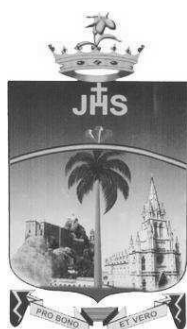


M.PHIL. SYLLABUS - 2013

CHEMISTRY



DEPARTMENT OF CHEMISTRY
St. JOSEPH'S COLLEGE (Autonomous)
Accredited at 'A' Grade (3rd Cycle) by NAAC
College with Potential for Excellence by UGC
TIRUCHIRAPPALLI – 620 002

GUIDELINES FOR FULL TIME M.Phil.

1. **Duration** : The programme runs for one year consisting of two semesters. The Semester- I is from August to February and the Semester- II runs from March to August, of the consecutive year.

2. **Course Work** :

Semester – I			Semester - II		
Course	Title	Cr	Course	Title	Cr
C1	General Skills for Teaching & Learning	3	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Subject	5			
C4	Guide Paper	5			
Total		17	Total		8

2. a. Each Course should contain 5 units, covering the subject requirements of the courses offered.

Marks for CIA and SE are in the ratio 40 : 60.

The CIA components are **Mid Semester Test (25), End Semester Test (25), Seminar (15), Objective Type Assignment Test (15)**. The total mark 80 will be converted into 40 marks.

The tests and Semester Examination are centrally conducted by COE for 3 hours.

CIA & SE	Tentatively on
Mid Semester Test	December 2 nd Week
End Semester Test	February 2 nd Week
Semester Examinations	February 4 th Week

Scholar should acquire **a minimum of 20 marks from CIA to appear for SE**. He/She will be declared to have passed in the various courses in Semester I, provided he/she secures not less than 50 marks on an aggregate (CIA+SE).

2b(i). In course C1 on '**General Skills for Teaching & Learning**' the first 3 units are common to all the departments of our college. The first three unit titles are **Soft Skills, E-teaching & E-learning, Elements of Technology of Teaching and Learning**. The remaining two units are department specific to make use of the above mentioned skills & techniques to teach the course subject at the Allied / UG level.

This paper is (to be) designed to exploit the various teaching-learning- research skills to be imbibed / cultivated to make the research scholars to be fit for the profession they would likely to acquire in the Education Industry. Thus only for the course (C1) the written component is 60% and Practical component 40% both in CIA and SE.

2b(ii) **EVALUATION for C1:**

Theory Component: For both CIA & SE, there will be a 2 hour test only from the first THREE units. The CIA components are Mid Semester Test (35), End Semester Test (35) and Assignment (30). The total 100 will be converted into 25 marks.

Practical Component: The last TWO units are department specific. There is no Mid and End Semester Tests. But the CIA for the same are assessed continuously by the teacher(s) concerned totaling 15 marks. For SE, the Practical evaluation is done by an external examiner.

2. c. Question papers for C1, C2 & C3 are set by external examiner.

2. d. Question paper for C4 will be set and valued by the Research Advisor only.

3. CREDITS

S E M E S T E R - I	Courses	Title		Contact Hrs.	Library Hrs.	Total Hrs.	Cr	CIA Mk	SE Mk	Total Mk
	C1	General Skills for Teaching & Learning	T	3	2	5	2	25	35	60
			P	2	2	4	1	15	25	40
	C2	Research Methodology		5	4	9	4	40	60	100
	C3	Core Subject		5	5	10	5	40	60	100
	C4	Guide Paper		5	5	10	5	40	60	100
Total				20	18	38	17	160	240	400

SEMESTER – II	C5 - D I S S E R T A T I O N	INTERNAL		EXTERNAL			
			Cr	Mk		Cr	Mk
		Seminar & Review of Related Literature	2	15	Dissertation Evaluation	6	75
		Mid term review Presentation	2	15	Viva-voce	2	25
		Dissertation work	3	60			
		Viva-Voce	1	10			
Total		8	100		8	100	

4. Question Pattern

	Course	Mid & End Semester Tests and Semester Examinations		
	Science	C1	Section A : Short Answers	7/9
Section B : Either / Or – Essay Type			3	3 x 7 = 21
C2		Section A : Short Answers	10	10 x 2 = 20
		Section B : Either / Or – Essay Type	5	5 x 8 = 40
C3		Section A : Short Answers	10	10 x 2 = 20
	Section B : Either / Or – Essay Type	5	5 x 8 = 40	
C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60	
Arts	Course	Mid & End Semester Tests and Semester Examinations		
	C1	Section A : Short Answers	7/9	7 x 2 = 14
		Section B : Either / Or – Essay Type	3	3 x 7 = 21
	C2	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C3	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60

5. Dissertation

For carrying out the dissertation, it is mandatory to strictly adhering to the rules of the college as given below:

5.1 Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis/Result/Mid Term Review just before the submission of the final draft of the dissertation

5.2 Submission

Candidates shall submit the Dissertations to the Controller of Examination **not earlier than five months but within six months** from the date of the start of the Semester –II. The above said time limit shall start from 1st of the month which follows the month in which Semester - I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of **four** months in the first instance and another **four** months in the second instance with penalty fees. If a candidate does not submit his/her Dissertation even after the two extensions, his/her registration shall be treated as cancelled and he/she has to re-register for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he/she has already passed these papers.

At the time of Submission of Dissertation, the guide concerned should forward the mark for 90% as stated above to the COE in a sealed cover

5.3 Requirement

For the valuation of dissertation it is mandatory to have passed in all the four courses. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university/colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the *viva-voce* will be done by both of them. The average marks will be considered.

5.4 Viva-Voce

The external examiner who valued the Dissertation and the Research Adviser shall conduct the *Viva-Voce* for the candidate for a maximum of 100 marks. A Candidate shall be declared to have passed in *viva-voce* if he/she secures not less than 50% of the marks prescribed for Dissertation and 50% of the marks in the aggregate of the marks secured in *viva-voce* and Dissertation valuation. *A student can undertake dissertation in the second semester whether or not he/she has passed the first semester.*

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES

6.1 The candidates who pass the Semester– I and Semester – II examinations in their first attempt shall be classified as follows:

No.	Total Marks secured in Semester – I and Semester – II Examinations	Classification
1.	80% and above in the case of Science Subjects & 75% and above in the case of Arts and Social Science Subjects	I Class with Distinction
2.	60% to 79% in the case of Science Subjects & 60 % to 74% in the case of Arts and Social Science Subjects	I Class
3.	50% to 59% in all the subjects	II Class

Note : Mathematics, Statistics and Computer Science/ Application shall be treated as Science Subjects

6.2 Candidates who pass the courses in more than one attempt shall be declared to have completed the programme under II Class.

6.3 Candidates who have failed in the courses may take the supplementary exams conducted by the COE immediately. Even then if they could not complete the course(s), they will be given two more chances only to appear for those courses along with the next batch scholars. The maximum duration for the completion of the M.Phil. Programme is 2 Years.

7. ATTENDANCE

Daily attendance for 90 working days should be enforced for the students.

Periodical report of a student to the guide concerned should be recorded in the register kept by the guide.

8. Scholar must obtain 80% of attendance per semester in order to appear for the Semester Examinations/ Viva-Voce

M.Phil. Chemistry Course Pattern – 2013

Sem	Code	Title Of The Paper
I	13 MCH 101	Course – C1 : General Skills On Teaching And Learning
	13 MCH 102	Course – C2 : Research Methodology
	13 MCH 103	Course – C3 : Selected Topics In Chemistry
	13 MCH 104 A	Course – C4 : Advanced Coordination Chemistry
	13 MCH 104 B	Course – C4 : