Debye models.
49-L44	**UNIT-V: MOLECULAR SPECTROSCOPY** **Introduction and Rotational Spectroscopy**
50-L45	Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio
51-IT-III	**Internal Test-III (03.10.2016)**
52-L46	width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle;
53-L47	intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients
54-L48	Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines
55-L49	selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17.10.2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper**

	discussion
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 26-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	To learn the concept of Partial molar properties, fugacity and activity
CO2	To apply phase rule for three component system
CO3	To understand the Principles of Thermodynamics of irreversible processes
CO4	To understand Quantum mechanics and Statistical Thermodynamics
CO5	To understand the importance of rotational spectroscopy
Experimental Learning	
EL1	To calculate the bond length of microwave active compounds from microwave spectroscopy
EL2	To calculate the force constant of IR active molecules and comparison with bond energy
Integrated Activity	
IA1	Phase diagram between water, acetone and ethanol is analysed
IA2	Prepare a mini-model to illustrate Thermoelectric effect.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	HCHL41
Class	II year (2016-2017)
Semester	Even
Staff Name	Dr. R. BIJU BENNIE
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimation of organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL - IV

A. List of Estimations

1. Ethyl methyl ketone
2. Glucose-Lane Eynon and method
3. Glucose-Bertrand‟s method
4. Saponification value of oil
5. Iodine value of oil
6. Number of hydroxyl groups in a given compound.
7. Purity of Glucose

B. List of Two stage preparations

1. Asprin from Methylsalicylate
2. p-Bromoaniline from Acetanilide
3. m-Nitrobenzene from Acetanilide
4. p- Nitroaniline from Acetanilide
5. Benzpinacolone from Benzophenone
6. Benzanilide from Benzophenone
7. s-Benzylisothiuroniumbenzoate from Thiourea
8. 9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride

9. Phthalimide from Phthalic acid
10. s-Tribromobenzene from Aniline

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 01-12-2016
1-E1	Estimation of Ethyl methyl ketone
2-E2	Estimation of Ethyl methyl ketone
3- E3	Estimation of Glucose-Lane Eynon and method
4-E4	Estimation of Glucose-Lane Eynon and method
5-E5	Estimation of Glucose-Bertrand‟s method
6-E6	Estimation of Glucose-Bertrand‟s method
7-E7	Saponification value of oil
8-E8	Saponification value of oil
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Iodine value of oil
16-E11	Iodine value of oil
17-E-12	Number of hydroxyl groups in a given compound
18-E13	Number of hydroxyl groups in a given compound
19-E14	Purity of Glucose
20-E15	Purity of Glucose
21-E16	Asprin from Methylsalicylate
22-E17	Asprin from Methylsalicylate
23-P2	**College level meeting/Cell function**
24-E18	p-Bromoaniline from Acetanilide
25-E19	p-Bromoaniline from Acetanilide
26-E20	p-Bromoaniline from Acetanilide
27-E21	p-Bromoaniline from Acetanilide
28-E22	m-Nitrobenzene from Acetanilide
29-E23	m-Nitrobenzene from Acetanilide
30-E24	p- Nitroaniline from Acetanilide
31-E25	p- Nitroaniline from Acetanilide
32-E26	Benzpinacolone from Benzophenone
33-E27	Benzpinacolone from Benzophenone
34-E28	Benzpinacolone from Benzophenone
35-E29	Benzpinacolone from Benzophenone
36-E30	Benzanilide from Benzophenone
37-E31	Benzanilide from Benzophenone
38-E32	s-Benzylisothiuroniumbenzoate from Thiourea
39-E33	s-Benzylisothiuroniumbenzoate from Thiourea
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**

42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
46-E35	9,10-Dihydroanthracene-9,10-α,β-succinic anhydride from Succinic anhydride
47-E36	Phthalimide from Phthalic acid
48-E37	s-Tribromobenzene from Aniline
49-E38	s-Tribromobenzene from Aniline
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	HCHL42
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand gravimetric estimations of Cations*
- *To understand the inorganic preparations*

INORGANIC CHEMISTRY PRACTICAL - II

I . Quantitative estimation of a mixture containing two metal ions (Volumetric and Gravimetric Estimations).

1. Estimation of Cu^{2+} and Ni^{2+} ions.
2 . Estimation of Cu^{2+} and Zn^{2+} ions.
3 . Estimation of Fe^{2+} and Cu^{2+} ions
4 . Estimation of Fe^{2+} and Ni^{2+} ions .
5. Estimation of Ca^{2+} and Mg^{2+} ions.
6. Estimation of Ca^{2+} and Ba^{2+} ions .
7. Analysis of ores and alloys (course work only)

Note: For examination, a mixture may be given from which one cation is to be estimated volumetrically and the other gravimetrically .

II . Preparation of single stage inorganic complexes (a minimum of 10 complexes).

Note : Characterisation of any two metal complex prepared during the practicals by UV or IR spectral techniques (course work only)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-E1	Estimation of Cu^{2+} and Ni^{2+} ions
2-E2	Estimation of Cu^{2+} and Ni^{2+} ions
3- E3	Estimation of Cu^{2+} and Ni^{2+} ions
4-E4	Estimation of Cu^{2+} and Ni^{2+} ions
5-E5	Estimation of Cu^{2+} and Zn^{2+} ions.
6-E6	Estimation of Cu^{2+} and Zn^{2+} ions.
7-E7	Estimation of Cu^{2+} and Zn^{2+} ions.
8-E8	Estimation of Cu^{2+} and Zn^{2+} ions.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	. Estimation of Fe^{2+} and Cu^{2+} ions
16-E11	. Estimation of Fe^{2+} and Cu^{2+} ions
17-E-12	. Estimation of Fe^{2+} and Cu^{2+} ions
18-E13	. Estimation of Fe^{2+} and Cu^{2+} ions
19-E14	Estimation of Fe^{2+} and Ni^{2+} ions
20-E15	Estimation of Fe^{2+} and Ni^{2+} ions
21-E16	Estimation of Fe^{2+} and Ni^{2+} ions
22-E17	Estimation of Fe^{2+} and Ni^{2+} ions
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Ca^{2+} and Mg^{2+} ions
25-E19	Estimation of Ca^{2+} and Mg^{2+} ions
26-E20	Estimation of Ca^{2+} and Mg^{2+} ions
27-E21	Estimation of Ca^{2+} and Mg^{2+} ions
28-E22	Estimation of Ca^{2+} and Ba^{2+} ions
29-E23	Estimation of Ca^{2+} and Ba^{2+} ions
30-E24	Estimation of Ca^{2+} and Ba^{2+} ions
31-E25	Estimation of Ca^{2+} and Ba^{2+} ions
32-E26	Analysis of ores and alloys
33-E27	Analysis of ores and alloys
34-E28	Analysis of ores and alloys
35-E29	Analysis of ores and alloys
36-E30	Preparation of single stage inorganic complexes
37-E31	Preparation of single stage inorganic complexes
38-E32	Preparation of single stage inorganic complexes
39-E33	Preparation of single stage inorganic complexes
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Preparation of single stage inorganic complexes
46-E35	Preparation of single stage inorganic complexes
47-E36	Preparation of single stage inorganic complexes
48-E37	Preparation of single stage inorganic complexes
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand gravimetric tirations
CO2	To understand inorganic preparations

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-II
Course Code	KCHL43
Class	II year (2016-2017)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand potentiometric titrations.*
- *To understand the adsorption and kinetics of reactions.*

PHYSICAL CHEMISTRY PRACTICAL - II

I. Potentiometric titrations- (a) Acid alkali titrations.

b) Precipitation titrations (a) Mixture of Cland I vs Ag+

(c) Redox titrations

(a) Fe2+ vs Cr2O7 2-

(b) Fe2+ vs Ce4+

(c) I - vs KMnO4

(d) Determination of dissociation constant of weak acids

(e) Determination of solubility product of sparingly soluble silver salts.

(f) Determination of activity and activity coefficient of ions.

(g) Determination of pH of a buffer solution using a quin hydrone electrode.

II. Titration using pH meter

(a) Determination of dissociation constant of dibasic acid.

III. Freundlich Adsorption isotherm

(a) Determination of dissociation constant of dibasic acid.

IV. Kinetic studies

(a) Kinetics –acid hydrolysis of ester –comparison of strength of acids.

(b) Kinetics –Persulfate –Iodide –clock reaction-primary salt effect.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 01-12-2016
1-E1	Potentiometric titrations- (a) Acid alkali titrations.
2-E2	Potentiometric titrations- (a) Acid alkali titrations.
3- E3	Potentiometric titrations- (a) Acid alkali titrations.
4-E4	Potentiometric titrations- (a) Acid alkali titrations.
5-E5	Precipitation titrations (a) Mixture of Cland I vs Ag+
6-E6	Precipitation titrations (a) Mixture of Cland I vs Ag+
7-E7	Precipitation titrations (a) Mixture of Cland I vs Ag+
8-E8	Precipitation titrations (a) Mixture of Cland I vs Ag+
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Fe2+ vs Cr2O7 2-
16-E11	Fe2+ vs Cr2O7 2-
17-E-12	Fe2+ vs Ce4+
18-E13	Fe2+ vs Ce4+
19-E14	I - vs KMnO4
20-E15	I - vs KMnO4
21-E16	Determination of dissociation constant of weak acids
22-E17	Determination of dissociation constant of weak acids
23-P2	**College level meeting/Cell function**
24-E18	Determination of solubility product of sparingly soluble silver salts
25-E19	Determination of solubility product of sparingly soluble silver salts
26-E20	Determination of activity and activity coefficient of ions
27-E21	Determination of activity and activity coefficient of ions
28-E22	Determination of pH of a buffer solution using a quin hydrone electrode
29-E23	Determination of pH of a buffer solution using a quin hydrone electrode
30-E24	Determination of pH of a buffer solution using a quin hydrone electrode
31-E25	Determination of pH of a buffer solution using a quin hydrone electrode
32-E26	Determination of dissociation constant of dibasic acid
33-E27	Determination of dissociation constant of dibasic acid
34-E28	Determination of dissociation constant of dibasic acid
35-E29	Determination of dissociation constant of dibasic acid
36-E30	Kinetics –acid hydrolysis of ester –comparison of strength of acids
37-E31	Kinetics –acid hydrolysis of ester –comparison of strength of acids
38-E32	Kinetics –acid hydrolysis of ester –comparison of strength of acids
39-E33	Kinetics –acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
46-E35	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
47-E36	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
48-E37	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	COs of the course “PHYSICAL CHEMISTRY PRACTICALS–II”
CO1	To understand the potentiometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. Nirmal Paul Raj)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-IV
Course Code	HCHM41
Class	II year (2016-2017)
Semester	Even
Staff Name	Mr. A. Nirmal Paul Raj
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the reactions of carbanions and carbocation intermediates.
- To understand the conformations of cyclic compounds.
- To understand the reterosynthetic analysis
- To study the uses of reagents
- To study the structure of steroids

ORGANIC CHEMISTRY –IV

Unit-I Reaction under Intermediate chemistry

Reaction Under Carbanion Intermediate : Clasien, Knoevenegal, Stobbe, Darzen, acyloic condensation Shapiro reaction and Julia olifination. Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions Carbocation intermediate : Oxymercuration, halolactonisation. Reaction following Radical intermediate: Mc Murray coupling, Gomberg-

Pechmann and Pschorr reactions. Reaction involving Ylide intermediate: Wittig reaction and Peterson olifination.

Unit-II Conformational analysis

Conformations of mono and disubstituted cyclohexanes-effect of hydrogen bonding, dipole and steric effects on the disubstituted cyclohexanes- conformation and reactivity of acyclic

and cyclic compounds (6members)- conformation of decalin and perhydrophenanthrene-curtin-Hammett principle.

Unit-III Reterosynthetic analysis

Synthon-synthetic equivalent-Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds- use of activating and blocking groups-Robinson annulations reaction-carbon skeletal complexity-Role of key intermediates in organic synthesis. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine, Baclofan, Brufen, Trihexyl phenydyl, Bisabolene, α-onocerin, Isonootkatone, cascarillic acid, camphor and 2,4dihydroxy pentanoic acid.

Unit-IV Reagents in organic synthesis

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), DMSO, Super hydrides- K and L selectrides -Dess-martin-periodinane- Baker‘s yeast –Quaternary ammonium salt and crown ethers. Introductory treatment of the application of silicon, boron (organoboranes), phosphorus, palladium, samarium, ruthenium and indium reagents in organic synthesis.

Unit-V Steroids

Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol- structural elucidation of androsterone, testosterone, progesterone, Oestrone. Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid. Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane.

Course calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 01-12-2016
1-L1	**Unit-I Reaction under Intermediate chemistry** Reaction Under Carbanion Intermediate : Clasien, Knoevenegal,
2-L2	Stobbe, Darzen, acyloic condensation
3- L3	Shapiro reaction and Julia olifination.
4-L4	Reaction through carbene intermediate : Bamford – Stevens and simmons-smith reactions
5-L5	Carbocation intermediate : Oxymercuration, halolactonisation
6-L6	. Reaction following Radical intermediate: Mc Murray coupling,
7-L7	Gomberg- Pechmann and Pschorr reactions.

8-L8	Reaction involving Ylide intermediate: Wittig reaction
9-L9	Peterson olifination.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**Unit-II Conformational analysis** Conformations of mono and disubstituted cyclohexanes-
14-L12	effect of hydrogen bonding,
15-L13	dipole and steric effects on the disubstituted cyclohexanes
16-L14	- conformation of acyclic compounds (6members)-.
17-L-15	reactivity of acyclic compounds (6members)-.
18-L16	- conformation of cyclic compounds (6members)-.
19-L17	- conformation of cyclic compounds (6members)-.
	Entering Internal Test-I Marks into University portal
20-L18	conformation of decalin
21-P2	**College level meeting/Cell function**
22-L19	conformation of perhydrophenanthrene
23-L20	-curtin-Hammett principle
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**Unit-III Reterosynthetic analysis** Synthon-synthetic equivalent-
27-L23	Functional group interconversions-use of protecting groups for alcohols, amines, acids, carbonyl compounds-
28-L24	use of activating and blocking groups-
29-L25	Robinson annulations reaction-carbon skeletal complexity-
30-L26	Role of key intermediates in organic synthesis
31-L27	. Reterosynthetic analysis of the following compounds: Twistane, cis-Jasmine,
32-L28	Baclofan, Brufen, Trihexyl phenydyl,
33-L29	Bisabolene, α-onocerin,
33-L30	Isonootkatone, cascarillic acid,
35-L31	camphor and 2,4dihydroxy pentanoic acid.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV Reagents in organic synthesis** 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ),
38-L34	DMSO, Super hydrides- -
39-L35	Dess-martin-periodinane- Baker‘s yeast –

40-L36	Quaternary ammonium salt and crown ethers.
41-L37	Introductory treatment of the application of silicon,
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	boron (organoboranes), phosphorus,
44-L39	palladium, samarium,
45-L40	**Submission of Assignment/take the seminar**
46-L41	ruthenium reagents in organic synthesis
47-L42	indium reagents in organic synthesis
48-L43	K and L selectrides
49-L44	**Unit-V Steroids** Classification- structural elucidation of cholesterol and ergosterol-irradiated products of ergosterol-
50-L45	structural elucidation of androsterone, testosterone,.
51-IT-III	**Internal Test-III**
52-L46	progesterone, Oestrone.
53-L47	Conversion of cholesterol into androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid.
54-L48	Conversion of Oestrone to Oestriol, Oestradiol and vice-versa. structural
55-L49	elucidation of equilenin (synthesis not expected)- Bile acids (general study) Conformational structure of cholestane and Coprostane
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –IV”
CO1	Understand the reactions of intermediates
CO2	Explain the conformations of cyclohexane and decalin
CO3	Understand the reterosynthesis of certain compounds
CO4	Explain the role of reagents in organic synthesis
CO5	Explain the structure and synthesis of steroids
Experimental Learning	
EL1	Make models of various conformers of cyclohexane
EL2	Synthesise a compound involving DMSO as reagent
Integrated Activity	
IA1	Discuss on different reagents and their uses
IA2	Elucidate the structure of cholesterol

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-IV
Course Code	HCHM42
Class	II year (2016-2017)
Semester	Even
Staff Name	Dr. C. JOEL
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the spectroscopy of inorganic compounds.
- To understand the theory and principle of thermoanalytical techniques.
- To understand the synthetic reactions of intercalation compounds
- To understand the photophysical properties of certain metal complexes
- To understand the chemistry of enzymes

INORGANIC CHEMISTRY –IV

UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III

Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states , Hund's rule and term symbols . Selection rules for electronic transition and hole formalism – splitting of terms – Orgel and Tanabe Sugano diagrams – Evaluation of 10 Dq and B for octahedral d 2 and d8 systems. Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes . Photo electron spectroscopy : Koopman's theorem , PES – XPES(ESCA) – chemical shifts in XPES – application of ESCA to inorganic systems – Auger electron spectroscopy.

UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS

Theory and principles of thermogravimetric analysis , differential thermal analysis and differential scanning colorimetry–characteristic features of TGA and DTA curves-factors affecting TGA and DTA curves- complementary nature of TGA and DTA – applications of thermal methods in analytical chemistry- thermometric titrations- the study of minerals and polymers. Principle and applications of colorimetry,spectrophotometry, nephelometry, turbidimetry , fluorimetry and atomic absorption spectroscopy.

UNIT – III : CHEMISTRY OF INORGANIC MATERIALS

Synthesis of inorganic materials – high temperature reactions and experimental methods – precipitation, gel, solution and hydrothermal methods , synthesis in sealed tubes and special atmospheres . Low temperature methods. Insertion compounds of metal oxides – Intercalation compounds of graphite and transition metal disulphides . Zeolites : structures and properties – pillared clays – fullerenes and fullerides.

UNIT -IV : INORGANIC PHOTOCHEMISTRY

Properties of excited states of metal complexes – charge transfer excitation – bimolecular deactivation(quenching) and energy transfer – photochemical path ways : oxidation-reduction, isomerisation and substitutional processes – photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –photophysical and photochemical properties of ruthenium polypyridyls – applications of inorganic photochemistry : photochemical conversion and storage of solar energy – inorganic photochemistry at semi-conductor electrodes.

UNIT – V : BIOINORGANIC CHEMISTRY – II

Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases – zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations . Chelate therapy - therapeutic chelating agents and their uses – anti - cancer platinum complexes and their interaction with nucleic acids , gold compounds and anti-arthritic agents – metal complexes as probes of nucleic acids.

Course calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 01-12-2016
1-L1	**UNIT – I : APPLICATION OF SPECTROSCOPY TO THE STUDY OF INORGANIC COMPOUNDS –III** Electronic spectroscopy : L-S coupling and j-j coupling schemes , micro states ,
2-L2	Hund‘s rule and term symbols .
3- L3	Selection rules for electronic transition and hole formalism
4-L4	– splitting of terms – Orgel and Tanabe Sugano diagrams.

5-L5	– Evaluation of 10 Dq and B for octahedral d 2 and d8 systems.
6-L6	Charge transfer spectra. Electronic spectra of lanthanide and actinide complexes.
7-L7	Photo electron spectroscopy : Koopman's theorem ,
8-L8	PES – XPES(ESCA) – chemical shifts in XPES –
9-L9	application of ESCA to inorganic systems – Auger electron spectroscopy.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT – II : THERMOANALYTICAL AND SPECTROANALYTICAL METHODS** Theory and principles of thermogravimetric analysis ,
14-L12	differential thermal analysis and differential scanning colorimetry–
15-L13	characteristic features of TGA and DTA curves-
16-L14	factors affecting TGA and DTA curves-
17-L-15	complementary nature of TGA and DTA –
18-L16	applications of thermal methods in analytical chemistry
19-L17	- thermometric titrations- the study of minerals and polymers.
	Entering Internal Test-I Marks into University portal
20-L18	Principle and applications of colorimetry,spectrophotometry,
21-P2	**College level meeting/Cell function**
22-L19	nephelometry,
23-L20	turbidimetry ,.
24-L21	**Allotting portion for Internal Test-II-** fluorimetry and atomic absorption spectroscopy
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**UNIT – III : CHEMISTRY OF INORGANIC MATERIALS** Synthesis of inorganic materials –
27-L23	high temperature reactions and experimental methods –
28-L24	precipitation, gel, solution and hydrothermal methods ,
29-L25	synthesis in sealed tubes and special atmospheres .
30-L26	Low temperature methods.
31-L27	Insertion compounds of metal oxides –
32-L28	Intercalation compounds of graphite and transition metal disulphides .
33-L29	Zeolites : structures and properties –.
33-L30	pillared clays
35-L31	– fullerenes and fullerides
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT -IV : INORGANIC PHOTOCHEMISTRY** Properties of excited states of metal complexes –
38-L34	charge transfer excitation –
39-L35	bimolecular deactivation(quenching) and energy transfer
40-L36	photochemical path ways:oxidation-reduction, isomerisation and substitutional

41-L37	– photochemistry of Cr(III), Co(III), Rh(III) and Pt(II) complexes –
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	photophysical and photochemical properties of ruthenium polypyridyls –
44-L39	applications of inorganic photochemistry.
45-L40	**Submission of Assignment/take the seminar**
46-L41	: photochemical conversion
47-L42	– inorganic photochemistry at semi-conductor electrodes
48-L43	storage of solar energy
49-L44	**UNIT – V : BIOINORGANIC CHEMISTRY – II** Metalloenzymes – enzymes in dioxygen management – superoxide dismutase, peroxidases, catalases, oxidases and monooxygeneases –
50-L45	zinc enzymes: carbonic anhydrase , carboxypeptidase and alcohol dehydrogenase – the structural role of zinc – trinuclear zinc constellations .
51-IT-III	**Internal Test-III**
52-L46	Chelate therapy - therapeutic chelating agents and their uses
53-L47	– anti - cancer platinum complexes and their interaction with nucleic acids ,
54-L48	gold compounds and anti-arthritic agents –
55-L49	metal complexes as probes of nucleic acids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –IV”
CO1	Learn the application of spectroscopy of inorganic compounds
CO2	Learn the principles and applications of thermoanalytical techniques
CO3	Explain the properties of zeolites and fullerenes
CO4	Learn the photophysical properties of metal complexes
CO5	Learn the role of metal ions in enzymes
Experimental Learning	
EL1	Record the TGA of any copper compound
EL2	Record the fluorescence of any chromium complex
Integrated Activity	
IA1	Analyse the TG-DTA curve of the given compound
IA2	Discuss the chelate therapy

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-IV
Course Code	HCHM43
Class	II year (2016-2017)
Semester	Even
Staff Name	Dr. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	6 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of rotational spectroscopy.
- To understand the principle of IR spectroscopy.
- To understand the principle of electronic spectroscopy
- To understand the principle of NMR and ESR spectroscopy
- To understand the principle of NQR and Mossbauer spectroscopy

PHYSICAL CHEMISTRY –IV

UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA

Characterization of electromagnetic radiation. Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and nonrigid diatomic molecules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic and symmetric top molecules. The stark effect.

UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY

Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect. The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules-Fundamental vibrations and their symmetry, overtone and combination frequencies, concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy: Rayleigh scattering . Raman Scattering, classical and quantum theories of Raman effect.

Rotational Raman Spectra for linear and symmetric top molecules. Vibrational Raman Spectra , rotational fine structure. Polarization of light and the Raman effect. Technique and instrumentation- Laser Raman spectrometer. Structure determination from Raman and Infra-red spectroscopy.

UNIT – III: ELECTRONIC SPECTROSCOPY

Electronic spectroscopy of diatomic molecules. Born – oppenheimer approximation. Sequences and progressions, the vibrational course structure and rotational fine structure of electronic band. The Franck-Condon principle, dissociation energy and dissociation products. Birje-Sponer extrapolation. The fortrat diagram. Predissociation, Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.

UNIT - IV: NMR AND ESR

Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions. NMR of simple AX and AMX type molecules. Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy. C, F and P NMR spectra-principle and applications. Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting . Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p- benzosemiquinone radicals, calculation of electron density-McConnel equation, Fine structure in ESR- Zero field shifting and Kramer‘s degeneracy. Double resonance-ELDOR and ENDOR, study of unstable paramagnetic species, spin labeling studies of bio-molecules.

UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY

(a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter, Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character. (b) Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift. Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds, (ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination, (iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).

Course calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-L1	**UNIT-I: INTRODUCTION OF SPECTROSCOPY AND ROTATIONAL SPECTRA** Characterization of electromagnetic radiation.
2-L2	Regions of Spectrum, transition probability
3- L3	the width and intensity of spectral transitions
4-L4	Classification of molecules according to their moment of inertia.
5-L5	The effect of isotopic substitution
6-L6	Rotational spectra of rigid and nonrigid diatomic molecules
7-L7	The intensities of spectral lines
8-L8	Polyatomic and symmetric top molecules.

9-L9	The stark effect.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Inauguration meeting**
13-L11	**UNIT- II: INFRARED SPECTROSCOPY AND RAMAN SPECTROSCOPY** Diatomic molecules: Molecules as harmonic oscillator, Force constant, zero point energy, isotope effect.
14-L12	The Anharmonic oscillator, the diatomic vibrating rotator. Polyatomic molecules
15-L13	Fundamental vibrations and their symmetry, overtone and combination frequencies,
16-L14	concept of group frequencies, Fermi resonance and FTIR. Raman Spectroscopy
17-L-15	Rayleigh scattering . Raman Scattering,
18-L16	Rotational Raman Spectra for linear and symmetric top molecules
19-L17	Vibrational Raman Spectra , rotational fine structure.
	Entering Internal Test-I Marks into University portal
20-L18	Polarization of light and the Raman effect
21-P2	**College level meeting/Cell function**
22-L19	Technique and instrumentation- Laser Raman spectrometer
23-L20	classical and quantum theories of Raman effect
24-L21	**Allotting portion for Internal Test-II-** Structure determination from Raman and Infra-red spectroscopy.
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**UNIT – III: ELECTRONIC SPECTROSCOPY**
27-L23	Electronic spectroscopy of diatomic molecules
28-L24	Born – oppenheimer approximation
29-L25	Sequences and progressions
30-L26	the vibrational course structure and rotational fine structure of electronic band.
31-L27	The Franck-Condon principle
32-L28	dissociation energy and dissociation products
33-L29	Birje-Sponer extrapolation
33-L30	The fortrat diagram
35-L31	Photoelectron spectroscopy: principle, instrumentation, X-ray and UV-PES. ESCA applications, Auger electron spectroscopy.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT - IV: NMR AND ESR** Nuclear Magnetic Resonance Spectroscopy: - The theory of PMR spectra, Chemical shift, factors affecting chemical shift, relaxation times and spin- spin interactions.
38-L34	NMR of simple AX and AMX type molecules.
39-L35	Calculation of coupling constants, Techniques and instrumentation of continuous wave and FT-NMR spectroscopy.
40-L36	C, F and P NMR spectra-principle and applications.
41-L37	Electron Spin Resonance Spectroscopy Basic principles , factors affecting ―g‖ value, hyperfine splitting
	Entering Internal Test-II Marks into University portal

42-P4	**College level meeting/ function**
43-L38	Deuterium, Methyl, benzene, naphthalene, anthrazene, xylene(o, m, p-), p-benzosemiquinone radicals,
44-L39	calculation of electron density- McConnel equation, Fine structure in ESR
45-L40	**Submission of Assignment/take the seminar**
46-L41	Zero field shifting and Kramer‘s degeneracy
47-L42	Double resonance-ELDOR and ENDOR,
48-L43	study of unstable paramagnetic species, spin labeling studies of bio-molecules.
49-L44	**UNIT – V: QUADRUPOLE RESONANCE AND MÖSSBAUER SPECTROSCOPY** (a)Nuclear quadrupole resonance: Basic principle, comparison with NMR, splitting of quadrupole energy levels, asymmetry parameter,
50-L45	Applications- hydrogen bonding, phase transition, substituent effect and Pi- bond character.
51-IT-III	**Internal Test-III**
52-L46	Mössbauer parameters:– Isomer shifts, quadrupole splitting, Magnetic hyperfine interaction, Doppler effect/shift.
53-L47	Application of Mössbauer Spectroscopy:- (i) covalently bonded compounds
54-L48	(ii) oxidation states of metal ion in compounds, (iii) Structural detetrmination
55-L49	(iv) magnetically ordered compounds (i.e Ferromagnetic & antiferromagnetic compounds).
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –IV”
CO1	Explain basic principles of rotational spectra
CO2	Explain basic principles of IR and Raman spectra
CO3	Explain basic principles of electronic spectra
CO4	Explain basic principles of NMR and ESR spectra
CO5	Explain basic principles of NQR and Mossbauer spectra
Experimental Learning	
EL1	Interpret NMR spectra for certain compounds
EL2	Interpret EPR spectra for certain compounds
Integrated Activity	
IA1	Prepare a compound and determine its structure through NMR spectra.
IA2	Record the electronic spectra for a given compound

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-I
Course Code	KCHL21
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. C. Joel
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand separation of two components in a mixture.*
- *To understand the analysis of organic compounds*

INORGANIC CHEMISTRY -I

A. Separation of Organic mixture:

(i) Separation of two component mixture and determination of their physical Constants.

(ii) Separation and analysis of at least **eight** two component mixture. The students are expected to determine the physical constants for both the components as well as their Derivatives.

(iii) Analysis may be performed in micro (or) macro scale depending upon the Conditions of the laboratory

B. List of single stage preparations

1. Preparation of benzal acetophenone from benzaldehyde

2. Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

3. Preparation of Resacetophenone from resorcinol

4. Preparation of dinitro diphenylamine from aniline

5. Preparation of benzoquinone from hydroquinone

C. For Class Work Only:

(1) Separation of Caffeine from Tea / Coffee.

(2) Interpretation of IR and NMR of any three simple organic compounds

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 01-12-2016
1-E1	Separation and analysis of mixture I
2-E2	Separation and analysis of mixture I
3- E3	Separation and analysis of mixture II
4-E4	Separation and analysis of mixture II
5-E5	Separation and analysis of mixture II
6-E6	Separation and analysis of mixture III
7-E7	Separation and analysis of mixture III
8-E8	Separation and analysis of mixture III
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Separation and analysis of mixture IV
16-E11	Separation and analysis of mixture IV
17-E-12	Separation and analysis of mixture V
18-E13	Separation and analysis of mixture V
19-E14	Separation and analysis of mixture V
20-E15	Separation and analysis of mixture VI
21-E16	Separation and analysis of mixture VI
22-E17	Separation and analysis of mixture VI
23-P2	**College level meeting/Cell function**
24-E18	Separation and analysis of mixture VII
25-E19	Separation and analysis of mixture VII
26-E20	Separation and analysis of mixture VII
27-E21	Separation and analysis of mixture VIII
28-E22	Separation and analysis of mixture VIII
29-E23	Separation and analysis of mixture VIII
30-E24	Preparation of benzal acetophenone from benzaldehyde
31-E25	Preparation of benzal acetophenone from benzaldehyde
32-E26	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone

33-E27	Preparation of 1,2,3,4-tetrahydrocarbazole from cyclohexanone
34-E28	Preparation of Resacetophenone from resorcinol
35-E29	Preparation of Resacetophenone from resorcinol
36-E30	Preparation of dinitro diphenylamine from aniline
37-E31	Preparation of dinitro diphenylamine from aniline
38-E32	Preparation of benzoquinone from hydroquinone
39-E33	Preparation of benzoquinone from hydroquinone
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Separation of Caffeine from Tea / Coffee
46-E35	Separation of Caffeine from Tea / Coffee
47-E36	Interpretation of IR and NMR of any three simple organic compounds
48-E37	Interpretation of IR and NMR of any three simple organic compounds
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand different methods of separation of organic compounds
CO2	To separate the components in a mixture
CO3	To analyse the separated organic compounds
CO4	To physical constants of the compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-I
Course Code	KCHL22
Class	I year (2016-2017)
Semester	EVEN
Staff Name	Dr. S. Asha Jebamary
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of different types of cations*
- *To understand the group separation*

INORGANIC CHEMISTRY -I

1. Qualitative analysis of inorganic mixture containing two familiar and two less familiar cations Pb, Cu, Bi, Cd, Sb, Zn, Co, Ni, Mn, Ca, Ba, Sr, W, Tl, Te, Se, Mo, Ce, Th, Zr, V, U, Ti and Li.

2. Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

3. Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)

4. Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).

5. Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-E1	Qualitative analysis of mixture I
2-E2	Qualitative analysis of mixture I
3- E3	Qualitative analysis of mixture I
4-E4	Qualitative analysis of mixture I
5-E5	Qualitative analysis of mixture II
6-E6	Qualitative analysis of mixture II
7-E7	Qualitative analysis of mixture II
8-E8	Qualitative analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Qualitative analysis of mixture III
16-E11	Qualitative analysis of mixture III
17-E-12	Qualitative analysis of mixture III
18-E13	Qualitative analysis of mixture III
19-E14	Qualitative analysis of mixture IV
20-E15	Qualitative analysis of mixture IV
21-E16	Qualitative analysis of mixture IV
22-E17	Qualitative analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Qualitative analysis of mixture V
25-E19	Qualitative analysis of mixture V
26-E20	Qualitative analysis of mixture V
27-E21	Qualitative analysis of mixture V
28-E22	Qualitative analysis of mixture VI
29-E23	Qualitative analysis of mixture VI
30-E24	Qualitative analysis of mixture VI
31-E25	Qualitative analysis of mixture VI
32-E26	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
33-E27	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
34-E28	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
35-E29	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
36-E30	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II)
37-E31	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
38-E32	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
39-E33	Estimation of Mg(II) by EDTA titration in the presence of either Pb(II) or Ba(II).
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
46-E35	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
47-E36	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
48-E37	Photocolorimetric estimation of Fe, Ni, Cr, Mn, Cu and NH_4^+
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand familiar cations
CO2	To understand less familiar cations
CO3	To study the group seperation
CO4	To know the confirmatory tests of different cations
CO5	To study the reason behind the results of the experiment

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-I
Course Code	KCHL23
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	5
L. Hours /P. Hours	6/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric titrations*
- *To understand the enthalpy of reactions*

PHYSICAL CHEMISTRY -I

A. Distribution

1. Distribution of bezoic acid between benzene/toluene and water

B. Conductivity

2. Determination of solubility product of sparingly soluble salt
3. Determination of Ka by using Oswald distribution method.
4. Titrations
   1. HCl + AcOH vs NaOH
   2. HCl + NH_4Cl vs NaOH
   3. AcOH + AcONa vs NaOH
   4. AcOH + AcONa vs HCl

C. Kinetics

5. Study of primary salt effect on $K_2S_2O_8$
6. Kinetics of $K_2S_2O_8$ and KI reaction

II. Thermometry

7. Determination of Solution enthalpy of

i. oxalic acid-water
ii. ammonium oxalate-water
iii. Naphthalene-toluene

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-E1	Distribution of bezoic acid between benzene/toluene and water
2-E2	Distribution of bezoic acid between benzene/toluene and water
3- E3	Distribution of bezoic acid between benzene/toluene and water
4-E4	Determination of solubility product of sparingly soluble salt
5-E5	Determination of solubility product of sparingly soluble salt
6-E6	Determination of solubility product of sparingly soluble salt
7-E7	Determination of Ka by using Oswald distribution method
8-E8	Determination of Ka by using Oswald distribution method
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	HCl + AcOH vs NaOH
16-E11	HCl + AcOH vs NaOH
17-E-12	HCl + AcOH vs NaOH
18-E13	HCl + NH_4Cl vs NaOH
19-E14	HCl + NH_4Cl vs NaOH
20-E15	HCl + NH_4Cl vs NaOH
21-E16	AcOH + AcONa vs NaOH
22-E17	AcOH + AcONa vs NaOH
23-P2	**College level meeting/Cell function**
24-E18	AcOH + AcONa vs HCl
25-E19	AcOH + AcONa vs HCl
26-E20	AcOH + AcONa vs HCl
27-E21	Kinetics of $K_2S_2O_8$ and KI reaction
28-E22	Kinetics of $K_2S_2O_8$ and KI reaction
29-E23	Kinetics of $K_2S_2O_8$ and KI reaction
30-E24	Kinetics of $K_2S_2O_8$ and KI reaction
31-E25	oxalic acid-water
32-E26	oxalic acid-water
33-E27	oxalic acid-water
34-E28	oxalic acid-water
35-E29	ammonium oxalate-water
36-E30	ammonium oxalate-water
37-E31	ammonium oxalate-water
38-E32	ammonium oxalate-water
39-E33	ammonium oxalate-water
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Naphthalene-toluene
46-E35	Naphthalene-toluene
47-E36	Naphthalene-toluene
48-E37	Naphthalene-toluene
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS –I"
CO1	To understand the conductometric titrations
CO2	To understand the enthalpy of reactions
CO3	To study kinetics of acid hydrolysis of ester

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	KCHM21
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h/unit)	

Objectives:

- To understand the concept of UV-visible spectroscopy and to apply Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
- To understand the concept of FT-IR spectroscopy and to apply the idea to find out the functional groups in organic compounds..
- To study the applications of ORD and CD for chiral compounds especially polypeptides and polynucleotides.
- To study nucleophilic substitution reactions in aromatic systems
- To study the different types of intermediates in a reaction
- To have a brief idea about the natural products especially terpenes and alkaloids.
- To learn about the synthesis and structural elucidation of selected antibiotics and vitamins.

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-7/

ORGANIC CHEMISTRY - II

Unit – I: ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD

UV: The absorption laws – Types of electronic transitions – effect of solvents and Hydrogen bonding on λ_{max} values. – Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones.

IR: Characteristic IR absorptions of different functional groups – factors influencing absorption of carbonyl and hydroxyl groups – electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region.

ORD and CD: Optical rotatory dispersion (ORD): Octant rule – alpha - halo ketone rule and their applications-Circular Dichroism.

Unit-II :Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond.

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms - Reactivity, effect of substrate, leaving group and attacking nucleophile-typical reaction as oxygen and sulphur as nucleophile - Bucherer and Rosenmund reaction- Smiles rearrangement.

Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich reaction - Wittig reaction-Sharpless asymmetric epoxidation-addition of hydrogen halides to carbon - carbon double bond - addition of boranes, Michael addition (1,2 and 1,4)

Addition of dialkyl groups to triple bonds. Addition of hydrides – $LiAlH_4$ and $NaBH_4$.

Unit-III :Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, and reactivity of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications.

Nitrenes: Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements.

Carbanion: Generation, Structure, Stability and reaction of carbanion- Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.

Arynes : Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit – IV: ALKALOIDS AND ANTIBIOTICS

Alkaloids: Degradation studies – HEM , Emde and Von – Braun – Structural elucidation and synthesis of Quinine, Morphine, Cocaine, Lysergic acid and Atropine. Synthesis of Reserpine and PaPaverine – Biosynthesis of tyrosine, tryptophan.

Antibioties: Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.

Unit – V: VITAMINS AND TERPENOIDS

Vitamins: Structural elucidation, synthesis of vitamins – A_1, $B_1$and C - synthesis of vitamins B_2, B_6 and D.

Terpenoids : Structural elucidation, synthesis of α-Pinene, α-Cadinene, Zingiberene, Camphor and sqalene - synthesis of α-Santonin and Gibberelic acid. Bio synthesis of mono and diterpenoids.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-L1	**ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD** **UV:** The absorption laws – Types of electronic transitions
2-L2	effect of solvents and Hydrogen bonding on λ_{max} values
3- L3	Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones
4-L4	**IR:** Characteristic IR absorptions of different functional groups
5-L5	factors influencing absorption of carbonyl and hydroxyl groups
6-L6	electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region
7-L7	Optical rotatory dispersion (ORD): Octant rule
8-L8	alpha - halo ketone rule and their application
9-L9	Circular Dichroism -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis** - **Unit-II :Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond. Aromatic nucleophilic substitution reaction:** Unimolecular, Bimolecular and Benzyne mechanisms.
12-P1	**Department function**
13-L11	Reactivity, effect of substrate, leaving group and attacking nucleophile- typical reaction as oxygen and sulphur as nucleophile
14-L12	Bucherer and Rosenmund reaction- Smiles rearrangement.
15-L13	Catalytic hydrogenation- Birch reduction
16-L14	Dieckmann condensation-Mannich reaction - Wittig reaction
17-L-15	Sharpless asymmetric epoxidation
18-L16	addition of hydrogen halides to carbon - carbon double bond
19-L17	addition of boranes,
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2 and 1,4)
21-P2	**College level meeting/Cell function**
22-L19	Addition of hydrides – $LiAlH_4$
23-L20	Addition of hydrides –$NaBH_4$.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**Test Paper distribution and result analysis-Unit – III: Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, and reactivity of carbenes-
27-L23	Generation, stability, structure, and reactivity of carbenes-
28-L24	Wolff rearrangement of acyl carbenes.
29-L25	Wolff rearrangement its synthetic applications.
30-L26	**Nitrenes:** Generation, stability, reaction of nitrenes

31-L27	**Nitrenes:** Generation, stability, reaction of nitrenes
32-L28	Mechanism of rearranegements through Nitrene intermediate: Schmidt rearrangement, Hoffmann rearrangement, Beckmann rearrangement
33-L29	Generation, Structure, Stability and reaction of carbanion
33-L30	Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.
35-L31	**Arynes :** Generation, Structure, Stability
36-L32	reactions and trapping of arynes- cine substitution -**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: ALKALOIDS AND ANTIBIOTICS** Degradation studies – HEM method
38-L34	Emde and Von – Braun method
39-L35	Structural elucidation and Synthesis of Quinine
40-L36	Structural elucidation and Synthesis of Morphine, Cocaine,
41-L37	Structural elucidation and Synthesis of Lysergic acid and Atropine
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Synthesis of Reserpine and PaPaverine
44-L39	Biosynthesis of tyrosine, tryptophan
45-L40	**Submission of Assignment/ seminar**
46-L41	**Antibioties:** Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.
47-L42	Structure and synthesis of cephalosporin – C
48-L43	Structure and synthesis of chloramphenicol and Streptomycin.
49-L44	**UNIT – V : VITAMINS AND TERPENOIDS** **Vitamins:** Structural elucidation, synthesis of vitamins – A_1, $B_1$and C
50-L45	synthesis of vitamins B_2, B_6 and D
51-IT-III	**Internal Test-III (………)**
52-L46	**Terpenoids :** Structural elucidation, synthesis of α-Pinene, α-Cadinene,
53-L47	**Terpenoids :** Structural elucidation, synthesis of Zingiberene, Camphor and sqalene
54-L48	synthesis of α-Santonin and Gibberelic acid.
55-L49	Bio synthesis of mono and di terpenoids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –II"
CO1	The concept of UV-visible spectroscopy and application of Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
CO2	The concept of FT-IR spectroscopy and application of the idea to find out the functional groups in organic compounds
CO3	Application of ORD and CD for chiral compounds especially polypeptides and polynucleotides
CO4	Importance of nucleophilic substitution reactions in aromatic systems
CO5	Different types of intermediates in a reaction
CO6	Idea about selected natural products especially from terpenes and alkaloids
CO7	synthesis and structural elucidation of selected antibiotics and vitamins
Experimental Learning	
EL1	Differentiation of geometrical isomers by FT-IR spectroscopy
EL2	Comparison of the calculated and observed λ_{max} values for selected organic compounds
EL3	Charctertization of functional groups in a given compound by FT-IR spectrosopy
EL4	Synthesis of aniline from chlorobenzene *via* Benzyne intermediate
Integrated Activity	
IA1	Differentiation of α-helix and β-sheet of selected proteins by ORD/CD spectroscopy
IA2	Detecting the Fermi resonance in selected organic compunds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M.Sc. Chemistry
Course Name	Inorganic Chemistry-II
Course Code	KCHM22
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the nature of metal-ligand bond and to study various theories of bonding in coordination compounds.*
- *To study the stability, chemical reactions and magnetic properties of coordination compounds.*
- *To study the applications of electronic and infra-red spectroscopic techniques in coordination compounds.*
- *To understand inorganic polymers and to study structures and bonding in metal clusters.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-8/

INORGANIC CHEMISTRY -II

Unit – I: BONDING IN COORDINATION COMPOUNDS

CFT and LFT: Basic features of CFT and LFT. Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries –Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions. Application of CFT: Magnetic Properties -Spectral properties -Spectrochemical series–Kinetic properties.**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants, Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE.

MOT: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.Application of MOT to spectrochemical series.

Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDS

Stability of complexes: Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes– factors affecting stability – chelate and template effects -Determination of stability constants and composition of the complexes: Bjerrum’s method, potentiometric determination, spectrophotometric method, ion-exchange method, polarographic method, continuous variation (Job’s) method.

Reactions of complexes: Lability – inertness –Ligand substitution reactions of square planar complexes – Trans effect and trans influence –Theories of trans effect – use of trans effect in synthesis of complexes– Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions – Electron transfer reactions – Inner sphere and outer sphere processes–complementary and non-complementary reactions.

Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPY

Electronic spectroscopy: Selection rules for electronic transitions–Line width and shape – Hole formalism –LS Coupling and jj coupling schemes and determination of term symbols – Splitting of terms – Orgel and Tanabe Sugano diagrams – Electronic spectra of Ist row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems.

Charge transfer spectra – types–Effect of tetragonal distortion and spin – orbit coupling on spectra. Electronic spectra of lanthanide and actinide complexes.

Infrared spectroscopy: Selection rules –calculation of force constants of IR vibrations.Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water. Application in the study of isomerism–linkage and geometrical isomerism and intra and intermolecular hydrogen bonding.

Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES

Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials–Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility – Faraday's and Gouy'smethods.First order and second order Zeeman effect, temperature independent paramagnetism, van Vleck equation and its applications–quenching of orbital contribution to magnetic moment by CF. Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field, high spin/low spin equilibrium.Comparison of the magnetic properties of O_h, T_d and square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes.

Unit V: INORGANIC POLYMERS ANDMETAL CLUSTERS

Inorganic polymers: General characteristics, degree of polymerization, catenation and heterocatenation- silicates - classification and structure - property correlation - Polyacids-structures of isopoly and heteropoly anions - Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers - Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.

Structure and Bonding of Metal clusters: DinuclearClusters: Cu(II) carboxylate, Chromium(II) acetate, and $[M_2Cl_8]^{4-}$(M = Mo and Re) –Trinuclear Clusters: $[M_3(CO)_{12}]$ (M = Fe, Ru, Os) –Teteranuclear Clusters: $[M_4(CO)_{12}]$ (M = Co, Rh, Ir) –Hexanuclear Clusters: $[Nb_6Cl_{12}]^{2+}$,$[Os_6(CO)_{18}]^{2-}$ and $[Mo_6Cl_8]Cl_4$–Capping rule – poly atomic Zintl ions.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-L1	**UNIT - I: BONDING IN COORDINATION COMPOUNDS: CFT and LFT**: Basic features of CFT and LFT.
2-L2	Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries
3- L3	Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions
4-L4	Application of CFT: Magnetic Properties -Spectral properties
5-L5	Spectrochemical series–Kinetic properties
6-L6	**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants
7-L7	Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE
8-L8	**MOT**: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.
9-L9	Application of MOT to spectrochemical series-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis**- **Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDSStability of complexes:**Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes
12-P1	**Department function**
13-L11	factors affecting stability – chelate and template effects
14-L12	Determination of stability constants and composition of the complexes: Bjerrum's method
15-L13	Determination of stability constants and composition of the complexes: potentiometric determination, spectrophotometric method
16-L14	Determination of stability constants and composition of the complexes:polarographic method, continuous variation (Job's) method
17-L-15	Lability – inertness –Ligand substitution reactions of square planar complexes
18-L16	Trans effect and trans influence
19-L17	Theories of trans effect – use of trans effect in synthesis of complexes
	Entering Internal Test-I Marks into University portal
20-L18	Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions
21-P2	**College level meeting/Cell function**
22-L19	Electron transfer reactions – Inner sphere and outer sphere processes
23-L20	Complementary and non-complementary reactions.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**Test Paper distribution and result analysis**-**Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPYElectronic spectroscopy**: Selection rules for electronic transitions–Line width and shape –Hole formalism
27-L23	LS Coupling and jj coupling schemes and determination of term symbols
28-L24	Splitting of terms – Orgel and Tanabe Sugano diagrams

29-L25	Electronic spectra of Ist row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
30-L26	Charge transfer spectra – types
31-L27	Effect of tetragonal distortion and spin – orbit coupling on spectra.
32-L28	Electronic spectra of lanthanide and actinide complexes
33-L29	Selection rules –calculation of force constants of IR vibrations
33-L30	Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water
35-L31	Application in the study of isomerism– linkage and geometrical isomerism and intra and intermolecular hydrogen bonding
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES** Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials
38-L34	Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility
39-L35	Faraday's and Gouy'smethods.First order and second order Zeeman effect
40-L36	temperature independent paramagnetism, van Vleck equation and its applications
41-L37	quenching of orbital contribution to magnetic moment by CF.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field,
44-L39	high spin/low spin equilibrium
45-L40	**Submission ofAssignment/take the seminar**
46-L41	Comparison of the magnetic properties of O_h Fe(II), Co(II), Ni(II) and Cu(II) complexes
47-L42	Comparison of the magnetic properties of T_d Fe(II), Co(II), Ni(II) and Cu(II) complexes
48-L43	Comparison of the magnetic properties of square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes
49-L44	**UNIT – V : INORGANIC POLYMERS ANDMETAL CLUSTERS** **Inorganic polymers:**General characteristics, degree of polymerization, catenation and heterocatenation
50-L45	silicates - classification and structure - property correlation
51-IT-III	**Internal Test-III (………)**
52-L46	Polyacids- structures of isopoly and heteropoly anions
53-L47	Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers
54-L48	Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.
55-L49	**Structure and Bonding of Metal clusters:**DinuclearClusters, Trinuclear Clusters, Teteranuclear Clusters, HexanuclearClustersCapping rule, poly atomic Zintl ions.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –II"
CO1	To know the nature of metal-ligand bond in complexes
CO2	To study various theories of bonding in coordination compounds
CO3	To study the stability, chemical reactions and magnetic properties of coordination compounds
CO4	To study the applications of electronic and infrared spectroscopic techniques in coordination compounds.
CO5	To understand inorganic polymers and understand its properties
Experimental Learning	
EL1	Differentiation of coordinated water and lattice water by IR spectroscopy
EL2	Measurement of magnetic susceptibility by Gouy's Method
EL3	Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
EL4	Preparation of Cu(II) carboxylate and Chromium(II) acetate to analyze the nature of metal-metal bonding
Integrated Activity	
IA1	Differentiation of linkage isomerism – Nitro and nitrito
IA2	Study of intra- and intermolecular hydrogen bonding

# Blended Learning	:Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,
# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature　　　　　　　　　　　　　　　　　　　　Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Physical Chemistry-II
Course Code	KCHM23
Class	I year (2016-2017)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- ✓ *To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics*
- ✓ *To learn about the Principles of Electrochemistry*
- ✓ *To get an idea of different electroanalytical techniques*
- ✓ *To know about Photochemistry and Radiation chemistry*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc. (Chemistry)/Sem.-2/Core-9/

PHYSICAL CHEMISTRY -II

UNIT-I: QuantumMechanics I

Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box, Particle in a ring, 3DRectangular box, 3D cubical box, the harmonic oscillator, the rigid rotator, and the hydrogen atom.Degeneracy and degenerate wave functions, Quantum mechanical tunnelling.Shapes and nodal properties of orbitals – Space quantisation.

UNIT-II: QuantumMechanics II

Electron spin, Anti symmetry and Pauli's exclusion principle – Slater determinantal wave functions. Approximation methods-The Variation theorem; Linear Variation Principle, Perturbation theory.Applications of Variation Method and Perturbation Theory to the Helium atom. Born-Oppenheimer approximation, VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems, Hartree FockSelf consistent field method for Helium atom. Hückel Molecular Orbital Theory and its application to ethylene, butadiene and benzene.

UNIT – III: Electrochemistry - I

Arrhenius theory, Derivation and Validity of Debye-Huckel Theory, Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation. Debye-Falkenhagen effect and Wien effect. Activity of electrolytes, Determination of activity and activity coefficient using Debye-Huckel theory.Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation.Definition and Determination of Transference number.Abnormal transference number.Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern models of electrical double layer- Applications and limitations.Kinetics of electrode reaction-Butler-Volmer equation, Tafel equation.

UNIT – IV:Electrochemistry - II

The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena-Zeta potential and its applications.Electrophoresis and related phenomena- The electro viscous effect, sedimentation Potential, Electrophoresis. Effect of electrical double layer-Electrocapillarity, Double layer capactance Corrosion and passivation of metals – Pourbaix diagram – Evans diagram – fuel cells – primary and secondary fuel cells – electrodeposition – principle

and applications. Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility, determination of ‘n’ values (usefulness of Illkovic equation), polarographic maxima, current time curves, Modern developments, Oscillographic polarography, AC polarography – Cyclic Voltammetry, advantages over polarographic techniques – Test of reversibility of electron transfer reactions – Chronopotentiometry – apparatus used, advantages over polarography – controlled potential coulometry.

UNIT-V: Photochemistry and Radiation Chemistry:

Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination. Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials. Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion, fluorescence, phosphorescence and other deactivation processes. Photosensitisation chemiluminescence and bioluminescence-Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.

Radiation Chemistry

Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 01-12-2016
1-L1	**UNIT-I: QuantumMechanics I** Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box
2-L2	Particle in a ring
3- L3	3DRectangular box
4-L4	3D cubical box
5-L5	Harmonic oscillator
6-L6	Rigid rotor
7-L7	Setting up and solving Schrodinger wave equation and arriving solution for the hydrogen atom.
8-L8	Degeneracy and degenerate wave functions.
9-L9	Quantum mechanical tunnelling. Shapes and nodal properties of orbitals – Space quantisation - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (24.01.2017)**
11-L10	**Test Paper distribution and result analysis - UNIT-II: QuantumMechanics II** Electron spin, Anti symmetry and Pauli's exclusion principle
12-P1	**Department function**
13-L11	Slater determinantal wave functions. Introduction to Approximation methods
14-L12	The Variation theorem; Linear Variation Principle,
15-L13	Perturbation theory.Applications of Variation Method
16-L14	Perturbation Theory to the Helium atom
17-L-15	Born-Oppenheimer approximation
18-L16	VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems
19-L17	Hartree FockSelf consistent field method for Helium atom
	Entering Internal Test-I Marks into University portal
20-L18	Hückel Molecular Orbital Theory and its application to ethylene
21-P2	**College level meeting/Cell function**
22-L19	Hückel Molecular Orbital Theory and its application to butadiene
23-L20	Hückel Molecular Orbital Theory and its application to benzene
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (24.02.2017)**
26-L22	**Test Paper distribution and result analysis - UNIT – III: Electrochemistry - I** Arrhenius theory, Derivation and Validity of Debye-Huckel Theory
27-L23	Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation
28-L24	Debye-Falkenhagen effect and Wien effect. Activity of electrolytes
29-L25	Determination of activity and activity coefficient using Debye-Huckel theory
30-L26	Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation
31-L27	Definition and Determination of Transference number.Abnormal transference number.
32-L28	Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern

	models of electrical double layer
33-L29	Electrical double layer- Applications and limitations
33-L30	Kinetics of electrode reaction-Butler-Volmer equation
35-L31	Tafel equation
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: Electrochemistry - II** The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena
38-L34	Zeta potential and its applications.Electrophoresis and related phenomena
39-L35	The electro viscous effect, sedimentation Potential, Electrophoresis
40-L36	Effect of electrical double layer-Electrocapillarity, Double layer capacitance
41-L37	Evans diagram – fuel cells – primary and secondary fuel cells
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	electrodeposition – principle and applications
44-L39	Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility
45-L40	**Submission of Assignment/take the seminar**
46-L41	determination of ‘n’ values (usefulness of Illkovic equation), polarographic maxima, current time curves,
47-L42	Modern developments, Oscillographic polarography, AC polarography
48-L43	Cyclic Voltammetry, advantages over polarographic techniques – Chronopotentiometry–advantages over polarography – controlled potential coulometry
49-L44	**UNIT – V : Photochemistry and Radiation Chemistry:** Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination
50-L45	Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials
51-IT-III	**Internal Test-III (………)**
52-L46	Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion
53-L47	Fluorescence, phosphorescence and other deactivation processes - Photosensitisation chemiluminescence and bioluminescence
54-L48	Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.
55-L49	**Radiation Chemistry:** Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (05.04.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 21-04-2017

Course Outcomes

Learning Outcomes	**COs** of the course “ PHYSICAL CHEMISTRY –II”
CO1	To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics
CO2	To learn about the Principles of Electrochemistry
CO3	To get an idea of different electroanalytical techniques
CO4	To know about Photochemistry and its applications
CO5	To know about Radiation chemistry and solvated electrons
Experimental Learning	
EL1	Demonstration of Electroless deposition
EL2	Interpretation of cyclic voltammograms and calculation of electrochemical bandgap
EL3	Photochemical activity of potassium hexaoxalatoferrate(III)
Integrated Activity	
IA1	Variation of band gap of semiconducting quantum dots with size and quantum confinement
IA2	Differential conductance of Si QD’s from STM

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Course Work
Course Code	KCHC12
Class	I year (2016-2017)
Semester	Odd
Staff Name	
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the **Absorption Spectroscopy**
- To understand the Basic principles of two-dimensional NMR spectroscopy
- To know about the Nuclear Quadruple Resonance Spectroscopy
- To get an idea analytical techniques in chemistry
- To understand the Principles and applications of XRD, Neutron and electron diffraction

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

Paper-II

COURSE WORK

No. of Hrs – 4 / Week Credits - 4

Objectives

Unit –I : Retrosynthetic Analysis : Introduction to disconnections – one group disconnections – two group disconnections – pericyclic reactions – small rings: three membered , four membered, and five membered.

Unit II: Applications of Advanced Organic Spectroscopy (12hrs.) NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications. Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M + 1 and M + 2 ions – calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV, IR, 1H-NMR, 13C-NMR and mass spectral data.

Unit-III: Metals in Medicine: Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic – biological defense mechanisms – chelation therapy – metals used for diagnosis and chemotherapy – platinum complexes as anticancer drugs, Pt-DNA binding ,complexes of gold ,copper, zinc , mercury, arsenic and antimony as drugs – Bioorganomentallic Chemistry.

Unit IV: Nano Science and Technology:

Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials - zero dimensional nanostructures – one dimentional nanostructures – nanowires and nanorods – two dimensional nanostructures – films , nanotubes and biopolymers- three dimensional nanostructures – fullerenes and dendrimers – quantum dots and their properties . Basic instrumentation and imaging techniques.

Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles – water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs.

Unit V: Advanced Photochemistry : Artificial photosynthesis and solar energy conversion – photoelectrochemical cells – dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts ; Fluorescence sensing – mechanism and applications ; Radioactive decay engineering – metal – enhanced fluorescence and surface plasmon – coupled emission.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2016
1-L1	**Unit –I : Retrosynthetic Analysis**
2-L2	Introduction to disconnections
3- L3	one group disconnections
4-L4	two group disconnections
5-L5	pericyclic reactions
6-L6	small rings
7-L7	three membered
8-L8	four membered
9-L9	five membered
10-IT-1	**Internal test – I (25-07-2016)**
11-L10	**Unit II: Applications of Advanced Organic Spectroscopy**
12-P1	NMR
13-L11	Basic principles of two-dimensional NMR spectroscopy
14-L12	HOMOCOSY, HETCOSY and NOESY spectra and their applications
15-L13	use of INEPT and DEPT methods and their applications
16-L14	Mass: Molecular ions, isotope peaks, fragmentation pattern
17-L-15	McLafferty rearrangement
18-L16	measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI)
19-L17	M + 1 and M + 2 ions
	Entering Internal Test-I Marks into University portal
20-L18	calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV
21-P2	**College level meeting/Cell function**
22-L19	IR, 1H-NMR
23-L20	13C-NMR and mass spectral data.
24-L21	Quick review of the chapter -**Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (22-08-2016)**

26-L22	**Unit-III: Metals in Medicine**
27-L23	Beneficial, essential ,and toxic elements
28-L24	Metal deficiency and disease
29-L25	toxicity of mercury, cadmium , lead , beryllium , selenium and arsenic
30-L26	biological defense mechanisms
31-L27	chelation therapy
32-L28	metals used for diagnosis and chemotherapy
33-L29	platinum complexes as anticancer drugs, Pt-DNA binding
33-L30	complexes of gold ,copper, zinc , mercury,
35-L31	arsenic and antimony as drugs
36-L32	Bioorganomentallic Chemistry
38-L33	**Unit IV: Nano Science and Technology:**
38-L34	Introduction : definition of nanoscience , nanochemistry – classification of the nanomaterials
39-L35	zero dimensional nanostructures – one dimentional nanostructures
40-L36	nanowires and nanorods – two dimensional nanostructures
41-L37	films , nanotubes and biopolymers- three dimensional nanostructures
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	fullerenes and dendrimers – quantum dots and their properties
44-L39	Basic instrumentation and imaging techniques
45-L40	**Submission of Assignment/take the seminar**
46-L41	Synthesis of Nanomaterials : Introduction – precipitative methods – gas phase synthesis of semiconductor nanoparticles
47-L42	water based gold nanoparticle synthesis – organic solution based synthesis – sonochemical methods and microwave methods .CNTs and CNFs
48-L43	Overview of the chapter
49-L44	**Unit V: Advanced Photochemistry**
50-L45	Artificial photosynthesis and solar energy conversion – photoelectrochemical cells
51-IT-III	**Internal Test-III (03-10-2016)**
52-L46	dynamics of excited state processes (excited state energy , redox properties , emission lifetime and its temperature dependence) in micelles
53-L47	reverse micelles and biomembranes – Fluorescence – Quenching and anisotropy concepts
54-L48	Fluorescence sensing – mechanism and applications ; Radioactive decay engineering
55-L49	metal – enhanced fluorescence and surface plasmon – coupled emission
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (17-10-2016)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2016

Course Outcomes

Learning Outcomes	**COs** of the course "ADVANCED TOPICS IN CHEMISTRY –I"
CO1	To understand the **Retrosynthetic Analysis**
CO2	To understand the Beneficial, essential ,and toxic elements – Metal deficiency and disease – toxicity of mercury, cadmium
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the sonochemical methods and microwave methods .CNTs and CNFs.
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	sonochemical methods and microwave methods .CNTs and CNFs.
IA2	Microwave mediated synthesis of CdO

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# Forslow learner	:Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-III
Course Code	KCHM31
Class	II year (2017-2018)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	5
L. Hours /P. Hours	5/ WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the Aliphatic nucleophilic substitution.
- To understand the E_1, E_2 and E_1CB mechanisms.
- To study the C-13 spectroscopy of certain compounds.
- To study the 2D NMR spectroscopy.
- To understand the Fragmentation pattern of simple compounds
- To learn the problem based on UV, IR, H^1 NMR, ^{13}C NMR and Mass spectroscopic techniques.
- To learn the Organic photochemistry.
- To learn the applications of Sigmatropic rearrangements.
- To gain knowledge about the Heterocyclic and biomolecules.
- To study the synthesis of flavones, isoflavones, flavonol.

ORGANIC CHEMISTRY – III

UNIT-I : ALIPHATIC NUCLEOPHILIC SUBSTITUTION AND ELIMINATION REACTIONS:

Aliphatic Nucleophilic Substitution : Mechanism of SN1, SN2, SNi, SN1‟, SN2‟ and SNi‟ reactions- Effect of substrate, nucleophile, leaving group and solvent on the rate of substitutionAmbident nucleophile- NGP- Mechanism of esterifications and ester hydrolysis (BAC2 and AAC2 mechanisms only). Elimination Reaction: E1, E2 and E1CB mechanisms- Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions competition between substitution and elimination reactions.

UNIT – II: NMR SPECTROSCOPY

^{1}H NMR spectroscopy: Basic Principle – number of signals – chemical shift – Factors influencing chemical shift - spin–spin splitting– classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR. C-13 spectroscopy: Principle of proton decoupled C-13 spectroscopy - comparison with H 1NMR – chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds). 2D NMR spectroscopy: H 1 –H 1COSY, H1 –C 13 COSY, NOESY, DEPT and INADEQUATE spectra.

UNIT – III: MASS SPECTROSCOPY

Basic Principles– Base peak – molecular ion – nitrogen rule – metastable ions – isotopic peak - daughter ions – Mc–Lafferty rearrangement – RDA – General rules for fragmentation pattern – Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds . Alternative electron impact ionization technique– CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF, ICP-MS.

UNIT-IV : ORGANIC PHOTOCHEMISTRY AND PERICYCLIC REACTIONS

Organic photochemistry: Jablonskii diagrams-intersystem crossing-energy transfer processPhotosensitization- alpha cleavage or Norris type-I and gamma hydrogen transfer or Norrish Type II cleavage – Paterno-Buchi reactions- Barton reaction, photo oxidation and reduction reaction - cis-trans isomerisation. - Di-π methane rearrangement. pericyclic reactions: Atomic and molecular orbital‟s -Woodward-Hoffmann rules, FMO method and correlation diagram approaches: Electrocyclic reaction: con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatrienes)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry. Cyclo addition: suprafacial and antarafacial, [2+2] and [4+2] cyclo addition reactions (ethylene and butadiene) Sigmatropic rearrangements - [i, j] shift of C-H and C-C bonds (1,3) and (1,5) carbon migration.

UNIT-V : HETEROCYCLIC AND BIOMOLECULES

Synthesis and reactions of indole, oxazole, imidazole, thiazole, Carbazole, chromans, Chromons, pyrimidine, pyridazine, pyrazine, coumarins, benzopyrones and anthocyaninssynthesis of flavones, isoflavones, flavonol, and quercetin -Biosynthesis of flavonoids. Synthesis Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A Detailed study on the structure of maltose, lactose and starch.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	Aliphatic nucleophilic substitution : Mechanism of S_N1, S_N2, S_Ni, S_N1', S_N2' and S_Ni' reactions
2-L2	Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution
3- L3	Ambident nucleophile
4-L4	NGP- Mechanism
5-L5	esterifications and ester hydrolysis ($B_{AC}2$ and $A_{AC}2$ mechanisms only)
6-L6	Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation
7-L7	Elimination reaction: E_1, E_2 and E_1CB mechanisms
8-L8	Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination
9-L9	Chugaev and cope reactions-competition between substitution and elimination reactions. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Department function**
13-L11	**Unit – II: NMR SPECTROSCOPY** **^{1}H-NMR spectroscopy**: Basic Principle
14-L12	number of signals – chemical shift
15-L13	Factors influencing chemical shift - spin–spin splitting–Proton exchange reactions
16-L14	classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings
17-L-15	**C-13 spectroscopy**: Principle of proton decoupled
18-L16	OFF- resonance decoupled C-13 spectroscopy
19-L17	comparison with H^1NMR
	Entering Internal Test-I Marks into University portal
20-L18	**2D NMR spectroscopy**
21-P2	**College level meeting/Cell function**
22-L19	H^1–H^1COSY, H^1–C^{13} COSY
23-L20	NOESY, DEPT
24-L21	**Allotting portion for Internal Test-II-** INADEQUATE spectra.
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- Unit – III: MASS SPECTROSCOPY** Basic Principles
27-L23	Basic Principles– Base peak – molecular ion – nitrogen rule
28-L24	– metastable ions – isotopic peak - daughter ions
29-L25	use of activating and blocking groups
30-L26	Mc–Lafferty rearrangement
31-L27	RDA – General rules for fragmentation pattern
32-L28	Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.

33-L29	Alternative electron impact ionization technique
33-L30	CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF, ICP- MS.
35-L31	conjunction problem based on UV, IR, H^1 NMR, ^{13}C NMR and Mass spectroscopic techniques is compulsory under section – c. Problems
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV : Organic photochemistry and pericyclic reactions**
38-L34	**Organic photochemistry**
39-L35	Jablonskii diagrams-intersystem crossing-energy transfer process
40-L36	Photosensitization- alpha cleavages
41-L37	Norrish type-I and Norrish Type II cleavages
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Paterno-Buchi reactions- Barton reaction
44-L39	cis-trans isomerisation. - Di-π methane rearrangement.
45-L40	**Submission of Assignment/take the seminar**
46-L41	**pericyclic reactions:** Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches
47-L42	**Electrocyclic reaction**: con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatrienes)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry
48-L43	**Cycloaddiation:** suprafacial and antarafacial, [2+2] and [4+2] cyclo addition reactions (ethylene and butadiene) **Sigmatropic rearrangements** - [i,j] shift of C-H and C-C bonds (1,3) and (1,5) carbon migration.
49-L44	**Unit-V : Heterocyclic and biomolecules**
50-L45	Synthesis and reactions of indole, oxazole, imidazole, thiazole, Reserpine and quinine chromans**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	pyrimidine, pyridazine, pyrazine, coumarins, benzopyrones and anthocyanins **Test Paper distribution and result analysis**
53-L47	synthesis of flavones, isoflavones, flavonol, and quercetin -Biosynthesis of flavonoids
54-L48	Pyranose and furanose forms of aldohexose and ketohexose-methods
55-L49	determination of ring size-A Detailed study on the structure of maltose, lactose and starch
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –III”
CO1	Explain the Aliphatic nucleophilic substitution
CO2	Write the mechanism Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions.
CO3	Understand the Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR.
CO4	Write the : H^1–H^1COSY, H^1–C^{13} COSY, NOESY, DEPT and INADEQUATE spectra.
CO5	Understand Mc–Lafferty rearrangement
CO6	Write the Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.
CO7	Explain the Jablonskii diagrams-intersystem crossing-energy transfer process- Photosensitization- alpha cleavages.
CO8	Ability to write the Synthesis and reactions of indole, oxazole
CO9	Know the Pyranose and furanose
CO10	Know the **Electrocyclic reaction**
Experimental Learning	
EL1	Write the E_1CB mechanisms
EL2	Write the competition between substitution and elimination reactions
EL3	Perform a Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches
EL4	Draw the structure of pyridazine, pyrazine, coumarins, benzopyrones
Integrated Activity	
IA1	Discuss about the Organic photochemistry and pericyclic reactions
IA2	Find the : Basic Principle – number of signals – chemical shift – Factors influencing chemical shift

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-III
Course Code	KCHM32
Class	II year (2017-2018)
Semester	Odd
Staff Name	1. Dr. C. JOEL
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To study synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes.
- To study about metallocenes.
- To study the applications of organometallic compounds.
- To study the applications of homogeneous and heterogeneous catalysis.
- To study the applications of NMR spectroscopy.
- To study the applications of EPR spectroscopy.
- To give an insight into theory and principles of thermogravimetric analysis.
- To study the photochemistry of inorganic metal complexes.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.16 / Core- 14
INORGANIC CHEMISTRY -III

Unit I – ORGANOMETALLIC CHEMISTRY – I
The 18 e− and 16 e− rules and its correlation to stability – Synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes – Substitution reactions of metal carbonyls - IR spectralapplications – identifications of bridging and terminal CO groups – Stretching mode analysis of metal carbonyls – evidence for M-M bonds. Synthesis, properties and structural features of metal complexes with alkene, alkyne, allyl andarene systems. Metallocenes – synthesis, properties, structure and bonding with particular reference to ferrocene and berryllocene – covalent versus ionic bonding in beryllocene. Template synthesis of macrocyclic ligands.

Unit II – ORGANOMETALLIC CHEMISTRY – II

Organometallic compounds as catalysts and the requirements: Agostic interaction – Oxidative addition and reductive elimination - insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands - cyclometallation reactions. **Homogeneous catalysis:** Wilkinson's catalyst and hydrogenation reactions, Tolman catalytic loop; hydroformylation (oxo) reaction, Wacker and Monsanto acetic acid processes. Cluster compounds, polymer-supported and phase-transfer catalysis. **Heterogeneous catalysis:** synthesis gas and water gas shift reactions; Fischer Tropsch process and synthetic gasoline, Ziegler-Natta polymerization and mechanism of stereoregular polymer synthesis. Cyclooligomerisation of acetylenes (Reppe's or Wilke's catalyst) – Olefin isomerisation using Ni catalyst – olefin metathesis catalysed by Schröck type carbene.

UNIT-III: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – I

NMR SPECTROSCOPY: 31P, 19F and 15N – NMR – applications in structural problems based on number of signals, multiplicity, anisotropy (like H3PO3, H3PO2, [HNi(PPh3)4]+, SF4, TiF4, PF5, HPF2, H2PF3, PF3(NH2)2, P4S3, P4N4Cl6(NHC6H5)2, P3N3(CH3)2Cl4, NF3, NH3 – mer- and fac-Rh(PPh3)3Cl3, fluxional molecules (including organometallic compounds) and study of fluxionality by NMR technique - NMR of paramagnetic molecules - contact shifts. Evaluation of rate constants - monitoring the course of reaction using NMR.

EPR spectroscopy: Factors affecting magnitude of g-values - Zero field splitting and Kramers' degeneracy - Application of EPR in the study of transition metal complexes based on number of signals, multiplicity, anisotropy (bis(salicylaldimine)copper(II), [Cu(bpy)3]2+, [Cu(Phen)Cl2], [(NH3)5Co-O2-Co(NH3)5]5+, Co3(CO)9Se, Co3(CO)9Rh, [CoF6]4-, [CrF6]3-, VO(acac)2, [VO(H2O)6]2+, [Fe(CN)5NO]2−). Applications in predicting the covalent character of M-L bond and Jahn-Teller distortion in Cu(II) complexes. EPR spectroscopy of metallobiomolecules: copper and iron proteins.

UNIT – IV: THERMOANALYTICAL AND SPECTROANALYTICAL METHODS

Theory and principles of thermogravimetric analysis, differential thermal analysis and differential scanning colorimetry – characteristic features of TGA and DTA curves – factors affecting TGA and DTA curves – complementary nature of TGA and DTA – applications of thermal methods in analytical chemistry – thermometric titrations – the study of minerals and metal compounds. Principle and applications of spectrophotometry, spectrofluorimetry, atomic absorption spectroscopy and atomic emission spectroscopy based on plasma sources.

UNIT -V : INORGANIC PHOTOCHEMISTRY

Frank Condon and thermally equilibrated excited (THEXI) states - properties of excited states of metal complexes (life time, redox potential etc.) – charge transfer excitation – bimolecular deactivation (quenching) and energy transfer – photochemical path ways : oxidation-reduction, isomerisation and substitutional processes – photochemistry of Cr(III), Co(III) complexes – Photochemical reactions of metal carbonyls. Photo physical and photochemical properties of [Ru(bpy)3] 2+and comparison with [Fe(bpy)3] 2+ – Applications of inorganic photochemistry: photochemical conversion and storage of solar energy – inorganic photochemistry at semiconductor electrodes - Catalyzed photo reduction of CO2 and CO – TiO2as a green photo catalyst in removing air and water pollutants.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	**Unit I – ORGANOMETALLIC CHEMISTRY – I** The 18 e– and 16 e– rules and its correlation to stability – Synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes
2-L2	Substitution reactions of metal carbonyls
3- L3	IR spectral applications
4-L4	identifications of bridging and terminal CO groups –Stretching mode analysis of metal carbonyls
5-L5	evidence for M-M bonds
6-L6	Synthesis, properties and structural features of metal complexes with alkene
7-L7	alkyne, allyl andarene systems
8-L8	Metallocenes – synthesis, properties, structure and bonding with particular reference to ferrocene and berryllocene
9-L9	covalent versus ionic bonding in beryllocene. Template synthesis of macrocyclic ligands. -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis- Unit II – ORGANOMETALLIC CHEMISTRY – II** Organometallic compounds as catalysts and the requirements: Agostic interaction – Oxidative addition and reductive elimination- cyclometallation reactions.
12-P1	**Department function**
13-L11	insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands,
14-L12	**Homogeneous catalysis:** Wilkinson's catalyst and hydrogenation reactions,
15-L13	Cluster compounds, polymer-supported and phase-transfer catalysis.
16-L14	**Heterogeneous catalysis:** synthesis gas and water gas shift reactions;
17-L-15	Fischer Tropsch process and synthetic gasoline, Ziegler-Natta polymerization and mechanism of stereoregular polymer synthesis
18-L16	Cyclooligomerisation of acetylenes (Reppe's or Wilke's catalyst)
19-L17	Olefin isomerisation using Ni catalyst
	Entering Internal Test-I Marks into University portal
20-L18	olefin metathesis catalysed by Schröck type carbene
21-P2	**College level meeting/Cell function**
22-L19	cyclometallation reactions
23-L20	Wacker and Monsanto acetic acid processes.
24-L21	**Allotting portion for Internal Test-II-** Tolman catalytic loop; hydroformylation (oxo) reaction,
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- UNIT-III: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – I NMR SPECTROSCOPY**: 31P, 19F and 15N – NMR – applications in structural problems based on number of signals
27-L23	multiplicity, anisotropy (like H3PO3, H3PO2, [HNi(PPh3)4]+, SF4, TiF4, PF5, HPF2, H2PF3, PF3(NH2)2, P4S3, P4N4Cl6(NHC6H5)2, P3N3(CH3)2Cl4, NF3, NH3 – mer- and fac-Rh(PPh3)3Cl3

28-L24	fluxional molecules (including organometallic compounds) and study of fluxionality by NMR technique
29-L25	NMR of paramagnetic molecules - contact shifts. Evaluation of rate constants
30-L26	monitoring the course of reaction using NMR.
31-L27	**EPR spectroscopy**: Factors affecting magnitude of g-values - Zero field splitting and Kramers' degeneracy
32-L28	Application of EPR in the study of transition metal complexes based on number of signals, multiplicity, anisotropy (bis(salicylaldimine)copper(II), [Cu(bpy)3]2+, [Cu(Phen)Cl2],
33-L29	Applications in predicting the covalent character of M-L bond and Jahn-Teller distortion in Cu(II) complexes
33-L30	Co3(CO)9Se, Co3(CO)9Rh
35-L31	VO(acac)2, [VO(H2O)6]2+, [Fe(CN)5NO]2−).
36-L32	[(NH3)5Co-O2-Co(NH3)5]5+, , [CoF6]4-, [CrF6]3-, -**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: THERMOANALYTICAL AND SPECTROANALYTICAL METHODS** Theory and principles of thermogravimetric analysis
38-L34	differential thermal analysis
39-L35	differential scanning colorimetry
40-L36	characteristic features of TGA and DTA curves
41-L37	factors affecting TGA and DTA curves
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	complementary nature of TGA and DTA
44-L39	applications of thermal methods in analytical chemistry
45-L40	**Submission of Assignment/take the seminar**
46-L41	thermometric titrations
47-L42	the study of minerals and metal compounds, Principle and applications of spectrophotometry, spectrofluorimetry,
48-L43	atomic absorption spectroscopy and atomic emission spectroscopy based on plasma sources.
49-L44	**UNIT -V : INORGANIC PHOTOCHEMISTRY** Frank Condon and thermally equilibrated excited (THEXI) states - properties of excited states of metal complexes (life time, redox potential etc.) –
50-L45	charge transfer excitation – bimolecular deactivation (quenching) and energy transfer – photochemical path ways :
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	oxidation-reduction, isomerisation and substitutional processes – photochemistry of Cr(III), Co(III) complexes –
53-L47	Photochemical reactions of metal carbonyls. Photo physical and photochemical properties of [Ru(bpy)3] 2+and comparison with [Fe(bpy)3] 2+ –
54-L48	Applications of inorganic photochemistry: photochemical conversion and storage of solar energy
55-L49	inorganic photochemistry at semiconductor electrodes - Catalyzed photo reduction of CO2 and CO – TiO_2 as a green photo catalyst in removing air and water pollutants.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**

57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –III"
CO1	Gain knowledge about structures of metal carbonyls, metal nitrosyls and dinitrogen complexes
CO2	Study the structure and bonding with particular reference to ferrocene and berryllocene
CO3	Explain the catalytic property of organometallic compounds
CO4	Gain knowledge about homogeneous and heterogeneous catalysts
CO5	Understand the principle of NMR spectroscopy
CO6	Understand the principle of EPR spectroscopy
CO7	Understanding the theory and principles of thermogravimetric analysis
CO8	Understanding the Principle and applications of spectrophotometry, spectrofluorimetry, atomic absorption spectroscopy and atomic emission spectroscopy.
CO9	Explain the properties of excited states of metal complexes
CO10	Know the applications of inorganic photochemistry
Experimental Learning	
EL1	Write the 18 e rule for various metal complexes
EL2	Interpret NMR spectra for several complexes
EL3	Interpret the TGA curve for a known compound
EL4	Study the photocatalytic activity of TiO_2 for MB degradation
Integrated Activity	
IA1	Prepare a Fe(II) complex and determine its structure through NMR spectra.
IA2	Interpret EPR spectra for an inorganic compound

Blended Learning : Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : Use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-III
Course Code	KCHM33
Class	II year (2017-2018)
Semester	Odd
Staff Name	1. Dr. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of Group theory.
- To study the point groups of molecules.
- To understand the applications of group theory.
- To calculate the delocalization energy through group theory.
- To study the theory of NMR spectroscopy.
- To learn the theories of 2D NMR techniques.
- To obtain knowledge about the Theory of NQR spectroscopy.
- To learn the theory of EPR spectroscopy.
- To learn the theory of electronic spectroscopy and photoelectron spectroscopy.
- To study theory of Mass and Moss Bauer spectroscopy.

PHYSICAL CHEMISTRY -III

UNIT - I: GROUP THEORY-I

Symmetry elements and operations. Group Postulates and types of groups. Identification of Point groups of molecules and Schoenflies symbols. Construction of multiplication table for C2v, C3v and C2h. Sub-groups and classes of symmetry operations. Rule of similarity transformations. Matrix representations of symmetry operations. Use of atomic wave functions as bases for point group representations. Reducible and irreducible representations. The Great Orthogonality theorem. Properties of Reducible and irreducible representations. Construction of character tables for C2V, C3V, C4V, C2h, and D2 point groups by using The Great Orthogonality theorem.

UNIT - II GROUP THEORY -II

Standard Reduction Formula, Vibrational modes as bases for group representations-Normal mode analysis for non-linear molecules H2O, POCl3, trans-N2F2 and PtCl4. Symmetry selection rules for infrared and Raman spectra. Mutual exclusion principle. Determination of Hybridisation of atomic orbitals in non-linear molecules (CH4, XeF4, and PF5). Electronic spectra of ethylene and formaldehyde molecules. Construction of Projection operators and Molecular orbitals by Symmetry Adapted Linear Combinations. Simplification of HMO calculations using group theory. Calculation of delocalization energy for ethylene, trans-1,3 – butadiene, and benzene systems.

UNIT - III NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Theory of Proton NMR spectroscopy, Chemical shift and its measurement, Factors influencing chemical shift, Solvents used in NMR, solvents shift-concentration and temperature effects-hydrogen bonding. Theory of Spin-spin splitting-Magnitude of coupling-coupling constants, J, First-order spectra of complex systems, chemical and magnetic equivalence in NMR, Proton exchange reactions, Factors influencing coupling constant, J. Theory and Principle of 13C, 19F, 31P NMR-Range of chemical shift values, spectra of typical examples. FT NMR-FIDs. Theory of Spin-spin splitting and double irradiation, InterNuclear Double Resonance (INDOR) and Selective Population Inversion (SPI), Nuclear Overhauser Effect (NOE), 2D NMR-shift correlation spectra-COSY, Magnetic Resonance Imaging (MRI).

UNIT - IV NQR AND EPR SPECTROSCOPY

Electron paramagnetic resonance spectroscopy: theory of EPR spectroscopy, presentation of the spectrum, nuclear hyperfine splitting in isotropic systems. EPR spectra of anisotropic systems: anisotropy in g-value, causes of an isotropy, anisotropy in hyperfine coupling. Double resonance in ESR, Zero field splitting and Kramers' degeneracy.
Theory and Principle of NQR spectroscopy-Nature of electric field gradient, Energy levels and selection rules, Interaction of electric quadrupole with electromagnetic radiation, nuclear orientations, the asymmetry parameter, quadrupole transitions in spherical, axially symmetric fields and not axially symmetric fields. Applications of NQR spectra.

UNIT-V : ELECTRONIC SPECTROSCOPY

Electronic spectra of molecules: Born-Oppenheimer approximation, Franck-Condon Principle, selection rules, intensity of electronic transition, Vibronic coupling, types of electronic transitions. Chemical analysis by electronic spectroscopy: assignment of electronic transitions, application to the study of organic compounds. Emission spectroscopy: state of electronically excited molecules- dissociation, reemission, emission spectra of molecules. Photo electron spectroscopy (PES): principle and technique of PES, ultra violet PES, X-ray PES. Lasers: nature of stimulated emission-coherence and mono chromaticity, population inversion, cavity and mode characteristics, Q-switching, mode locking; types of lasers-solidstate, gas, chemical, and dye lasers

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	UNIT I– GROUP THEORY-I - Symmetry elements and operations. Group Postulates and types of groups.
2-L2	Identification of Point groups of molecules and Schoenflies symbols.
3- L3	Construction of multiplication table for C2v, C3v and C2h.
4-L4	Sub-groups and classes of symmetry operations.
5-L5	Rule of similarity transformations
6-L6	Matrix representations of symmetry operations.
7-L7	Use of atomic wave functions as bases for point group representations.
8-L8	Reducible and irreducible representations.
9-L9	The Great Orthogonality theorem - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis**- Properties of Reducible and irreducible representations. Construction of character tables for C2V, C3V, C4V, C2h, and D2 point groups by using The Great Orthogonality theorem.
12-P1	**Department function**
13-L11	UNIT – II GROUP THEORY -II – Standard Reduction Formula, Vibrational modes as bases for group representations
14-L12	Normal mode analysis for non linear molecules H2O, POCl3, trans-N2F2 and PtCl4.
15-L13	Symmetry selection rules for infrared and Raman spectra.
16-L14	Mutual exclusion principle.
17-L-15	Electronic spectra of ethylene and formaldehyde molecules.
18-L16	Construction of Projection operators and Molecular orbitals by Symmetry Adapted Linear Combinations.
19-L17	Simplification of HMO calculations using group theory.
	Entering Internal Test-I Marks into University portal
20-L18	Determination of Hybridisation of atomic orbitals in non-linear molecules (CH4, XeF4, and PF5)
21-P2	**College level meeting/Cell function**
22-L19	Calculation of delocalization energy for ethylene
23-L20	trans-1,3 –butadiene, and benzene systems.
24-L21	**Allotting portion for Internal Test-II-** Brief outlook of group theory I and II
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis**- UNIT - III NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY - Theory of Proton NMR spectroscopy, Chemical shift and its measurement
27-L23	Factors influencing chemical shift, Solvents used in NMR
28-L24	solvents shift-concentration and temperature effects-hydrogen bonding
29-L25	Theory of Spin-spin splitting-Magnitude of coupling-coupling constants
30-L26	First-order spectra of complex systems, chemical and magnetic equivalence in NMR
31-L27	Proton exchange reactions, Factors influencing coupling constant, J.
32-L28	Theory and Principle of 13C, 19F, 31P NMR-Range of chemical shift values
33-L29	spectra of typical examples. FT NMR-FIDs.

33-L30	Theory of Spin-spin splitting and double irradiation, InterNuclear Double Resonance (INDOR) and Selective Population Inversion (SPI), Nuclear Overhauser Effect (NOE),
35-L31	2D NMR-shift correlation spectra-COSY, Magnetic Resonance Imaging (MRI).
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT - IV NQR AND EPR SPECTROSCOPY** Electron paramagnetic resonance spectroscopy: theory of EPR spectroscopy, presentation of the spectrum, nuclear hyperfine splitting in isotropic systems.
38-L34	EPR spectra of anisotropic systems:
39-L35	anisotropy in g-value, causes of an isotropy, anisotropy in hyperfine coupling
40-L36	Double resonance in ESR, Zero field splitting and Kramers' degeneracy
41-L37	Theory and Principle of NQR spectroscopy-Nature of electric field gradient
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Interaction of electric quadrupole with electromagnetic radiation
44-L39	nuclear orientations, the asymmetry parameter
45-L40	**Submission of Assignment/take the seminar**
46-L41	quadrupole transitions in spherical
47-L42	axially symmetric fields and not axially symmetric fields
48-L43	Applications of NQR spectra
49-L44	**UNIT-V : ELECTRONIC SPECTROSCOPY** Electronic spectra of molecules: Born-Oppenheimer approximation, Franck-Condon Principle, selection rules, intensity of electronic transition, Vibronic coupling, types of electronic transitions.
50-L45	Chemical analysis by electronic spectroscopy: assignment of electronic transitions, application to the study of organic compounds. **Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	Emission spectroscopy: state of electronically excited molecules- dissociation, reemission, emission spectra of molecules.
53-L47	Photo electron spectroscopy (PES): principle and technique of PES, ultra violet PES, X-ray PES.
54-L48	Lasers: nature of stimulated emission-coherence and mono chromaticity, population inversion, cavity and mode characteristics,
55-L49	Q-switching, mode locking; types of lasers-solid state, gas, chemical, and dye lasers
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –III"

CO1	Explain basic principles of group theory
CO2	Identification of point group of molecules
CO3	Explain the vibrational modes of molecules using group theory
CO4	Determine the applications of group theory
CO5	Understand the theory of NMR
CO6	Explain the 2D NMR techniques.
CO7	Explain the theory of EPR.
CO8	Explain the theory of NQR.
CO9	Knowledge about the theory of electronic spectra.
CO10	Knowledge about the theory of PES.
Experimental Learning	
EL1	Find out vibrational modes for various molecules using group theory
EL2	Interpret NMR spectra for certain compounds
EL3	Interpret EPR spectra for certain compounds
EL4	Record the electronic spectra for a given compound
Integrated Activity	
IA1	Prepare a compound and determine its structure through NMR spectra.
IA2	Interpret the electronic spectra for a given compound

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr.C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Scientific-Research Methodology
Course Code	PCHM34
Class	II year (2016-2017)
Semester	Odd
Staff Name	1.Dr.C. JOEL
Credits	3
L. Hours /P. Hours	3 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To *learn the process of survey for literature*.
- To search the *chemical abstract* in terms of the research area
- To get clear idea about *choosing a research problem*
- To learn about the *scientific writing*.
- To explore knowledge about *characterization and data analysis*
- To *search the literature via computer searching.*
- To know the process of *applying for the various finding agencies.*

SCIENTIFIC - RESEARCH METHODOLOGY – III

Unit – I: LITERATURE SURVEY

Source of chemical information – primary, secondary, tertiary sources-literature survey-Indexes and abstracts in science and technology – Applied science and technology index, chemical abstracts, chemical titles, current chemical reactions, current contents and science citation index.
Classical and comprehensive reference works in chemistry-synthetic methods and techniques, treatises, reviews, patents and monographs.

UNIT - II : CHEMICAL ABSTRACTS:

Current awareness searching: CA weekly issues, CA issue indexes. Retrospective searching: CA volume indexes-general subject index, chemical substance index-formula index, index of ring systems, author index, patent index.CA collective indexes: collective index (CI), decennial index (DI). Access points for searching CA indexes- Index guide, general subject, terms, chemical substance names, molecular formulas, ring systems, author names, patent numbers. Locating the reference: finding the abstract, finding the original document chemical abstract - service source index.

UNIT –III: CHOOSING A RESEARCH PROBLEM AND SCIENTIFIC WRITING

Identification of research problem – assessing the status of the problem - guidance from the supervisor – actual investigation and analysis of experimental results – conclusions.
Scientific writing-research reports, thesis, journal articles and books.
Steps to publishing a scientific article in a journal – types of publications-communications, articles, reviews, when to publish, where to publish ,specific format required for submission.
Documenting- Abstracts-indicative (or) descriptive abstracts, informative abstract, footnotes, end notes, referencing styles-bibliography-journal abbreviations (CASSI), abbreviation used in scientific writing.

Unit –IV: INSTRUMENTAL CHARACTERIZATION AND DATA ANALYSIS

Principle and Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD characterization of observed results – Data analysis - Report.
Errors in chemical analysis – classification of errors – determination of accuracy of methods – improving accuracy of analysis – significant figures – mean, standard deviation – comparison of results : “t” test, “f” test, Q test and “chi” square test – rejection of results – presentation of data.

UNIT –V: COMPUTER SEARCHES AND LITERATURE.

ASAP – Alerts, CA Alerts, scifinder, chemport, science direct, STN international, journal home pages. Online browsing of research articles – online submission of research papers in various Journals (ACS, RSC, Elsevier, Springer etc.) –Instructions to the authors – Impact factors.Writing project proposal to funding agencies (UGC, DST etc.).

Course Calendar

Hour allotment	**Class Schedule**
	Odd Semester Begin on 16-06-2017
1-L1	**LITERATURE SURVEY** Source of chemical information
2-L2	primary, secondary, tertiary sources
3- L3	literature survey-Indexes and abstracts in science and technology
4-L4	Applied science and technology index
5-L5	chemical abstracts, chemical titles
6-L6	current chemical reactions, current contents
7-L7	Science citation index.
8-L8	Classical and comprehensive reference works in chemistry
9-L9	synthetic methods and techniques, treatises, reviews, patents and monographs. **-Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis- UNIT - II : CHEMICAL**

	ABSTRACTS: Current awareness searching:
12-P1	**Department function**
13-L11	CA weekly issues, CA issue indexes
14-L12	Retrospective searching: CA volume indexes-general subject index
15-L13	chemical substance index, formula index & index of ring systems,
16-L14	author index, patent index.CA collective indexes: collective index (CI), decennial index (DI).
17-L-15	Access points for searching CA indexes
18-L16	Index guide, general subject, terms
19-L17	chemical substance names, molecular formulas & ring systems
	Entering Internal Test-I Marks into University portal
20-L18	author names & patent numbers
21-P2	**College level meeting/Cell function**
22-L19	Locating the reference: finding the abstract
23-L20	finding the original document chemical abstract
24-L21	**Allotting portion for Internal Test-II-** service source index.
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- UNIT –III: CHOOSING A RESEARCH PROBLEM AND SCIENTIFIC WRITING** Identification of research problem
27-L23	assessing the status of the problem
28-L24	guidance from the supervisor
29-L25	actual investigation and analysis of experimental results – conclusions
30-L26	Scientific writing-research reports
31-L27	thesis, journal articles and books
32-L28	Steps to publishing a scientific article in a journal
33-L29	types of publications-communications, articles, reviews
33-L30	specific format required for submission
35-L31	Documenting- Abstracts-indicative (or) descriptive abstracts, informative abstract, footnotes, end notes
36-L32	referencing styles-bibliography-journal abbreviations (CASSI), abbreviation used in scientific writing.
38-L33	**Unit –IV: INSTRUMENTAL CHARACTERIZATION AND DATA ANALYSIS** Principle of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD
38-L34	Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD
39-L35	characterization of observed results
40-L36	Data analysis - Report.
41-L37	Errors in chemical analysis – classification of errors
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	determination of accuracy of methods – improving accuracy of analysis
44-L39	significant figures – mean, standard deviation – comparison of results
45-L40	**Submission of Assignment/take the seminar**
46-L41	"t" test, "f" test, Q test and "chi" square test
47-L42	rejection of results
48-L43	presentation of data
49-L44	**UNIT –V: COMPUTER SEARCHES AND LITERATURE.** ASAP – Alerts
50-L45	CA Alerts, scifinder, chemport, science direct, STN international, journal home

	pages.
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	Online browsing of research articles
53-L47	online submission of research papers in various Journals (ACS, RSC, Elsevier, Springer etc.)
54-L48	Instructions to the authors – Impact factors.
55-L49	Writing project proposal to funding agencies (UGC, DST etc.).
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "Scientific- Research Methodology - III"
CO1	How will you search the literature
CO2	Explain the sources of literature
CO3	Explain Current awareness searching
CO4	How will you locate the reference in the original document
CO5	How will you Identify a research problem
CO6	What are the steps to publish a scientific article in a journal
CO7	Explain the Principle and Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD.
CO8	Explain the types of Errors in chemical analysis
CO9	Explain the method for Online browsing of research articles
CO10	Write the process involved in writing project proposal to the

	funding agencies
Experimental Learning	
EL1	Find out the method of research literature searching
EL2	To analyse the chemical abstracts
EL3	Preparation & characterisation of samples for various spectroscopic techniques
EL4	Determination of significant figures
Integrated Activity	
IA1	Download journals related to a particular topic.
IA2	Prepare a sample and record its UV-vis spectra and interpret it.

Blended Learning : Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : Use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Advanced Topics in Chemistry-I
Course Code	**PCHE11**
Class	I year (2017-2018)
Semester	Odd
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the need for green chemistry and its contribution towards betterment of environment
- To understand the potential of nanochemistry and different synthetic strategies
- To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
- To get an idea analytical techniques in chemistry
- To understand the potential of solar energy and nuclear energy

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

ADVANCED TOPICS IN CHEMISTRY – I

Unit – I :Green Chemistry

Need of green Chemistry – Anastas twelve principles of green Chemistry – Concept of atom economy – Green Reactions – Microwave assisted reactions – Superiority of microwave exposure over thermal reactions – Functional groups – Transportation – Condensation reactions – Oxidation and reduction reactions.

Unit – II :Nano Chemistry

Definition and terminology of Nano particles and Nano structural materials – Synthesis of Nano particles by Physical approaches (Laser ablation, evaporation and sputtering) and Chemical approaches (reduction of metal ions by Citrate and borohydride, Polyol synthesis) green synthesis – Optical and electronic properties of Nano materials.

Unit – III :Applied electro Chemistry

Principles of Corrosion – Definition – Cost of Corrosion – Electro chemical principles of Corrosion – Corrosion monitoring methods - Coupan (weight loss) – electrical resistance – gasometric – Potentiodynamic polarisation – impedance – hydrogen permeation – Corrosion inhibition – definition – Classification of inhibitors based on electrode process – mechanism of inhibitor action in acidic medium.

Unit – IV :Analytical Chemistry

Principle and Techniques of GC – MS, HPLC, cyclic voltammetry, Coulometry and Amprometry.

Theoretical and practical aspects of Colorimetry analysis - Flame emission and Atomic absorption spectroscopy - Advantages of atomic absorption spectrometry over flame photometry.

Unit – V :Industrial Chemistry

Nuclear fuels for various types of Nuclear reactors – Hydrogen as fuel in the future, Hydrogen storage materials – Solar energy – fuel from Sun light – Splitting of water – Hydrogen from Sun light – Hydrogen economy – Fuel cells – batteries – Photovoltaics – Stealing the Sun.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	**Unit – I :Green Chemistry** Need of green Chemistry
2-L2	Anastas twelve principles of green Chemistry
3- L3	Concept of atom economy
4-L4	Microwave assisted reactions – Superiority of microwave exposure over thermal reactions
5-L5	Functional groups – Transportation
6-L6	Condensation reactions
7-L7	Oxidation and reduction reactions.
8-L8	Green Reactions
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis- Unit – II :Nano Chemistry** Definition and terminology of Nanoparticles and Nanostructural materials
12-P1	**Department function**
13-L11	Synthesis of Nano particles by Physical approaches (Laser ablation)
14-L12	Synthesis of Nano particles by Physical approaches (sputtering)
15-L13	Synthesis of Nano particles by Physical approaches (evaporation)
16-L14	Chemical approaches (reduction of metal ions by Citrate)
17-L-15	Chemical approaches (borohydride, Polyol synthesis)
18-L16	Green synthesis
19-L17	Optical properties of Nano materials
	Entering Internal Test-I Marks into University portal
20-L18	Electronic properties of Nano materials
21-P2	**College level meeting/Cell function**
22-L19	Quantum confinement of charge carriers and optical properties
23-L20	Phonon confinement and specific heat capacity
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- Unit – III :Applied electro Chemistry** Principles of Corrosion – Definition – Cost of Corrosion
27-L23	Electro chemical principles of Corrosion
28-L24	Corrosion monitoring methods
29-L25	Coupan (weight loss)
30-L26	electrical resistance
31-L27	gasometric method
32-L28	Potentiodynamic polarisation - Impedance analysis
33-L29	hydrogen permeation
33-L30	Corrosion inhibition – definition and its impact
35-L31	Classification of inhibitors based on electrode process
36-L32	–mechanism of inhibitor action in acidic medium
38-L33	**Unit – IV :Analytical Chemistry** Principle and Techniques of GC – MS

38-L34	HPLC
39-L35	Cyclic voltammetry
40-L36	Coulometry
41-L37	Amperometry
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Theoretical and practical aspects of Colorimetry analysis
44-L39	Flame emission spectroscopy
45-L40	**Submission of Assignment/take the seminar**
46-L41	Atomic absorption spectroscopy
47-L42	Advantages of atomic absorption spectrometry over flame photometry
48-L43	Overview of the chapter
49-L44	**Unit – V :Industrial Chemistry** Nuclear fuels for various types of Nuclear reactors
50-L45	Hydrogen as fuel in the future
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	Hydrogen storage materials
53-L47	Solar energy – fuel from Sun light
54-L48	Splitting of water – Hydrogen from Sun light – Hydrogen economy
55-L49	Fuel cells – batteries – Photovoltaics – Stealing the Sun
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ADVANCED TOPICS IN CHEMISTRY –I"
CO1	To understand the need for green chemistry and its contribution towards betterment of environment
CO2	To understand the potential of nano chemistry and different synthetic strategies
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the typical p-n junction diode using p-type Cu_2O/n-type ZnO semiconductors
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Synthesize nanomaterial and compare their morphology with different capping agents
IA2	Microwave mediated synthesis of CdO

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-I
Course Code	PCHL11
Class	I year (2017-2018)
Semester	Odd
Staff Name	Dr. C. Joel
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand separation of two components in a mixture.*
- *To understand the analysis of organic compounds*

INORGANIC CHEMISTRY -I

A. Separation of Organic mixture:

(i) Separation of two component mixture and determination of their physical Constants.

(ii) Separation and analysis of at least **six** two component mixture. The students are expected to determine the physical constants for both the components as well as their Derivatives.

(iii) Analysis may be performed in micro (or) macro scale depending upon the Conditions of the laboratory

B. For Class Work Only:

(1) Separation of Caffeine from Tea / Coffee.

(2) Separation of green, blue, red inks by TLC method

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-E1	Separation and analysis of mixture I
2-E2	Separation and analysis of mixture I
3- E3	Separation and analysis of mixture I
4-E4	Separation and analysis of mixture I
5-E5	Separation and analysis of mixture II
6-E6	Separation and analysis of mixture II
7-E7	Separation and analysis of mixture II
8-E8	Separation and analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Separation and analysis of mixture III
16-E11	Separation and analysis of mixture III
17-E-12	Separation and analysis of mixture III
18-E13	Separation and analysis of mixture III
19-E14	Separation and analysis of mixture IV
20-E15	Separation and analysis of mixture IV
21-E16	Separation and analysis of mixture IV
22-E17	Separation and analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Separation and analysis of mixture V
25-E19	Separation and analysis of mixture V
26-E20	Separation and analysis of mixture V
27-E21	Separation and analysis of mixture V
28-E22	Separation and analysis of mixture VI
29-E23	Separation and analysis of mixture VI
30-E24	Separation and analysis of mixture VI
31-E25	Separation and analysis of mixture VI
32-E26	Separation and analysis of mixture VII
33-E27	Separation and analysis of mixture VII
34-E28	Separation and analysis of mixture VII
35-E29	Separation and analysis of mixture VII
36-E30	Separation of Caffeine from Tea / Coffee
37-E31	Separation of Caffeine from Tea / Coffee
38-E32	Separation of Caffeine from Tea / Coffee
39-E33	Separation of Caffeine from Tea / Coffee
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Separation of green, blue, red inks by TLC method
46-E35	Separation of green, blue, red inks by TLC method
47-E36	Separation of green, blue, red inks by TLC method
48-E37	Separation of green, blue, red inks by TLC method
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand different methods of separation of organic compounds
CO2	To separate the components in a mixture
CO3	To analyse the separated organic compounds
CO4	To physical constants of the compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-I
Course Code	PCHL12
Class	I year (2017-2018)
Semester	Odd
Staff Name	1. Dr. S. Asha Jebamary
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of different types of cations*
- *To understand the group separation*

INORGANIC CHEMISTRY -I

Qualitative analysis of inorganic mixture containing two familiar and two less familiar cations Pb, Cu, Bi, Cd, Sb, Zn, Co, Ni, Mn, Ca, Ba, Sr, W, Tl, Te, Se, Mo, Ce, Th, Zr, V, U, Ti and Li.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-E1	Qualitative analysis of mixture I
2-E2	Qualitative analysis of mixture I
3- E3	Qualitative analysis of mixture I
4-E4	Qualitative analysis of mixture I
5-E5	Qualitative analysis of mixture II
6-E6	Qualitative analysis of mixture II
7-E7	Qualitative analysis of mixture II
8-E8	Qualitative analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Qualitative analysis of mixture III
16-E11	Qualitative analysis of mixture III
17-E-12	Qualitative analysis of mixture III
18-E13	Qualitative analysis of mixture III
19-E14	Qualitative analysis of mixture IV
20-E15	Qualitative analysis of mixture IV
21-E16	Qualitative analysis of mixture IV
22-E17	Qualitative analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Qualitative analysis of mixture V
25-E19	Qualitative analysis of mixture V
26-E20	Qualitative analysis of mixture V
27-E21	Qualitative analysis of mixture V
28-E22	Qualitative analysis of mixture VI
29-E23	Qualitative analysis of mixture VI
30-E24	Qualitative analysis of mixture VI
31-E25	Qualitative analysis of mixture VI
32-E26	Qualitative analysis of mixture VII
33-E27	Qualitative analysis of mixture VII
34-E28	Qualitative analysis of mixture VII
35-E29	Qualitative analysis of mixture VII
36-E30	Qualitative analysis of mixture VIII
37-E31	Qualitative analysis of mixture VIII
38-E32	Qualitative analysis of mixture VIII
39-E33	Qualitative analysis of mixture VIII
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Qualitative analysis of mixture IX
46-E35	Qualitative analysis of mixture IX
47-E36	Qualitative analysis of mixture IX
48-E37	Qualitative analysis of mixture IX
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2017

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand familiar cations
CO2	To understand less familiar cations
CO3	To study the group seperation
CO4	To know the confirmatory tests of different cations
CO5	To study the reason behind the results of the experiment

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-I
Course Code	PCHL13
Class	I year (2017-2018)
Semester	Odd
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric titrations*
- *To understand the enthalpy of reactions*

PHYSICAL CHEMISTRY -I

I. Conductometry Conductometric Titrations

a. Estimation of HCl and AcOH in a mixture

b. Estimation of NH4Cl and HCl in a mixture

c. Conductometry- solubility product of sparingly soluble silver salts.

II. Thermometry

a. Determination of Solution enthalpy of

i. oxalic acid-water

ii. ammonium oxalate-water

iii. Potassium dichromate-water

III. Kinetics -Acid hydrolysis of ester –comparison of strength of acids.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-E1	Estimation of HCl and AcOH in a mixture
2-E2	Estimation of HCl and AcOH in a mixture
3- E3	Estimation of HCl and AcOH in a mixture
4-E4	Estimation of HCl and AcOH in a mixture
5-E5	Estimation of NH4Cl and HCl in a mixture
6-E6	Estimation of NH4Cl and HCl in a mixture
7-E7	Estimation of NH4Cl and HCl in a mixture
8-E8	Estimation of NH4Cl and HCl in a mixture
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	- solubility product of sparingly soluble silver salts
16-E11	- solubility product of sparingly soluble silver salts
17-E-12	- solubility product of sparingly soluble silver salts
18-E13	- solubility product of sparingly soluble silver salts
19-E14	Determination of Solution enthalpy of oxalic acid-water
20-E15	Determination of Solution enthalpy of oxalic acid-water
21-E16	Determination of Solution enthalpy of oxalic acid-water
22-E17	Determination of Solution enthalpy of oxalic acid-water
23-P2	**College level meeting/Cell function**
24-E18	Determination of Solution enthalpy of ammonium oxalate-water
25-E19	Determination of Solution enthalpy of ammonium oxalate-water
26-E20	Determination of Solution enthalpy of ammonium oxalate-water
27-E21	Determination of Solution enthalpy of ammonium oxalate-water
28-E22	Determination of Solution enthalpy of Potassium dichromate-water
29-E23	Determination of Solution enthalpy of Potassium dichromate-water
30-E24	Determination of Solution enthalpy of Potassium dichromate-water
31-E25	Determination of Solution enthalpy of Potassium dichromate-water
32-E26	- solubility product of sparingly soluble silver salts
33-E27	- solubility product of sparingly soluble silver salts
34-E28	- solubility product of sparingly soluble silver salts
35-E29	- solubility product of sparingly soluble silver salts
36-E30	Acid hydrolysis of ester –comparison of strength of acids
37-E31	Acid hydrolysis of ester –comparison of strength of acids
38-E32	Acid hydrolysis of ester –comparison of strength of acids
39-E33	Acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Acid hydrolysis of ester –comparison of strength of acids
46-E35	Acid hydrolysis of ester –comparison of strength of acids
47-E36	Acid hydrolysis of ester –comparison of strength of acids
48-E37	Acid hydrolysis of ester –comparison of strength of acids
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2017

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS –I"
CO1	To understand the conductometric titrations
CO2	To understand the enthalpy of reactions
CO3	To study kinetics of acid hydrolysis of ester

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	PCHM11
Class	I year (2017-2018)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reagents.
- To learn the applications of rearrangements.
- To learn the reactions of rearrangements
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
UNIT – I: AROMATICITY AND NOVEL RING SYSTEM

Aromaticity: Benzenoid and non–benzenoid compounds – generations and reactions – sextet theory – MO theory – Huckel's rule – Annulenes and hetero annulenes – Anti and homo aromaticity – Fullerenes.

Novel ring system: Nomenclature of bicyclic and tricyclic systems – structure and synthesis of Adamantane – Congressane – Alternant and non – alternant – Azulene – and sydnones.

UNIT – II: ORGANIC REACTION MECHANISM AND METHODS

Reaction mechanism: Energy diagram of simple Organic reactions – Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions –Baldwin rules for ring closure -Hammond Postulate and microscopic reversibility.

Methods: Kinetic and Thermodynamic control of product formation. Kinetic methods of determination: Rate law – Primary and secondary isotope effect. Non-Kinetic methods of determination: Testing and Trapping of intermediates, isotopic labeling, Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.

UNIT – III: STEREOCHEMISTRY

Concept of chirality: – Enantiotopic, diastereotopic hydrogens and prochiral centres – axial and planar chirality – stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes. R/S notations of Spiranes, allenes and Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds. Stereospecific and stereoselective synthesis – Methods of Asymmetric synthesis including enzymatic and catalytic process – Cram's rule and Prelog's rule – Cram chelation model and Felkin – Ahn model.

UNIT – IV: REARRANGEMENT REACTIONS

Types of rearrangements: Nucleophilic, electrophilic and Free radical and protrophic reactions. **Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements.

Reactions: Carbon to carbon migration: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid, Arndt – Eistert synthesis, Demjanov and dienone-phenol rearrangements.

Carbon to oxygen migration: Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.

Carbon to Nitrogen migration: Lossen, Neber and curtius rearrangements.

Miscellaneous: Von – Richter rearrangement and Fischer - Indole synthesis.

UNIT – V: REAGENTS IN ORGANIC SYNTHESIS

Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) – Selenium dioxide. Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	, **Aromaticity**: Benzenoid compounds
2-L2	and non–benzenoid compounds
3- L3	sextet theory
4-L4	MO theory
5-L5	Huckel's rule
6-L6	Annulenes and hetero annulenes
7-L7	Anti and homo aromaticity – Fullerenes.
8-L8	Nomenclature of bicyclic and tricyclic systems
9-L9	structure and synthesis of Adamantane – Congressane –. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Welcome**
13-L11	**MECHANISM AND METHODS UNIT – II: ORGANIC REACTION**
14-L12	**Reaction mechanism:** Energy diagram of simple Organic reactions
15-L13	Transition state and intermediate.
16-L14	Kinetic and Thermodynamic requirements of reactions
17-L-15	Baldwin rules for ring closure
18-L16	Hammond Postulate and microscopic reversibility.
19-L17	**Methods:** Kinetic and Thermodynamic control of product formation
	Entering Internal Test-I Marks into University portal
20-L18	Kinetic methods of determination: Rate law
21-P2	**College level meeting/Cell function**
22-L19	Primary and secondary isotope effect. Non-Kinetic methods of determination:
23-L20	and Trapping of intermediates, isotopic labeling
24-L21	**Allotting portion for Internal Test-II-** Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: STEREOCHEMISTRY** **Concept of chirality:** – Enantiotopic, diastereotopic hydrogens
27-L23	prochiral centres – axial and planar chirality
28-L24	stereochemistry of compounds containing two dissimilar asymmetric carbons
29-L25	ansa compounds and para cyclophanes.
30-L26	R/S notations of Spiranes, allenes
31-L27	R/S notations of Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds

32-L28	Stereospecific and stereoselective synthesis
33-L29	Methods of Asymmetric synthesis including enzymatic and catalytic process
33-L30	Cram's rule and Prelog's rule
35-L31	Cram chelation model and Felkin – Ahn model.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: REARRANGEMENT REACTIONS** **Types of rearrangements:** Nucleophilic, electrophilic and Free radical and protrophic reactions.
38-L34	**Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements
39-L35	**Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone,
40-L36	Benzil – Benzilic acid, Arndt – Eistert synthesis
41-L37	Demjanov and dienone-phenol rearrangements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	**Carbon to oxygen migration:** Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.
44-L39	**Carbon to Nitrogen migration:**
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lossen, Neber and curtius rearrangements
47-L42	**Miscellaneous:** Von – Richter rearrangement
48-L43	Fischer - Indole synthesis.
49-L44	**UNIT – V: REAGENTS IN ORGANIC SYNTHESIS**
50-L45	Gilman's reagent – LDA**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	DCC – 1,3 – dithane (umpolung synthesis) **Test Paper distribution and result analysis**
53-L47	Selenium dioxide. Fetizon's reagent
54-L48	Lemieux – Von Rudloff reagent
55-L49	Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 31-10-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –I"
CO1	Explain the **Aromaticity**.
CO2	Write the Nomenclature of bicyclic and tricyclic systems
CO3	Understand the Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions
CO4	Write Hammett equation Physical significance of σ and ρ Applications and Limitations Taft equation.
CO5	Understand stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes.
CO6	Write the R/S notations of Spiranes, allenes.
CO7	Explain **Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid,
CO8	Write the Lossen, Neber and curtius rearrangements
CO9	Woodward and prevost hydroxylation. Merrifield resin
CO10	Know the Wilkinson's
Experimental Learning	
EL1	Write the Woodward and prevost hydroxylation. Merrifield resin
EL2	Write the Arndt Eistert synthesis, Demjanov and dienone-phenol rearrangements
EL3	Perform a Cram's rule and Prelog's rule Cram chelation model and Felkin – Ahn model.
EL4	Draw the structure Azulene and sydnones
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry-I
Course Code	PCHM12
Class	I year (2017-2018)
Semester	Odd
Staff Name	1. Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To understand different type of bonds and to study different theories of bonding.*
- *To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.*
- *To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.*
- *To introduce nuclear chemistry and to study the applications of radio isotopes.*
- *To study the extraction of lanthanides and actinides from ores and to understand their properties.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-2/

INORGANIC CHEMISTRY -I

Unit – I: CHEMICAL BONDING

Valence Bond theory: Linear combination of A.O's in hybridization –stereochemistry of the hybrid orbitals –Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory –Walsh diagrams – Bent's rule.

Molecular Orbital theory: symmetry and overlap in M.O's,– σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation) – M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2).

Ionic Bond: Lattice energy –Born-Lande equation, Born Haber cycle –problems involving of calculation of electron affinity and lattice energy–Kapustinskii equation.

Unit – II: REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS

Redox potential: Applications of redox potential to inorganic reactions - factors affecting redox potential.

Acid-Base: Concept of acids and bases, Hard Soft Acid Base (HSAB) concept, symbiosis in hardening or softening a centre - levelling effect - acid-base strength verses HSAB principle.

Non-aqueous solvents: Classification of protic and aprotic solvents. Self ionization and leveling effect.Reactions in non-aqueous solvents - acid-base reactions, complex formation solvolysis, solvation - reactions in liquid ammonia and liquid SO_2.Use of ionic liquids in synthesis.

Unit – III: SOLID STATE CHEMISTRY

Description of crystal structures: calcite, zinc blende, wurtzite, rutile, fluorite, antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite. Crystal defects in solids – line and plane defects – Point defects - Schottky and Frenkel defects – Non-stoichiometric defects – Colour centres – Solid electrolytes and their applications.**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors. **Super conductivity**:High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.

Unit – IV: LANTHANIDES AND ACTINIDES

Correlation of electronic structures, occurrence, extraction from ores and separation methods (Ion exchange and solvent extraction method) and properties of the elements – Chemistry of separation of Pu from U and fission products – Common and uncommon oxidation states – Comparison with transition elements – Lanthanide and actinide contractions – magnetic characteristics of lanthanides and actinides – Similarities between actinides and lanthanides - Use of lanthanide complexes as shift reagents.

UNIT –V: NUCLEAR CHEMISTRY

Atomic nuclei : Nuclear shell structure – nuclear reactions : types, Q-value, threshold energy, cross sections and excitation functions. Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions : neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India.

Radio isotopes: Preparation - Analytical applications - radio chromatography, neutron activation analysis, neutron absorptiometry and radiometric titrations.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	**Unit I – CHEMICAL BONDING** Linear combination of A.O's in hybridization – stereochemistry of the hybrid orbitals
2-L2	Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory
3- L3	Walsh diagrams – Bent's rule
4-L4	symmetry and overlap in M.O's – σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation)
5-L5	M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2)
6-L6	Lattice energy –Born-Lande equation
7-L7	Born Haber cycle –problems involving of calculation of electron affinity and lattice energy
8-L8	Kapustinskii equation.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis- Unit II – REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS** **Redox potential:** Applications of redox potential to inorganic reactions
12-P1	**Department function**
13-L11	Concept of acids and bases, Hard Soft Acid Base (HSAB) concept
14-L12	symbiosis in hardening or softening a centre - levelling effect
15-L13	acid-base strength verses HSAB principle
16-L14	**Heterogeneous catalysis:** synthesis gas and water gas shift reactions;
17-L-15	Classification of protic and aprotic solvents
18-L16	Self ionization and leveling effect
19-L17	Reactions in non-aqueous solvents
	Entering Internal Test-I Marks into University portal
20-L18	acid-base reactions, complex formation solvolysis, solvation
21-P2	**College level meeting/Cell function**
22-L19	reactions in liquid ammonia and liquid SO_2
23-L20	Use of ionic liquids in synthesis
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- UNIT-III: SOLID STATE CHEMISTRY**: **Description of crystal structures**: calcite, zinc blende, wurtzite
27-L23	rutile, fluorite, antifluorite
28-L24	CsCl, CdI_2, K_2NiF_4
29-L25	spinels and perovskite
30-L26	Crystal defects in solids – line and plane defects
31-L27	Point defects - Schottky and Frenkel defects
32-L28	Non-stoichiometric defects – Colour centres
33-L29	Solid electrolytes and their applications
33-L30	**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors

35-L31	**Super conductivity**: High temperature super conductors, properties and applications
36-L32	**Allotting portion for Assignment/seminar -** BCS theory – Cooper electrons – Meissner effect and levitation
38-L33	**UNIT – IV: LANTHANIDES AND ACTINIDES** Correlation of electronic structures, occurrence, extraction from ores
38-L34	separation methods (Ion exchange and solvent extraction method) and properties of the elements
39-L35	Chemistry of separation of Pu from U and fission products
40-L36	Common and uncommon oxidation states
41-L37	Comparison with transition elements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Lanthanide and actinide contractions
44-L39	magnetic characteristics of lanthanides and actinides
45-L40	**Submission of Assignment/take the seminar**
46-L41	Similarities between actinides and lanthanides
47-L42	Use of lanthanide complexes as shift reagents
48-L43	Overview of the chapter
49-L44	**UNIT -V : NUCLEAR CHEMISTRY** **Atomic nuclei** : Nuclear shell structure
50-L45	Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions - neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	Nuclear fusion and stellar energy - nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons
53-L47	Theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India
54-L48	Preparation - Analytical applications - radio chromatography
55-L49	neutron activation analysis, neutron absorptiometry and radiometric titrations.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY –I”
CO1	To understand different type of bonds and to study different theories of bonding.
CO2	To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.
CO3	To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.
CO4	To introduce nuclear chemistry and to study the applications of radio isotopes.
CO5	To study the extraction of lanthanides and actinides from ores and to understand their properties.
Experimental Learning	
EL1	Electrochemical series was used to construct redox couple forming different Galvanic cells.
EL2	Qualitative analyses of selected Lanthanides and Actinides were performed
EL3	Synthesize Oxygen deficient ZnO to illustrate metal excess defect
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Prepare zinc blende phase of ZnS and characterize by XRD
IA2	Prepare a mini-model to illustrate Meissner effect (Magnetic Levitation)

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-I
Course Code	PCHM13
Class	I year (2017-2018)
Semester	Odd
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of Partial molar properties, fugacity and activity

To apply phase rule for three component system

To understand the Principles of Thermodynamics of irreversible processes

To understand Quantum mechanics and Statistical Thermodynamics

To understand the importance of rotational spectroscopy

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-3/

PHYSICAL CHEMISTRY -I

UNIT-I

Thermodynamics

Concepts of Partial molar properties – Partial molar free energy, chemical potential, partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature and Variation

of Chemical Potentialwith pressure. Determination of partial molar volume: Graphical method, intercept method and Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method, Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity. Activity and activity coefficient: Defi nition of activity and activity coefficient, determination of activity coefficient by EMF and solubility method. Thermodynamics of non ideal system-Excess thermodynamic function, GE, SE, HE etc.

UNIT-II

Phase Rule & Thermodynamics of irreversible processes:

Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule, Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system. Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.

Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance.Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility, the Onsager reciprocal relations- Validity and Verification. Thermal osmosis,Thermoelectric phenomena-Electro kinetic and thermo mechanical effects. Application of irreversible thermodynamics to biological and non-linear systems.

UNIT-III

Quantum Chemistry

Inadequacy of classical mechanics, Black body radiation, Planck's quantum theory, Photoelectric effect. Bohr's theory of hydrogen atom :Hydrogen spectra, wave particle duality – uncertainty principle. Operators- Linear, differential, Laplacian, Hermitian and Hamiltonian operators angular momentum operator. Eigen functions and Eigen values. commutation relations, related theorems,simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and (Lx, $L_{y)}$] and their significance. Commutation relations, related theorems.Time-dependent and time-independent Schrödinger wave equations – Postulates of quantum mechanics.

UNIT-IV Statistical thermodynamics

Concept of thermodynamics and mathematical probabilities – Micro and macro state - phase space – Maxwell – Boltzmann, Bose – Einstein statistics and Fermi –

Dirac statistics – comparison and applications – modes of contribution to energy. Partition functions. Separation of partition functions. Translational, rotational, vibrational and electronic partition functions. Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure, Gibbs function, residual entropy, equilibrium constant, average energies. Equipartition theorem.Statistical approach to Heat capacity of mono and diatomic gases.Heat capacity of solids- Einstein and Debye models.

UNIT-V: MOLECULAR SPECTROSCOPY

Introduction and Rotational Spectroscopy

Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio; width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle; intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients, Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines, select ion rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	**UNIT-I Thermodynamics:** Concepts of Partial molar properties – Partial molar free energy, chemical potential
2-L2	partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature
3- L3	Variation of Chemical Potentialwith pressure
4-L4	Determination of partial molar volume: Graphical method, intercept method
5-L5	Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method
6-L6	Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity
7-L7	. Activity and activity coefficient: Defi nition of activity and activity coefficient,
8-L8	Determination of activity coefficient by EMF and solubility method. Thermodynamics of non- ideal system-Excess thermodynamic function, GE, SE, HE etc.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (31.07.2017)**
11-L10	**Test Paper distribution and result analysis- Unit II – Phase Rule & Thermodynamics of irreversible processes**: Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule
12-P1	**Department function**
13-L11	Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system.
14-L12	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
15-L13	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
16-L14	Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance
17-L-15	Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility
18-L16	the Onsager reciprocal relations- Validity and Verification
19-L17	Thermal osmosis,Thermoelectric phenomena-
	Entering Internal Test-I Marks into University portal
20-L18	Electro kinetic and thermo mechanical effects
21-P2	**College level meeting/Cell function**
22-L19	Application of irreversible thermodynamics to biological systems
23-L20	Application of irreversible thermodynamics to non-linear systems
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (30.08.2017)**
26-L22	**Test Paper distribution and result analysis- UNIT-III Quantum Chemistry** Inadequacy of classical mechanics, Black body radiation, Planck's quantum theory
27-L23	Photoelectric effect. Bohr's theory of hydrogen atom

28-L24	Hydrogen spectra, wave particle duality – uncertainty principle.
29-L25	Operators- Linear, differential, Laplacian
30-L26	Hermitian and Hamiltonian operators angular momentum operator
31-L27	Eigen functions and Eigen values. commutation relations
32-L28	simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and their significance
33-L29	simultaneous measurement of several properties : evaluation of commutators such (Lx, $L_{y)}$] and their significance
33-L30	Commutation relations, related theorems.
35-L31	Time-dependent and time-independent Schrödinger wave equations
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV Statistical thermodynamics**
38-L34	Concept of thermodynamics and mathematical probabilities – Micro and macro state
39-L35	phase space – Maxwell – Boltzmann statistics
40-L36	Bose-Einstein statistics
41-L37	Fermi-Dirac statistics
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Comparison and applications – modes of contribution to energy
44-L39	Partition functions. Separation of partition functions
45-L40	**Submission of Assignment/ seminar**
46-L41	Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure
47-L42	Gibbs function, residual entropy, equilibrium constant, average energies
48-L43	Equipartition theorem. Statistical approach to Heat capacity of mono and diatomic gases. Heat capacity of solids- Einstein and Debye models.
49-L44	**UNIT-V: MOLECULAR SPECTROSCOPY** **Introduction and Rotational Spectroscopy**
50-L45	Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio
51-IT-III	**Internal Test-III (03.10.2017)**
52-L46	width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle;
53-L47	intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients
54-L48	Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines
55-L49	selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19.10.2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper**

	discussion
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	To learn the concept of Partial molar properties, fugacity and activity
CO2	To apply phase rule for three component system
CO3	To understand the Principles of Thermodynamics of irreversible processes
CO4	To understand Quantum mechanics and Statistical Thermodynamics
CO5	To understand the importance of rotational spectroscopy
Experimental Learning	
EL1	To calculate the bond length of microwave active compounds from microwave spectroscopy
EL2	To calculate the force constant of IR active molecules and comparison with bond energy
Integrated Activity	
IA1	Phase diagram between water, acetone and ethanol is analysed
IA2	Prepare a mini-model to illustrate Thermoelectric effect.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	KCHL41
Class	II year (2017-2018)
Semester	Even
Staff Name	Dr. R. BIJU BENNIE
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimation of organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL - IV

A. List of Estimations

1. Ethyl methyl ketone
2. Glucose-Lane Eynon and method
3. Glucose-Bertrand‟s method
4. Saponification value of oil
5. Iodine value of oil
6. Determination of Percentage purity in an unsaturated acid.
7. Purity of Glucose

B. List of Two stage preparations

1. Benzaldehyde Benzoic acid m-nitro benzoic acid
2. Acetanilide p-acetanilide p-Bromoaniline
3. Methyl benzoate m-nitro methyl benzoate m-nitro benzoic acid
4. Acetanilide p-nitro acetanilide p - nitroaniline
5. Benzophenone Benzo phenone oxime Benzanilide
6. Benzophenone Benzpinacol Benzpinacolone
7. Phthalic acid Phthalic anhydride Phthalimide

8. Thiourea s-benzyl isothiuronium chloride s- Benzyl-isothiuronium benzoate
9. Aniline Tri bromoaniline Sym-Tribromobenzene

Students are expected to submit at the time of practical examination at least eight recrystallised samples of the final products, for evaluation by the examiners.

C. For Class Work Only

(I) Chromatographic techniques

1. TLC of Nitroaniline
2. TLC of Analgesic Drug
3. Column Chromatography-Separation of leaf pigments
4. Paper Chromatography-Analysis of Inks and Dyes

(II)Spectral analysis:

5. Interpretation of H 1 NMR spectra of pure ethyl alcohol and aqueous ethyl alcohol.
6. DEPT spectra of isopentyl acetate.
7. Mass spectrum of Anisole, Phenol and Crotonaldehyde

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 07-12-2017
1-E1	Estimation of Ethyl methyl ketone
2-E2	Estimation of Ethyl methyl ketone
3- E3	Estimation of Glucose-Lane Eynon and method
4-E4	Estimation of Glucose-Lane Eynon and method
5-E5	Estimation of Glucose-Bertrand‟s method
6-E6	Estimation of Glucose-Bertrand‟s method
7-E7	Saponification value of oil
8-E8	Saponification value of oil
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Iodine value of oil
16-E11	Iodine value of oil
17-E-12	Determination of Percentage purity in an unsaturated acid
18-E13	Purity of Glucose
19-E14	Benzaldehyde Benzoic acid m-nitro benzoic acid
20-E15	Benzaldehyde Benzoic acid m-nitro benzoic acid
21-E16	Acetanilide p-acetanilide p-Bromoaniline
22-E17	. Methyl benzoate m-nitro methyl benzoate m-nitro benzoic acid
23-P2	**College level meeting/Cell function**
24-E18	Acetanilide p-nitro acetanilide p - nitroaniline
25-E19	Benzophenone Benzo phenone oxime Benzanilide
26-E20	Benzophenone Benzpinacol Benzpinacolone
27-E21	Benzophenone Benzpinacol Benzpinacolone

28-E22	Phthalic acid Phthalic anhydride Phthalimide
29-E23	Phthalic acid Phthalic anhydride Phthalimide
30-E24	Thiourea s-benzyl isothiuronium chloride s- Benzyl-isothiuronium benzoate
31-E25	Thiourea s-benzyl isothiuronium chloride s- Benzyl-isothiuronium benzoate
32-E26	Aniline Tri bromoaniline Sym-Tribromobenzene
33-E27	Aniline Tri bromoaniline Sym-Tribromobenzene
34-E28	TLC of Nitroaniline
35-E29	TLC of Nitroaniline
36-E30	TLC of Analgesic Drug
37-E31	Column Chromatography-Separation of leaf pigments
38-E32	Column Chromatography-Separation of leaf pigments
39-E33	Interpretation of H 1 NMR spectra of pure ethyl alcohol and aqueous ethyl alcohol
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	. DEPT spectra of isopentyl acetate
46-E35	. DEPT spectra of isopentyl acetate
47-E36	Mass spectrum of Anisole, Phenol and Crotonaldehyde
48-E37	Mass spectrum of Anisole, Phenol and Crotonaldehyde
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY PRACTICALS–II”
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	KCHL42
Class	II year (2017-2018)
Semester	Even
Staff Name	1. Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand gravimetric estimations of Cations*
- *To understand the inorganic preparations*

INORGANIC CHEMISTRY PRACTICAL - II

I . Quantitative estimation of a mixture containing two metal ions (Volumetric and Gravimetric Estimations).

1. Estimation of Cu2+ and Ni2+ ions.
2 . Estimation of Cu2+ and Zn2+ ions.
3 . Estimation of Fe2+ and Cu2+ ions
4 . Estimation of Fe2+ and Ni2+ ions .
5. Estimation of Ca2+ and Mg2+ ions.
6. Estimation of Ca2+ and Ba2+ ions .
7. Analysis of ores and alloys (course work only)

Note: For examination, a mixture may be given from which one cation is to be estimated volumetrically and the other gravimetrically .

II . Preparation of single stage inorganic complexes (a minimum of 10 complexes).

Note : Characterisation of any two metal complex prepared during the practicals by UV or IR spectral techniques (course work only)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-E1	Estimation of Cu^{2+} and Ni^{2+} ions
2-E2	Estimation of Cu^{2+} and Ni^{2+} ions
3- E3	Estimation of Cu^{2+} and Ni^{2+} ions
4-E4	Estimation of Cu^{2+} and Ni^{2+} ions
5-E5	Estimation of Cu^{2+} and Zn^{2+} ions.
6-E6	Estimation of Cu^{2+} and Zn^{2+} ions.
7-E7	Estimation of Cu^{2+} and Zn^{2+} ions.
8-E8	Estimation of Cu^{2+} and Zn^{2+} ions.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	. Estimation of Fe^{2+} and Cu^{2+} ions
16-E11	. Estimation of Fe^{2+} and Cu^{2+} ions
17-E-12	. Estimation of Fe^{2+} and Cu^{2+} ions
18-E13	. Estimation of Fe^{2+} and Cu^{2+} ions
19-E14	Estimation of Fe^{2+} and Ni^{2+} ions
20-E15	Estimation of Fe^{2+} and Ni^{2+} ions
21-E16	Estimation of Fe^{2+} and Ni^{2+} ions
22-E17	Estimation of Fe^{2+} and Ni^{2+} ions
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Ca^{2+} and Mg^{2+} ions
25-E19	Estimation of Ca^{2+} and Mg^{2+} ions
26-E20	Estimation of Ca^{2+} and Mg^{2+} ions
27-E21	Estimation of Ca^{2+} and Mg^{2+} ions
28-E22	Estimation of Ca^{2+} and Ba^{2+} ions
29-E23	Estimation of Ca^{2+} and Ba^{2+} ions
30-E24	Estimation of Ca^{2+} and Ba^{2+} ions
31-E25	Estimation of Ca^{2+} and Ba^{2+} ions
32-E26	Analysis of ores and alloys
33-E27	Analysis of ores and alloys
34-E28	Analysis of ores and alloys
35-E29	Analysis of ores and alloys
36-E30	Preparation of single stage inorganic complexes
37-E31	Preparation of single stage inorganic complexes
38-E32	Preparation of single stage inorganic complexes
39-E33	Preparation of single stage inorganic complexes
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Preparation of single stage inorganic complexes
46-E35	Preparation of single stage inorganic complexes
47-E36	Preparation of single stage inorganic complexes
48-E37	Preparation of single stage inorganic complexes
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand gravimetric tirations
CO2	To understand inorganic preparations

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-II
Course Code	KCHL43
Class	II year (2017-2018)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand potentiometric titrations.*
- *To understand the adsorption and kinetics of reactions.*

PHYSICAL CHEMISTRY PRACTICAL - II

I. Potentiometric titrations- (a) Acid alkali titrations.

b) Precipitation titrations (a) Mixture of Cland I vs Ag+

(c) Redox titrations

(a) Fe2+ vs Cr2O7 2-

(b) Fe2+ vs Ce4+

(c) I - vs KMnO4

(d) Determination of dissociation constant of weak acids

(e) Determination of solubility product of sparingly soluble silver salts.

(f) Determination of activity and activity coefficient of ions.

(g) Determination of pH of a buffer solution using a quin hydrone electrode.

II. Titration using pH meter

(a) Determination of dissociation constant of dibasic acid.

III. Freundlich Adsorption isotherm

(a) Determination of dissociation constant of dibasic acid.

IV. Kinetic studies

(a) Kinetics –acid hydrolysis of ester –comparison of strength of acids.

(b) Kinetics –Persulfate –Iodide –clock reaction-primary salt effect.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 07-12-2017
1-E1	Potentiometric titrations- (a) Acid alkali titrations.
2-E2	Potentiometric titrations- (a) Acid alkali titrations.
3- E3	Potentiometric titrations- (a) Acid alkali titrations.
4-E4	Potentiometric titrations- (a) Acid alkali titrations.
5-E5	Precipitation titrations (a) Mixture of Cland I vs Ag+
6-E6	Precipitation titrations (a) Mixture of Cland I vs Ag+
7-E7	Precipitation titrations (a) Mixture of Cland I vs Ag+
8-E8	Precipitation titrations (a) Mixture of Cland I vs Ag+
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Fe2+ vs Cr2O7 2-
16-E11	Fe2+ vs Cr2O7 2-
17-E-12	Fe2+ vs Ce4+
18-E13	Fe2+ vs Ce4+
19-E14	I - vs KMnO4
20-E15	I - vs KMnO4
21-E16	Determination of dissociation constant of weak acids
22-E17	Determination of dissociation constant of weak acids
23-P2	**College level meeting/Cell function**
24-E18	Determination of solubility product of sparingly soluble silver salts
25-E19	Determination of solubility product of sparingly soluble silver salts
26-E20	Determination of activity and activity coefficient of ions
27-E21	Determination of activity and activity coefficient of ions
28-E22	Determination of pH of a buffer solution using a quin hydrone electrode
29-E23	Determination of pH of a buffer solution using a quin hydrone electrode
30-E24	Determination of pH of a buffer solution using a quin hydrone electrode
31-E25	Determination of pH of a buffer solution using a quin hydrone electrode
32-E26	Determination of dissociation constant of dibasic acid
33-E27	Determination of dissociation constant of dibasic acid
34-E28	Determination of dissociation constant of dibasic acid
35-E29	Determination of dissociation constant of dibasic acid
36-E30	Kinetics –acid hydrolysis of ester –comparison of strength of acids
37-E31	Kinetics –acid hydrolysis of ester –comparison of strength of acids
38-E32	Kinetics –acid hydrolysis of ester –comparison of strength of acids
39-E33	Kinetics –acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
46-E35	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
47-E36	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
48-E37	Kinetics –Persulfate –Iodide –clock reaction-primary salt effect
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–II"
CO1	To understand the potentiometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-IV
Course Code	KCHM41
Class	II year (2017-2018)
Semester	Even
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reterosynthesis.
- To learn the reterosynthetic path of certain compounds.
- To learn the reactions of reagents.
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

ORGANIC CHEMISTRY -IV

UNIT-I : REACTION UNDER INTERMEDIATE CHEMISTRY

Reaction Under Carbanion Intermediate: Stobbe, Darzen, acyloin condensation Shapiro reaction and Julia olefination. Reaction through carbene intermediate: Bamford – Stevens, Reimer- Tiemann reactions. Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation, Baeyer-villiger oxidation. Reaction following Radical intermediate: Mc Murray coupling, Gomberg-Pechmann and Pschorr reactions. Reaction involving Ylide intermediate: Wittig reaction and Peterson olefination.

UNIT-II : CONFORMATIONAL ANALYSIS

Conformation and configuration-conformational free energy-conformational analysis of mono substituted (alkyl, halogens) and 1,1-disubstituted (alkyl) and 1,2-1,3-and 1,4-dimethyl substituted cyclohexanes -compounds existing in boat form-conformation of cyclohexanone, decalin and perhydrophenanthrene-Curtin-Hammett principle- conformation and reactivity of acyclic and cyclic compounds (6membered).

UNIT-III : RETEROSYNTHETIC ANALYSIS

Synthon-synthetic equivalent-Functional group interconversions -use of protecting groups for alcohols, amines, acids, carbonyl compounds- use of activating and blocking groups-Robinson annulations reaction-carbon skeletal complexity-Role of key intermediates in organic synthesis. Reterosynthetic analysis of the following compounds: Twistane, cis -Jasmone, Baclofen, Trihexyl phenydyl, S-propanediol, Isonootkatone, cascarillic acid, camphor and 2,4-dimethyl-2-hydroxy pentanoic acid.

UNIT-IV : REAGENTS IN ORGANIC SYNTHESIS

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), DMSO, Super hydrides- Dess-martin-periodinane-Osmium tetra oxide.

Modern Reagents: Introductory treatment of the application of silicon (Tri alkyl silyl halides, organo silanes), Boron (9 – BBN, borane, and alkyl borane), phosphorus (phosphoranes), palladium(Still coupling, Suzuki Coupling, Heck and Negishi reactions) samarium(SmI2), ruthenium(RuO2,Ru-Binap Complex), platinum(PtO2, Adam’s Catalyst) reagents in organic synthesis.

UNIT-V : STEROID

Classification- structural elucidation of cholesterol, irradiated products of ergosterol. Conversion of cholesterol to androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid. Conversion of Oestrone to Oestriol, Oestrodiol and vice-versa. Conformational structure of cholestane and Coprostane. General study of Bile acids and Prostoglandins.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-L1	Unit-I : Reaction under Intermediate chemistry Reaction Under Carbanion Intermediate: Stobbe, Darzen,
2-L2	acyloin condensation Shapiro reaction
3- L3	Julia olefination
4-L4	Reaction through carbene intermediate: Bamford – Stevens
5-L5	Reimer- Tiemann reactions.
6-L6	Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation
7-L7	Baeyer-villiger oxidation
8-L8	Reaction following Radical intermediate: Mc Murray coupling, Gomberg-Pechmann and Pschorr reactions.
9-L9	Reaction involving Ylide intermediate: Wittig reaction. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (22.01.2018)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Department function**
13-L11	Unit-II : Conformational analysis – Conformation and configuration-conformational free energy-conformational analysis of mono substituted (alkyl, halogens)
14-L12	1,1-disubstituted (alkyl)
15-L13	1,2-1,3-and 1,4-dimethyl substituted cyclohexanes
16-L14	compounds existing in boat form
17-L-15	conformation of cyclohexanone
18-L16	decalin
19-L17	perhydrophenanthrene
	Entering Internal Test-I Marks into University portal
20-L18	Curtin-Hammett principle
21-P2	**College level meeting/Cell function**
22-L19	conformation and reactivity of acyclic compounds
23-L20	conformation and reactivity of cyclic compounds
24-L21	**Allotting portion for Internal Test-II-** Brief outlook of conformational analysis
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis**- Unit-III : Reterosynthetic analysis Synthon and synthetic equivalent
27-L23	Functional group interconversions
28-L24	use of protecting groups for alcohols, amines, acids, carbonyl compounds
29-L25	use of activating and blocking groups
30-L26	Robinson annulations reaction
31-L27	carbon skeletal complexity-Role of key intermediates in organic synthesis
32-L28	Reterosynthetic analysis of Twistane, cis - Jasmone,
33-L29	Reterosynthetic analysis of Baclofen, Trihexyl phenydyl, S-propanediol
33-L30	Reterosynthetic analysis of Isonootkatone, cascarillic acid
35-L31	Reterosynthetic analysis of camphor and 2,4-dimethyl-2-hydroxy pentanoic acid
36-L32	**Allotting portion for Assignment/seminar**

38-L33	Unit-IV : Reagents in organic synthesis 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ),
38-L34	Super hydrides- Dess-martin-periodinane-Osmium tetra oxide.
39-L35	Modern Reagents: Introductory treatment of the application of silicon (Tri alkyl silyl halides, organo silanes),
40-L36	Boron (9 – BBN, borane, and alkyl borane),
41-L37	phosphorus (phosphoranes),
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	palladium(Still coupling, Suzuki Coupling, Heck and Negishi reactions)
44-L39	samarium(SmI2),
45-L40	**Submission of Assignment/take the seminar**
46-L41	ruthenium(RuO2,Ru-Binap Complex),
47-L42	platinum(PtO2, Adam’s Catalyst) reagents in organic synthesis.
48-L43	DMSO
49-L44	Unit-V : Steroid Classification
50-L45	structural elucidation of cholesterol**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	irradiated products of ergosterol **Test Paper distribution and result analysis**
53-L47	Conversion of cholesterol to androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid
54-L48	Conversion of Oestrone to Oestriol, Oestrodiol and vice-versa
55-L49	Conformational structure of cholestane and Coprostane. General study of Bile acids and Prostoglandins.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –IV”
CO1	Explain the reactions of intermediates.
CO2	Write the mechanism of reactions involving intermediates.
CO3	Understand the conformers of certain compounds
CO4	Write the stable conformers
CO5	Understand how reterosynthesis is performed.
CO6	Write the reterosynthetic approach of certain compounds.
CO7	Explain the role of reagents.
CO8	Ability to write the various reactions of reagents.
CO9	Able to elucidate the structure of steroids
CO10	Know the structure of certain steroids
Experimental Learning	

EL1	Write the stable conformers of certain molecules
EL2	Write the protecting groups for some given functional groups
EL3	Perform a synthetic reaction involving DMSO
EL4	Draw the structure of cholesterol
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-IV
Course Code	KCHM42
Class	II year (2017-2018)
Semester	Even
Staff Name	1. Dr. C. JOEL
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To study the applications of Mossbauer spectroscopic techniques in Iron and Tin based compounds.
- To study the applications of Mossbauer spectra of in Bio-inorganic systems.
- To study the applications of ORD and CD to determine absolute configuration of chelate complexes.
- To study the applications of photoelectron and nuclear quadrupole resonance spectroscopic techniques for inorganic compounds.
- To introduce bioinorganic chemistry and its applications
- To study the role of metalloporphrins and metalloenzymes in various biological processes.
- To give an insight into material science.

INORGANIC CHEMISTRY -IV

UNIT - I : SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – II

Mossbauer spectroscopy: Principle – isomer shift (IS) – splitting of resonance lines: quadrupole splitting and magnetic hyperfine splitting. Applications: MB spectra of iron compounds/complexes – structural elucidation, π- bonding effect, determination of high spin and low spin, spin state crossover and cis–trans isomers – nature of the complexes – mixed valence complexes. Tin compounds: MB spectra of Sn(II) and Sn(IV) compounds, oxidation states of Sn in its different compounds. Applications in bioinorganic chemistry: oxy and deoxy- hemerythrin - catalase, peroxidases, Fe-S protein systems.

ORD AND CD - Optical isomerism in octahedral complexes – absolute configuration of chelate complexes from ORD and CD.

UNIT - II: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – III

Photo electron spectroscopy: Theory – types of PES –origin of fine structures – adiabatic and vertical transitions – PE spectra of homonuclear diatomic molecules (N_2, O_2) – hetero nuclear diatomic molecule (CO) – polyatomic molecules (H_2O, CO_2, CH_4, NH_3). Evaluation of vibrational constant – Koopman's theorem – application and limitation of the theorem. XPS (ESCA): structure of N_3^- ion, CCl_3CH_3, N (1s) spectrum of $[Co(en)_2(NO)_2]NO_3$, C(1s) spectrum of $C_2H_5COOCF_3$. Shake-up and shake-off processes – Structural and bonding information in metal carbonyls – Auger electron spectroscopy.

NQR spectroscopy: Applications – fingerprint technique. Investigating the electronic structure of molecules – information about EFG of nuclei – ionic character and hybridization of the bonds – structure of charge transfer complexes – Phase transition – hydrogen bonding.

Unit - III: BIOINORGANIC CHEMISTRY - I

Non-metals and metals in biological systems, essential and trace elements; classification of metallo-biomolecules, coordination environment and entatic state. Metalloporphyrins – chlorophyll and photosynthesis; cytochromes, hemoglobin, myoglobin and dioxygen binding, vitamin B_{12} and co-enzyme – *in vivo* and *in vitro* nitrogen fixation. Iron storage and transport: ferritin, transferrins and siderophores, iron proteins: hemerythrin, cytochrome P450 enzyme, ferredoxin and rubredoxin.

Unit - IV: BIOINORGANIC CHEMISTRY - II

Copper proteins and Enzymes : plastocyanin, azurin, hemocyanin and ascorbic oxidase – different types of Cu present in proteins and enzymes. Zinc enzymes: carboxypeptidase A, carbonic anhydrase and superoxide dismutase. Inhibition and poisoning of enzymes illustrated by xanthine oxidase and aldehyde oxidase. Toxicity of metals and the role of metallothionins – excess and deficient levels of Cu and Fe and the consequent diseases – chelate therapy – metal complexes as drugs, anticancer and antiarthritic agents. Metal complexes as probes of nucleic acids.

UNIT – V: CHEMISTRY OF INORGANIC MATERIALS

Synthesis of inorganic materials – High temperature ceramic methods – Co-Precipitation and Precursor Methods – Combustion synthesis – High temperature reactions – precipitation, gel, solution and hydrothermal methods – Synthesis in sealed tubes and special atmospheres – Low temperature methods – Chemical Vapour Deposition (CVD) – Preparing single crystals -Epitaxy methods – Chemical Vapour Transport - Solution Methods. Insertion compounds of metal oxides – Intercalation compounds of graphite and transition metal disulphides. Zeolites: structures and properties – pillared clays – fullerenes and fullerides.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-L1	**Mossbauer spectroscopy** : Principle – isomer shift (IS) – splitting of resonance lines:
2-L2	quadrupole splitting and magnetic hyperfine splitting.
3- L3	Applications: MB spectra of iron compounds/complexes.
4-L4	structural elucidation, π- bonding effect, determination of high spin and low spin by MB spectroscopy.
5-L5	Determination of Spin state crossover, nature of the complexes – mixed valence complexes and cis–trans isomers by MB spectroscopy.
6-L6	Tin compounds: MB spectra of Sn(II) and Sn(IV) compounds, oxidation states of Sn in its different compounds.
7-L7	Applications in bioinorganic chemistry: oxy and deoxy- hemerythrin - catalase, peroxidases Fe-S protein systems.
8-L8	**ORD AND CD -** Optical isomerism in octahedral complexes.
9-L9	Absolute configuration of chelate complexes from ORD and CD-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (22.01.2018)**
11-L10	**Test Paper distribution and result analysis- UNIT - II: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – III Photo electron spectroscopy:** Theory – types of PES –origin of fine structures
12-P1	**Department function**
13-L11	Adiabatic and vertical transitions – PE spectra of homonuclear diatomic molecules (N_2, O_2) – hetero nuclear diatomic molecule (CO) – polyatomic molecules (H_2O, CO_2, CH_4, NH_3).
14-L12	Evaluation of vibrational constant – Koopman's theorem – application and limitation of the theorem.
15-L13	XPS (ESCA): structure of N_3^- ion, CCl_3CH_3, N (1s) spectrum of $Co(en)_2(NO)_2]NO_3$, C(1s) spectrum of $C_2H_5COOCF_3$.
16-L14	Shake-up and shake-off processes
17-L-15	Structural and bonding information in metal carbonyls
18-L16	Auger electron spectroscopy.
19-L17	**NQR spectroscopy:** Applications – fingerprint technique.
	Entering Internal Test-I Marks into University portal
20-L18	Investigating the electronic structure of molecules – information about EFG of nuclei
21-P2	**College level meeting/Cell function**
22-L19	Ionic character and hybridization of the bonds
23-L20	Structure of charge transfer complexes
24-L21	**Allotting portion for Internal Test-II-** Phase transition – hydrogen bonding.
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis- Unit - III: BIOINORGANIC CHEMISTRY – I** Non-metals and metals in biological systems, essential and trace elements;
27-L23	Classification of metallo-biomolecules,
28-L24	Coordination environment and entatic state.

29-L25	Metalloporphyrins – chlorophyll and photosynthesis;
30-L26	Structure of Cytochromes
31-L27	Structure of hemoglobin, myoglobin and dioxygen binding
32-L28	Structure of vitamin B_{12} and co-enzyme
33-L29	*in vivo* and *in vitro* nitrogen fixation
33-L30	Iron storage and transport: ferritin, transferrins and siderophores,
35-L31	iron proteins: hemerythrin, cytochrome P450 enzyme
36-L32	Ferredoxin and rubredoxin-**Allotting portion for Assignment/seminar**
38-L33	**Unit - IV: BIOINORGANIC CHEMISTRY – II** Copper proteins and Enzymes :
38-L34	Plastocyanin, azurin, hemocyanin and ascorbic oxidase
39-L35	Different types of Cu present in proteins and enzymes.
40-L36	Zinc enzymes: carboxypeptidase A, carbonic anhydrase and superoxide dismutase.
41-L37	Inhibition and poisoning of enzymes illustrated by xanthine oxidase and aldehyde oxidase.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Toxicity of metals and the role of metallothionins
44-L39	Excess and deficient levels of Cu and Fe and the consequent diseases
45-L40	**Submission of Assignment/take the seminar**
46-L41	Chelation therapy
47-L42	Metal complexes as drugs, anticancer and antiarthritic agents
48-L43	Metal complexes as probes of nucleic acids.
49-L44	**UNIT – V : CHEMISTRY OF INORGANIC MATERIALS** Synthesis of inorganic materials
50-L45	High temperature ceramic methods – Co-Precipitation and Precursor Methods
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	Combustion synthesis – High temperature reactions – precipitation, gel, solution and hydrothermal methods
53-L47	Synthesis in sealed tubes and special atmospheres – Low temperature methods – Chemical Vapour Deposition (CVD)
54-L48	Preparing single crystals -Epitaxy methods – Chemical Vapour Transport - Solution Methods. Insertion compounds of metal oxides- Intercalation compounds of graphite and transition metal disulphides.
55-L49	Zeolites: structures and properties – pillared clays – fullerenes and fullerides.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –IV"
CO1	Explain basic principles of MB spectroscopy
CO2	Identification Iron and tin compounds by Mossbauer spectroscopy
CO3	Explain basic principles of XPES, Auger & NQR spectroscopy
CO4	Determine the structure of inorganic homo & hetero-diatomic molecules by ESCA
CO5	Understand the mechanism of metals and non-metals in biological systems
CO6	Explain how the binding of dioxygen occurs in metallo biomolecules
CO7	Understanding the structure and properties of Cu and Zn enzymes
CO8	How the metal complexes acts as anticancer and antiarthritic agents
CO9	Explain the various types of synthesising inorganic materials
CO10	How to Prepare single crystals by Epitaxy methods, Chemical Vapour Transport-Solution Methods.
Experimental Learning	
EL1	Find out the structure of Fe & Sn compounds
EL2	Interpret XPES spectra for homo & hetero diatomic molecules
EL3	By using models to understand the structure activity relationship of biomolecules
EL4	Determine which method is suitable for growing a single crystal
Integrated Activity	
IA1	Prepare a Fe(II) complex and determine its structure through MB spectra.
IA2	Interpret XPES and NQR spectra for some inorganic compounds

Blended Learning : Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : Use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-IV
Course Code	KCHM43
Class	II year (2017-2018)
Semester	Even
Staff Name	1. Dr. R. BIJU BENNIE
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To study the kinetics of fast reactions.
- To learn the theories of unimolecular and bimolecular reactions.
- To obtain knowledge about the kinetics of reactions in solutions.
- To learn the applications of kinetics.
- To gain knowledge about adsorption isotherm and its types.
- To study about photochemistry.

PHYSICAL CHEMISTRY -IV

UNIT-I: CHEMICAL KINETICS I

Potential Energy surfaces-energy of activation. Thermodynamic treatment-statistical mechanism and chemical equilibrium- Kinetics of some reactions. Theories of reaction rates: Collision theory-steric factor. Absolute Reaction Rate Theory (ARRT)-derivation of rate equations and application of ARRT to bimolecular processes. Comparison between collision and Absolute Reaction Rate theories. Unimolecular reactions; Lindemann - Christiansen hypothesis, Hinshelwood, RRK, RRKM and Slater theories. Rate expressions for opposing, parallel and consecutive reactions. Chain reactions and its characteristics-steady state treatment, kinetics of H2-Br2 reactions, formation of Phosgene-decomposition of N2O5. Rice-Herzfeld mechanism, Explosive reactions: H2-O2 reaction.

UNIT-II : CHEMICAL KINETICS - II

Reactions in solution: factors determining reaction rates in solutions, effect of dielectric constant and ionic strength, cage effect, Brønsted-Bjerrum equation, primary and secondary kinetic salt effect, influence of solvent on reaction rates, significance of volume of activation. Fast reaction kinetics- Flow techniques - relaxation theory and relaxation techniques - Temperature, Pressure, electric field and magnetic field jump methods; Flash photolysis and pulse radiolysis. NMR and ESR methods of studying fast reactions.

UNIT-III : SURFACE CHEMISTRY & CATALYSIS

Introduction: Adsorption- Physisorption and chemisorptions. Adsorption isotherms: Freundlich, Langmuir, BET and Gibbs adsorption isotherms. Surface area dertermination. ARRT to surface reactions. Micelles: Micelles and reverse micelles- micro emulsion-solubilisation. Catalysis: Homogeneous catalysis- acid-base catalysis- van‟t Hoff and Arrhenius complexes for protropic and protolytic mechanisms. Bronsted catalysis law- Hammett acidity function. Heterogeneous catalysis. Chemical reactions on solid surfaces. Enzyme catalysis: Michaelis - Menton kinetics- Rate of enzyme catalyzed reaction- effect of substrate concentration, pH and temperature on enzyme catalyzed reactions.

UNIT-IV: POLYMER CHEMISTRY

Polymers – definition – types of polymers – liquid crystalline polymers. Molecular mass-number and mass average molecular mass – determination of molecular mass (osmometry, viscosity, diffusion, light scattering, and sedimentation methods). Visco-elasticity, Rubber elasticity. Kinetics and mechanism of linear stepwise polymerization – addition polymerization – free radical, cationic and anionic polymerization. Kinetics of co-polymerization. Polymerization in homogeneous and heterogeneous systems. Stereochemistry and mechanism of polymerization.

UNIT-V: PHOTOCHEMISTRY AND RADIATION CHEMISTRY:

Photochemistry- Introduction. Laws of photochemistry, Quantum yield and its determination. Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials. Photo physical processes in electronically excited molecules: Jablonskii diagram – Intersystem system crossing internal conversion, fluorescence, phosphorescence and other deactivation processes. Photo sensitization chemiluminescence and bioluminescence-Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers. Radiation Chemistry-Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- applications of radiation chemistry in industries and biology.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017

1-L1	**UNIT-I: CHEMICAL KINETICS I** Potential Energy surfaces-energy of activation. Thermodynamic treatment-statistical mechanism and chemical equilibrium- Kinetics of some reactions.
2-L2	Theories of reaction rates: Collision theory-steric factor
3- L3	. Absolute Reaction Rate Theory (ARRT)-derivation of rate equations and application of ARRT to bimolecular processes.
4-L4	Comparison between collision and Absolute Reaction Rate theories. Unimolecular reactions; Lindemann - Christiansen hypothesis,
5-L5	Hinshelwood, RRK, RRKM and Slater theories. Rate expressions for opposing, parallel and consecutive reactions.
6-L6	Chain reactions and its characteristics-steady state treatment, kinetics of H2-Br2 reactions,
7-L7	formation of Phosgene-decomposition of N2O5.
8-L8	Rice-Herzfeld mechanism,
9-L9	Explosive reactions: H2-O2 reaction.- **Allotting portion for Internal Test-I**
10-IT-1	**Internal test - In(22.01.2018)**
11-L10	**Test Paper distribution and result analysis-**
12-P1	**Department function**
13-L11	**UNIT-II : CHEMICAL KINETICS - II** Reactions in solution: factors determining reaction rates in solutions,
14-L12	effect of dielectric constant and ionic strength, cage effect,
15-L13	Brønsted-Bjerrum equation, primary and secondary kinetic salt effect
16-L14	influence of solvent on reaction rates, significance of volume of activation. Fast reaction kinetics-
17-L-15	Flow techniques - relaxation theory and relaxation techniques -
18-L16	Temperature, Pressure, electric field and magnetic field jump methods
19-L17	; Flash photolysis and pulse radiolysis.
	Entering Internal Test-I Marks into University portal
20-L18	NMR and ESR methods of studying fast reactions.
21-P2	**College level meeting/Cell function**
22-L19	NMR and ESR methods of studying fast reactions.
23-L20	Brief outlook of Chemical kinetics
24-L21	**Allotting portion for Internal Test-II-**
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT-III : SURFACE CHEMISTRY & CATALYSIS** Introduction: Adsorption- Physisorption and chemisorptions.
27-L23	Adsorption isotherms: Freundlich, Langmuir, BET and Gibbs adsorption isotherms.
28-L24	Surface area dertermination. ARRT to surface reactions.
29-L25	Micelles: Micelles and reverse micelles- micro emulsion-solubilisation.
30-L26	Application of ARRT to Reaction between atoms and reaction between molecules.
31-L27	Catalysis: Homogeneous catalysis- acid-base catalysis- van‟t Hoff and Arrhenius complexes for protropic and protolytic mechanisms.
32-L28	Bronsted catalysis law- Hammett acidity function. Heterogeneous catalysis. Chemical reactions on solid surfaces.
33-L29	Enzyme catalysis: Michaelis - Menton kinetics-
33-L30	Rate of enzyme catalyzed reaction- effect of substrate concentration,

35-L31	pH and temperature on enzyme catalyzed reactions
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV: POLYMER CHEMISTRY** Polymers – definition – types of polymers – liquid crystalline polymers.
38-L34	Molecular mass- number and mass average molecular mass – determination of molecular mass (osmometry, viscosity, diffusion, light scattering, and sedimentation methods).
39-L35	Visco-elasticity, Rubber elasticity.
40-L36	addition polymerization –
41-L37	free radical, cationic and anionic polymerization.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Kinetics of co-polymerization.
44-L39	Polymerization in homogeneous and heterogeneous systems.
45-L40	**Submission of Assignment/take the seminar**
46-L41	Stereochemistry and mechanism of polymerization.
47-L42	Kinetics and mechanism of linear stepwise polymerization
48-L43	osmometry, viscosity, diffusion, light scattering, and sedimentation methods
49-L44	**UNIT-V: PHOTOCHEMISTRY AND RADIATION CHEMISTRY:** Photochemistry- Introduction. Laws of photochemistry, Quantum yield and its determination.
50-L45	Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials.
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	Photo physical processes in electronically excited molecules: Jablonskii diagram – Intersystem system crossing internal conversion, fluorescence, phosphorescence and other deactivation processes. **Test Paper distribution and result analysis**
53-L47	Photo sensitization chemiluminescence and bioluminescence-Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.
54-L48	Radiation Chemistry-Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons
55-L49	– Definition of G-value- Dosimetry and dosimeters in radiation chemistry- applications of radiation chemistry in industries and biology.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY –IV”
CO1	Understand how the kinetics of fast reactions are measured

CO2	Explain how activation energy affects rate and use the Arrhenius equation to predict a rate law for a reaction.
CO3	Explain how solvent affects the reaction rate.
CO4	Ability to derive the kinetics of various reactions.
CO5	Derive various adsorption isotherms
CO6	Know about polymerisation
CO7	Knowledge of photochemistry
Experimental Learning	
EL1	study the kinetics of simple reaction
EL2	Prepare benzpinacolone from benzophenone
EL3	Prepare a conducting polymer
EL4	Compare the surface area of a compound at various annealing temperatures
Integrated Activity	
IA1	Derive the kinetics of a certain reaction.
IA2	Plot the Langmuir and Freundlich adsorption isotherms for a given set of data

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Advanced Topics In Chemistry II
Course Code	PCHE21
Class	I year (2017-2018)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	4
L. Hours /P. Hours	5/ WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

To understand the concept of forensic and computer applications, nano materials, industrial polymer, medicinal chemistry and bio-organic chemistry.

- To understand the concept of chemistry in forensic science.
- To understand molecular modelling simulation and animation by Computer Applications
- To study the applications in catalysis.
- To study Important industrial polymers.
- To understand the Synthetic route, structure and applications of engineering plastics
- To learn the Streochemistry and solubility issues in drug design
- To learn the Quantitative structure activity relationships (QSARS),.
- To learn the applications of Streochemistry and solubility issues in drug design.
- To gain knowledge about the Characteristics of enzymes- mechanism of enzyme action- chymotrypsin
- To study the bio metic chemistry cyclodextrins- Calixarenes as enzyme model.

2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-II/Elec.2/

ADVANCED TOPICS IN CHEMISTRY - II

UNIT I: Forensic and computer applications in Chemistry

Forensic science: Finger printing, forensic serology, hair and fiber analysis, explosive residue, glass comparisons, drug analysis, bullet and cartridge analysis. **Computer Applications:** molecular modelling simulation and animation. World Wide Web and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw.

UNIT –II: Applications of nanomaterials

Applications of nanomaterials: Applications in catalysis - Organic transformations and fuel cells - Environmental application - Water purification, air purification - Nano particles as sensors - **Nanocomposites** - Polymer-based Nanocomposites - Polyamide/clay Nano composites – Synthesis, characterization and properties of Nylon 6 - clay hybrid - Polystyrene/clay Nanocomposites – syndiotactic polystyrene/clay Nano composites, properties. Poly(butylenes terephthalate) (PBT) based nano composites, Epoxy nano composites on layered silicates. Bio-Nanocomposites- properties and applications.

UNIT III : Industrial polymer

Important industrial polymers – synthesis and applications of poly tetra flouro ethylene (TEFLON), ion exchange resins. Synthetic route, structure and applications of engineering plastics- Acrylonitrile butadiene styrene (ABS), Poly amides (PA), Poly ethylene terephthalate (PET), Polyphenylene Oxide (PPO), Poly sulphone (PSU), Poly ether ether ketone (PEEK), Poly amides, Poly phenylene sulphide(PPS).

UNIT IV : Medicinal chemistry

Drug Discovery, Design and development: Identification of diseases and corresponding targets, Bio assays and leads. Streochemistry and solubility issues in drug design. **Structure Activity Relationship (SARS):** Changing size and shape- introduction of new substituents. Quantitative structure activity relationships (QSARS), Lipophilicity – electronic and steric effects- Hansch Analysis – Top liss decision tree. Chemical and process development of drugs.**Preclinical trials:** Pharmacology, Toxicology, metabolism and stability studies-formulation. **Clinical trials:** Phase I- IV Studies- ethical issues. Patent protection.Regulation.

UNIT V: Bio-organic chemistry:

Characteristics of enzymes- mechanism of enzyme action- chymotrypsin- antibodies of enzymes- biological energy- ATP, NADH, NADPH, $FADH_2$ as electron carriers- Co – enzyme A as universal carriers of acyl groups- glycolysis- citric acid cycle- urea cycle – Link between glycolysis and citric acid cycle- lipid metabolism- biological oxidation- bio metic chemistry cyclodextrins- Calixarenes as enzyme model.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 07-12-2017
1-L1	**UNIT I: Forensic and computer applications in Chemistry**
2-L2	**Forensic science**
3- L3	Finger printing, forensic serology
4-L4	hair and fiber analysis
5-L5	explosive residue, glass comparisons
6-L6	drug analysis, bullet and cartridge analysis
7-L7	Computer Applications
8-L8	molecular modelling simulation and animation
9-L9	World Wide Web and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw. . - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I**
11-L10	**Test Paper distribution and result analysis-** Peterson olefination
12-P1	**Department function**
13-L11	**UNIT –II: Applications of nanomaterials**
14-L12	**Applications of nanomaterials:** Applications in catalysis
15-L13	Organic transformations and fuel cells - Environmental application
16-L14	Water purification, air purification - Nano particles as sensors
17-L-15	**Nanocomposites** - Polymer-based Nanocomposites
18-L16	Polyamide/clay Nano composites – Synthesis, characterization and properties of Nylon 6
19-L17	clay hybrid - Polystyrene/clay Nanocomposites – syndiotactic polystyrene/clay Nano composites
	Entering Internal Test-I Marks into University portal
20-L18	**2D NMR spectroscopy**
21-P2	**College level meeting/Cell function**
22-L19	Poly(butylenes terephthalate) (PBT) based nano composites, Epoxy nano composites on layered silicates
23-L20	Bio-Nanocomposites- properties and applications
24-L21	**Allotting portion for Internal Test-II-** INADEQUATE spectra.
25-IT-II	**Internal test – II**
26-L22	**Test Paper distribution and result analysis- UNIT III : Industrial polymer**
27-L23	Important industrial polymers
28-L24	synthesis and applications of poly tetra flouro ethylene (TEFLON), ion exchange resins
29-L25	Synthetic route, structure and applications of engineering plastics
30-L26	Acrylonitrile butadiene styrene (ABS),
31-L27	Poly amides (PA), Poly ethylene terephthalate (PET),
32-L28	Polyphenylene Oxide (PPO),
33-L29	Poly sulphone (PSU),

33-L30	Poly ether ether ketone (PEEK)
35-L31	Poly amides, Poly phenylene sulphide(PPS).
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT IV : Medicinal chemistry**
38-L34	**Drug Discovery, Design and development**
39-L35	Identification of diseases
40-L36	corresponding targets, Bio assays and leads
41-L37	**Structure Activity Relationship (SARS):**
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Changing size and shape- introduction of new substituents
44-L39	Quantitative structure activity relationships (QSARS),
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lipophilicity – electronic and steric effects- Hansch Analysis – Top liss decision tree. Chemical and process development of drugs.
47-L42	**Preclinical trials:** Pharmacology, Toxicology, metabolism and stability studies- formulation
48-L43	**Clinical trials:** Phase I- IV Studies- ethical issues. Patent protection.Regulation.
49-L44	**UNIT V: Bio-organic chemistry**
50-L45	Characteristics of enzymes- mechanism of enzyme action**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III**
52-L46	chymotrypsin- antibodies of enzymes- biological energy **Test Paper distribution and result analysis**
53-L47	ATP, NADH, NADPH, $FADH_2$ as electron carriers- Co –enzyme A as universal carriers of acyl groups- glycolysis
54-L48	citric acid cycle- urea cycle – Link between glycolysis and citric acid cycle- lipid metabolism
55-L49	biological oxidation- bio metic chemistry cyclodextrins- Calixarenes as enzyme model.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "Advanced Topics In Chemistyr II"
CO1	Explain the Finger printing, forensic serology, hair and fiber analysis, explosive residue, glass comparisons
CO2	Write the and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw
CO3	Understand the nanomaterials
CO4	Write the Synthesis, characterization and properties of Nylon 6.
CO5	Understand Mc–Lafferty rearrangement
CO6	Write the Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.
CO7	Explain the Jablonskii diagrams-intersystem crossing-energy transfer process- Photosensitization- alpha cleavages.
CO8	Ability to write the Synthesis and reactions of indole, oxazole
CO9	Know the Pyranose and furanose
CO10	Know the **Electrocyclic reaction**
Experimental Learning	
EL1	Write the E_1CB mechanisms
EL2	Write the competition between substitution and elimination reactions
EL3	Perform a Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches
EL4	Draw the structure of pyridazine, pyrazine, coumarins, benzopyrones
Integrated Activity	
IA1	Discuss about the Organic photochemistry and pericyclic reactions
IA2	Find the : Basic Principle – number of signals – chemical shift – Factors influencing chemical shift

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	PCHL21
Class	I year (2017-2018)
Semester	Even
Staff Name	Dr. C. Joel
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand estimation of organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL - II

A. Estimation

(i) Estimation of phenol
(ii) Estimation of aniline
(iii) Estimation of ascorbic acid

B. List of single stage preparations:

(i) Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone.
(ii) Preparation of Resacetophenone from Resorcinol.
(iii) Preparation of p-benzoquinone from hydroquinone.
(iv) Preparation of Bis-2-Naphthol.
(v) Preparation of Di Benzylidene acetone.
(vi) Preparation of anthraquinone from anthracene
(vii) Preparation of benzophenone oxime from benzophenone
(viii) Preparation of Nerolin from β-Naphthol
(ix) Preparation of anthranilic acid from Phthalimide
(x) Preparation of Benzilic acid from Benzil

C. For Class Work Only :

1. Download the following spectra from **internet** and give interpretation.

I. Differentiate the following pair by UV- spectra

(a) Trans stilbene and its cis isomer.

(b) Vinyl methyl ketone and acetone.

(c) Vinyl methyl ketone in two solvents such as n-Hexane and alcohol.

II. Differentiate the following pair by IR spectra

(a) para and ortho hydroxy benzoic acid.

(b) p-nitro and p-amino acetophenone.

(c) Maleic acid and fumaric acid.

(2) Separation of Caffeine from Tea / Coffee.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 07-12-2017
1-E1	Estimation of phenol
2-E2	Estimation of phenol
3- E3	Estimation of phenol
4-E4	Estimation of phenol
5-E5	Estimation of aniline
6-E6	Estimation of aniline
7-E7	Estimation of aniline
8-E8	Estimation of aniline
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of ascorbic acid
16-E11	Estimation of ascorbic acid
17-E-12	Estimation of ascorbic acid
18-E13	Estimation of ascorbic acid
19-E14	Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone
20-E15	Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone
21-E16	Preparation of Resacetophenone from Resorcinol
22-E17	Preparation of Resacetophenone from Resorcinol
23-P2	**College level meeting/Cell function**
24-E18	Preparation of p-benzoquinone from hydroquinone
25-E19	Preparation of p-benzoquinone from hydroquinone

26-E20	Preparation of Bis-2-Naphthol
27-E21	Preparation of Bis-2-Naphthol
28-E22	Preparation of Di Benzylidene acetone
29-E23	Preparation of Di Benzylidene acetone
30-E24	Preparation of anthraquinone from anthracene
31-E25	Preparation of anthraquinone from anthracene
32-E26	Preparation of benzophenone oxime from benzophenone
33-E27	Preparation of benzophenone oxime from benzophenone
34-E28	Preparation of Nerolin from β-Naphthol
35-E29	Preparation of Nerolin from β-Naphthol
36-E30	Preparation of anthranilic acid from Phthalimide
37-E31	Preparation of anthranilic acid from Phthalimide
38-E32	Preparation of Benzilic acid from Benzil
39-E33	Preparation of Benzilic acid from Benzil
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Differentiate the following pair by UV- spectra (a) Trans stilbene and its cis isomer. (b) Vinyl methyl ketone and acetone. (c) Vinyl methyl ketone in two solvents such as n-Hexane and alcohol.
46-E35	Differentiate the following pair by IR spectra (a) para and ortho hydroxy benzoic acid. (b) p-nitro and p-amino acetophenone. (c) Maleic acid and fumaric acid.
47-E36	Separation of Caffeine from Tea / Coffee
48-E37	Separation of Caffeine from Tea / Coffee
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	PCHL22
Class	I year (2017-2018)
Semester	Even
Staff Name	1. Dr. S. Asha Jebamary
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of Analysis of Mixture of Cations by Complexometric titrations*
- *To understand the photocalorimetric estimations*

INORGANIC CHEMISTRY PRACTICAL - II

A. Analysis of Mixture of Cations by Complexometric titrations

1. Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).

2. Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).

3. Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).

4. Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).

5. Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F^-)

6. Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F^-).

7. Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).

B. Photocolorimetric Analysis of Cations (Course work only)

Estimation of Fe, Ni, Cr, Mn, Cu and NH4+. (Any four experiments)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-E1	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
2-E2	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
3- E3	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
4-E4	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
5-E5	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
6-E6	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
7-E7	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
8-E8	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
16-E11	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
17-E-12	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
18-E13	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
19-E14	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
20-E15	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
21-E16	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
22-E17	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
25-E19	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
26-E20	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by

	F−)
27-E21	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
28-E22	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
29-E23	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
30-E24	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
31-E25	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
32-E26	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
33-E27	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
34-E28	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
35-E29	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
36-E30	Photocolorimetic Estimation of Fe, Ni, Mn
37-E31	Photocolorimetic Estimation of Fe, Ni, Mn
38-E32	Photocolorimetic Estimation of Fe, Ni, Mn
39-E33	Photocolorimetic Estimation of Fe, Ni, Mn
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Photocolorimetic Estimation of Mn, Cu and NH4+.
46-E35	Photocolorimetic Estimation of Mn, Cu and NH4+.
47-E36	Photocolorimetic Estimation of Mn, Cu and NH4+.
48-E37	Photocolorimetic Estimation of Mn, Cu and NH4+.
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand complexometric tirations
CO2	To understand photocolorimetric estimations

# Blended Learning	:Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,
# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-II
Course Code	PCHL23
Class	I year (2017-2018)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric experiments*
- *To understand the enthalpy of solutions*

PHYSICAL CHEMISTRY PRACTICAL - II

I Conductometric experiments
(i) Estimation of K_2SO_4 using $BaCl_2$
(ii) Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
(iii) Determination of Dissociation constant of a weak acid
II Distribution law
(i) Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
(ii) Distribution of benzoic acid between two immiscible solvents
III Thermometry Determination of Solution enthalpy of (i) Benzoic acid-water (ii) Napthalene-Toluene

IV Kinetics – Study of Kinetics of KI - $K_2S_2O_8$ system

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-E1	Estimation of K_2SO_4 using $BaCl_2$
2-E2	Estimation of K_2SO_4 using $BaCl_2$
3- E3	Estimation of K_2SO_4 using $BaCl_2$
4-E4	Estimation of K_2SO_4 using $BaCl_2$
5-E5	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
6-E6	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
7-E7	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
8-E8	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
16-E11	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
17-E-12	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
18-E13	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
19-E14	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
20-E15	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
21-E16	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
22-E17	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
23-P2	**College level meeting/Cell function**
24-E18	Distribution of benzoic acid between two immiscible solvents
25-E19	Distribution of benzoic acid between two immiscible solvents
26-E20	Distribution of benzoic acid between two immiscible solvents
27-E21	Distribution of benzoic acid between two immiscible solvents
28-E22	Distribution of benzoic acid between two immiscible solvents
29-E23	Distribution of benzoic acid between two immiscible solvents
30-E24	Distribution of benzoic acid between two immiscible solvents
31-E25	Distribution of benzoic acid between two immiscible solvents
32-E26	Determination of Solution enthalpy of (i) Benzoic acid-water
33-E27	Determination of Solution enthalpy of (i) Benzoic acid-water
34-E28	Determination of Solution enthalpy of (i) Benzoic acid-water
35-E29	Determination of Solution enthalpy of (i) Benzoic acid-water
36-E30	Determination of Solution enthalpy of Napthalene-Toluene
37-E31	Determination of Solution enthalpy of Napthalene-Toluene

38-E32	Determination of Solution enthalpy of Napthalene-Toluene
39-E33	Determination of Solution enthalpy of Napthalene-Toluene
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Study of Kinetics of KI - K2S2O8 system
46-E35	Study of Kinetics of KI - K2S2O8 system
47-E36	Study of Kinetics of KI - K2S2O8 system
48-E37	Study of Kinetics of KI - K2S2O8 system
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY PRACTICALS–II”
CO1	To understand the conductometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	PCHM21
Class	I year (2017-2018)
Semester	Even
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h/unit)	

Objectives:

- To understand the concept of UV-visible spectroscopy and to apply Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
- To understand the concept of FT-IR spectroscopy and to apply the idea to find out the functional groups in organic compounds..
- To study the applications of ORD and CD for chiral compounds especially polypeptides and polynucleotides.
- To study nucleophilic substitution reactions in aromatic systems
- To study the different types of intermediates in a reaction
- To have a brief idea about the natural products especially terpenes and alkaloids.
- To learn about the synthesis and structural elucidation of selected antibiotics and vitamins.

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-7/

ORGANIC CHEMISTRY - II

Unit – I: ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD

UV: The absorption laws – Types of electronic transitions – effect of solvents and Hydrogen bonding on λ_{max} values. – Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones.

IR: Characteristic IR absorptions of different functional groups – factors influencing absorption of carbonyl and hydroxyl groups – electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region.

ORD and CD: Optical rotatory dispersion (ORD): Octant rule – alpha - halo ketone rule and their applications-Circular Dichroism.

Unit-II :Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond.

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms - Reactivity, effect of substrate, leaving group and attacking nucleophile-typical reaction as oxygen and sulphur as nucleophile - Bucherer and Rosenmund reaction- Smiles rearrangement.

Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich reaction - Wittig reaction-Sharpless asymmetric epoxidation-addition of hydrogen halides to carbon - carbon double bond - addition of boranes, Michael addition (1,2 and 1,4)

Addition of dialkyl groups to triple bonds. Addition of hydrides – $LiAlH_4$ and $NaBH_4$.

Unit-III :Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, and reactivity of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications.

Nitrenes: Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements.

Carbanion: Generation, Structure, Stability and reaction of carbanion- Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.

Arynes : Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit – IV: ALKALOIDS AND ANTIBIOTICS

Alkaloids: Degradation studies – HEM , Emde and Von – Braun – Structural elucidation and synthesis of Quinine, Morphine, Cocaine, Lysergic acid and Atropine. Synthesis of Reserpine and PaPaverine – Biosynthesis of tyrosine, tryptophan.

Antibioties: Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.

Unit – V: VITAMINS AND TERPENOIDS

Vitamins: Structural elucidation, synthesis of vitamins – A_1, $B_1$and C - synthesis of vitamins B_2, B_6 and D.

Terpenoids : Structural elucidation, synthesis of α-Pinene, α-Cadinene, Zingiberene, Camphor and sqalene - synthesis of α-Santonin and Gibberelic acid. Bio synthesis of mono and diterpenoids.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-L1	**ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD** **UV:** The absorption laws – Types of electronic transitions
2-L2	effect of solvents and Hydrogen bonding on λ_{max} values
3- L3	Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones
4-L4	**IR:** Characteristic IR absorptions of different functional groups
5-L5	factors influencing absorption of carbonyl and hydroxyl groups
6-L6	electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region
7-L7	Optical rotatory dispersion (ORD): Octant rule
8-L8	alpha - halo ketone rule and their application
9-L9	Circular Dichroism -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (22.01.2018)**
11-L10	**Test Paper distribution and result analysis** - **Unit-II :Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond. Aromatic nucleophilic substitution reaction:** Unimolecular, Bimolecular and Benzyne mechanisms.
12-P1	**Department function**
13-L11	Reactivity, effect of substrate, leaving group and attacking nucleophile- typical reaction as oxygen and sulphur as nucleophile
14-L12	Bucherer and Rosenmund reaction- Smiles rearrangement.
15-L13	Catalytic hydrogenation- Birch reduction
16-L14	Dieckmann condensation-Mannich reaction - Wittig reaction
17-L-15	Sharpless asymmetric epoxidation
18-L16	addition of hydrogen halides to carbon - carbon double bond
19-L17	addition of boranes,
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2 and 1,4)
21-P2	**College level meeting/Cell function**
22-L19	Addition of hydrides – $LiAlH_4$
23-L20	Addition of hydrides –$NaBH_4$.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis-Unit – III: Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, and reactivity of carbenes-
27-L23	Generation, stability, structure, and reactivity of carbenes-
28-L24	Wolff rearrangement of acyl carbenes.
29-L25	Wolff rearrangement its synthetic applications.
30-L26	**Nitrenes:** Generation, stability, reaction of nitrenes

31-L27	**Nitrenes:** Generation, stability, reaction of nitrenes
32-L28	Mechanism of rearranegements through Nitrene intermediate: Schmidt rearrangement, Hoffmann rearrangement, Beckmann rearrangement
33-L29	Generation, Structure, Stability and reaction of carbanion
33-L30	Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.
35-L31	**Arynes :** Generation, Structure, Stability
36-L32	reactions and trapping of arynes- cine substitution -**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: ALKALOIDS AND ANTIBIOTICS** Degradation studies – HEM method
38-L34	Emde and Von – Braun method
39-L35	Structural elucidation and Synthesis of Quinine
40-L36	Structural elucidation and Synthesis of Morphine, Cocaine,
41-L37	Structural elucidation and Synthesis of Lysergic acid and Atropine
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Synthesis of Reserpine and PaPaverine
44-L39	Biosynthesis of tyrosine, tryptophan
45-L40	**Submission of Assignment/ seminar**
46-L41	**Antibioties:** Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.
47-L42	Structure and synthesis of cephalosporin – C
48-L43	Structure and synthesis of chloramphenicol and Streptomycin.
49-L44	**UNIT – V : VITAMINS AND TERPENOIDS** **Vitamins:** Structural elucidation, synthesis of vitamins – A_1, $B_1$and C
50-L45	synthesis of vitamins B_2, B_6 and D
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	**Terpenoids :** Structural elucidation, synthesis of α-Pinene, α-Cadinene,
53-L47	**Terpenoids :** Structural elucidation, synthesis of Zingiberene, Camphor and sqalene
54-L48	synthesis of α-Santonin and Gibberelic acid.
55-L49	Bio synthesis of mono and di terpenoids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY –II”
CO1	The concept of UV-visible spectroscopy and application of Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
CO2	The concept of FT-IR spectroscopy and application of the idea to find out the functional groups in organic compounds
CO3	Application of ORD and CD for chiral compounds especially polypeptides and polynucleotides
CO4	Importance of nucleophilic substitution reactions in aromatic systems
CO5	Different types of intermediates in a reaction
CO6	Idea about selected natural products especially from terpenes and alkaloids
CO7	synthesis and structural elucidation of selected antibiotics and vitamins
Experimental Learning	
EL1	Differentiation of geometrical isomers by FT-IR spectroscopy
EL2	Comparison of the calculated and observed λ_{max} values for selected organic compounds
EL3	Charctertization of functional groups in a given compound by FT-IR spectrosopy
EL4	Synthesis of aniline from chlorobenzene *via* Benzyne intermediate
Integrated Activity	
IA1	Differentiation of α-helix and β-sheet of selected proteins by ORD/CD spectroscopy
IA2	Detecting the Fermi resonance in selected organic compunds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M.Sc. Chemistry
Course Name	Inorganic Chemistry-II
Course Code	PCHM22
Class	I year (2017-2018)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the nature of metal-ligand bond and to study various theories of bonding in coordination compounds.*
- *To study the stability, chemical reactions and magnetic properties of coordination compounds.*
- *To study the applications of electronic and infra-red spectroscopic techniques in coordination compounds.*
- *To understand inorganic polymers and to study structures and bonding in metal clusters.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-8/

INORGANIC CHEMISTRY -II

Unit – I: BONDING IN COORDINATION COMPOUNDS

CFT and LFT: Basic features of CFT and LFT. Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries –Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions. Application of CFT: Magnetic Properties -Spectral properties -Spectrochemical series–Kinetic properties.**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants, Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE.

MOT: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.Application of MOT to spectrochemical series.

Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDS

Stability of complexes: Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes– factors affecting stability – chelate and template effects -Determination of stability constants and composition of the complexes: Bjerrum's method, potentiometric determination, spectrophotometric method, ion-exchange method, polarographic method, continuous variation (Job's) method.

Reactions of complexes: Lability – inertness –Ligand substitution reactions of square planar complexes – Trans effect and trans influence –Theories of trans effect – use of trans effect in synthesis of complexes– Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions – Electron transfer reactions – Inner sphere and outer sphere processes–complementary and non-complementary reactions.

Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPY

Electronic spectroscopy: Selection rules for electronic transitions–Line width and shape – Hole formalism –LS Coupling and jj coupling schemes and determination of term symbols – Splitting of terms – Orgel and Tanabe Sugano diagrams – Electronic spectra of Ist row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems.

Charge transfer spectra – types–Effect of tetragonal distortion and spin – orbit coupling on spectra. Electronic spectra of lanthanide and actinide complexes.

Infrared spectroscopy: Selection rules –calculation of force constants of IR vibrations.Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water. Application in the study of isomerism–linkage and geometrical isomerism and intra and intermolecular hydrogen bonding.

Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES

Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials–Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility – Faraday's and Gouy'smethods.First order and second order Zeeman effect, temperature independent paramagnetism, van Vleck equation and its applications–quenching of orbital contribution to magnetic moment by CF. Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field, high spin/low spin equilibrium.Comparison of the magnetic properties of O_h, T_d and square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes.

Unit V: INORGANIC POLYMERS ANDMETAL CLUSTERS

Inorganic polymers: General characteristics, degree of polymerization, catenation and heterocatenation- silicates - classification and structure - property correlation - Polyacids-structures of isopoly and heteropoly anions - Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers - Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.

Structure and Bonding of Metal clusters: DinuclearClusters: Cu(II) carboxylate, Chromium(II) acetate, and $[M_2Cl_8]^{4-}$(M = Mo and Re) –Trinuclear Clusters: $[M_3(CO)_{12}]$ (M = Fe, Ru, Os) –Teteranuclear Clusters: $[M_4(CO)_{12}]$ (M = Co, Rh, Ir) –Hexanuclear Clusters: $[Nb_6Cl_{12}]^{2+}$,$[Os_6(CO)_{18}]^{2-}$ and $[Mo_6Cl_8]Cl_4$–Capping rule – poly atomic Zintl ions.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-L1	**UNIT - I: BONDING IN COORDINATION COMPOUNDS: CFT and LFT**: Basic features of CFT and LFT.
2-L2	Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries
3- L3	Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions
4-L4	Application of CFT: Magnetic Properties -Spectral properties
5-L5	Spectrochemical series–Kinetic properties
6-L6	**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants
7-L7	Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE
8-L8	**MOT**: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.
9-L9	Application of MOT to spectrochemical series-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (22.01.2018)**
11-L10	**Test Paper distribution and result analysis**- **Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDSStability of complexes:**Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes
12-P1	**Department function**
13-L11	factors affecting stability – chelate and template effects
14-L12	Determination of stability constants and composition of the complexes: Bjerrum's method
15-L13	Determination of stability constants and composition of the complexes: potentiometric determination, spectrophotometric method
16-L14	Determination of stability constants and composition of the complexes:polarographic method, continuous variation (Job's) method
17-L-15	Lability – inertness –Ligand substitution reactions of square planar complexes
18-L16	Trans effect and trans influence
19-L17	Theories of trans effect – use of trans effect in synthesis of complexes
	Entering Internal Test-I Marks into University portal
20-L18	Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions
21-P2	**College level meeting/Cell function**
22-L19	Electron transfer reactions – Inner sphere and outer sphere processes
23-L20	Complementary and non-complementary reactions.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis**-**Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPYElectronic spectroscopy**: Selection rules for electronic transitions–Line width and shape –Hole formalism
27-L23	LS Coupling and jj coupling schemes and determination of term symbols
28-L24	Splitting of terms – Orgel and Tanabe Sugano diagrams

29-L25	Electronic spectra of I[st] row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
30-L26	Charge transfer spectra – types
31-L27	Effect of tetragonal distortion and spin – orbit coupling on spectra.
32-L28	Electronic spectra of lanthanide and actinide complexes
33-L29	Selection rules –calculation of force constants of IR vibrations
33-L30	Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water
35-L31	Application in the study of isomerism– linkage and geometrical isomerism and intra and intermolecular hydrogen bonding
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES** Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials
38-L34	Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility
39-L35	Faraday's and Gouy'smethods.First order and second order Zeeman effect
40-L36	temperature independent paramagnetism, van Vleck equation and its applications
41-L37	quenching of orbital contribution to magnetic moment by CF.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field,
44-L39	high spin/low spin equilibrium
45-L40	**Submission ofAssignment/take the seminar**
46-L41	Comparison of the magnetic properties of O_h Fe(II), Co(II), Ni(II) and Cu(II) complexes
47-L42	Comparison of the magnetic properties of T_d Fe(II), Co(II), Ni(II) and Cu(II) complexes
48-L43	Comparison of the magnetic properties of square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes
49-L44	**UNIT – V : INORGANIC POLYMERS ANDMETAL CLUSTERS** **Inorganic polymers:**General characteristics, degree of polymerization, catenation and heterocatenation
50-L45	silicates - classification and structure - property correlation
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	Polyacids- structures of isopoly and heteropoly anions
53-L47	Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers
54-L48	Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.
55-L49	**Structure and Bonding of Metal clusters:**DinuclearClusters, Trinuclear Clusters, Teteranuclear Clusters, HexanuclearClustersCapping rule, poly atomic Zintl ions.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –II"
CO1	To know the nature of metal-ligand bond in complexes
CO2	To study various theories of bonding in coordination compounds
CO3	To study the stability, chemical reactions and magnetic properties of coordination compounds
CO4	To study the applications of electronic and infrared spectroscopic techniques in coordination compounds.
CO5	To understand inorganic polymers and understand its properties
Experimental Learning	
EL1	Differentiation of coordinated water and lattice water by IR spectroscopy
EL2	Measurement of magnetic susceptibility by Gouy's Method
EL3	Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
EL4	Preparation of Cu(II) carboxylate and Chromium(II) acetate to analyze the nature of metal-metal bonding
Integrated Activity	
IA1	Differentiation of linkage isomerism – Nitro and nitrito
IA2	Study of intra- and intermolecular hydrogen bonding

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Physical Chemistry-II
Course Code	PCHM23
Class	I year (2017-2018)
Semester	Even
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- ✓ *To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics*
- ✓ *To learn about the Principles of Electrochemistry*
- ✓ *To get an idea of different electroanalytical techniques*
- ✓ *To know about Photochemistry and Radiation chemistry*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc. (Chemistry)/Sem.-2/Core-9/

PHYSICAL CHEMISTRY -II

UNIT-I: QuantumMechanics I

Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box, Particle in a ring, 3DRectangular box, 3D cubical box, the harmonic oscillator, the rigid rotator, and the hydrogen atom.Degeneracy and degenerate wave functions, Quantum mechanical tunnelling.Shapes and nodal properties of orbitals – Space quantisation.

UNIT-II: QuantumMechanics II

Electron spin, Anti symmetry and Pauli's exclusion principle – Slater determinantal wave functions. Approximation methods-The Variation theorem; Linear Variation Principle, Perturbation theory.Applications of Variation Method and Perturbation Theory to the Helium atom. Born-Oppenheimer approximation, VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems, Hartree FockSelf consistent field method for Helium atom. Hückel Molecular Orbital Theory and its application to ethylene, butadiene and benzene.

UNIT – III: Electrochemistry - I

Arrhenius theory, Derivation and Validity of Debye-Huckel Theory, Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation. Debye-Falkenhagen effect and Wien effect. Activity of electrolytes, Determination of activity and activity coefficient using Debye-Huckel theory.Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation.Definition and Determination of Transference number.Abnormal transference number.Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern models of electrical double layer- Applications and limitations.Kinetics of electrode reaction-Butler-Volmer equation, Tafel equation.

UNIT – IV:Electrochemistry - II

The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena-Zeta potential and its applications.Electrophoresis and related phenomena- The electro viscous effect, sedimentation Potential, Electrophoresis. Effect of electrical double layer-Electrocapillarity, Double layer capactance Corrosion and passivation of metals – Pourbaix diagram – Evans diagram – fuel cells – primary and secondary fuel cells – electrodeposition – principle

and applications. Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility, determination of 'n' values (usefulness of Illkovic equation), polarographic maxima, current time curves, Modern developments, Oscillographic polarography, AC polarography – Cyclic Voltammetry, advantages over polarographic techniques – Test of reversibility of electron transfer reactions – Chronopotentiometry – apparatus used, advantages over polarography – controlled potential coulometry.

UNIT-V: Photochemistry and Radiation Chemistry:

Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination. Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials. Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion, fluorescence, phosphorescence and other deactivation processes. Photosensitisation chemiluminescence and bioluminescence-Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.

Radiation Chemistry

Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 07-12-2017
1-L1	**UNIT-I: QuantumMechanics I** Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box
2-L2	Particle in a ring
3- L3	3DRectangular box
4-L4	3D cubical box
5-L5	Harmonic oscillator
6-L6	Rigid rotor
7-L7	Setting up and solving Schrodinger wave equation and arriving solution for the hydrogen atom.
8-L8	Degeneracy and degenerate wave functions.
9-L9	Quantum mechanical tunnelling. Shapes and nodal properties of orbitals – Space quantisation - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (22.01.2018)**
11-L10	**Test Paper distribution and result analysis - UNIT-II: QuantumMechanics II** Electron spin, Anti symmetry and Pauli's exclusion principle
12-P1	**Department function**
13-L11	Slater determinantal wave functions. Introduction to Approximation methods
14-L12	The Variation theorem; Linear Variation Principle,
15-L13	Perturbation theory.Applications of Variation Method
16-L14	Perturbation Theory to the Helium atom
17-L-15	Born-Oppenheimer approximation
18-L16	VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems
19-L17	Hartree FockSelf consistent field method for Helium atom
	Entering Internal Test-I Marks into University portal
20-L18	Hückel Molecular Orbital Theory and its application to ethylene
21-P2	**College level meeting/Cell function**
22-L19	Hückel Molecular Orbital Theory and its application to butadiene
23-L20	Hückel Molecular Orbital Theory and its application to benzene
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (26.02.2018)**
26-L22	**Test Paper distribution and result analysis - UNIT – III: Electrochemistry - I** Arrhenius theory, Derivation and Validity of Debye-Huckel Theory
27-L23	Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation
28-L24	Debye-Falkenhagen effect and Wien effect. Activity of electrolytes
29-L25	Determination of activity and activity coefficient using Debye-Huckel theory
30-L26	Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation
31-L27	Definition and Determination of Transference number.Abnormal transference number.
32-L28	Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern

	models of electrical double layer
33-L29	Electrical double layer- Applications and limitations
33-L30	Kinetics of electrode reaction-Butler-Volmer equation
35-L31	Tafel equation
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: Electrochemistry - II** The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena
38-L34	Zeta potential and its applications.Electrophoresis and related phenomena
39-L35	The electro viscous effect, sedimentation Potential, Electrophoresis
40-L36	Effect of electrical double layer-Electrocapillarity, Double layer capacitance
41-L37	Evans diagram – fuel cells – primary and secondary fuel cells
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	electrodeposition – principle and applications
44-L39	Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility
45-L40	**Submission of Assignment/take the seminar**
46-L41	determination of ‘n’ values (usefulness of Illkovic equation), polarographic maxima, current time curves,
47-L42	Modern developments, Oscillographic polarography, AC polarography
48-L43	Cyclic Voltammetry, advantages over polarographic techniques – Chronopotentiometry–advantages over polarography – controlled potential coulometry
49-L44	**UNIT – V : Photochemistry and Radiation Chemistry:** Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination
50-L45	Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials
51-IT-III	**Internal Test-III (01.04.2018)**
52-L46	Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion
53-L47	Fluorescence, phosphorescence and other deactivation processes - Photosensitisation chemiluminescence and bioluminescence
54-L48	Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.
55-L49	**Radiation Chemistry:** Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (12.04.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2018

Course Outcomes

Learning Outcomes	**COs** of the course " PHYSICAL CHEMISTRY –II"
CO1	To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics
CO2	To learn about the Principles of Electrochemistry
CO3	To get an idea of different electroanalytical techniques
CO4	To know about Photochemistry and its applications
CO5	To know about Radiation chemistry and solvated electrons
Experimental Learning	
EL1	Demonstration of Electroless deposition
EL2	Interpretation of cyclic voltammograms and calculation of electrochemical bandgap
EL3	Photochemical activity of potassium hexaoxalatoferrate(III)
Integrated Activity	
IA1	Variation of band gap of semiconducting quantum dots with size and quantum confinement
IA2	Differential conductance of Si QD's from STM

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Course Work
Course Code	PCHC11
Class	I year (2017-2018)
Semester	Odd
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings- 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the **Absorption Spectroscopy**
- To understand the Basic principles of two-dimensional NMR spectroscopy
- To know about the Nuclear Quadruple Resonance Spectroscopy
- To get an idea analytical techniques in chemistry
- To understand the Principles and applications of XRD, Neutron and electron diffraction

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

Paper-II

ADVANCED SCIENTIFIC TECHNIQUES IN CHEMICAL ANALYSIS

No. of Hrs – 4 / Week Credits - 4

Unit –I : Absorption Spectroscopy (12hrs.) Infrared and Raman Spectroscopy: FT-IR, basic principles, quantitative IR, resonance Raman and laser Raman spectroscopy, applications of IR and Raman spectroscopy to organic and inorganic compounds. Electronic Spectroscopy: term symbols, spin-orbit coupling in free ions, electronic spectra of Oh and Td complexes, charge transfer transition, structural evidence from electronic spectra.

Unit II: Applications of Advanced Organic Spectroscopy (12hrs.) NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications. Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M + 1 and M + 2 ions – calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV, IR, 1H-NMR, 13C-NMR and mass spectral data.

Unit-III: Spectroscopy (12hrs.)

Nuclear Quadruple Resonance Spectroscopy: effect of magnetic field on the spectra, electric field gradient and molecular structure, structural elucidation of inorganic and coordination compounds. Electron Paramagnetic Resonance Spectroscopy: hyperfine splitting in isotropic systems; epr spectra of systems with more than one unpaired electrons-Kramer's degeneracy, zero field

splitting, epr of triplet states, anisotropy in g-value, anisotropy in hyperfine splitting, nuclear quadrupleinteraction; applications of epr to organic and inorganic compounds. Mossbauer Spectroscopy: interpretation of isomer shifts, quadruple and magnetic interactions, Mossbauer emission spectroscopy, structural elucidation.

Unit IV: Diffraction & Surface Techniques: (12hrs.) Principles and applications of XRD, Neutron and electron diffraction – Scanning electron microscopy (SEM)-Instrumentation – applications – surface area analysis, particle size determination – Scanning

Probe Microscopes – Scanning Tunneling Microscopes – Atomic force microscopes (AFM) – Principle &applications.

Unit V: Electrochemical Techniques (12hrs.) Polarography – Chronopotentiometry – Chronoamperometry – chronocontometry- Linear Potential Sweep voltametry – Cyclic Voltametry – ImpendenceMeasurements – AC Voltametry – Principles and their applications

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2017
1-L1	**Unit –I : Absorption Spectroscopy**
2-L2	Infrared and Raman Spectroscopy
3- L3	FT-IR
4-L4	basic principles
5-L5	quantitative IR
6-L6	resonance Raman and laser Raman spectroscopy
7-L7	applications of IR and Raman spectroscopy to organic and inorganic compounds
8-L8	Electronic Spectroscopy: term symbols, spin-orbit coupling in free ions, electronic spectra of Oh and Td complexes
9-L9	charge transfer transition, structural evidence from electronic spectra
10-IT-1	**Internal test – I (31-07-2017)**
11-L10	**Unit II: Applications of Advanced Organic Spectroscopy**
12-P1	NMR
13-L11	Basic principles of two-dimensional NMR spectroscopy
14-L12	HOMOCOSY, HETCOSY and NOESY spectra and their applications
15-L13	use of INEPT and DEPT methods and their applications
16-L14	Mass: Molecular ions, isotope peaks, fragmentation pattern
17-L-15	McLafferty rearrangement
18-L16	measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI)
19-L17	M + 1 and M + 2 ions
	Entering Internal Test-I Marks into University portal
20-L18	calculation of molecular formula from PM+1 and PM+2 Road-map problems covering UV
21-P2	**College level meeting/Cell function**
22-L19	IR, 1H-NMR
23-L20	13C-NMR and mass spectral data.

24-L21	Quick review of the chapter -**Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (30-08-2017)**
26-L22	**Unit-III: Spectroscopy**
27-L23	Nuclear Quadruple Resonance Spectroscopy
28-L24	effect of magnetic field on the spectra
29-L25	electric field gradient and molecular structure
30-L26	structural elucidation of inorganic and coordination compounds
31-L27	Electron Paramagnetic Resonance Spectroscopy
32-L28	hyperfine splitting in isotropic systems
33-L29	spectra of systems with more than one unpaired electrons-Kramer's degeneracy
33-L30	zero field splitting, epr of triplet states, anisotropy in g-value, anisotropy in hyperfine splitting
35-L31	nuclear quadrupleinteraction; applications of epr to organic and inorganic compounds. Mossbauer Spectroscopy
36-L32	interpretation of isomer shifts, quadruple and magnetic interactions, Mossbauer emission spectroscopy, structural elucidation.
38-L33	**Unit IV: Diffraction & Surface Techniques**
38-L34	Principles and applications of XRD
39-L35	Neutron and electron diffraction
40-L36	Scanning electron microscopy (SEM)- Instrumentation
41-L37	applications – surface area analysis
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	particle size determination
44-L39	Scanning Probe Microscopes
45-L40	**Submission of Assignment/take the seminar**
46-L41	Scanning Tunneling Microscopes
47-L42	Atomic force microscopes (AFM) – Principle &applications
48-L43	Overview of the chapter
49-L44	**Unit V: Electrochemical Techniques**
50-L45	Polarography – Chronopotentiometry
51-IT-III	**Internal Test-III (03-10-2017)**
52-L46	Chronoamperometry – chronocontometry
53-L47	Linear Potential Sweep voltametry
54-L48	Cyclic Voltametry – ImpendenceMeasurements
55-L49	AC Voltametry – Principles and their applications
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (19-10-2017)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 06-11-2017

Course Outcomes

Learning Outcomes	**COs** of the course "ADVANCED TOPICS IN CHEMISTRY –I"
CO1	To understand the need for green chemistry and its contribution towards betterment of environment
CO2	To understand the potential of nano chemistry and different synthetic strategies
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the typical p-n junction diode using p-type Cu_2O/n-type ZnO semiconductors
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Synthesize nanomaterial and compare their morphology with different capping agents
IA2	Microwave mediated synthesis of CdO

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# Forslow learner	:Special care taken, motivate the advanced learner to support the slow learner to study.To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Advanced Topics in Chemistry-I
Course Code	**PCHE11**
Class	I year (2018-2019)
Semester	Odd
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- To understand the need for green chemistry and its contribution towards betterment of environment
- To understand the potential of nanochemistry and different synthetic strategies
- To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
- To get an idea analytical techniques in chemistry
- To understand the potential of solar energy and nuclear energy

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/ Elec.-1/

ADVANCED TOPICS IN CHEMISTRY – I

Unit – I :Green Chemistry

Need of green Chemistry – Anastas twelve principles of green Chemistry – Concept of atom economy – Green Reactions – Microwave assisted reactions – Superiority of microwave exposure over thermal reactions – Functional groups – Transportation – Condensation reactions – Oxidation and reduction reactions.

Unit – II :Nano Chemistry

Definition and terminology of Nano particles and Nano structural materials – Synthesis of Nano particles by Physical approaches (Laser ablation, evaporation and sputtering) and Chemical approaches (reduction of metal ions by Citrate and borohydride, Polyol synthesis) green synthesis – Optical and electronic properties of Nano materials.

Unit – III :Applied electro Chemistry

Principles of Corrosion – Definition – Cost of Corrosion – Electro chemical principles of Corrosion – Corrosion monitoring methods - Coupan (weight loss) – electrical resistance – gasometric – Potentiodynamic polarisation – impedance – hydrogen permeation – Corrosion inhibition – definition – Classification of inhibitors based on electrode process – mechanism of inhibitor action in acidic medium.

Unit – IV :Analytical Chemistry

Principle and Techniques of GC – MS, HPLC, cyclic voltammetry, Coulometry and Amprometry.

Theoretical and practical aspects of Colorimetry analysis - Flame emission and Atomic absorption spectroscopy - Advantages of atomic absorption spectrometry over flame photometry.

Unit – V :Industrial Chemistry

Nuclear fuels for various types of Nuclear reactors – Hydrogen as fuel in the future, Hydrogen storage materials – Solar energy – fuel from Sun light – Splitting of water – Hydrogen from Sun light – Hydrogen economy – Fuel cells – batteries – Photovoltaics – Stealing the Sun.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	**Unit – I :Green Chemistry** Need of green Chemistry
2-L2	Anastas twelve principles of green Chemistry
3- L3	Concept of atom economy
4-L4	Microwave assisted reactions – Superiority of microwave exposure over thermal reactions
5-L5	Functional groups – Transportation
6-L6	Condensation reactions
7-L7	Oxidation and reduction reactions.
8-L8	Green Reactions
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis**- **Unit – II :Nano Chemistry** Definition and terminology of Nanoparticles and Nanostructural materials
12-P1	**Department function**
13-L11	Synthesis of Nano particles by Physical approaches (Laser ablation)
14-L12	Synthesis of Nano particles by Physical approaches (sputtering)
15-L13	Synthesis of Nano particles by Physical approaches (evaporation)
16-L14	Chemical approaches (reduction of metal ions by Citrate)
17-L-15	Chemical approaches (borohydride, Polyol synthesis)
18-L16	Green synthesis
19-L17	Optical properties of Nano materials
	Entering Internal Test-I Marks into University portal
20-L18	Electronic properties of Nano materials
21-P2	**College level meeting/Cell function**
22-L19	Quantum confinement of charge carriers and optical properties
23-L20	Phonon confinement and specific heat capacity
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis**- **Unit – III :Applied electro Chemistry** Principles of Corrosion – Definition – Cost of Corrosion
27-L23	Electro chemical principles of Corrosion
28-L24	Corrosion monitoring methods
29-L25	Coupan (weight loss)
30-L26	electrical resistance
31-L27	gasometric method
32-L28	Potentiodynamic polarisation - Impedance analysis
33-L29	hydrogen permeation
33-L30	Corrosion inhibition – definition and its impact
35-L31	Classification of inhibitors based on electrode process
36-L32	–mechanism of inhibitor action in acidic medium
38-L33	**Unit – IV :Analytical Chemistry** Principle and Techniques of GC – MS

38-L34	HPLC
39-L35	Cyclic voltammetry
40-L36	Coulometry
41-L37	Amperometry
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Theoretical and practical aspects of Colorimetry analysis
44-L39	Flame emission spectroscopy
45-L40	**Submission of Assignment/take the seminar**
46-L41	Atomic absorption spectroscopy
47-L42	Advantages of atomic absorption spectrometry over flame photometry
48-L43	Overview of the chapter
49-L44	**Unit – V :Industrial Chemistry** Nuclear fuels for various types of Nuclear reactors
50-L45	Hydrogen as fuel in the future
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	Hydrogen storage materials
53-L47	Solar energy – fuel from Sun light
54-L48	Splitting of water – Hydrogen from Sun light – Hydrogen economy
55-L49	Fuel cells – batteries – Photovoltaics – Stealing the Sun
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "ADVANCED TOPICS IN CHEMISTRY –I"
CO1	To understand the need for green chemistry and its contribution towards betterment of environment
CO2	To understand the potential of nano chemistry and different synthetic strategies
CO3	To know about the techniques to monitor corrosion rate and steps to inhibit corrosion
CO4	To get an idea analytical techniques in chemistry
CO5	To understand the potential of solar energy and nuclear energy
Experimental Learning	
EL1	Electrochemical series was used to construct appropriate redox couple to form different Galvanic cells from available metals in lab such as Cu, Zn, Ag, Fe, etc.,
EL2	To study the electronic spectra and its variation with dimension of the semiconductors
EL3	To understand the typical p-n junction diode using p-type Cu_2O/n-type ZnO semiconductors
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Synthesize nanomaterial and compare their morphology with different capping agents
IA2	Microwave mediated synthesis of CdO

# Blended Learning	:Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,
# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-I
Course Code	PCHL11
Class	I year (2018-2019)
Semester	Odd
Staff Name	Dr. C. Joel
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand separation of two components in a mixture.*
- *To understand the analysis of organic compounds*

INORGANIC CHEMISTRY -I

A. Separation of Organic mixture:

(i) Separation of two component mixture and determination of their physical Constants.

(ii) Separation and analysis of at least **six** two component mixture. The students are expected to determine the physical constants for both the components as well as their Derivatives.

(iii) Analysis may be performed in micro (or) macro scale depending upon the Conditions of the laboratory

B. For Class Work Only:

(1) Separation of Caffeine from Tea / Coffee.

(2) Separation of green, blue, red inks by TLC method

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2018
1-E1	Separation and analysis of mixture I
2-E2	Separation and analysis of mixture I
3- E3	Separation and analysis of mixture I
4-E4	Separation and analysis of mixture I
5-E5	Separation and analysis of mixture II
6-E6	Separation and analysis of mixture II
7-E7	Separation and analysis of mixture II
8-E8	Separation and analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Separation and analysis of mixture III
16-E11	Separation and analysis of mixture III
17-E-12	Separation and analysis of mixture III
18-E13	Separation and analysis of mixture III
19-E14	Separation and analysis of mixture IV
20-E15	Separation and analysis of mixture IV
21-E16	Separation and analysis of mixture IV
22-E17	Separation and analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Separation and analysis of mixture V
25-E19	Separation and analysis of mixture V
26-E20	Separation and analysis of mixture V
27-E21	Separation and analysis of mixture V
28-E22	Separation and analysis of mixture VI
29-E23	Separation and analysis of mixture VI
30-E24	Separation and analysis of mixture VI
31-E25	Separation and analysis of mixture VI
32-E26	Separation and analysis of mixture VII
33-E27	Separation and analysis of mixture VII
34-E28	Separation and analysis of mixture VII
35-E29	Separation and analysis of mixture VII
36-E30	Separation of Caffeine from Tea / Coffee
37-E31	Separation of Caffeine from Tea / Coffee
38-E32	Separation of Caffeine from Tea / Coffee
39-E33	Separation of Caffeine from Tea / Coffee
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Separation of green, blue, red inks by TLC method
46-E35	Separation of green, blue, red inks by TLC method
47-E36	Separation of green, blue, red inks by TLC method
48-E37	Separation of green, blue, red inks by TLC method
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand different methods of separation of organic compounds
CO2	To separate the components in a mixture
CO3	To analyse the separated organic compounds
CO4	To physical constants of the compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-I
Course Code	PCHL12
Class	I year (2018-2019)
Semester	Odd
Staff Name	1. Dr. S. Asha Jebamary
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of different types of cations*
- *To understand the group separation*

INORGANIC CHEMISTRY -I

Qualitative analysis of inorganic mixture containing two familiar and two less familiar cations Pb, Cu, Bi, Cd, Sb, Zn, Co, Ni, Mn, Ca, Ba, Sr, W, Tl, Te, Se, Mo, Ce, Th, Zr, V, U, Ti and Li.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-E1	Qualitative analysis of mixture I
2-E2	Qualitative analysis of mixture I
3- E3	Qualitative analysis of mixture I
4-E4	Qualitative analysis of mixture I
5-E5	Qualitative analysis of mixture II
6-E6	Qualitative analysis of mixture II
7-E7	Qualitative analysis of mixture II
8-E8	Qualitative analysis of mixture II
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Qualitative analysis of mixture III
16-E11	Qualitative analysis of mixture III
17-E-12	Qualitative analysis of mixture III
18-E13	Qualitative analysis of mixture III
19-E14	Qualitative analysis of mixture IV
20-E15	Qualitative analysis of mixture IV
21-E16	Qualitative analysis of mixture IV
22-E17	Qualitative analysis of mixture IV
23-P2	**College level meeting/Cell function**
24-E18	Qualitative analysis of mixture V
25-E19	Qualitative analysis of mixture V
26-E20	Qualitative analysis of mixture V
27-E21	Qualitative analysis of mixture V
28-E22	Qualitative analysis of mixture VI
29-E23	Qualitative analysis of mixture VI
30-E24	Qualitative analysis of mixture VI
31-E25	Qualitative analysis of mixture VI
32-E26	Qualitative analysis of mixture VII
33-E27	Qualitative analysis of mixture VII
34-E28	Qualitative analysis of mixture VII
35-E29	Qualitative analysis of mixture VII
36-E30	Qualitative analysis of mixture VIII
37-E31	Qualitative analysis of mixture VIII
38-E32	Qualitative analysis of mixture VIII
39-E33	Qualitative analysis of mixture VIII
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Qualitative analysis of mixture IX
46-E35	Qualitative analysis of mixture IX
47-E36	Qualitative analysis of mixture IX
48-E37	Qualitative analysis of mixture IX
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–I"
CO1	To understand familiar cations
CO2	To understand less familiar cations
CO3	To study the group seperation
CO4	To know the confirmatory tests of different cations
CO5	To study the reason behind the results of the experiment

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-I
Course Code	PCHL13
Class	I year (2018-2019)
Semester	Odd
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the conductometric titrations*
- *To understand the enthalpy of reactions*

PHYSICAL CHEMISTRY -I

I. Conductometry Conductometric Titrations

a. Estimation of HCl and AcOH in a mixture

b. Estimation of NH4Cl and HCl in a mixture

c. Conductometry- solubility product of sparingly soluble silver salts.

II. Thermometry

a. Determination of Solution enthalpy of

i. oxalic acid-water

ii. ammonium oxalate-water

iii. Potassium dichromate-water

III. Kinetics -Acid hydrolysis of ester –comparison of strength of acids.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2018
1-E1	Estimation of HCl and AcOH in a mixture
2-E2	Estimation of HCl and AcOH in a mixture
3- E3	Estimation of HCl and AcOH in a mixture
4-E4	Estimation of HCl and AcOH in a mixture
5-E5	Estimation of NH4Cl and HCl in a mixture
6-E6	Estimation of NH4Cl and HCl in a mixture
7-E7	Estimation of NH4Cl and HCl in a mixture
8-E8	Estimation of NH4Cl and HCl in a mixture
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	- solubility product of sparingly soluble silver salts
16-E11	- solubility product of sparingly soluble silver salts
17-E-12	- solubility product of sparingly soluble silver salts
18-E13	- solubility product of sparingly soluble silver salts
19-E14	Determination of Solution enthalpy of oxalic acid-water
20-E15	Determination of Solution enthalpy of oxalic acid-water
21-E16	Determination of Solution enthalpy of oxalic acid-water
22-E17	Determination of Solution enthalpy of oxalic acid-water
23-P2	**College level meeting/Cell function**
24-E18	Determination of Solution enthalpy of ammonium oxalate-water
25-E19	Determination of Solution enthalpy of ammonium oxalate-water
26-E20	Determination of Solution enthalpy of ammonium oxalate-water
27-E21	Determination of Solution enthalpy of ammonium oxalate-water
28-E22	Determination of Solution enthalpy of Potassium dichromate-water
29-E23	Determination of Solution enthalpy of Potassium dichromate-water
30-E24	Determination of Solution enthalpy of Potassium dichromate-water
31-E25	Determination of Solution enthalpy of Potassium dichromate-water
32-E26	- solubility product of sparingly soluble silver salts
33-E27	- solubility product of sparingly soluble silver salts
34-E28	- solubility product of sparingly soluble silver salts
35-E29	- solubility product of sparingly soluble silver salts
36-E30	Acid hydrolysis of ester –comparison of strength of acids
37-E31	Acid hydrolysis of ester –comparison of strength of acids
38-E32	Acid hydrolysis of ester –comparison of strength of acids
39-E33	Acid hydrolysis of ester –comparison of strength of acids
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Acid hydrolysis of ester –comparison of strength of acids
46-E35	Acid hydrolysis of ester –comparison of strength of acids
47-E36	Acid hydrolysis of ester –comparison of strength of acids
48-E37	Acid hydrolysis of ester –comparison of strength of acids
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course “PHYSICAL CHEMISTRY PRACTICALS –I”
CO1	To understand the conductometric titrations
CO2	To understand the enthalpy of reactions
CO3	To study kinetics of acid hydrolysis of ester

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. Biju Bennie)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-III
Course Code	PCHL31
Class	II year (2018-2019)
Semester	Odd
Staff Name	Dr. R. Biju Bennie
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimations of certain organic compounds*
- *To understand the preparation of organic compounds*

ORGANIC CHEMISTRY PRACTICAL – III

A. List of Estimations

1.Ethylmethylketone
2.Acetone
3. Saponification value of an oil
4.Determination of Percentage purity in an unsaturated acid.
5. Estimation of hydroxyl group

B. List of Two stage preparations

1.Benzaldehyde $\longrightarrow$ Benzoic acid $\longrightarrow$ m-nitro benzoic acid
2. Acetanilide $\longrightarrow$ p-acetanilide $\longrightarrow$ p-Bromoaniline
3.Methyl benzoate $\longrightarrow$ m-nitro methyl benzoate $\longrightarrow$ m-nitro benzoic acid
4. Acetanilide $\longrightarrow$ p-nitro acetanilide $\longrightarrow$ p - nitroaniline
5. Benzophenone $\longrightarrow$ Benzo phenone oxime $\longrightarrow$ Benzanilide

1. Download the following spectra from **internet** and give interpretation.
   Differentiate the following pair by ^{1}HNMR spectra
   (a) Maleic acid and Fumaric acid.
   (b) Aqueous ethyl alcohol and Pure ethyl alcohol.
   (c) Dimethyl Ether and Aqueous ethyl alcohol.

Interpret the following C-13 NMR Spectra.

(a)OFF- Resonance decoupled C-13 spectrum of menthol.
(b) DEPT spectrum of isopentyl acetate.
(c) INADEQUATE spectrum of 2- butanone.

Interpret the mass spectrum of anisole and benzoic acid.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2018
1-E1	Estimation of Ethylmethylketone
2-E2	Estimation of Ethylmethylketone
3- E3	Estimation of Ethylmethylketone
4-E4	Estimation of Ethylmethylketone
5-E5	Estimation of Acetone
6-E6	Estimation of Acetone
7-E7	Estimation of Acetone
8-E8	Estimation of Acetone
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of Saponification value of an oil
16-E11	Estimation of Saponification value of an oil
17-E-12	Estimation of Saponification value of an oil
18-E13	Estimation of Saponification value of an oil
19-E14	Determination of Percentage purity in an unsaturated acid.
20-E15	Determination of Percentage purity in an unsaturated acid.
21-E16	Determination of Percentage purity in an unsaturated acid.
22-E17	Determination of Percentage purity in an unsaturated acid.
23-P2	**College level meeting/Cell function**
24-E18	Estimation of hydroxyl group
25-E19	Estimation of hydroxyl group
26-E20	Estimation of hydroxyl group
27-E21	Estimation of hydroxyl group
28-E22	Preparation of m-nitrobenzoic acid from benzaldehyde
29-E23	Preparation of m-nitrobenzoic acid from benzaldehyde
30-E24	Preparation of m-nitrobenzoic acid from benzaldehyde
31-E25	Preparation of m-nitrobenzoic acid from benzaldehyde
32-E26	Preparation of p-Bromoaniline from Acetanilide
33-E27	Preparation of p-Bromoaniline from Acetanilide
34-E28	Preparation of p-Bromoaniline from Acetanilide
35-E29	Preparation of p-Bromoaniline from Acetanilide
36-E30	Preparation of p- m-nitro benzoic acid from Acetanilide
37-E31	Preparation of p- m-nitro benzoic acid from Acetanilide
38-E32	Preparation of p- m-nitro benzoic acid from Acetanilide
39-E33	Preparation of p- m-nitro benzoic acid from Acetanilide

40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Preparation of Benzanilide from Benzophenone
46-E35	Preparation of Benzanilide from Benzophenone
47-E36	Preparation of Benzanilide from Benzophenone
48-E37	Preparation of Benzanilide from Benzophenone
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY PRACTICALS–III”
CO1	To understand the estimation of certain organic compounds
CO2	To prepare the organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-III
Course Code	PCHL32
Class	II year (2018-2019)
Semester	Odd
Staff Name	1. Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand quantitative estimation of a mixture containing two metal ions by Volumetric and Gravimetric Estimations*
- *To understand the Analysis of ores and alloys.*
- *To understand the importance of industrial visit.*

INORGANIC CHEMISTRY PRACTICAL – III

I. Quantitative estimation of a mixture containing two metal ions (Volumetric and Gravimetric Estimations).

1. Estimation of mixture of Cu2+ and Ni2+ ions.

2. Estimation of mixture of Cu2+and Zn2+ ions.

3. Estimation of mixture of Fe2+and Cu2+ ions.

4. Estimation of mixture of Fe2+ and Ni2+ ions.

5. Estimation of mixture of Ca2+ and Mg2+ions.

6. Estimation of mixture of Ca2+ and Ba2+ ions.

II. Analysis of ores and alloys (course work).

III. One day visit to Industry/Research Institution and submission of a minor report.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2018
1-E1	Estimation of mixture of Cu^{2+} and Ni^{2+} ions
2-E2	Estimation of mixture of Cu^{2+} and Ni^{2+} ions
3- E3	Estimation of mixture of Cu^{2+} and Ni^{2+} ions
4-E4	Estimation of mixture of Cu^{2+} and Ni^{2+} ions
5-E5	Estimation of mixture of $Cu^{2+}$and Zn^{2+} ions
6-E6	Estimation of mixture of $Cu^{2+}$and Zn^{2+} ions
7-E7	Estimation of mixture of $Cu^{2+}$and Zn^{2+} ions
8-E8	Estimation of mixture of $Cu^{2+}$and Zn^{2+} ions
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of mixture of $Fe^{2+}$and Cu^{2+} ions
16-E11	Estimation of mixture of $Fe^{2+}$and Cu^{2+} ions
17-E-12	Estimation of mixture of $Fe^{2+}$and Cu^{2+} ions
18-E13	Estimation of mixture of $Fe^{2+}$and Cu^{2+} ions
19-E14	Estimation of mixture of Fe^{2+} and Ni^{2+} ions
20-E15	Estimation of mixture of Fe^{2+} and Ni^{2+} ions
21-E16	Estimation of mixture of Fe^{2+} and Ni^{2+} ions
22-E17	Estimation of mixture of Fe^{2+} and Ni^{2+} ions
23-P2	**College level meeting/Cell function**
24-E18	Estimation of mixture of Ca^{2+} and Mg^{2+}ions
25-E19	Estimation of mixture of Ca^{2+} and Mg^{2+}ions
26-E20	Estimation of mixture of Ca^{2+} and Mg^{2+}ions
27-E21	Estimation of mixture of Ca^{2+} and Mg^{2+}ions
28-E22	Estimation of mixture of Ca^{2+} and Ba^{2+} ions
29-E23	Estimation of mixture of Ca^{2+} and Ba^{2+} ions
30-E24	Estimation of mixture of Ca^{2+} and Ba^{2+} ions
31-E25	Estimation of mixture of Ca^{2+} and Ba^{2+} ions
32-E26	Analysis of ores and alloys
33-E27	Analysis of ores and alloys
34-E28	Analysis of ores and alloys
35-E29	Analysis of ores and alloys
36-E30	Analysis of ores and alloys
37-E31	Analysis of ores and alloys
38-E32	Analysis of ores and alloys
39-E33	Analysis of ores and alloys
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	One day visit to Industry/Research Institution and submission of a minor report
46-E35	One day visit to Industry/Research Institution and submission of a minor report
47-E36	One day visit to Industry/Research Institution and submission of a minor report
48-E37	One day visit to Industry/Research Institution and submission of a minor report
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–III"
CO1	To understand quantitative estimation of a mixture containing two metal ions by Volumetric and Gravimetric Estimations
CO2	To understand the Analysis of ores and alloys
CO3	To understand the importance of industrial visit

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. Nirmal Paul Raj)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-III
Course Code	PCHL32
Class	II year (2018-2019)
Semester	Odd
Staff Name	Mr. A. Nirmal Paul Raj
Credits	4
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To learn and apply the Principles of Potentiometric Titrations.*
- *To understand the Principles and applications of Adsorption*

PHYSICAL CHEMISTRY PRACTICAL – III

I. **POTENTIOMETRIC TITRATIONS**

(a) Acid alkali titrations.

(b) Redox titrations (i) Fe2+ vs Cr2O7 2-

(d) Determination of dissociation constant of weak acids.

(e) Determination of activity and activity coefficient of ions.

(f) Determination of pH of a buffer solution using a quinhydrone electrode.

II. TITRATION USING PH METER

(a) Determination of dissociation constant of Weak acid.

III. ADSORPTION

Freundlich Adsorption isotherm

Adsorption of oxalic acid on charcoal.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 16-06-2018
1-E1	Acid alkali titrations
2-E2	Acid alkali titrations
3- E3	Acid alkali titrations
4-E4	Acid alkali titrations
5-E5	Redox titrations (i) Fe2+ vs Cr2O7 2-
6-E6	Redox titrations (i) Fe2+ vs Cr2O7 2-
7-E7	Redox titrations (i) Fe2+ vs Cr2O7 2-
8-E8	Redox titrations (i) Fe2+ vs Cr2O7 2-
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Determination of dissociation constant of weak acids
16-E11	Determination of dissociation constant of weak acids
17-E-12	Determination of dissociation constant of weak acids
18-E13	Determination of dissociation constant of weak acids
19-E14	Determination of activity and activity coefficient of ions
20-E15	Determination of activity and activity coefficient of ions
21-E16	Determination of activity and activity coefficient of ions
22-E17	Determination of activity and activity coefficient of ions
23-P2	**College level meeting/Cell function**
24-E18	Determination of pH of a buffer solution using a quinhydrone electrode
25-E19	Determination of pH of a buffer solution using a quinhydrone electrode
26-E20	Determination of pH of a buffer solution using a quinhydrone electrode
27-E21	Determination of pH of a buffer solution using a quinhydrone electrode
28-E22	Determination of pH of a buffer solution using a quinhydrone electrode
29-E23	Determination of pH of a buffer solution using a quinhydrone electrode
30-E24	Determination of pH of a buffer solution using a quinhydrone electrode
31-E25	Determination of pH of a buffer solution using a quinhydrone electrode
32-E26	Determination of dissociation constant of Weak acid using pH meter
33-E27	Determination of dissociation constant of Weak acid using pH meter
34-E28	Determination of dissociation constant of Weak acid using pH meter
35-E29	Determination of dissociation constant of Weak acid using pH meter
36-E30	Determination of dissociation constant of Weak acid using pH meter
37-E31	Determination of dissociation constant of Weak acid using pH meter
38-E32	Determination of dissociation constant of Weak acid using pH meter
39-E33	Determination of dissociation constant of Weak acid using pH meter
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**

44-P4	**College level meeting**
45-E34	Adsorption of oxalic acid on charcoal
46-E35	Adsorption of oxalic acid on charcoal
47-E36	Adsorption of oxalic acid on charcoal
48-E37	Adsorption of oxalic acid on charcoal
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 30-10-2018

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–III"
CO1	To understand the Principles of Potentiometric Titrations.
CO2	To understand the Principles of adsorption.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-I
Course Code	PCHM11
Class	I year (2018-2019)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	5
L. Hours /P. Hours	5 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reagents.
- To learn the applications of rearrangements.
- To learn the reactions of rearrangements
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
UNIT – I: AROMATICITY AND NOVEL RING SYSTEM

Aromaticity: Benzenoid and non–benzenoid compounds – generations and reactions – sextet theory – MO theory – Huckel's rule – Annulenes and hetero annulenes – Anti and homo aromaticity – Fullerenes.

Novel ring system: Nomenclature of bicyclic and tricyclic systems – structure and synthesis of Adamantane – Congressane – Alternant and non – alternant – Azulene – and sydnones.

UNIT – II: ORGANIC REACTION MECHANISM AND METHODS

Reaction mechanism: Energy diagram of simple Organic reactions – Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions –Baldwin rules for ring closure -Hammond Postulate and microscopic reversibility.

Methods: Kinetic and Thermodynamic control of product formation. Kinetic methods of determination: Rate law – Primary and secondary isotope effect. Non-Kinetic methods of determination: Testing and Trapping of intermediates, isotopic labeling, Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.

UNIT – III: STEREOCHEMISTRY

Concept of chirality: – Enantiotopic, diastereotopic hydrogens and prochiral centres – axial and planar chirality – stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes. R/S notations of Spiranes, allenes and Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds. Stereospecific and stereoselective synthesis – Methods of Asymmetric synthesis including enzymatic and catalytic process – Cram's rule and Prelog's rule – Cram chelation model and Felkin – Ahn model.

UNIT – IV: REARRANGEMENT REACTIONS

Types of rearrangements: Nucleophilic, electrophilic and Free radical and protrophic reactions. **Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements.

Reactions: Carbon to carbon migration: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid, Arndt – Eistert synthesis, Demjanov and dienone-phenol rearrangements.

Carbon to oxygen migration: Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.

Carbon to Nitrogen migration: Lossen, Neber and curtius rearrangements.

Miscellaneous: Von – Richter rearrangement and Fischer - Indole synthesis.

UNIT – V: REAGENTS IN ORGANIC SYNTHESIS

Gilman's reagent – LDA – DCC – 1,3 – dithane (umpolung synthesis) – Selenium dioxide. Fetizon's reagent – Lemieux – Von Rudloff reagent – Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.

Course calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	, **Aromaticity**: Benzenoid compounds
2-L2	and non–benzenoid compounds
3- L3	sextet theory
4-L4	MO theory
5-L5	Huckel's rule
6-L6	Annulenes and hetero annulenes
7-L7	Anti and homo aromaticity – Fullerenes.
8-L8	Nomenclature of bicyclic and tricyclic systems
9-L9	structure and synthesis of Adamantane – Congressane –. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Welcome**
13-L11	**MECHANISM AND METHODS UNIT – II: ORGANIC REACTION**
14-L12	**Reaction mechanism:** Energy diagram of simple Organic reactions
15-L13	Transition state and intermediate.
16-L14	Kinetic and Thermodynamic requirements of reactions
17-L-15	Baldwin rules for ring closure
18-L16	Hammond Postulate and microscopic reversibility.
19-L17	**Methods:** Kinetic and Thermodynamic control of product formation
	Entering Internal Test-I Marks into University portal
20-L18	Kinetic methods of determination: Rate law
21-P2	**College level meeting/Cell function**
22-L19	Primary and secondary isotope effect. Non-Kinetic methods of determination:
23-L20	and Trapping of intermediates, isotopic labeling
24-L21	**Allotting portion for Internal Test-II-** Cross–over experiment and stereo chemical evidence. **LFER:** Hammett equation – Physical significance of σ and ρ – Applications and Limitations – Taft equation.
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT – III: STEREOCHEMISTRY** **Concept of chirality:** – Enantiotopic, diastereotopic hydrogens
27-L23	prochiral centres – axial and planar chirality
28-L24	stereochemistry of compounds containing two dissimilar asymmetric carbons
29-L25	ansa compounds and para cyclophanes.
30-L26	R/S notations of Spiranes, allenes
31-L27	R/S notations of Biphenyl ortho derivatives – E/Z notation of compounds containing one and two double bonds

32-L28	Stereospecific and stereoselective synthesis
33-L29	Methods of Asymmetric synthesis including enzymatic and catalytic process
33-L30	Cram's rule and Prelog's rule
35-L31	Cram chelation model and Felkin – Ahn model.
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: REARRANGEMENT REACTIONS** **Types of rearrangements:** Nucleophilic, electrophilic and Free radical and protrophic reactions.
38-L34	**Mechanism:** Nature of migration – migrating aptitude and memory effects, ring enlargement and ring contraction rearrangements
39-L35	**Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone,
40-L36	Benzil – Benzilic acid, Arndt – Eistert synthesis
41-L37	Demjanov and dienone-phenol rearrangements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	**Carbon to oxygen migration:** Baeyer–Villiger, Hydro peroxide and Dakin rearrangements.
44-L39	**Carbon to Nitrogen migration:**
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lossen, Neber and curtius rearrangements
47-L42	**Miscellaneous:** Von – Richter rearrangement
48-L43	Fischer - Indole synthesis.
49-L44	**UNIT – V: REAGENTS IN ORGANIC SYNTHESIS**
50-L45	Gilman's reagent – LDA**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	DCC – 1,3 – dithane (umpolung synthesis) **Test Paper distribution and result analysis**
53-L47	Selenium dioxide. Fetizon's reagent
54-L48	Lemieux – Von Rudloff reagent
55-L49	Lemieux–Johnson reagent – Woodward and prevost hydroxylation. Merrifield resin – Vaskas catalyst – Wilkinson's catalyst.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –I"
CO1	Explain the **Aromaticity**.
CO2	Write the Nomenclature of bicyclic and tricyclic systems
CO3	Understand the Transition state and intermediate. Kinetic and Thermodynamic requirements of reactions
CO4	Write Hammett equation Physical significance of σ and ρ Applications and Limitations Taft equation.
CO5	Understand stereochemistry of compounds containing two dissimilar asymmetric carbons, ansa compounds and para cyclophanes.
CO6	Write the R/S notations of Spiranes, allenes.
CO7	Explain **Carbon to carbon migration**: Wagner – Meerwein, Pinacol – Pinacolone, Benzil – Benzilic acid,
CO8	Write the Lossen, Neber and curtius rearrangements
CO9	Woodward and prevost hydroxylation. Merrifield resin
CO10	Know the Wilkinson's
Experimental Learning	
EL1	Write the Woodward and prevost hydroxylation. Merrifield resin
EL2	Write the Arndt Eistert synthesis, Demjanov and dienone-phenol rearrangements
EL3	Perform a Cram's rule and Prelog's rule Cram chelation model and Felkin – Ahn model.
EL4	Draw the structure Azulene and sydnones
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry-I
Course Code	PCHM12
Class	I year (2018-2019)
Semester	Odd
Staff Name	1. Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To understand different type of bonds and to study different theories of bonding.*
- *To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.*
- *To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.*
- *To introduce nuclear chemistry and to study the applications of radio isotopes.*
- *To study the extraction of lanthanides and actinides from ores and to understand their properties.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-2/

INORGANIC CHEMISTRY -I

Unit – I: CHEMICAL BONDING

Valence Bond theory: Linear combination of A.O's in hybridization –stereochemistry of the hybrid orbitals –Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory –Walsh diagrams – Bent's rule.

Molecular Orbital theory: symmetry and overlap in M.O's,– σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation) – M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2).

Ionic Bond: Lattice energy –Born-Lande equation, Born Haber cycle –problems involving of calculation of electron affinity and lattice energy–Kapustinskii equation.

Unit – II: REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS

Redox potential: Applications of redox potential to inorganic reactions - factors affecting redox potential.

Acid-Base: Concept of acids and bases, Hard Soft Acid Base (HSAB) concept, symbiosis in hardening or softening a centre - levelling effect - acid-base strength verses HSAB principle.

Non-aqueous solvents: Classification of protic and aprotic solvents. Self ionization and leveling effect.Reactions in non-aqueous solvents - acid-base reactions, complex formation solvolysis, solvation - reactions in liquid ammonia and liquid SO_2.Use of ionic liquids in synthesis.

Unit – III: SOLID STATE CHEMISTRY

Description of crystal structures: calcite, zinc blende, wurtzite, rutile, fluorite, antifluorite, CsCl, CdI_2, K_2NiF_4 – spinels and perovskite. Crystal defects in solids – line and plane defects – Point defects - Schottky and Frenkel defects – Non-stoichiometric defects – Colour centres – Solid electrolytes and their applications.**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors. **Super conductivity**:High temperature super conductors, properties and applications – BCS theory – Cooper electrons – Meissener effect and levitation.

Unit – IV: LANTHANIDES AND ACTINIDES

Correlation of electronic structures, occurrence, extraction from ores and separation methods (Ion exchange and solvent extraction method) and properties of the elements – Chemistry of separation of Pu from U and fission products – Common and uncommon oxidation states – Comparison with transition elements – Lanthanide and actinide contractions – magnetic characteristics of lanthanides and actinides – Similarities between actinides and lanthanides - Use of lanthanide complexes as shift reagents.

UNIT –V: NUCLEAR CHEMISTRY

Atomic nuclei : Nuclear shell structure – nuclear reactions : types, Q-value, threshold energy, cross sections and excitation functions. Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions : neutron evaporation and spallation – heavy ion reactions – photonuclear reactions. Nuclear fusion and stellar energy – nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons – theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India.

Radio isotopes: Preparation - Analytical applications - radio chromatography, neutron activation analysis, neutron absorptiometry and radiometric titrations.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	**Unit I – CHEMICAL BONDING** Linear combination of A.O's in hybridization – stereochemistry of the hybrid orbitals
2-L2	Calculation of *s* and *p* characters of equivalence and non-equivalence hybrid orbitals – Draw backs of VSEPR theory
3- L3	Walsh diagrams – Bent's rule
4-L4	symmetry and overlap in M.O's – σ, π, δ M.O's– phi(ϕ) and mu (μ) bonds (Delta and quadrupole bond formation)
5-L5	M.O. diagrams of hetero nuclear diatomic molecules (CO, NO) and triatomic molecules (BeH_2, CO_2)
6-L6	Lattice energy –Born-Lande equation
7-L7	Born Haber cycle –problems involving of calculation of electron affinity and lattice energy
8-L8	Kapustinskii equation.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis- Unit II – REDOX POTENTIAL AND NON-AQUEOUS SOLVENTS** **Redox potential:** Applications of redox potential to inorganic reactions
12-P1	**Department function**
13-L11	Concept of acids and bases, Hard Soft Acid Base (HSAB) concept
14-L12	symbiosis in hardening or softening a centre - levelling effect
15-L13	acid-base strength verses HSAB principle
16-L14	**Heterogeneous catalysis:** synthesis gas and water gas shift reactions;
17-L-15	Classification of protic and aprotic solvents
18-L16	Self ionization and leveling effect
19-L17	Reactions in non-aqueous solvents
	Entering Internal Test-I Marks into University portal
20-L18	acid-base reactions, complex formation solvolysis, solvation
21-P2	**College level meeting/Cell function**
22-L19	reactions in liquid ammonia and liquid SO_2
23-L20	Use of ionic liquids in synthesis
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT-III: SOLID STATE CHEMISTRY**: **Description of crystal structures**: calcite, zinc blende, wurtzite
27-L23	rutile, fluorite, antifluorite
28-L24	CsCl, CdI_2, K_2NiF_4
29-L25	spinels and perovskite
30-L26	Crystal defects in solids – line and plane defects
31-L27	Point defects - Schottky and Frenkel defects
32-L28	Non-stoichiometric defects – Colour centres
33-L29	Solid electrolytes and their applications
33-L30	**Band theory:** Bonding in metals– free electron theory–optical and electrical properties of semiconductors

35-L31	**Super conductivity**:High temperature super conductors, properties and applications
36-L32	**Allotting portion for Assignment/seminar -** BCS theory – Cooper electrons – Meissner effect and levitation
38-L33	**UNIT – IV: LANTHANIDES AND ACTINIDES** Correlation of electronic structures, occurrence, extraction from ores
38-L34	separation methods (Ion exchange and solvent extraction method) and properties of the elements
39-L35	Chemistry of separation of Pu from U and fission products
40-L36	Common and uncommon oxidation states
41-L37	Comparison with transition elements
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Lanthanide and actinide contractions
44-L39	magnetic characteristics of lanthanides and actinides
45-L40	**Submission of Assignment/take the seminar**
46-L41	Similarities between actinides and lanthanides
47-L42	Use of lanthanide complexes as shift reagents
48-L43	Overview of the chapter
49-L44	**UNIT -V : NUCLEAR CHEMISTRY** **Atomic nuclei** : Nuclear shell structure
50-L45	Direct nuclear reactions – transmutation reactions: stripping and pick-up – high energy reactions - neutron evaporation and spallation – heavy ion reactions – photonuclear reactions.
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	Nuclear fusion and stellar energy - nuclear fission : mass and charge distribution of fission products – fission energy – fission neutrons
53-L47	Theory of nuclear fission – spontaneous fission. Waste disposal and atomic power project in India
54-L48	Preparation - Analytical applications - radio chromatography
55-L49	neutron activation analysis, neutron absorptiometry and radiometric titrations.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	COs of the course "INORGANIC CHEMISTRY –I"
CO1	To understand different type of bonds and to study different theories of bonding.
CO2	To understand the acid-base concept, reactions in non-aqueous medium and to study applications of redox potential in inorganic systems.
CO3	To study the crystal structures, defects in solid crystals, band theory of solids and superconductors.
CO4	To introduce nuclear chemistry and to study the applications of radio isotopes.
CO5	To study the extraction of lanthanides and actinides from ores and to understand their properties.
Experimental Learning	
EL1	Electrochemical series was used to construct redox couple forming different Galvanic cells.
EL2	Qualitative analyses of selected Lanthanides and Actinides were performed
EL3	Synthesize Oxygen deficient ZnO to illustrate metal excess defect
EL4	Chart displaying different disposal methods of nuclear states
Integrated Activity	
IA1	Prepare zinc blende phase of ZnS and characterize by XRD
IA2	Prepare a mini-model to illustrate Meissner effect (Magnetic Levitation)

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry-I
Course Code	PCHM13
Class	I year (2018-2019)
Semester	Odd
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

To learn the concept of Partial molar properties, fugacity and activity

To apply phase rule for three component system

To understand the Principles of Thermodynamics of irreversible processes

To understand Quantum mechanics and Statistical Thermodynamics

To understand the importance of rotational spectroscopy

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc.(Chemistry)/Sem.-1/Core-3/

PHYSICAL CHEMISTRY -I

UNIT-I

Thermodynamics

Concepts of Partial molar properties – Partial molar free energy, chemical potential, partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature and Variation

of Chemical Potentialwith pressure. Determination of partial molar volume: Graphical method, intercept method and Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method, Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity. Activity and activity coefficient: Defi nition of activity and activity coefficient, determination of activity coefficient by EMF and solubility method. Thermodynamics of non ideal system-Excess thermodynamic function, GE, SE, HE etc.

UNIT-II

Phase Rule & Thermodynamics of irreversible processes:

Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule, Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system. Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.

Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance.Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility, the Onsager reciprocal relations- Validity and Verification. Thermal osmosis,Thermoelectric phenomena-Electro kinetic and thermo mechanical effects. Application of irreversible thermodynamics to biological and non-linear systems.

UNIT-III

Quantum Chemistry

Inadequacy of classical mechanics, Black body radiation, Planck's quantum theory, Photoelectric effect. Bohr's theory of hydrogen atom :Hydrogen spectra, wave particle duality – uncertainty principle. Operators- Linear, differential, Laplacian, Hermitian and Hamiltonian operators angular momentum operator. Eigen functions and Eigen values. commutation relations, related theorems,simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and (Lx, $L_{y)}$] and their significance. Commutation relations, related theorems.Time-dependent and time-independent Schrödinger wave equations – Postulates of quantum mechanics.

UNIT-IV Statistical thermodynamics

Concept of thermodynamics and mathematical probabilities – Micro and macro state - phase space – Maxwell – Boltzmann, Bose – Einstein statistics and Fermi –

Dirac statistics – comparison and applications – modes of contribution to energy. Partition functions. Separation of partition functions. Translational, rotational, vibrational and electronic partition functions. Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure, Gibbs function, residual entropy, equilibrium constant, average energies. Equipartition theorem.Statistical approach to Heat capacity of mono and diatomic gases.Heat capacity of solids- Einstein and Debye models.

UNIT-V: MOLECULAR SPECTROSCOPY

Introduction and Rotational Spectroscopy

Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio; width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle; intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients, Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines, select ion rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	**UNIT-I Thermodynamics:** Concepts of Partial molar properties – Partial molar free energy, chemical potential
2-L2	partial molar volume and its significance.Gibbs-Duhem equation, Gibbs-DuhemMargulus equation.Chemical Potential, Variation of Chemical Potentialwith temperature
3- L3	Variation of Chemical Potentialwith pressure
4-L4	Determination of partial molar volume: Graphical method, intercept method
5-L5	Apparent molar volume method. Concept of Fugacity; Determination of Fugacity by graphical method and compressibility factor method
6-L6	Fugacity of a liquid component in a liquid mixture, Physical significance of Fugacity
7-L7	. Activity and activity coefficient: Defi nition of activity and activity coefficient,
8-L8	Determination of activity coefficient by EMF and solubility method. Thermodynamics of non- ideal system-Excess thermodynamic function, GE, SE, HE etc.
9-L9	Quick review of the chapter-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis- Unit II – Phase Rule & Thermodynamics of irreversible processes**: Lever rule, Derivation of Lever rule. Phase rule and compressed Phase rule
12-P1	**Department function**
13-L11	Derivation of phase rule from the concept of chemical potential. Application of Phase rule to three components system.
14-L12	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
15-L13	Principle of triangular diagram: Plots for a mixture of three liquids consisting of one, two and three pairs of partially miscible liquids.
16-L14	Thermodynamics of irreversible processes with simple examples.Uncompensated heat and its physical significance
17-L-15	Entropy production- rate of entropy production, entropy production in chemical reactions.The principle of microscopic reversibility
18-L16	the Onsager reciprocal relations- Validity and Verification
19-L17	Thermal osmosis,Thermoelectric phenomena-
	Entering Internal Test-I Marks into University portal
20-L18	Electro kinetic and thermo mechanical effects
21-P2	**College level meeting/Cell function**
22-L19	Application of irreversible thermodynamics to biological systems
23-L20	Application of irreversible thermodynamics to non-linear systems
24-L21	Quick review of the chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT-III Quantum Chemistry** Inadequacy of classical mechanics, Black body radiation, Planck's quantum theory
27-L23	Photoelectric effect. Bohr's theory of hydrogen atom

28-L24	Hydrogen spectra, wave particle duality – uncertainty principle.
29-L25	Operators- Linear, differential, Laplacian
30-L26	Hermitian and Hamiltonian operators angular momentum operator
31-L27	Eigen functions and Eigen values. commutation relations
32-L28	simultaneous measurement of several properties : evaluation of commutators such as [(x , P_x) and their significance
33-L29	simultaneous measurement of several properties : evaluation of commutators such (Lx, $L_{y)}$] and their significance
33-L30	Commutation relations, related theorems.
35-L31	Time-dependent and time-independent Schrödinger wave equations
36-L32	Quick review of the chapter- **Allotting portion for Assignment/seminar**
38-L33	**UNIT-IV Statistical thermodynamics**
38-L34	Concept of thermodynamics and mathematical probabilities – Micro and macro state
39-L35	phase space – Maxwell – Boltzmann statistics
40-L36	Bose-Einstein statistics
41-L37	Fermi-Dirac statistics
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Comparison and applications – modes of contribution to energy
44-L39	Partition functions. Separation of partition functions
45-L40	**Submission of Assignment/ seminar**
46-L41	Interpretation of partition function- relation between partition function and Thermodynamic properties: Internal energy, entropy, enthalpy, Helmholtz function, pressure
47-L42	Gibbs function, residual entropy, equilibrium constant, average energies
48-L43	Equipartition theorem. Statistical approach to Heat capacity of mono and diatomic gases. Heat capacity of solids- Einstein and Debye models.
49-L44	**UNIT-V: MOLECULAR SPECTROSCOPY** **Introduction and Rotational Spectroscopy**
50-L45	Electromagnetic radiation: quantization of energy; rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra. Resolution and intensity of spectral transition: signal-to-noise ratio
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	width of spectral lines-collision broadening, Doppler broadening, Heisenberg uncertainty principle;
53-L47	intensity of spectral lines-selection rules and transition probability, transition moment integral, Einstein absorption and emission coefficients
54-L48	Boltzmann distribution. Enhancing sensitivity of spectral lines: Fourier Transform (FT) and computer averaging techniques (CAT). Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines
55-L49	selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors: rotational transitions, centrifugal distortion constant; rotational spectra of linear and symmetric top polyatomic molecules.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper**

	discussion
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –I"
CO1	To learn the concept of Partial molar properties, fugacity and activity
CO2	To apply phase rule for three component system
CO3	To understand the Principles of Thermodynamics of irreversible processes
CO4	To understand Quantum mechanics and Statistical Thermodynamics
CO5	To understand the importance of rotational spectroscopy
Experimental Learning	
EL1	To calculate the bond length of microwave active compounds from microwave spectroscopy
EL2	To calculate the force constant of IR active molecules and comparison with bond energy
Integrated Activity	
IA1	Phase diagram between water, acetone and ethanol is analysed
IA2	Prepare a mini-model to illustrate Thermoelectric effect.

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-III
Course Code	PCHM31
Class	II year (2018-2019)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	4
L. Hours /P. Hours	5/ WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the Aliphatic nucleophilic substitution.
- To understand the E_1, E_2 and E_1CB mechanisms.
- To study the C-13 spectroscopy of certain compounds.
- To study the 2D NMR spectroscopy.
- To understand the Fragmentation pattern of simple compounds
- To learn the problem based on UV, IR, H^1 NMR, ^{13}C NMR and Mass spectroscopic techniques.
- To learn the Organic photochemistry.
- To learn the applications of Sigmatropic rearrangements.
- To gain knowledge about the Heterocyclic and biomolecules.
- To study the synthesis of flavones, isoflavones, flavonol.

2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-III/Core-13/

ORGANIC CHEMISTRY – III

Unit-I : Aliphatic nucleophilic substitution and Elimination Reactions:
Aliphatic nucleophilic substitution : Mechanism of S_N1, S_N2, S_Ni, S_N1', S_N2' and S_Ni' reactions- Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution- Ambident nucleophile- NGP- Mechanism of esterifications and ester hydrolysis ($B_{AC}2$ and $A_{AC}2$ mechanisms only) Elimination reaction: E_1, E_2 and E_1CB mechanisms-Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic

elimination- Chugaev and cope reactions-competition between substitution and elimination reactions.

Unit – II: NMR SPECTROSCOPY

^{1}H-NMR spectroscopy: Basic Principle – number of signals – chemical shift – Factors influencing chemical shift - spin–spin splitting–Proton exchange reactions - classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR. **C-13 spectroscopy**: Principle of proton decoupled and OFF- resonance decoupled C-13 spectroscopy - comparison with H^1NMR - chemical shifts (aliphatic, olefinic, alkynic, aromatic and carbonyl compounds) **2D NMR spectroscopy**: H^1–H^1COSY, H^1–C^{13} COSY, NOESY, DEPT and INADEQUATE spectra.

Unit – III: MASS SPECTROSCOPY

Basic Principles– Base peak – molecular ion – nitrogen rule – metastable ions – isotopic peak - daughter ions – Mc–Lafferty rearrangement – RDA – General rules for fragmentation pattern – Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds. Alternative electron impact ionization technique– CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF, ICP-MS. One conjunction problem based on UV, IR, H^1 NMR, ^{13}C NMR and Mass spectroscopic techniques is compulsory under section – c. Problems shall be based on the reference books.

Unit-IV : Organic photochemistry and pericyclic reactions

Organic photochemistry: Jablonskii diagrams-intersystem crossing-energy transfer process-Photosensitization- alpha cleavages or Norrish type-I and Norrish Type II cleavages - Paterno-Buchi reactions- Barton reaction, cis-trans isomerisation. - Di-π methane rearrangement. **pericyclic reactions:** Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches: **Electrocyclic reaction**: con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatrienes)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry. **Cycloaddiation:** suprafacial and antarafacial, [2+2] and [4+2] cyclo addition reactions (ethylene and butadiene) **Sigmatropic rearrangements** - [i,j] shift of C-H and C-C bonds (1,3) and (1,5) carbon migration.

Unit-V : Heterocyclic and biomolecules

Synthesis and reactions of indole, oxazole, imidazole, thiazole, Reserpine and quinine chromans, pyrimidine, pyridazine, pyrazine, coumarins, benzopyrones and anthocyanins-synthesis of flavones, isoflavones, flavonol, and quercetin -Biosynthesis of flavonoids. Synthesis **-** Pyranose and furanose forms of aldohexose and ketohexose-methods used for the determination of ring size-A Detailed study on the structure of maltose, lactose and starch.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	Aliphatic nucleophilic substitution : Mechanism of S_N1, S_N2, S_Ni, S_N1', S_N2' and S_Ni' reactions
2-L2	Effect of substrate, nucleophile, leaving group and solvent on the rate of substitution
3- L3	Ambident nucleophile
4-L4	NGP- Mechanism
5-L5	esterifications and ester hydrolysis ($B_{AC}2$ and $A_{AC}2$ mechanisms only)
6-L6	Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation
7-L7	Elimination reaction: E_1, E_2 and E_1CB mechanisms
8-L8	Factors influencing elimination reactions- Hofmann and Satyzeff rules- Pyrolytic elimination
9-L9	Chugaev and cope reactions-competition between substitution and elimination reactions. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Department function**
13-L11	**Unit – II: NMR SPECTROSCOPY** **^{1}H-NMR spectroscopy**: Basic Principle
14-L12	number of signals – chemical shift
15-L13	Factors influencing chemical shift - spin–spin splitting–Proton exchange reactions
16-L14	classification of spin systems – analysis of AX, AMX and ABX systems – Geminal, Vicinal and long range couplings
17-L-15	**C-13 spectroscopy**: Principle of proton decoupled
18-L16	OFF- resonance decoupled C-13 spectroscopy
19-L17	comparison with H^1NMR
	Entering Internal Test-I Marks into University portal
20-L18	**2D NMR spectroscopy**
21-P2	**College level meeting/Cell function**
22-L19	H^1–H^1COSY, H^1–C^{13} COSY
23-L20	NOESY, DEPT
24-L21	**Allotting portion for Internal Test-II-** INADEQUATE spectra.
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- Unit – III: MASS SPECTROSCOPY** Basic Principles
27-L23	Basic Principles– Base peak – molecular ion – nitrogen rule
28-L24	– metastable ions – isotopic peak - daughter ions
29-L25	use of activating and blocking groups
30-L26	Mc–Lafferty rearrangement
31-L27	RDA – General rules for fragmentation pattern
32-L28	Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.

33-L29	Alternative electron impact ionization technique
33-L30	CI, FAB, ESI – MS, MALDI –MS, MALDI-TOF, ICP- MS.
35-L31	conjunction problem based on UV, IR, H^1 NMR, ^{13}C NMR and Mass spectroscopic techniques is compulsory under section – c. Problems
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**Unit-IV : Organic photochemistry and pericyclic reactions**
38-L34	**Organic photochemistry**
39-L35	Jablonskii diagrams-intersystem crossing-energy transfer process
40-L36	Photosensitization- alpha cleavages
41-L37	Norrish type-I and Norrish Type II cleavages
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Paterno-Buchi reactions- Barton reaction
44-L39	cis-trans isomerisation. - Di-π methane rearrangement.
45-L40	**Submission of Assignment/take the seminar**
46-L41	**pericyclic reactions:** Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches
47-L42	**Electrocyclic reaction**: con and dis rotatory motions for 4n and 4n+2system (butadiene and 1,3,5-hexatrienes)- Stereochemical course of electro cyclic reaction in terms of conservation of orbital symmetry
48-L43	**Cycloaddiation:** suprafacial and antarafacial, [2+2] and [4+2] cyclo addition reactions (ethylene and butadiene) **Sigmatropic rearrangements** - [i,j] shift of C-H and C-C bonds (1,3) and (1,5) carbon migration.
49-L44	**Unit-V : Heterocyclic and biomolecules**
50-L45	Synthesis and reactions of indole, oxazole, imidazole, thiazole, Reserpine and quinine chromans**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	pyrimidine, pyridazine, pyrazine, coumarins, benzopyrones and anthocyanins **Test Paper distribution and result analysis**
53-L47	synthesis of flavones, isoflavones, flavonol, and quercetin -Biosynthesis of flavonoids
54-L48	Pyranose and furanose forms of aldohexose and ketohexose-methods
55-L49	determination of ring size-A Detailed study on the structure of maltose, lactose and starch
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –III"
CO1	Explain the Aliphatic nucleophilic substitution
CO2	Write the mechanism Hofmann and Satyzeff rules- Pyrolytic elimination- Chugaev and cope reactions.
CO3	Understand the Geminal, Vicinal and long range couplings–NOE in stereochemistry – FTNMR.
CO4	Write the : H^1–H^1COSY, H^1–C^{13} COSY, NOESY, DEPT and INADEQUATE spectra.
CO5	Understand Mc–Lafferty rearrangement
CO6	Write the Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.
CO7	Explain the Jablonskii diagrams-intersystem crossing-energy transfer process- Photosensitization- alpha cleavages.
CO8	Ability to write the Synthesis and reactions of indole, oxazole
CO9	Know the Pyranose and furanose
CO10	Know the Electrocyclic reaction
Experimental Learning	
EL1	Synthesise an imidazole compound
EL2	Demonstration of photo oxidation reaction
Integrated Activity	
IA1	Discuss about the organic photochemistry and pericyclic reactions
IA2	Discuss the number of signals – chemical shift in NMR of certain compounds

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Inorganic Chemistry-III
Course Code	PCHM32
Class	II year (2018-2019)
Semester	Odd
Staff Name	1. Dr. C. JOEL
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To study synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes.
- To study about metallocenes.
- To study the applications of organometallic compounds.
- To study the applications of homogeneous and heterogeneous catalysis.
- To study the applications of NMR spectroscopy.
- To study the applications of EPR spectroscopy.
- To give an insight into theory and principles of thermogravimetric analysis.
- To study the photochemistry of inorganic metal complexes.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.16 / Core- 14
INORGANIC CHEMISTRY -III

Unit I – ORGANOMETALLIC CHEMISTRY – I
The 18 e− and 16 e− rules and its correlation to stability – Synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes – Substitution reactions of metal carbonyls - IR spectralapplications – identifications of bridging and terminal CO groups – Stretching mode analysis of metal carbonyls – evidence for M-M bonds. Synthesis, properties and structural features of metal complexes with alkene, alkyne, allyl andarene systems. Metallocenes – synthesis, properties, structure and bonding with particular reference to ferrocene and berryllocene – covalent versus ionic bonding in beryllocene. Template synthesis of macrocyclic ligands.

Unit II – ORGANOMETALLIC CHEMISTRY – II

Organometallic compounds as catalysts and the requirements: Agostic interaction – Oxidative addition and reductive elimination - insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands - cyclometallation reactions. **Homogeneous catalysis:** Wilkinson’s catalyst and hydrogenation reactions, Tolman catalytic loop; hydroformylation (oxo) reaction, Wacker and Monsanto acetic acid processes. Cluster compounds, polymer-supported and phase-transfer catalysis. **Heterogeneous catalysis:** synthesis gas and water gas shift reactions; Fischer Tropsch process and synthetic gasoline, Ziegler-Natta polymerization and mechanism of stereoregular polymer synthesis. Cyclooligomerisation of acetylenes (Reppe’s or Wilke’s catalyst) – Olefin isomerisation using Ni catalyst – olefin metathesis catalysed by Schröck type carbene.

UNIT-III: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – I

NMR SPECTROSCOPY: 31P, 19F and 15N – NMR – applications in structural problems based on number of signals, multiplicity, anisotropy (like H3PO3, H3PO2, [HNi(PPh3)4]+, SF4, TiF4, PF5, HPF2, H2PF3, PF3(NH2)2, P4S3, P4N4Cl6(NHC6H5)2, P3N3(CH3)2Cl4, NF3, NH3 – mer- and fac-Rh(PPh3)3Cl3, fluxional molecules (including organometallic compounds) and study of fluxionality by NMR technique - NMR of paramagnetic molecules - contact shifts. Evaluation of rate constants - monitoring the course of reaction using NMR.

EPR spectroscopy: Factors affecting magnitude of g-values - Zero field splitting and Kramers’ degeneracy - Application of EPR in the study of transition metal complexes based on number of signals, multiplicity, anisotropy (bis(salicylaldimine)copper(II), [Cu(bpy)3]2+, [Cu(Phen)Cl2], [(NH3)5Co-O2-Co(NH3)5]5+, Co3(CO)9Se, Co3(CO)9Rh, [CoF6]4-, [CrF6]3-, VO(acac)2, [VO(H2O)6]2+, [Fe(CN)5NO]2−). Applications in predicting the covalent character of M-L bond and Jahn-Teller distortion in Cu(II) complexes. EPR spectroscopy of metallobiomolecules: copper and iron proteins.

UNIT – IV: THERMOANALYTICAL AND SPECTROANALYTICAL METHODS

Theory and principles of thermogravimetric analysis, differential thermal analysis and differential scanning colorimetry – characteristic features of TGA and DTA curves – factors affecting TGA and DTA curves – complementary nature of TGA and DTA – applications of thermal methods in analytical chemistry – thermometric titrations – the study of minerals and metal compounds. Principle and applications of spectrophotometry, spectrofluorimetry, atomic absorption spectroscopy and atomic emission spectroscopy based on plasma sources.

UNIT -V : PHOTOCHEMISTRY OF METAL COMPLEXES

Frank Condon and thermally equilibrated excited (THEXI) states – properties of excited states of metal complexes – types of excited states, photophysical processes: bimolecular deactivation and energy transfer, photochemical processes: electron transfer reactions, isomerisation and substitutional processes – Photochemistry of Cr(III) and Co(III) complexes – Photophysical and photochemical properties of [Ru(bpy)3]2+. Applications of inorganic photochemistry: photochemical conversion and storage of solar energy – inorganic photochemistry at semi-conductor electrodes - Catalyzed photoreduction of CO2 and CO – TiO2 as a green photocatalyst in removing air and water pollutants.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	**Unit I – ORGANOMETALLIC CHEMISTRY – I** The 18 e− and 16 e− rules and its correlation to stability – Synthesis and structures of metal carbonyls, metal nitrosyls and dinitrogen complexes
2-L2	Substitution reactions of metal carbonyls
3- L3	IR spectral applications
4-L4	identifications of bridging and terminal CO groups –Stretching mode analysis of metal carbonyls
5-L5	evidence for M-M bonds
6-L6	Synthesis, properties and structural features of metal complexes with alkene
7-L7	alkyne, allyl andarene systems
8-L8	Metallocenes – synthesis, properties, structure and bonding with particular reference to ferrocene and berryllocene
9-L9	covalent versus ionic bonding in beryllocene. Template synthesis of macrocyclic ligands. -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis- Unit II – ORGANOMETALLIC CHEMISTRY – II** Organometallic compounds as catalysts and the requirements: Agostic interaction – Oxidative addition and reductive elimination- cyclometallation reactions.
12-P1	**Department function**
13-L11	insertion and elimination reactions – nucleophilic and electrophilic attack of coordinating ligands,
14-L12	**Homogeneous catalysis:** Wilkinson’s catalyst and hydrogenation reactions,
15-L13	Cluster compounds, polymer-supported and phase-transfer catalysis.
16-L14	**Heterogeneous catalysis:** synthesis gas and water gas shift reactions;
17-L-15	Fischer Tropsch process and synthetic gasoline, Ziegler-Natta polymerization and mechanism of stereoregular polymer synthesis
18-L16	Cyclooligomerisation of acetylenes (Reppe’s or Wilke’s catalyst)
19-L17	Olefin isomerisation using Ni catalyst
	Entering Internal Test-I Marks into University portal
20-L18	olefin metathesis catalysed by Schröck type carbene
21-P2	**College level meeting/Cell function**
22-L19	cyclometallation reactions
23-L20	Wacker and Monsanto acetic acid processes.
24-L21	**Allotting portion for Internal Test-II-** Tolman catalytic loop; hydroformylation (oxo) reaction,
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT-III: SPECTRAL METHODS TO THE STUDY OF INORGANIC COMPOUNDS – I NMR SPECTROSCOPY**: 31P, 19F and 15N – NMR – applications in structural problems based on number of signals
27-L23	multiplicity, anisotropy (like H3PO3, H3PO2, [HNi(PPh3)4]+, SF4, TiF4, PF5, HPF2, H2PF3, PF3(NH2)2, P4S3, P4N4Cl6(NHC6H5)2, P3N3(CH3)2Cl4, NF3, NH3 – mer- and fac-Rh(PPh3)3Cl3

28-L24	fluxional molecules (including organometallic compounds) and study of fluxionality by NMR technique
29-L25	NMR of paramagnetic molecules - contact shifts. Evaluation of rate constants
30-L26	monitoring the course of reaction using NMR.
31-L27	**EPR spectroscopy**: Factors affecting magnitude of g-values - Zero field splitting and Kramers' degeneracy
32-L28	Application of EPR in the study of transition metal complexes based on number of signals, multiplicity, anisotropy (bis(salicylaldimine)copper(II), $[Cu(bpy)_3]^{2+}$, $[Cu(Phen)Cl_2]$,
33-L29	Applications in predicting the covalent character of M-L bond and Jahn-Teller distortion in Cu(II) complexes
33-L30	$Co_3(CO)_9Se$, $Co_3(CO)_9Rh$
35-L31	$VO(acac)_2$, $[VO(H_2O)_6]^{2+}$, $[Fe(CN)_5NO]^{2-}$).
36-L32	$[(NH_3)_5Co\text{-}O_2\text{-}Co(NH_3)_5]^{5+}$, , $[CoF_6]^{4-}$, $[CrF_6]^{3-}$, -**Allotting portion for Assignment/seminar**
38-L33	**UNIT – IV: THERMOANALYTICAL AND SPECTROANALYTICAL METHODS** Theory and principles of thermogravimetric analysis
38-L34	differential thermal analysis
39-L35	differential scanning colorimetry
40-L36	characteristic features of TGA and DTA curves
41-L37	factors affecting TGA and DTA curves
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	complementary nature of TGA and DTA
44-L39	applications of thermal methods in analytical chemistry
45-L40	**Submission of Assignment/take the seminar**
46-L41	thermometric titrations
47-L42	the study of minerals and metal compounds, Principle and applications of spectrophotometry, spectrofluorimetry,
48-L43	atomic absorption spectroscopy and atomic emission spectroscopy based on plasma sources.
49-L44	**UNIT -V : PHOTOCHEMISTRY OF METAL COMPLEXES** Frank Condon and thermally equilibrated excited (THEXI) states – properties of excited states of metal complexes
50-L45	types of excited states, photophysical processes
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	bimolecular deactivation and energy transfer, photochemical processes: electron transfer reactions, isomerisation and substitutional processes
53-L47	Photochemistry of Cr(III) and Co(III) complexes – Photophysical and photochemical properties of $[Ru(bpy)_3]^{2+}$.
54-L48	Applications of inorganic photochemistry: photochemical conversion and storage of solar energy
55-L49	Inorganic photochemistry at semi-conductor electrodes - Catalyzed photoreduction of CO_2 and CO – TiO_2 as a green photocatalyst in removing air and water pollutants.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**

58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –III"
CO1	Gain knowledge about structures of metal carbonyls, metal nitrosyls and dinitrogen complexes
CO2	Study the structure and bonding with particular reference to ferrocene and berryllocene
CO3	Explain the catalytic property of organometallic compounds
CO4	Gain knowledge about homogeneous and heterogeneous catalysts
CO5	Understand the principle of NMR spectroscopy
CO6	Understand the principle of EPR spectroscopy
CO7	Understanding the theory and principles of thermogravimetric analysis
CO8	Understanding the Principle and applications of spectrophotometry, spectrofluorimetry, atomic absorption spectroscopy and atomic emission spectroscopy.
CO9	Explain the properties of excited states of metal complexes
CO10	Know the applications of inorganic photochemistry
Experimental Learning	
EL1	Write the 18 e rule for various metal complexes
EL2	Interpret NMR spectra for several complexes
EL3	Interpret the TGA curve for a known compound
EL4	Study the photocatalytic activity of TiO_2 for MB degradation
Integrated Activity	
IA1	Prepare a Fe(II) complex and determine its structure through NMR spectra.
IA2	Interpret EPR spectra for an inorganic compound

Blended Learning : Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : Use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. BIJU BENNIE)

Programme Name	M. Sc Chemistry
Course Name	Physical Chemistry-III
Course Code	PCHM33
Class	II year (2018-2019)
Semester	Odd
Staff Name	1. Dr. R. BIJU BENNIE
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the principle of Group theory.
- To study the point groups of molecules.
- To understand the applications of group theory.
- To calculate the delocalization energy through group theory.
- To study the theory of NMR spectroscopy.
- To learn the theories of 2D NMR techniques.
- To obtain knowledge about the Theory of NQR spectroscopy.
- To learn the theory of EPR spectroscopy.
- To learn the theory of electronic spectroscopy and photoelectron spectroscopy.
- To study theory of Mass and Moss Bauer spectroscopy.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-III / Ppr.No.17 / Core- 15
PHYSICAL CHEMISTRY -III

UNIT - I: GROUP THEORY-I

Symmetry elements and operations. Group Postulates and types of groups. Identification of Point groups of molecules and Schoenflies symbols. Construction of multiplication table for C2v, C3v and C2h. Sub-groups and classes of symmetry operations. Rule of similarity transformations. Matrix representations of symmetry operations. Use of atomic wave functions as bases for point group representations. Reducible and irreducible representations. The Great Orthogonality theorem. Properties of Reducible and irreducible representations.

Construction of character tables for C2V, C3V, C4V, C2h, and D2 point groups by using The Great Orthogonality theorem.

UNIT - II GROUP THEORY -II

Standard Reduction Formula, Vibrational modes as bases for group representations-Normal mode analysis for non-linear molecules H_2O, $POCl_3$, trans-N_2F_2 and $PtCl_4$. Symmetry selection rules for infrared and Raman spectra. Mutual exclusion principle. Determination of Hybridisation of atomic orbitals in non-linear molecules (CH_4, XeF_4, and PF_5). Electronic spectra of ethylene and formaldehyde molecules. Construction of Projection operators and Molecular orbitals by Symmetry Adapted Linear Combinations. Simplification of HMO calculations using group theory. Calculation of delocalization energy for ethylene, trans-1,3 – butadiene, and benzene systems.

UNIT - III NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Theory of Proton NMR spectroscopy, Chemical shift and its measurement, Factors influencing chemical shift, Solvents used in NMR, solvents shift-concentration and temperature effects-hydrogen bonding. Theory of Spin-spin splitting-Magnitude of coupling-coupling constants, J, First-order spectra of complex systems, chemical and magnetic equivalence in NMR, Proton exchange reactions, Factors influencing coupling constant, J. Theory and Principle of 13C, 19F, 31P NMR-Range of chemical shift values, spectra of typical examples. FT NMR-FIDs. Theory of Spin-spin splitting and double irradiation, InterNuclear Double Resonance (INDOR) and Selective Population Inversion (SPI), Nuclear Overhauser Effect (NOE), 2D NMR-shift correlation spectra-COSY, Magnetic Resonance Imaging (MRI).

UNIT - IV NQR AND EPR SPECTROSCOPY

Electron paramagnetic resonance spectroscopy: theory of EPR spectroscopy, presentation of the spectrum, nuclear hyperfine splitting in isotropic systems. EPR spectra of anisotropic systems: anisotropy in g-value, causes of an isotropy, anisotropy in hyperfine coupling. Double resonance in ESR, Zero field splitting and Kramers’ degeneracy.

Theory and Principle of NQR spectroscopy-Nature of electric field gradient, Energy levels and selection rules, Interaction of electric quadrupole with electromagnetic radiation, nuclear orientations, the asymmetry parameter, quadrupole transitions in spherical, axially symmetric fields and not axially symmetric fields. Applications of NQR spectra.

UNIT - V ELECTRONIC SPECTROSCOPY, MOSSBAUER SPECTROSCOPY AND MASS SPECTROMETRY

Electronic Spectroscopy-Electronic Spectrum of diatomic molecules-Born-Oppenheimer approximation, Progressions, Franck-Condon Principle, Dissociation Energy and dissociation products, Rotational Fine structure of Electronic-Vibration Transitions, The Fortrat diagram, Predissociation, Electronic states of atoms, Electron orbitals in diatomic molecules, Electronic states of diatomic molecules, Potential energy curves for Electronic states of diatomic molecules.

Photoelectron Spectroscopy-Basic Principles, Ultra-Violet Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy, Chemical information from Photoelectron Spectroscopy.

Mössbauer spectra: Theory and Principle of Mössbauer spectra, isomer shift, quadrupole interactions, magnetic hyperfine interaction, Doppler shift, recoil energy, experimental technique-sources, absorber, calibration, Chemical applications.

Mass spectrometry: Operation and representation of spectra. Effect of combination of high energy electron with a molecule. Finger print application and the interaction of mass spectra, Effect of isotopes on the appearance of a mass spectrum, Molecular weight determinations.

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	UNIT I– GROUP THEORY-I - Symmetry elements and operations. Group Postulates and types of groups.
2-L2	Identification of Point groups of molecules and Schoenflies symbols.
3- L3	Construction of multiplication table for C2v, C3v and C2h.
4-L4	Sub-groups and classes of symmetry operations.
5-L5	Rule of similarity transformations
6-L6	Matrix representations of symmetry operations.
7-L7	Use of atomic wave functions as bases for point group representations.
8-L8	Reducible and irreducible representations.
9-L9	The Great Orthogonality theorem - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis-** Properties of Reducible and irreducible representations. Construction of character tables for C2V, C3V, C4V, C2h, and D2 point groups by using The Great Orthogonality theorem.
12-P1	**Department function**
13-L11	UNIT – II GROUP THEORY -II – Standard Reduction Formula, Vibrational modes as bases for group representations
14-L12	Normal mode analysis for non linear molecules H_2O, $POCl_3$, trans-N_2F_2 and $PtCl_4$.
15-L13	Symmetry selection rules for infrared and Raman spectra.
16-L14	Mutual exclusion principle.
17-L-15	Electronic spectra of ethylene and formaldehyde molecules.
18-L16	Construction of Projection operators and Molecular orbitals by Symmetry Adapted Linear Combinations.
19-L17	Simplification of HMO calculations using group theory.
	Entering Internal Test-I Marks into University portal
20-L18	Determination of Hybridisation of atomic orbitals in non-linear molecules (CH_4, XeF_4, and PF_5)
21-P2	**College level meeting/Cell function**
22-L19	Calculation of delocalization energy for ethylene
23-L20	trans-1,3 –butadiene, and benzene systems.
24-L21	**Allotting portion for Internal Test-II-** Brief outlook of group theory I and II
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis**- UNIT - III NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY - Theory of Proton NMR spectroscopy, Chemical shift and its measurement
27-L23	Factors influencing chemical shift, Solvents used in NMR
28-L24	solvents shift-concentration and temperature effects-hydrogen bonding
29-L25	Theory of Spin-spin splitting-Magnitude of coupling-coupling constants
30-L26	First-order spectra of complex systems, chemical and magnetic equivalence in NMR

31-L27	Proton exchange reactions, Factors influencing coupling constant, J.
32-L28	Theory and Principle of 13C, 19F, 31P NMR-Range of chemical shift values
33-L29	spectra of typical examples. FT NMR-FIDs.
33-L30	Theory of Spin-spin splitting and double irradiation, InterNuclear Double Resonance (INDOR) and Selective Population Inversion (SPI), Nuclear Overhauser Effect (NOE),
35-L31	2D NMR-shift correlation spectra-COSY, Magnetic Resonance Imaging (MRI).
36-L32	**Allotting portion for Assignment/seminar**
38-L33	UNIT - IV NQR AND EPR SPECTROSCOPY Electron paramagnetic resonance spectroscopy: theory of EPR spectroscopy, presentation of the spectrum, nuclear hyperfine splitting in isotropic systems.
38-L34	EPR spectra of anisotropic systems:
39-L35	anisotropy in g-value, causes of an isotropy, anisotropy in hyperfine coupling
40-L36	Double resonance in ESR, Zero field splitting and Kramers' degeneracy
41-L37	Theory and Principle of NQR spectroscopy-Nature of electric field gradient
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Interaction of electric quadrupole with electromagnetic radiation
44-L39	nuclear orientations, the asymmetry parameter
45-L40	**Submission of Assignment/take the seminar**
46-L41	quadrupole transitions in spherical
47-L42	axially symmetric fields and not axially symmetric fields
48-L43	Applications of NQR spectra
49-L44	UNIT-V: ELECTRONIC SPECTROSCOPY, MOSSBAUER SPECTROSCOPY AND MASS SPECTROMETRY Electronic Spectroscopy-Electronic Spectrum of diatomic molecules-Born-Oppenheimer approximation, Progressions
50-L45	Franck-Condon Principle, Dissociation Energy and dissociation products, Rotational Fine structure of Electronic-Vibration Transitions**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	The Fortrat diagram, Predissociation, Electronic states of atoms, Electron orbitals in diatomic molecules, **Test Paper distribution and result analysis**
53-L47	Electronic states of diatomic molecules, Potential energy curves for Electronic states of diatomic molecules. Photoelectron Spectroscopy-Basic Principles, Ultra-Violet Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy, Chemical information from Photoelectron Spectroscopy
54-L48	Mössbauer spectra: Theory and Principle of Mössbauer spectra, isomer shift, quadrupole interactions, magnetic hyperfine interaction, Doppler shift, recoil energy, experimental technique-sources, absorber, calibration, Chemical applications.
55-L49	Mass spectrometry: Operation and representation of spectra. Effect of combination of high energy electron with a molecule. Finger print application and the interaction of mass spectra, Effect of isotopes on the appearance of a mass spectrum, Molecular weight determinations.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**

59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY –III"
CO1	Explain basic principles of group theory
CO2	Identification of point group of molecules
CO3	Explain the vibrational modes of molecules using group theory
CO4	Determine the applications of group theory
CO5	Understand the theory of NMR
CO6	Explain the 2D NMR techniques.
CO7	Explain the theory of EPR.
CO8	Explain the theory of NQR.
CO9	Knowledge about the theory of electronic spectra and PES.
CO10	Knowledge about the theory of Moss Bauer and Mass Spectra.
Experimental Learning	
EL1	Find out vibrational modes for various molecules using group theory
EL2	Interpret NMR spectra for certain compounds
EL3	Interpret EPR spectra for certain compounds
EL4	Interpret mass spectra of a compound
Integrated Activity	
IA1	Prepare a compound and determine its structure through NMR spectra.
IA2	Record the electronic spectra for a given compound

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr.C. JOEL)

Programme Name	M. Sc Chemistry
Course Name	Scientific-Research Methodology
Course Code	PCHM34
Class	II year (2018-2019)
Semester	Odd
Staff Name	1.Dr.C. JOEL
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To *learn the process of survey for literature*.
- To search the *chemical abstract* in terms of the research area
- To get clear idea about *choosing a research problem*
- To learn about the *scientific writing*.
- To explore knowledge about *characterization and data analysis*
- To *search the literature via computer searching.*
- To know the process of *applying for the various finding agencies.*

2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-III/Core-16
SCIENTIFIC - RESEARCH METHODOLOGY – III

Unit – I: LITERATURE SURVEY

Source of chemical information – primary, secondary, tertiary sources-literature survey-Indexes and abstracts in science and technology – Applied science and technology index, chemical abstracts, chemical titles, current chemical reactions, current contents and science citation index.
Classical and comprehensive reference works in chemistry-synthetic methods and techniques, treatises, reviews, patents and monographs.

UNIT - II : CHEMICAL ABSTRACTS:

Current awareness searching: CA weekly issues, CA issue indexes. Retrospective searching: CA volume indexes-general subject index, chemical substance index-formula index, index of ring systems, author index, patent index.CA collective indexes: collective index (CI), decennial index (DI). Access points for searching CA indexes- Index guide, general subject, terms, chemical substance names, molecular formulas, ring systems, author names, patent numbers. Locating the reference: finding the abstract, finding the original document chemical abstract - service source index.

UNIT –III: CHOOSING A RESEARCH PROBLEM AND SCIENTIFIC WRITING

Identification of research problem – assessing the status of the problem - guidance from the supervisor – actual investigation and analysis of experimental results – conclusions.
Scientific writing-research reports, thesis, journal articles and books.
Steps to publishing a scientific article in a journal – types of publications-communications, articles, reviews, when to publish, where to publish ,specific format required for submission.
Documenting- Abstracts-indicative (or) descriptive abstracts, informative abstract, footnotes, end notes, referencing styles-bibliography-journal abbreviations (CASSI), abbreviation used in scientific writing.

Unit –IV: INSTRUMENTAL CHARACTERIZATION AND DATA ANALYSIS

Principle and Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD characterization of observed results – Data analysis - Report.
Errors in chemical analysis – classification of errors – determination of accuracy of methods – improving accuracy of analysis – significant figures – mean, standard deviation – comparison of results : “t” test, “f” test, Q test and “chi” square test – rejection of results – presentation of data.

UNIT –V: COMPUTER SEARCHES AND LITERATURE.

ASAP – Alerts, CA Alerts, scifinder, chemport, science direct, STN international, journal home pages. Online browsing of research articles – online submission of research papers in various Journals (ACS, RSC, Elsevier, Springer etc.) –Instructions to the authors – Impact factors.Writing project proposal to funding agencies (UGC, DST etc.).

Course Calendar

Hour allotment	Class Schedule
	Odd Semester Begin on 18-06-2018
1-L1	**LITERATURE SURVEY** Source of chemical information
2-L2	primary, secondary, tertiary sources
3- L3	literature survey-Indexes and abstracts in science and technology
4-L4	Applied science and technology index
5-L5	chemical abstracts, chemical titles
6-L6	current chemical reactions, current contents
7-L7	Science citation index.
8-L8	Classical and comprehensive reference works in chemistry
9-L9	synthetic methods and techniques, treatises, reviews, patents and monographs. -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (30.07.2018)**
11-L10	**Test Paper distribution and result analysis- UNIT - II : CHEMICAL ABSTRACTS:** Current awareness searching:
12-P1	**Department function**
13-L11	CA weekly issues, CA issue indexes
14-L12	Retrospective searching: CA volume indexes-general subject index
15-L13	chemical substance index, formula index & index of ring systems,
16-L14	author index, patent index.CA collective indexes: collective index (CI), decennial index (DI).
17-L-15	Access points for searching CA indexes
18-L16	Index guide, general subject, terms
19-L17	chemical substance names, molecular formulas & ring systems
	Entering Internal Test-I Marks into University portal
20-L18	author names & patent numbers
21-P2	**College level meeting/Cell function**
22-L19	Locating the reference: finding the abstract
23-L20	finding the original document chemical abstract
24-L21	**Allotting portion for Internal Test-II-** service source index.
25-IT-II	**Internal test – II (03.09.2018)**
26-L22	**Test Paper distribution and result analysis- UNIT –III: CHOOSING A RESEARCH PROBLEM AND SCIENTIFIC WRITING** Identification of research problem
27-L23	assessing the status of the problem
28-L24	guidance from the supervisor
29-L25	actual investigation and analysis of experimental results – conclusions
30-L26	Scientific writing-research reports
31-L27	thesis, journal articles and books
32-L28	Steps to publishing a scientific article in a journal
33-L29	types of publications-communications, articles, reviews
33-L30	specific format required for submission
35-L31	Documenting- Abstracts-indicative (or) descriptive abstracts, informative abstract, footnotes, end notes
36-L32	referencing styles-bibliography-journal abbreviations (CASSI), abbreviation used in scientific writing.

38-L33	**Unit –IV: INSTRUMENTAL CHARACTERIZATION AND DATA ANALYSIS** Principle of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD
38-L34	Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD
39-L35	characterization of observed results
40-L36	Data analysis - Report.
41-L37	Errors in chemical analysis – classification of errors
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	determination of accuracy of methods – improving accuracy of analysis
44-L39	significant figures – mean, standard deviation – comparison of results
45-L40	**Submission of Assignment/take the seminar**
46-L41	"t" test, "f" test, Q test and "chi" square test
47-L42	rejection of results
48-L43	presentation of data
49-L44	**UNIT –V: COMPUTER SEARCHES AND LITERATURE.** ASAP – Alerts
50-L45	CA Alerts, scifinder, chemport, science direct, STN international, journal home pages.
51-IT-III	**Internal Test-III (08.10.2018)**
52-L46	Online browsing of research articles
53-L47	online submission of research papers in various Journals (ACS, RSC, Elsevier, Springer etc.)
54-L48	Instructions to the authors – Impact factors.
55-L49	Writing project proposal to funding agencies (UGC, DST etc.).
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (22.10.2018)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-11-2018

Course Outcomes

Learning Outcomes	**COs** of the course "Scientific- Research Methodology - III"
CO1	How will you search the literature
CO2	Explain the sources of literature
CO3	Explain Current awareness searching
CO4	How will you locate the reference in the original document
CO5	How will you Identify a research problem
CO6	What are the steps to publish a scientific article in a journal
CO7	Explain the Principle and Sample preparation of UV, FT-IR, TEM, SEM, EDAX, AFM and XRD.
CO8	Explain the types of Errors in chemical analysis
CO9	Explain the method for Online browsing of research articles
CO10	Write the process involved in writing project proposal to the funding agencies
Experimental Learning	
EL1	Find out the method of research literature searching
EL2	To analyse the chemical abstracts
EL3	Preparation & characterisation of samples for various spectroscopic techniques
EL4	Determination of significant figures
Integrated Activity	
IA1	Download journals related to a particular topic.
IA2	Prepare a sample and record its UV-vis spectra and interpret it.

Blended Learning : Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : Use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature   Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Advanced Topics In Chemistry II
Course Code	PCHE21
Class	I year (2018-2019)
Semester	Odd
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	4
L. Hours /P. Hours	5/ WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

To understand the concept of forensic and computer applications, nano materials, industrial polymer, medicinal chemistry and bio-organic chemistry.

- To understand the concept of chemistry in forensic science.
- To understand molecular modelling simulation and animation by Computer Applications
- To study the applications in catalysis.
- To study Important industrial polymers.
- To understand the Synthetic route, structure and applications of engineering plastics
- To learn the Streochemistry and solubility issues in drug design
- To learn the Quantitative structure activity relationships (QSARS),.
- To learn the applications of Streochemistry and solubility issues in drug design.
- To gain knowledge about the Characteristics of enzymes- mechanism of enzyme action- chymotrypsin
- To study the bio metic chemistry cyclodextrins- Calixarenes as enzyme model.

2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc.(Chemistry)/Sem.-II/Elec.2/

ADVANCED TOPICS IN CHEMISTRY - II

UNIT I: Forensic and computer applications in Chemistry

Forensic science: Finger printing, forensic serology, hair and fiber analysis, explosive residue, glass comparisons, drug analysis, bullet and cartridge analysis. **Computer Applications:** molecular modelling simulation and animation. World Wide Web and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw.

UNIT –II: Applications of nanomaterials

Applications of nanomaterials: Applications in catalysis - Organic transformations and fuel cells - Environmental application - Water purification, air purification - Nano particles as sensors - **Nanocomposites** - Polymer-based Nanocomposites - Polyamide/clay Nano composites – Synthesis, characterization and properties of Nylon 6 - clay hybrid - Polystyrene/clay Nanocomposites – syndiotactic polystyrene/clay Nano composites, properties. Poly(butylenes terephthalate) (PBT) based nano composites, Epoxy nano composites on layered silicates. Bio-Nanocomposites- properties and applications.

UNIT III : Industrial polymer

Important industrial polymers – synthesis and applications of poly tetra flouro ethylene (TEFLON), ion exchange resins. Synthetic route, structure and applications of engineering plastics- Acrylonitrile butadiene styrene (ABS), Poly amides (PA), Poly ethylene terephthalate (PET), Polyphenylene Oxide (PPO), Poly sulphone (PSU), Poly ether ether ketone (PEEK), Poly amides, Poly phenylene sulphide(PPS).

UNIT IV : Medicinal chemistry

Drug Discovery, Design and development: Identification of diseases and corresponding targets, Bio assays and leads. Streochemistry and solubility issues in drug design. **Structure Activity Relationship (SARS):** Changing size and shape- introduction of new substituents. Quantitative structure activity relationships (QSARS), Lipophilicity – electronic and steric effects- Hansch Analysis – Top liss decision tree. Chemical and process development of drugs.**Preclinical trials:** Pharmacology, Toxicology, metabolism and stability studies- formulation. **Clinical trials:** Phase I- IV Studies- ethical issues. Patent protection.Regulation.

UNIT V: Bio-organic chemistry:

Characteristics of enzymes- mechanism of enzyme action- chymotrypsin- antibodies of enzymes- biological energy- ATP, NADH, NADPH, $FADH_2$ as electron carriers- Co – enzyme A as universal carriers of acyl groups- glycolysis- citric acid cycle- urea cycle – Link between glycolysis and citric acid cycle- lipid metabolism- biological oxidation- bio metic chemistry cyclodextrins- Calixarenes as enzyme model.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-L1	**UNIT I: Forensic and computer applications in Chemistry**
2-L2	**Forensic science**
3- L3	Finger printing, forensic serology
4-L4	hair and fiber analysis
5-L5	explosive residue, glass comparisons
6-L6	drug analysis, bullet and cartridge analysis
7-L7	Computer Applications
8-L8	molecular modelling simulation and animation
9-L9	World Wide Web and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw. . - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (18.01.2019)**
11-L10	**Test Paper distribution and result analysis-** Peterson olefination
12-P1	**Department function**
13-L11	**UNIT –II: Applications of nanomaterials**
14-L12	**Applications of nanomaterials:** Applications in catalysis
15-L13	Organic transformations and fuel cells - Environmental application
16-L14	Water purification, air purification - Nano particles as sensors
17-L-15	**Nanocomposites** - Polymer-based Nanocomposites
18-L16	Polyamide/clay Nano composites – Synthesis, characterization and properties of Nylon 6
19-L17	clay hybrid - Polystyrene/clay Nanocomposites – syndiotactic polystyrene/clay Nano composites
	Entering Internal Test-I Marks into University portal
20-L18	**2D NMR spectroscopy**
21-P2	**College level meeting/Cell function**
22-L19	Poly(butylenes terephthalate) (PBT) based nano composites, Epoxy nano composites on layered silicates
23-L20	Bio-Nanocomposites- properties and applications
24-L21	**Allotting portion for Internal Test-II-** INADEQUATE spectra.
25-IT-II	**Internal test – II (25.02.2019)**
26-L22	**Test Paper distribution and result analysis- UNIT III : Industrial polymer**
27-L23	Important industrial polymers
28-L24	synthesis and applications of poly tetra flouro ethylene (TEFLON), ion exchange resins
29-L25	Synthetic route, structure and applications of engineering plastics
30-L26	Acrylonitrile butadiene styrene (ABS),
31-L27	Poly amides (PA), Poly ethylene terephthalate (PET),
32-L28	Polyphenylene Oxide (PPO),
33-L29	Poly sulphone (PSU),

33-L30	Poly ether ether ketone (PEEK)
35-L31	Poly amides, Poly phenylene sulphide(PPS).
36-L32	**Allotting portion for Assignment/seminar**
38-L33	**UNIT IV : Medicinal chemistry**
38-L34	**Drug Discovery, Design and development**
39-L35	Identification of diseases
40-L36	corresponding targets, Bio assays and leads
41-L37	**Structure Activity Relationship (SARS):**
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Changing size and shape- introduction of new substituents
44-L39	Quantitative structure activity relationships (QSARS),
45-L40	**Submission of Assignment/take the seminar**
46-L41	Lipophilicity – electronic and steric effects- Hansch Analysis – Top liss decision tree. Chemical and process development of drugs.
47-L42	**Preclinical trials:** Pharmacology, Toxicology, metabolism and stability studies-formulation
48-L43	**Clinical trials:** Phase I- IV Studies- ethical issues. Patent protection.Regulation.
49-L44	**UNIT V: Bio-organic chemistry**
50-L45	Characteristics of enzymes- mechanism of enzyme action**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (22.03.2019)**
52-L46	chymotrypsin- antibodies of enzymes- biological energy **Test Paper distribution and result analysis**
53-L47	ATP, NADH, NADPH, $FADH_2$ as electron carriers- Co –enzyme A as universal carriers of acyl groups- glycolysis
54-L48	citric acid cycle- urea cycle – Link between glycolysis and citric acid cycle- lipid metabolism
55-L49	biological oxidation- bio metic chemistry cyclodextrins- Calixarenes as enzyme model.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (08.04.2019)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "Advanced Topics In Chemistyr II"
CO1	Explain the Finger printing, forensic serology, hair and fiber analysis, explosive residue, glass comparisons
CO2	Write the and Chemical Databases on internet Techniques of information search, Chemsketch and Chemdraw
CO3	Understand the nanomaterials
CO4	Write the Synthesis, characterization and properties of Nylon 6.
CO5	Understand Mc–Lafferty rearrangement
CO6	Write the Fragmentation pattern of simple compounds of hydrocarbons, alcohols, amines, aldehyde, ketone, ether, acids, phenols ,nitro compounds, alicyclic compounds.
CO7	Explain the Jablonskii diagrams-intersystem crossing-energy transfer process- Photosensitization- alpha cleavages.
CO8	Ability to write the Synthesis and reactions of indole, oxazole
CO9	Know the Pyranose and furanose
CO10	Know the **Electrocyclic reaction**
Experimental Learning	
EL1	Write the E_1CB mechanisms
EL2	Write the competition between substitution and elimination reactions
EL3	Perform a Atomic and molecular orbitals-Woodward-Hoffmann rules, FMO and correlation diagram approaches
EL4	Draw the structure of pyridazine, pyrazine, coumarins, benzopyrones
Integrated Activity	
IA1	Discuss about the Organic photochemistry and pericyclic reactions
IA2	Find the : Basic Principle – number of signals – chemical shift – Factors influencing chemical shift

Blended Learning : using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,

For Advanced Learner : use library books, E- books, motivate student to prepare for higher studies.

For slow learner : special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. C. Joel)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry Practicals-II
Course Code	PCHL22
Class	I year (2018-2019)
Semester	Even
Staff Name	Dr. C. Joel
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of Analysis of Mixture of Cations by Complexometric titrations*
- *To understand the photocalorimetric estimations*

ORGANIC CHEMISTRY PRACTICAL - II

A. Estimation

(i) Estimation of phenol
(ii) Estimation of aniline
(iii) Estimation of ascorbic acid

B. List of single stage preparations:

(i) Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone.

(ii) Preparation of Resacetophenone from Resorcinol.

(iii) Preparation of p-benzoquinone from hydroquinone.

(iv) Preparation of Bis-2-Naphthol.

(v) Preparation of Di Benzylidene acetone.

(vi) Preparation of anthraquinone from anthracene

(vii) Preparation of benzophenone oxime from benzophenone

(viii) Preparation of Nerolin from β-Naphthol

(ix) Preparation of anthranilic acid from Phthalimide

(x) Preparation of Benzilic acid from Benzil

C. For Class Work Only :

1. Download the following spectra from **internet** and give interpretation.

I. Differentiate the following pair by UV- spectra

(a) Trans stilbene and its cis isomer.

(b) Vinyl methyl ketone and acetone.

(c) Vinyl methyl ketone in two solvents such as n-Hexane and alcohol.

II. Differentiate the following pair by IR spectra

(a) para and ortho hydroxy benzoic acid.

(b) p-nitro and p-amino acetophenone.

(c) Maleic acid and fumaric acid.

(2) Separation of Caffeine from Tea / Coffee.

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2018
1-E1	Estimation of phenol
2-E2	Estimation of phenol
3- E3	Estimation of phenol
4-E4	Estimation of phenol
5-E5	Estimation of aniline
6-E6	Estimation of aniline
7-E7	Estimation of aniline
8-E8	Estimation of aniline
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of ascorbic acid
16-E11	Estimation of ascorbic acid
17-E-12	Estimation of ascorbic acid
18-E13	Estimation of ascorbic acid
19-E14	Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone
20-E15	Preparation of 1,2,3,4 –Tetrahydro carbazole from cyclohexanone
21-E16	Preparation of Resacetophenone from Resorcinol
22-E17	Preparation of Resacetophenone from Resorcinol
23-P2	**College level meeting/Cell function**
24-E18	Preparation of p-benzoquinone from hydroquinone

25-E19	Preparation of p-benzoquinone from hydroquinone
26-E20	Preparation of Bis-2-Naphthol
27-E21	Preparation of Bis-2-Naphthol
28-E22	Preparation of Di Benzylidene acetone
29-E23	Preparation of Di Benzylidene acetone
30-E24	Preparation of anthraquinone from anthracene
31-E25	Preparation of anthraquinone from anthracene
32-E26	Preparation of benzophenone oxime from benzophenone
33-E27	Preparation of benzophenone oxime from benzophenone
34-E28	Preparation of Nerolin from β-Naphthol
35-E29	Preparation of Nerolin from β-Naphthol
36-E30	Preparation of anthranilic acid from Phthalimide
37-E31	Preparation of anthranilic acid from Phthalimide
38-E32	Preparation of Benzilic acid from Benzil
39-E33	Preparation of Benzilic acid from Benzil
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Differentiate the following pair by UV- spectra (a) Trans stilbene and its cis isomer. (b) Vinyl methyl ketone and acetone. (c) Vinyl methyl ketone in two solvents such as n-Hexane and alcohol.
46-E35	Differentiate the following pair by IR spectra (a) para and ortho hydroxy benzoic acid. (b) p-nitro and p-amino acetophenone. (c) Maleic acid and fumaric acid.
47-E36	Separation of Caffeine from Tea / Coffee
48-E37	Separation of Caffeine from Tea / Coffee
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 24-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course “ORGANIC CHEMISTRY PRACTICALS–II”
CO1	To understand the estimation of certain organic compounds
CO2	To understand the preparation of certain organic compounds

# Blended Learning	:Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,
# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature　　　　　　　　　　　　　　　　　　Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-II
Course Code	PCHL22
Class	I year (2018-2019)
Semester	Even
Staff Name	1. Dr. S. Asha Jebamary
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of Analysis of Mixture of Cations by Complexometric titrations*
- *To understand the photocalorimetric estimations*

INORGANIC CHEMISTRY PRACTICAL - II

A. Analysis of Mixture of Cations by Complexometric titrations

1. Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).

2. Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).

3. Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).

4. Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).

5. Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F^-)

6. Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F^-).

7. Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).

B. Photocolorimetric Analysis of Cations (Course work only)

Estimation of Fe, Ni, Cr, Mn, Cu and NH4+. (Any four experiments)

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-E1	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
2-E2	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
3- E3	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
4-E4	Estimation of Cu(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
5-E5	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
6-E6	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
7-E7	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
8-E8	Estimation of Zn(II) by EDTA titration in the presence of either Pb(II) or Ba(II) (Sepearation of Pb(II) or Ba(II) by precipitation).
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
16-E11	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
17-E-12	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
18-E13	Estimation of Ca(II) and Pb(II) in a mixture by EDTA titration (Selective titration by control of pH).
19-E14	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
20-E15	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
21-E16	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
22-E17	Estimation of Cr(III) and Fe(III) in a mixture by EDTA titration (Kinetic masking).
23-P2	**College level meeting/Cell function**
24-E18	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
25-E19	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
26-E20	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by

	F−)
27-E21	Estimation of Mg(II) and Mn(II) in a mixture by EDTA titration (Demasking by F−)
28-E22	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
29-E23	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
30-E24	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
31-E25	Estimation of Pb and Sn in Solder alloy by EDTA titration (Demasking by F−).
32-E26	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
33-E27	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
34-E28	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
35-E29	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
36-E30	Photocolorimetic Estimation of Fe, Ni, Mn
37-E31	Photocolorimetic Estimation of Fe, Ni, Mn
38-E32	Photocolorimetic Estimation of Fe, Ni, Mn
39-E33	Photocolorimetic Estimation of Fe, Ni, Mn
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Photocolorimetic Estimation of Mn, Cu and NH4+.
46-E35	Photocolorimetic Estimation of Mn, Cu and NH4+.
47-E36	Photocolorimetic Estimation of Mn, Cu and NH4+.
48-E37	Photocolorimetic Estimation of Mn, Cu and NH4+.
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY PRACTICALS–II"
CO1	To understand complexometric tirations
CO2	To understand photocolorimetric estimations

# Blended Learning	:Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,
# For Advanced Learner	:Use library books, E- books, motivate student to prepare for higher study.
# For slow learner	:Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature

Staff Signature

Principal

St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. D. S. Ivan Jebakumar)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practical’s-II
Course Code	PCHL23
Class	I year (2018-2019)
Semester	Even
Staff Name	Dr. D. S. Ivan Jebakumar
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand analysis of Analysis of Mixture of Cations by Complexometric titrations*
- *To understand the photocalorimetric estimations*

PHYSICAL CHEMISTRY PRACTICAL - II

I Conductometric experiments
(i) Estimation of K_2SO_4 using $BaCl_2$
(ii) Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
(iii) Determination of Dissociation constant of a weak acid
II Distribution law
(i) Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
(ii) Distribution of benzoic acid between two immiscible solvents
III Thermometry Determination of Solution enthalpy of (i) Benzoic acid-water (ii) Napthalene-Toluene

IV Kinetics – Study of Kinetics of KI - $K_2S_2O_8$ system

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-E1	Estimation of K_2SO_4 using $BaCl_2$
2-E2	Estimation of K_2SO_4 using $BaCl_2$
3- E3	Estimation of K_2SO_4 using $BaCl_2$
4-E4	Estimation of K_2SO_4 using $BaCl_2$
5-E5	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
6-E6	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
7-E7	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
8-E8	Estimation of CH_3COOH and $CH_3COOONa$ in a Buffer solution.
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
16-E11	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
17-E-12	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
18-E13	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
19-E14	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
20-E15	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
21-E16	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
22-E17	Distribution of Iodine between two immiscible solvents & Study of the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$
23-P2	**College level meeting/Cell function**
24-E18	Distribution of benzoic acid between two immiscible solvents
25-E19	Distribution of benzoic acid between two immiscible solvents
26-E20	Distribution of benzoic acid between two immiscible solvents
27-E21	Distribution of benzoic acid between two immiscible solvents
28-E22	Distribution of benzoic acid between two immiscible solvents
29-E23	Distribution of benzoic acid between two immiscible solvents
30-E24	Distribution of benzoic acid between two immiscible solvents
31-E25	Distribution of benzoic acid between two immiscible solvents
32-E26	Determination of Solution enthalpy of (i) Benzoic acid-water
33-E27	Determination of Solution enthalpy of (i) Benzoic acid-water
34-E28	Determination of Solution enthalpy of (i) Benzoic acid-water
35-E29	Determination of Solution enthalpy of (i) Benzoic acid-water
36-E30	Determination of Solution enthalpy of Napthalene-Toluene

37-E31	Determination of Solution enthalpy of Napthalene-Toluene
38-E32	Determination of Solution enthalpy of Napthalene-Toluene
39-E33	Determination of Solution enthalpy of Napthalene-Toluene
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Study of Kinetics of KI - K2S2O8 system
46-E35	Study of Kinetics of KI - K2S2O8 system
47-E36	Study of Kinetics of KI - K2S2O8 system
48-E37	Study of Kinetics of KI - K2S2O8 system
49-E38	Record submission and valuation
50-E-39	Record submission and valuation
51-E-40	Record submission and valuation
52-E41	Viva voce discussion
53-E42	Viva voce discussion
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–II"
CO1	To understand the conductometric experiments
CO2	To understand the kinetics of reactions

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. R. Biju Bennie)

Programme Name	M. Sc. Chemistry
Course Name	Organic Chemistry Practicals-IV
Course Code	PCHL42
Class	II year (2018-2019)
Semester	Even
Staff Name	Dr. R. Biju Bennie
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand the estimation of organic compounds*
- *To understand the preparation of organic compounds*

INORGANIC CHEMISTRY PRACTICAL - IV

A. List of Estimation

1. Glucose-Lane Eynon and method
2 .Glucose-Bertrand's method
3. Iodine value of an oil
4. Estimation of acetyl group
5. Purity of Glucose.

B. List of Two stage preparations

1. Preparation of Benzpinacolone from Benzophenone
2. Preparation of Phthalimide from Phthalic acid
3. Preparation of s- Benzyl-isothiuronium benzoate from Thiourea
4. Preparation of Sym-Tribromobenzene from Aniline
5. Preparation of Anthranilic acid from Phthalic anhydride

Isolation of carotene from carrot

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-E1	Estimation of Glucose-Lane Eynon and method
2-E2	Estimation of Glucose-Lane Eynon and method
3- E3	Estimation of Glucose-Lane Eynon and method
4-E4	Estimation of Glucose-Lane Eynon and method
5-E5	Estimation of Glucose- Bertrand's method
6-E6	Estimation of Glucose- Bertrand's method
7-E7	Estimation of Glucose- Bertrand's method
8-E8	Estimation of Glucose- Bertrand's method
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Estimation of Iodine value of an oil
16-E11	Estimation of Iodine value of an oil
17-E-12	Estimation of Iodine value of an oil
18-E13	Estimation of Iodine value of an oil
19-E14	Estimation of acetyl group
20-E15	Estimation of acetyl group
21-E16	Estimation of acetyl group
22-E17	Estimation of acetyl group
23-P2	**College level meeting/Cell function**
24-E18	Purity of Glucose
25-E19	Purity of Glucose
26-E20	Purity of Glucose
27-E21	Purity of Glucose
28-E22	Preparation of Benzpinacolone from Benzophenone
29-E23	Preparation of Benzpinacolone from Benzophenone
30-E24	Preparation of Benzpinacolone from Benzophenone
31-E25	Preparation of Benzpinacolone from Benzophenone
32-E26	Preparation of Phthalimide from Phthalic acid
33-E27	Preparation of Phthalimide from Phthalic acid
34-E28	Preparation of Phthalimide from Phthalic acid
35-E29	Preparation of Phthalimide from Phthalic acid
36-E30	Preparation of s- Benzyl-isothiuronium benzoate from Thiourea
37-E31	Preparation of s- Benzyl-isothiuronium benzoate from Thiourea
38-E32	Preparation of s- Benzyl-isothiuronium benzoate from Thiourea
39-E33	Preparation of s- Benzyl-isothiuronium benzoate from Thiourea
40-IT-II	**Internal Test II**

41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Preparation of Sym-Tribromobenzene from Aniline
46-E35	Preparation of Sym-Tribromobenzene from Aniline
47-E36	Preparation of Sym-Tribromobenzene from Aniline
48-E37	Preparation of Sym-Tribromobenzene from Aniline
49-E38	Preparation of Anthranilic acid from Phthalic anhydride
50-E-39	Preparation of Anthranilic acid from Phthalic anhydride
51-E-40	Isolation of carotene from carrot
52-E41	Record submission and valuation
53-E42	Record submission and valuation
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 24-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY PRACTICALS–IV"
CO1	To estimate the organic compounds
CO2	To prepare organic compounds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

Principal

St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M. Sc. Chemistry
Course Name	Inorganic Chemistry Practicals-IV
Course Code	PCHL42
Class	II year (2018-2019)
Semester	Even
Staff Name	1. Dr. S. Asha Jebamary
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To understand Preparation of inorganic complexes and quantitative estimation by volumetric or instrumental methods*
- *To understand the linkage isomerism using IR*

INORGANIC CHEMISTRY PRACTICAL - IV

I. Preparation of inorganic complexes and quantitative estimation by volumetric or instrumental methods.

1. Preparation, and analysis of potassium trisoxalatochromate(III) trihydrate K3[Cr(C2O4)3].3H2O

2. Preparation and analysis of potassium hexathiocyanatochromate(III) tetrahydrate K3[Cr(SCN)6].4H2O

3. Preparation and analysis of potassium trisoxalatomanganate(III) trihydrate K3[Mn(C2O4)3].3H2O

4. Preparationand analysis of potassium trisoxalatoferrate(III) trihydrate K3[Fe(C2O4)3].3H2O

5. Preparation and analysis of potassium trisoxalatocobaltate(III) trihydrate, K3[Co(C2O4)3].3H2O

6. Preparation and analysis of Durrant's salt, K4[C2O4) 2Co(OH)2Co(C2O4)2].3H2O

7. Preparation and analysishexamminecobalt(III) Chloride, [Co(NH3)6]Cl3

8. Preparation and analysis of chloropentaamminecobalt(III) chloride, $[Co(NH_3)_5Cl]Cl_2$

9. Preparation and analysis of trinitrotriamminecobalt(III), $[Co(NH_3)_3(NO_2)_3]$

10. Preparation and analysis of trans-dichlorobis(diaminoethane)cobalt(III) chloride, trans-$[Co(en)_2Cl_2]Cl$

11. Preparation and analysis of $(NH_4)_2[VO(C_2O_4)_2].2H_2O$

12. Preparation and analysis of tris(thiourea)copper(I) sulphate dihydrate, $[Cu(tu)_3]_2SO_4.2H_2O$

II. Characterisation of metal complexes prepared during the practicals by UV and IR spectral techniques (Course work).

III. Study of linkage isomerism in pentaamminenitritocobalt(III) chloride, and pentaamminenitrocobalt(III) chloride using IR (Course work).

Course Calendar

Hour allotment	**Class Schedule**
	Even Semester Begin on 03-12-2018
1-E1	Preparation, and analysis of potassium trisoxalatochromate(III) trihydrate $K_3[Cr(C_2O_4)_3].3H_2O$
2-E2	Preparation, and analysis of potassium trisoxalatochromate(III) trihydrate $K_3[Cr(C_2O_4)_3].3H_2O$
3- E3	Preparation, and analysis of potassium trisoxalatochromate(III) trihydrate $K_3[Cr(C_2O_4)_3].3H_2O$
4-E4	Preparation, and analysis of potassium trisoxalatochromate(III) trihydrate $K_3[Cr(C_2O_4)_3].3H_2O$
5-E5	Preparation and analysis of potassium hexathiocyanatochromate(III) tetrahydrate $K_3[Cr(SCN)_6].4H_2O$
6-E6	Preparation and analysis of potassium hexathiocyanatochromate(III) tetrahydrate $K_3[Cr(SCN)_6].4H_2O$
7-E7	Preparation and analysis of potassium hexathiocyanatochromate(III) tetrahydrate $K_3[Cr(SCN)_6].4H_2O$
8-E8	Preparation and analysis of potassium hexathiocyanatochromate(III) tetrahydrate $K_3[Cr(SCN)_6].4H_2O$
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Preparation and analysis of potassium trisoxalatomanganate(III) trihydrate $K_3[Mn(C_2O_4)_3].3H_2O$
16-E11	Preparation and analysis of potassium trisoxalatomanganate(III) trihydrate $K_3[Mn(C_2O_4)_3].3H_2O$
17-E-12	Preparation and analysis of potassium trisoxalatomanganate(III) trihydrate $K_3[Mn(C_2O_4)_3].3H_2O$
18-E13	Preparation and analysis of potassium trisoxalatomanganate(III) trihydrate

	K3[Mn(C2O4)3].3H2O
19-E14	Preparationand analysis of potassium trisoxalatoferrate(III) trihydrate K3[Fe(C2O4)3].3H2O
20-E15	Preparationand analysis of potassium trisoxalatoferrate(III) trihydrate K3[Fe(C2O4)3].3H2O
21-E16	Preparationand analysis of potassium trisoxalatoferrate(III) trihydrate K3[Fe(C2O4)3].3H2O
22-E17	Preparationand analysis of potassium trisoxalatoferrate(III) trihydrate K3[Fe(C2O4)3].3H2O
23-P2	**College level meeting/Cell function**
24-E18	Preparation and analysis of potassium trisoxalatocobaltate(III) trihydrate, K3[Co(C2O4)3].3H2O
25-E19	Preparation and analysis of potassium trisoxalatocobaltate(III) trihydrate, K3[Co(C2O4)3].3H2O
26-E20	Preparation and analysis of potassium trisoxalatocobaltate(III) trihydrate, K3[Co(C2O4)3].3H2O
27-E21	Preparation and analysis of potassium trisoxalatocobaltate(III) trihydrate, K3[Co(C2O4)3].3H2O
28-E22	Preparation and analysis of Durrant's salt, K4[C2O4) 2Co(OH)2Co(C2O4)2].3H2O
29-E23	Preparation and analysis of Durrant's salt, K4[C2O4) 2Co(OH)2Co(C2O4)2].3H2O
30-E24	Preparation and analysis of Durrant's salt, K4[C2O4) 2Co(OH)2Co(C2O4)2].3H2O
31-E25	Preparation and analysis of Durrant's salt, K4[C2O4) 2Co(OH)2Co(C2O4)2].3H2O
32-E26	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
33-E27	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
34-E28	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
35-E29	Estimation of Ca(II) ion in an antacid or diet supplement pill by EDTA titration (Substitution titration).
36-E30	. Preparation and analysis of hexamine cobalt(III) Chloride, [Co(NH3)6]Cl3
37-E31	. Preparation and analysis of hexammine cobalt(III) Chloride, [Co(NH3)6]Cl3
38-E32	Preparation and analysis of chloropentaamminecobalt(III) chloride, [Co(NH3)5Cl]Cl2
39-E33	Preparation and analysis of chloropentaamminecobalt(III) chloride, [Co(NH3)5Cl]Cl2
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Preparation and analysis of trinitrotriamminecobalt(III), [Co(NH3)3(NO2)3]
46-E35	Preparation and analysis of trinitrotriamminecobalt(III), [Co(NH3)3(NO2)3]
47-E36	Preparation and analysis of trans-dichlorobis(diaminoethane)cobalt(III) chloride,

	trans-$[Co(en)_2Cl_2]Cl$
48-E37	. Preparation and analysis of $(NH_4)_2[VO(C_2O_4)_2].2H_2O$
49-E38	Preparation and analysis of tris(thiourea)copper(I) sulphate dihydrate, $[Cu(tu)_3]_2SO_4.2H_2O$
50-E-39	Characterisation of metal complexes prepared during the practicals by UV and IR spectral techniques (Course work).
51-E-40	Study of linkage isomerism in pentaamminenitritocobalt(III) chloride, and pentaamminenitrocobalt(III) chloride using IR (Course work).
52-E41	Record submission and valuation
53-E42	Record submission and valuation
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course “INORGANIC CHEMISTRY PRACTICALS–IV”
CO1	To Characterise metal complexes by UV techniques
CO2	To Characterise metal complexes by IR spectral techniques

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

HOD Signature Staff Signature

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. Nirmal Paul Raj)

Programme Name	M. Sc. Chemistry
Course Name	Physical Chemistry Practicals-IV
Course Code	PCHL42
Class	II year (2018-2019)
Semester	Even
Staff Name	Mr. A. Nirmal Paul Raj
Credits	2
L. Hours /P. Hours	4/ WK
Total 60 h/Semester Internal Test-8 h Model Test- 4 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 44 h	

Objectives:

- *To obtain and improve the Knowledge of Potentiometric Titrations.*
- *To understand the Principles and applications of Adsorption*

PHYSICAL CHEMISTRY PRACTICAL - IV

POTENTIOMETRIC TITRATIONS

I. **Precipitation titrations**

Mixture of Cl^- and I^- vs Ag^+

II . **Redox titrations**

(i) Fe^{2+} vs Ce^{4+}

(ii) I^- vs $KMnO_4$

III. **Solubility Product** Determination of solubility product of sparingly soluble silver salts.

ADSORPTION

Freundlich Adsorption isotherm:

Adsorption of acetic acid on charcoal.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-E1	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
2-E2	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
3- E3	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
4-E4	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
5-E5	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
6-E6	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
7-E7	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
8-E8	Mixture of Cl- and I- vs Ag+ by potentiometric titrations
9-E9	**Allotting portion for Internal Test-I**
10-IT-1	**Internal test - I**
11- IT-1	**Internal test - I**
12- IT-1	**Internal test - I**
13- IT-1	**Internal test - I**
14-P1	**Department function**
15-E10	Fe2+ vs Ce4+ by potentiometric titrations
16-E11	Fe2+ vs Ce4+ by potentiometric titrations
17-E-12	Fe2+ vs Ce4+ by potentiometric titrations
18-E13	Fe2+ vs Ce4+ by potentiometric titrations
19-E14	Fe2+ vs Ce4+ by potentiometric titrations
20-E15	Fe2+ vs Ce4+ by potentiometric titrations
21-E16	Fe2+ vs Ce4+ by potentiometric titrations
22-E17	Fe2+ vs Ce4+ by potentiometric titrations
23-P2	**College level meeting/Cell function**
24-E18	I- vs KMnO4 by potentiometric titrations
25-E19	I- vs KMnO4 by potentiometric titrations
26-E20	I- vs KMnO4 by potentiometric titrations
27-E21	I- vs KMnO4 by potentiometric titrations
28-E22	I- vs KMnO4 by potentiometric titrations
29-E23	I- vs KMnO4 by potentiometric titrations
30-E24	I- vs KMnO4 by potentiometric titrations
31-E25	I- vs KMnO4 by potentiometric titrations
32-E26	I- vs KMnO4 by potentiometric titrations
33-E27	Determination of solubility product of sparingly soluble silver salts
34-E28	Determination of solubility product of sparingly soluble silver salts
35-E29	Determination of solubility product of sparingly soluble silver salts
36-E30	Determination of solubility product of sparingly soluble silver salts
37-E31	Determination of solubility product of sparingly soluble silver salts
38-E32	Determination of solubility product of sparingly soluble silver salts

39-E33	Determination of solubility product of sparingly soluble silver salts
40-IT-II	**Internal Test II**
41- IT-II	**Internal Test II**
42- IT-II	**Internal Test II**
43- IT-II	**Internal Test II**
44-P4	**College level meeting**
45-E34	Adsorption of acetic acid on charcoal
46-E35	Adsorption of acetic acid on charcoal
47-E36	Adsorption of acetic acid on charcoal
48-E37	Adsorption of acetic acid on charcoal
49-E38	Adsorption of acetic acid on charcoal
50-E-39	Adsorption of acetic acid on charcoal
51-E-40	Adsorption of acetic acid on charcoal
52-E41	Record submission and valuation
53-E42	Record submission and valuation
54-E43	Viva voce discussion
55-E44	Viva voce discussion
56-MT	**Model Test**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 24-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "PHYSICAL CHEMISTRY PRACTICALS–IV"
CO1	To improve the Knowledge of Potentiometric Titrations
CO2	To understand the Principles and applications of Adsorption

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Organic Chemistry-II
Course Code	PCHM21
Class	I year (2018-2019)
Semester	Even
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h/unit)	

Objectives:

- To understand the concept of UV-visible spectroscopy and to apply Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
- To understand the concept of FT-IR spectroscopy and to apply the idea to find out the functional groups in organic compounds..
- To study the applications of ORD and CD for chiral compounds especially polypeptides and polynucleotides.
- To study nucleophilic substitution reactions in aromatic systems
- To study the different types of intermediates in a reaction
- To have a brief idea about the natural products especially terpenes and alkaloids.
- To learn about the synthesis and structural elucidation of selected antibiotics and vitamins.

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-7/

ORGANIC CHEMISTRY - II

Unit – I: ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD

UV: The absorption laws – Types of electronic transitions – effect of solvents and Hydrogen bonding on λ_{max} values. – Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones.

IR: Characteristic IR absorptions of different functional groups – factors influencing absorption of carbonyl and hydroxyl groups – electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region.

ORD and CD: Optical rotatory dispersion (ORD): Octant rule – alpha - halo ketone rule and their applications-Circular Dichroism.

Unit-II: Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond.

Aromatic nucleophilic substitution reaction: Unimolecular, Bimolecular and Benzyne mechanisms - Reactivity, effect of substrate, leaving group and attacking nucleophile-typical reaction as oxygen and sulphur as nucleophile - Bucherer and Rosenmund reaction- Smiles rearrangement.

Catalytic hydrogenation- Birch reduction-Dieckmann condensation-Mannich reaction - Wittig reaction-Sharpless asymmetric epoxidation-addition of hydrogen halides to carbon - carbon double bond - addition of boranes, Michael addition (1,2 and 1,4)

Addition of dialkyl groups to triple bonds. Addition of hydrides – $LiAlH_4$ and $NaBH_4$.

Unit-III :Reactive intermediates and rearrangements

Carbenes: Generation, stability, structure, and reactivity of carbenes-Wolff rearrangement of acyl carbenes and its synthetic applications.

Nitrenes: Generation, stability, reaction of nitrenes- Mechanism of rearranegements through Nitrene intermediate: Schmidt, Hoffmann, Beckmann rearrangements.

Carbanion: Generation, Structure, Stability and reaction of carbanion- Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.

Arynes : Generation, Structure, Stability, reactions and trapping of arynes- cine substitution.

Unit – IV: ALKALOIDS AND ANTIBIOTICS

Alkaloids: Degradation studies – HEM , Emde and Von – Braun – Structural elucidation and synthesis of Quinine, Morphine, Cocaine, Lysergic acid and Atropine. Synthesis of Reserpine and PaPaverine – Biosynthesis of tyrosine, tryptophan.

Antibioties: Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.

Unit – V: VITAMINS AND TERPENOIDS

Vitamins: Structural elucidation, synthesis of vitamins – A_1, $B_1$and C - synthesis of vitamins B_2, B_6 and D.

Terpenoids : Structural elucidation, synthesis of α-Pinene, α-Cadinene, Zingiberene, Camphor and sqalene - synthesis of α-Santonin and Gibberelic acid. Bio synthesis of mono and diterpenoids.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-L1	**ULTRAVIOLET, INFRA – RED SPECTROSCOPY, ORD AND CD** **UV:** The absorption laws – Types of electronic transitions
2-L2	effect of solvents and Hydrogen bonding on λ_{max} values
3- L3	Woodward – Fieser rules to calculate λ_{max} values of conjugated dienes and α,β - unsaturated ketones
4-L4	**IR:** Characteristic IR absorptions of different functional groups
5-L5	factors influencing absorption of carbonyl and hydroxyl groups
6-L6	electronic effect and effect of hydrogen bonding , Fermi resonance and Finger print region
7-L7	Optical rotatory dispersion (ORD): Octant rule
8-L8	alpha - halo ketone rule and their application
9-L9	Circular Dichroism -**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (18.01.2019)**
11-L10	**Test Paper distribution and result analysis** - **Unit-II :Aromatic nucleophilic substitution Reaction and Addition to carbon-carbon multiple bonds and carbon - oxygen double bond. Aromatic nucleophilic substitution reaction:** Unimolecular, Bimolecular and Benzyne mechanisms.
12-P1	**Department function**
13-L11	Reactivity, effect of substrate, leaving group and attacking nucleophile-typical reaction as oxygen and sulphur as nucleophile
14-L12	Bucherer and Rosenmund reaction- Smiles rearrangement.
15-L13	Catalytic hydrogenation- Birch reduction
16-L14	Dieckmann condensation-Mannich reaction - Wittig reaction
17-L-15	Sharpless asymmetric epoxidation
18-L16	addition of hydrogen halides to carbon - carbon double bond
19-L17	addition of boranes,
	Entering Internal Test-I Marks into University portal
20-L18	Michael addition (1,2 and 1,4)
21-P2	**College level meeting/Cell function**
22-L19	Addition of hydrides – $LiAlH_4$
23-L20	Addition of hydrides –$NaBH_4$.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (25.02.2019)**
26-L22	**Test Paper distribution and result analysis-Unit – III: Reactive intermediates and rearrangements Carbenes:** Generation, stability, structure, and reactivity of carbenes-
27-L23	Generation, stability, structure, and reactivity of carbenes-
28-L24	Wolff rearrangement of acyl carbenes.
29-L25	Wolff rearrangement its synthetic applications.
30-L26	**Nitrenes:** Generation, stability, reaction of nitrenes

31-L27	**Nitrenes:** Generation, stability, reaction of nitrenes
32-L28	Mechanism of rearranegements through Nitrene intermediate: Schmidt rearrangement, Hoffmann rearrangement, Beckmann rearrangement
33-L29	Generation, Structure, Stability and reaction of carbanion
33-L30	Mechanism of rearrangements involving carbanion as intermediate: Steven, Sommelet- Hauser and Favorski rearrangements.
35-L31	**Arynes :** Generation, Structure, Stability
36-L32	reactions and trapping of arynes- cine substitution -**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: ALKALOIDS AND ANTIBIOTICS** Degradation studies – HEM method
38-L34	Emde and Von – Braun method
39-L35	Structural elucidation and Synthesis of Quinine
40-L36	Structural elucidation and Synthesis of Morphine, Cocaine,
41-L37	Structural elucidation and Synthesis of Lysergic acid and Atropine
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Synthesis of Reserpine and PaPaverine
44-L39	Biosynthesis of tyrosine, tryptophan
45-L40	**Submission of Assignment/ seminar**
46-L41	**Antibioties:** Structure and synthesis of penicillin, cephalosporin – C, chloramphenicol and Streptomycin.
47-L42	Structure and synthesis of cephalosporin – C
48-L43	Structure and synthesis of chloramphenicol and Streptomycin.
49-L44	**UNIT – V : VITAMINS AND TERPENOIDS** **Vitamins:** Structural elucidation, synthesis of vitamins – A_1, $B_1$and C
50-L45	synthesis of vitamins B_2, B_6 and D
51-IT-III	**Internal Test-III (22.03.2019)**
52-L46	**Terpenoids :** Structural elucidation, synthesis of α-Pinene, α-Cadinene,
53-L47	**Terpenoids :** Structural elucidation, synthesis of Zingiberene, Camphor and sqalene
54-L48	synthesis of α-Santonin and Gibberelic acid.
55-L49	Bio synthesis of mono and di terpenoids.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (08.04.2019)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –II"
CO1	The concept of UV-visible spectroscopy and application of Woodward-Feiser rules to calculate the maximum absorption wavelength of organic compounds
CO2	The concept of FT-IR spectroscopy and application of the idea to find out the functional groups in organic compounds
CO3	Application of ORD and CD for chiral compounds especially polypeptides and polynucleotides
CO4	Importance of nucleophilic substitution reactions in aromatic systems
CO5	Different types of intermediates in a reaction
CO6	Idea about selected natural products especially from terpenes and alkaloids
CO7	synthesis and structural elucidation of selected antibiotics and vitamins
Experimental Learning	
EL1	Differentiation of geometrical isomers by FT-IR spectroscopy
EL2	Comparison of the calculated and observed λ_{max} values for selected organic compounds
EL3	Charctertization of functional groups in a given compound by FT-IR spectrosopy
EL4	Synthesis of aniline from chlorobenzene *via* Benzyne intermediate
Integrated Activity	
IA1	Differentiation of α-helix and β-sheet of selected proteins by ORD/CD spectroscopy
IA2	Detecting the Fermi resonance in selected organic compunds

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John’s College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Dr. S. Asha Jebamary)

Programme Name	M.Sc. Chemistry
Course Name	Inorganic Chemistry-II
Course Code	PCHM22
Class	I year (2018-2019)
Semester	Even
Staff Name	Dr. S. Asha Jebamary
Credits	4
L. Hours /P. Hours	5 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- *To know the nature of metal-ligand bond and to study various theories of bonding in coordination compounds.*
- *To study the stability, chemical reactions and magnetic properties of coordination compounds.*
- *To study the applications of electronic and infra-red spectroscopic techniques in coordination compounds.*
- *To understand inorganic polymers and to study structures and bonding in metal clusters.*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll./PG/M.Sc. (Chemistry)/Sem.-2/Core-8/

INORGANIC CHEMISTRY -II

Unit – I: BONDING IN COORDINATION COMPOUNDS

CFT and LFT: Basic features of CFT and LFT. Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries –Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions. Application of CFT: Magnetic Properties -Spectral properties -Spectrochemical series–Kinetic properties.**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants, Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE.

MOT: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.Application of MOT to spectrochemical series.

Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDS

Stability of complexes: Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes– factors affecting stability – chelate and template effects - Determination of stability constants and composition of the complexes: Bjerrum’s method, potentiometric determination, spectrophotometric method, ion-exchange method, polarographic method, continuous variation (Job’s) method.

Reactions of complexes: Lability – inertness –Ligand substitution reactions of square planar complexes – Trans effect and trans influence –Theories of trans effect – use of trans effect in synthesis of complexes– Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions – Electron transfer reactions – Inner sphere and outer sphere processes–complementary and non-complementary reactions.

Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPY

Electronic spectroscopy: Selection rules for electronic transitions–Line width and shape – Hole formalism –LS Coupling and jj coupling schemes and determination of term symbols – Splitting of terms – Orgel and Tanabe Sugano diagrams – Electronic spectra of I^{st} row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems.

Charge transfer spectra – types–Effect of tetragonal distortion and spin – orbit coupling on spectra. Electronic spectra of lanthanide and actinide complexes.

Infrared spectroscopy: Selection rules –calculation of force constants of IR vibrations.Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water. Application in the study of isomerism–linkage and geometrical isomerism and intra and intermolecular hydrogen bonding.

Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES

Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials–Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility – Faraday's and Gouy'smethods.First order and second order Zeeman effect, temperature independent paramagnetism, van Vleck equation and its applications–quenching of orbital contribution to magnetic moment by CF. Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field, high spin/low spin equilibrium.Comparison of the magnetic properties of O_h, T_d and square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes.

Unit V: INORGANIC POLYMERS ANDMETAL CLUSTERS

Inorganic polymers: General characteristics, degree of polymerization, catenation and heterocatenation- silicates - classification and structure - property correlation - Polyacids-structures of isopoly and heteropoly anions - Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers - Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.

Structure and Bonding of Metal clusters: DinuclearClusters: Cu(II) carboxylate, Chromium(II) acetate, and $[M_2Cl_8]^{4-}$(M = Mo and Re) –Trinuclear Clusters: $[M_3(CO)_{12}]$ (M = Fe, Ru, Os) –Teteranuclear Clusters: $[M_4(CO)_{12}]$ (M = Co, Rh, Ir) –Hexanuclear Clusters: $[Nb_6Cl_{12}]^{2+}$,$[Os_6(CO)_{18}]^{2-}$ and $[Mo_6Cl_8]Cl_4$–Capping rule – poly atomic Zintl ions.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-L1	**UNIT - I: BONDING IN COORDINATION COMPOUNDS: CFT and LFT**: Basic features of CFT and LFT.
2-L2	Splitting of the metal *d*- orbitals in T_d, O_h and square planar symmetries
3- L3	Jahn-Teller distortion in O_h and T_d complexes –Static and dynamic J.T distortions
4-L4	Application of CFT: Magnetic Properties -Spectral properties
5-L5	Spectrochemical series–Kinetic properties
6-L6	**CFSE**: Calculation of CFSE in O_h and T_d complexes - Contribution of CFSC to M-L bond energy, M-L step-wise stability constants
7-L7	Hydration energies of M^{n+}– Lattice energy –Preferred stereochemistry –Site selection of the cations in spinel and inverse spinel and OSSE
8-L8	**MOT**: σ-bonding and π-bonding in O_h complexes - Effect of π-bonding on the value of Δ(10Dq).MOT for square planar (16 e^-) and T_d (18 e^-)complexes.
9-L9	Application of MOT to spectrochemical series-**Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (18.01.2019)**
11-L10	**Test Paper distribution and result analysis**- **Unit – II: STABILITY AND REACTIONS OF COORDINATION COMPOUNDSStability of complexes:**Thermodynamic and kinetic stabilities -stepwise and overall stability constants of the metal complexes
12-P1	**Department function**
13-L11	factors affecting stability – chelate and template effects
14-L12	Determination of stability constants and composition of the complexes: Bjerrum's method
15-L13	Determination of stability constants and composition of the complexes: potentiometric determination, spectrophotometric method
16-L14	Determination of stability constants and composition of the complexes:polarographic method, continuous variation (Job's) method
17-L-15	Lability – inertness –Ligand substitution reactions of square planar complexes
18-L16	Trans effect and trans influence
19-L17	Theories of trans effect – use of trans effect in synthesis of complexes
	Entering Internal Test-I Marks into University portal
20-L18	Substitution reactions in octahedral complexes – acid hydrolysis, base hydrolysis and anation reactions
21-P2	**College level meeting/Cell function**
22-L19	Electron transfer reactions – Inner sphere and outer sphere processes
23-L20	Complementary and non-complementary reactions.
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (25.02.2019)**
26-L22	**Test Paper distribution and result analysis**-**Unit – III: ELECTRONIC AND INFRARED SPECTROSCOPYElectronic spectroscopy**: Selection rules for electronic transitions–Line width and shape –Hole formalism
27-L23	LS Coupling and jj coupling schemes and determination of term symbols
28-L24	Splitting of terms – Orgel and Tanabe Sugano diagrams

29-L25	Electronic spectra of Ist row transition metal complexes –Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
30-L26	Charge transfer spectra – types
31-L27	Effect of tetragonal distortion and spin – orbit coupling on spectra.
32-L28	Electronic spectra of lanthanide and actinide complexes
33-L29	Selection rules –calculation of force constants of IR vibrations
33-L30	Changes in the IR spectra accompanying changes in symmetry upon coordination, differentiation of coordinated water and lattice water
35-L31	Application in the study of isomerism– linkage and geometrical isomerism and intra and intermolecular hydrogen bonding
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV:MAGNETIC PROPERTIES OF METAL COMPLEXES** Types of magnetism –temperature dependence of magnetic susceptibilityof different types of magnetic materials
38-L34	Curie equation, Curie law and Curie-Weiss law–Determination of magnetic susceptibility
39-L35	Faraday's and Gouy'smethods.First order and second order Zeeman effect
40-L36	temperature independent paramagnetism, van Vleck equation and its applications
41-L37	quenching of orbital contribution to magnetic moment by CF.
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	Magnetic properties of transition metal complexes in cubic and axially symmetric crystal field,
44-L39	high spin/low spin equilibrium
45-L40	**Submission ofAssignment/take the seminar**
46-L41	Comparison of the magnetic properties of O_h Fe(II), Co(II), Ni(II) and Cu(II) complexes
47-L42	Comparison of the magnetic properties of T_d Fe(II), Co(II), Ni(II) and Cu(II) complexes
48-L43	Comparison of the magnetic properties of square planar Fe(II), Co(II), Ni(II) and Cu(II) complexes
49-L44	**UNIT – V : INORGANIC POLYMERS ANDMETAL CLUSTERS** **Inorganic polymers:**General characteristics, degree of polymerization, catenation and heterocatenation
50-L45	silicates - classification and structure - property correlation
51-IT-III	**Internal Test-III (22.03.2019)**
52-L46	Polyacids- structures of isopoly and heteropoly anions
53-L47	Polymeric sulphur nitride - Borazines-Phosphazenes - Phosphazene polymers
54-L48	Boranes and carboranes-Structure and bonding in boranes - Molecular frame work of hydrides of boron skeletal electron pair counting and Wade's rule.
55-L49	**Structure and Bonding of Metal clusters:**DinuclearClusters, Trinuclear Clusters, Teteranuclear Clusters, HexanuclearClustersCapping rule, poly atomic Zintl ions.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (08.04.2019)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**

60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "INORGANIC CHEMISTRY –II"
CO1	To know the nature of metal-ligand bond in complexes
CO2	To study various theories of bonding in coordination compounds
CO3	To study the stability, chemical reactions and magnetic properties of coordination compounds
CO4	To study the applications of electronic and infrared spectroscopic techniques in coordination compounds.
CO5	To understand inorganic polymers and understand its properties
Experimental Learning	
EL1	Differentiation of coordinated water and lattice water by IR spectroscopy
EL2	Measurement of magnetic susceptibility by Gouy's Method
EL3	Evaluation of 10 Dq, β and B' for octahedral d^2 and d^8 systems
EL4	Preparation of Cu(II) carboxylate and Chromium(II) acetate to analyze the nature of metal-metal bonding
Integrated Activity	
IA1	Differentiation of linkage isomerism – Nitro and nitrito
IA2	Study of intra- and intermolecular hydrogen bonding

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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St. John's College, Palayamkottai

Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by D. S. Ivan Jebakumar)

Programme Name	M.Sc. Chemistry
Course Name	Physical Chemistry-II
Course Code	PCHM23
Class	I year (2018-2019)
Semester	Even
Staff Name	D. S. Ivan Jebakumar
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 h/Semester Internal Test-3 h Model Test- 3 h Dept. Meetings - 2 h College Meetings - 2 h Remaining 50 h (5 units; 5×10=65; 50h /unit)	

Objectives:

- ✓ *To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics*
- ✓ *To learn about the Principles of Electrochemistry*
- ✓ *To get an idea of different electroanalytical techniques*
- ✓ *To know about Photochemistry and Radiation chemistry*

MSU/2017-18/ MSU/46th SCAA/ Affiliated coll. /PG/M.Sc. (Chemistry)/Sem.-2/Core-9/

PHYSICAL CHEMISTRY -II

UNIT-I: QuantumMechanics I

Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box, Particle in a ring, 3DRectangular box, 3D cubical box, the harmonic oscillator, the rigid rotator, and the hydrogen atom.Degeneracy and degenerate wave functions, Quantum mechanical tunnelling.Shapes and nodal properties of orbitals – Space quantisation.

UNIT-II: QuantumMechanics II

Electron spin, Anti symmetry and Pauli's exclusion principle – Slater determinantal wave functions. Approximation methods-The Variation theorem; Linear Variation Principle, Perturbation theory.Applications of Variation Method and Perturbation Theory to the Helium atom. Born-Oppenheimer approximation, VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems, Hartree FockSelf consistent field method for Helium atom. Hückel Molecular Orbital Theory and its application to ethylene, butadiene and benzene.

UNIT – III: Electrochemistry - I

Arrhenius theory, Derivation and Validity of Debye-Huckel Theory, Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation. Debye-Falkenhagen effect and Wien effect. Activity of electrolytes, Determination of activity and activity coefficient using Debye-Huckel theory.Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation.Definition and Determination of Transference number.Abnormal transference number.Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern models of electrical double layer- Applications and limitations.Kinetics of electrode reaction-Butler-Volmer equation, Tafel equation.

UNIT – IV:Electrochemistry - II

The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena-Zeta potential and its applications.Electrophoresis and related phenomena- The electro viscous effect, sedimentation Potential, Electrophoresis. Effect of electrical double layer-Electrocapillarity, Double layer capactance Corrosion and passivation of metals – Pourbaix diagram – Evans diagram – fuel cells – primary and secondary fuel cells – electrodeposition – principle

and applications. Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility, determination of 'n' values (usefulness of Illkovic equation), polarographic maxima, current time curves, Modern developments, Oscillographic polarography, AC polarography – Cyclic Voltammetry, advantages over polarographic techniques – Test of reversibility of electron transfer reactions – Chronopotentiometry – apparatus used, advantages over polarography – controlled potential coulometry.

UNIT-V: Photochemistry and Radiation Chemistry:

Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination. Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials. Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion, fluorescence, phosphorescence and other deactivation processes. Photosensitisation chemiluminescence and bioluminescence-Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.

Radiation Chemistry

Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-L1	**UNIT-I: QuantumMechanics I** Setting up and solving Schrodinger wave equation and arriving solution for Particle in 1D box
2-L2	Particle in a ring
3- L3	3DRectangular box
4-L4	3D cubical box
5-L5	Harmonic oscillator
6-L6	Rigid rotor
7-L7	Setting up and solving Schrodinger wave equation and arriving solution for the hydrogen atom.
8-L8	Degeneracy and degenerate wave functions.
9-L9	Quantum mechanical tunnelling. Shapes and nodal properties of orbitals – Space quantisation - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (18.01.2019)**
11-L10	**Test Paper distribution and result analysis - UNIT-II: QuantumMechanics II** Electron spin, Anti symmetry and Pauli's exclusion principle
12-P1	**Department function**
13-L11	Slater determinantal wave functions. Introduction to Approximation methods
14-L12	The Variation theorem; Linear Variation Principle,
15-L13	Perturbation theory.Applications of Variation Method
16-L14	Perturbation Theory to the Helium atom
17-L-15	Born-Oppenheimer approximation
18-L16	VB and MO theory, for H_2^+ molecular ion and H_2 molecule problems
19-L17	Hartree FockSelf consistent field method for Helium atom
	Entering Internal Test-I Marks into University portal
20-L18	Hückel Molecular Orbital Theory and its application to ethylene
21-P2	**College level meeting/Cell function**
22-L19	Hückel Molecular Orbital Theory and its application to butadiene
23-L20	Hückel Molecular Orbital Theory and its application to benzene
24-L21	Quick review of Chapter - **Allotting portion for Internal Test-II**
25-IT-II	**Internal test – II (25.02.2019)**
26-L22	**Test Paper distribution and result analysis - UNIT – III: Electrochemistry - I** Arrhenius theory, Derivation and Validity of Debye-Huckel Theory
27-L23	Debye-Huckel-Onsager conductance equation, Deviations from Onsager equation
28-L24	Debye-Falkenhagen effect and Wien effect. Activity of electrolytes
29-L25	Determination of activity and activity coefficient using Debye-Huckel theory
30-L26	Debye-Huckel Limiting law, Debye-Huckel-Bronsted equation
31-L27	Definition and Determination of Transference number.Abnormal transference number.
32-L28	Electrified interfaces-Lipmann equation derivation.Electrical Double Layer, Structure of electrical double layer Helmholtz-Perrin, Guoy-Chapmann and Stern

	models of electrical double layer
33-L29	Electrical double layer- Applications and limitations
33-L30	Kinetics of electrode reaction-Butler-Volmer equation
35-L31	Tafel equation
36-L32	Quick review of the chapter-**Allotting portion for Assignment/seminar**
38-L33	**Unit – IV: Electrochemistry - II** The Poisson-Boltzmann equation and its solutions.Electrocapillary phenomena
38-L34	Zeta potential and its applications.Electrophoresis and related phenomena
39-L35	The electro viscous effect, sedimentation Potential, Electrophoresis
40-L36	Effect of electrical double layer-Electrocapillarity, Double layer capacitance
41-L37	Evans diagram – fuel cells – primary and secondary fuel cells
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	electrodeposition – principle and applications
44-L39	Principles and applications of Polarography–Instrumentation, Interpretation of current voltage curves, tests for reversibility
45-L40	**Submission of Assignment/take the seminar**
46-L41	determination of ‘n’ values (usefulness of Illkovic equation), polarographic maxima, current time curves,
47-L42	Modern developments, Oscillographic polarography, AC polarography
48-L43	Cyclic Voltammetry, advantages over polarographic techniques – Chronopotentiometry–advantages over polarography – controlled potential coulometry
49-L44	**UNIT – V : Photochemistry and Radiation Chemistry:** Photochemistry: Introduction. Laws of photochemistry, Quantum yield and its determination
50-L45	Physical properties of electronically excited molecules: excited state dipole moment, acidity constant and redox Potentials
51-IT-III	**Internal Test-III (22.03.2019)**
52-L46	Photophysical processes in electronically excited molecules: Jablonski diagram – Intersystem system crossing internal conversion
53-L47	Fluorescence, phosphorescence and other deactivation processes - Photosensitisation chemiluminescence and bioluminescence
54-L48	Stern-Volmer equation and its applications – mechanisms of quenching – electron transfer – energy transfer–experimental techniques in photochemistry –chemical actinometers.
55-L49	**Radiation Chemistry:** Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – Definition of G-value- Dosimetry and dosimeters in radiation chemistry- application of radiation chemistry.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (08.04.2019)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	COs of the course " PHYSICAL CHEMISTRY –II"
CO1	To inculcate Knowledge about Quantum mechanics and Statistical Thermodynamics
CO2	To learn about the Principles of Electrochemistry
CO3	To get an idea of different electroanalytical techniques
CO4	To know about Photochemistry and its applications
CO5	To know about Radiation chemistry and solvated electrons
Experimental Learning	
EL1	Demonstration of Electroless deposition
EL2	Interpretation of cyclic voltammograms and calculation of electrochemical bandgap
EL3	Photochemical activity of potassium hexaoxalatoferrate(III)
Integrated Activity	
IA1	Variation of band gap of semiconducting quantum dots with size and quantum confinement
IA2	Differential conductance of Si QD's from STM

Blended Learning :Using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, study tour, etc.,

For Advanced Learner :Use library books, E- books, motivate student to prepare for higher study.

For slow learner :Special care taken, motivate the advanced learner to support the slow learner to study. To attend the remedial classes.

Extension activity : Motivate student to take classes for school students.

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Department of Chemistry

COURSE ACADEMIC PLAN

(Prepared by Mr. A. NIRMAL PAULRAJ)

Programme Name	M. Sc Chemistry
Course Name	Organic Chemistry-IV
Course Code	PCHM41
Class	II year (2018-2019)
Semester	Even
Staff Name	Mr. A. NIRMAL PAULRAJ
Credits	4
L. Hours /P. Hours	4 / WK
Total 60 Hrs/Sem Internal Test-3 Hrs Model Test-3 Hrs Dept. Meetings-2 Hrs College Meetings-2 Hrs Remaining 50 Hrs (5 units; 5×10=50; 10Hrs /unit)	

Course Objectives

- To understand the organic reactions.
- To understand the role of intermediates.
- To study the stable conformers of certain compounds.
- To study the reactivity of conformers.
- To understand the use of reterosynthesis.
- To learn the reterosynthetic path of certain compounds.
- To learn the reactions of reagents.
- To learn the applications of certain reagents in chemistry.
- To gain knowledge about the structural elucidation of various steroids.
- To study the bile acids and prostaglandins.

MSU / 2017-18 / PG-Colleges / M.Sc.(Chemistry) / Semester-IV / Ppr.No.23 / Core- 21
ORGANIC CHEMISTRY -IV

UNIT-I : REACTION UNDER INTERMEDIATE CHEMISTRY

Reaction Under Carbanion Intermediate: Stobbe, Darzen, acyloin condensation Shapiro reaction and Julia olefination. Reaction through carbene intermediate: Bamford – Stevens, Reimer- Tiemann reactions. Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation, Baeyer-villiger oxidation. Reaction following Radical intermediate: Mc Murray coupling, Gomberg-Pechmann and Pschorr reactions. Reaction involving Ylide intermediate: Wittig reaction and Peterson olefination.

UNIT-II : CONFORMATIONAL ANALYSIS

Conformation and configuration-conformational free energy-conformational analysis of mono substituted (alkyl, halogens) and 1,1-disubstituted (alkyl) and 1,2-1,3-and 1,4-dimethyl substituted cyclohexanes -compounds existing in boat form-conformation of cyclohexanone, decalin and perhydrophenanthrene-Curtin-Hammett principle- conformation and reactivity of acyclic and cyclic compounds (6membered).

UNIT-III : RETEROSYNTHETIC ANALYSIS

Synthon-synthetic equivalent-Functional group interconversions -use of protecting groups for alcohols, amines, acids, carbonyl compounds- use of activating and blocking groups- Robinson annulations reaction-carbon skeletal complexity-Role of key intermediates in organic synthesis. Reterosynthetic analysis of the following compounds: Twistane, cis - Jasmone, Baclofen, Trihexyl phenydyl, S-propanediol, Isonootkatone, cascarillic acid, camphor and 2,4-dimethyl-2-hydroxy pentanoic acid.

UNIT-IV : REAGENTS IN ORGANIC SYNTHESIS

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), DMSO, Super hydrides- Dess-martin-periodinane-Osmium tetra oxide.

Modern Reagents: Introductory treatment of the application of silicon (Tri alkyl silyl halides, organo silanes), Boron (9 – BBN, borane, and alkyl borane), phosphorus (phosphoranes), palladium(Still coupling, Suzuki Coupling, Heck and Negishi reactions) samarium(SmI2), ruthenium(RuO2,Ru-Binap Complex), platinum(PtO2, Adam’s Catalyst) reagents in organic synthesis.

UNIT-V : STEROID

Classification- structural elucidation of cholesterol, irradiated products of ergosterol. Conversion of cholesterol to androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid. Conversion of Oestrone to Oestriol, Oestrodiol and vice-versa. Conformational structure of cholestane and Coprostane. General study of Bile acids and Prostoglandins.

Course Calendar

Hour allotment	Class Schedule
	Even Semester Begin on 03-12-2018
1-L1	Unit-I : Reaction under Intermediate chemistry Reaction Under Carbanion Intermediate: Stobbe, Darzen,
2-L2	acyloin condensation Shapiro reaction
3- L3	Julia olefination
4-L4	Reaction through carbene intermediate: Bamford – Stevens
5-L5	Reimer- Tiemann reactions.
6-L6	Reaction Under Carbocation intermediate: Oxymercuration, halolactonisation
7-L7	Baeyer-villiger oxidation
8-L8	Reaction following Radical intermediate: Mc Murray coupling, Gomberg-Pechmann and Pschorr reactions.
9-L9	Reaction involving Ylide intermediate: Wittig reaction. - **Allotting portion for Internal Test-I**
10-IT-1	**Internal test – I (18.01.2019)**
11-L10	**Test Paper distribution and result analysis**- Peterson olefination
12-P1	**Department function**
13-L11	Unit-II : Conformational analysis – Conformation and configuration-conformational free energy-conformational analysis of mono substituted (alkyl, halogens)
14-L12	1,1-disubstituted (alkyl)
15-L13	1,2-1,3-and 1,4-dimethyl substituted cyclohexanes
16-L14	compounds existing in boat form
17-L-15	conformation of cyclohexanone
18-L16	decalin
19-L17	perhydrophenanthrene
	Entering Internal Test-I Marks into University portal
20-L18	Curtin-Hammett principle
21-P2	**College level meeting/Cell function**
22-L19	conformation and reactivity of acyclic compounds
23-L20	conformation and reactivity of cyclic compounds
24-L21	**Allotting portion for Internal Test-II-** Brief outlook of conformational analysis
25-IT-II	**Internal test – II (25.02.2019)**
26-L22	**Test Paper distribution and result analysis**- Unit-III : Reterosynthetic analysis Synthon and synthetic equivalent
27-L23	Functional group interconversions
28-L24	use of protecting groups for alcohols, amines, acids, carbonyl compounds
29-L25	use of activating and blocking groups
30-L26	Robinson annulations reaction
31-L27	carbon skeletal complexity-Role of key intermediates in organic synthesis
32-L28	Reterosynthetic analysis of Twistane, cis - Jasmone,
33-L29	Reterosynthetic analysis of Baclofen, Trihexyl phenydyl, S-propanediol
33-L30	Reterosynthetic analysis of Isonootkatone, cascarillic acid
35-L31	Reterosynthetic analysis of camphor and 2,4-dimethyl-2-hydroxy pentanoic acid
36-L32	**Allotting portion for Assignment/seminar**

38-L33	Unit-IV : Reagents in organic synthesis 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ),
38-L34	Super hydrides- Dess-martin-periodinane-Osmium tetra oxide.
39-L35	Modern Reagents: Introductory treatment of the application of silicon (Tri alkyl silyl halides, organo silanes),
40-L36	Boron (9 – BBN, borane, and alkyl borane),
41-L37	phosphorus (phosphoranes),
	Entering Internal Test-II Marks into University portal
42-P4	**College level meeting/ function**
43-L38	palladium(Still coupling, Suzuki Coupling, Heck and Negishi reactions)
44-L39	samarium(SmI_2),
45-L40	**Submission of Assignment/take the seminar**
46-L41	ruthenium(RuO_2,Ru-Binap Complex),
47-L42	platinum(PtO_2, Adam's Catalyst) reagents in organic synthesis.
48-L43	DMSO
49-L44	Unit-V : Steroid Classification
50-L45	structural elucidation of cholesterol**, Allotting portion for Internal Test-III**
51-IT-III	**Internal Test-III (22.03.2019)**
52-L46	irradiated products of ergosterol **Test Paper distribution and result analysis**
53-L47	Conversion of cholesterol to androsterone, progesterone, testosterone, 5α- and 5 β-cholanic acid
54-L48	Conversion of Oestrone to Oestriol, Oestrodiol and vice-versa
55-L49	Conformational structure of cholestane and Coprostane. General study of Bile acids and Prostoglandins.
	Entering Internal Test-III Marks into University portal
56-MT	**Model Test (08.04.2019)**
57-MT	**Model Test**
58-MT	**Model Test**
59-MT	**Model test paper distribution and previous year university question paper discussion**
60-L50	**Feedback of the Course, analysis and report preparation**
	Last Working day on 23-04-2019

Course Outcomes

Learning Outcomes	**COs** of the course "ORGANIC CHEMISTRY –IV"
CO1	Explain the reactions of intermediates.
CO2	Write the mechanism of reactions involving intermediates.
CO3	Understand the conformers of certain compounds
CO4	Write the stable conformers
CO5	Understand how reterosynthesis is performed.
CO6	Write the reterosynthetic approach of certain compounds.
CO7	Explain the role of reagents.
CO8	Ability to write the various reactions of reagents.
CO9	Able to elucidate the structure of steroids
CO10	Know the structure of certain steroids
Experimental Learning	

EL1	Write the stable conformers of certain molecules
EL2	Write the protecting groups for some given functional groups
EL3	Perform a synthetic reaction involving DMSO
EL4	Draw the structure of cholesterol
Integrated Activity	
IA1	Discuss about the intermediates formed in some organic reactions
IA2	Find the reterosynthetic route for a given molecule

# Blended Learning	: using PPT, video, library resources, ICT techniques, E-learning resources, Google classroom, etc.,
# For Advanced Learner	: use library books, E- books, motivate student to prepare for higher studies.
# For slow learner	: special care taken, motivate the advanced learner to support the slow learner in their studies. To attend the remedial classes.
# Extension activity	: Motivate student to take classes for school students.

HOD Signature　　　　　　　　　　　　　　　　　　　　　　Staff Signature

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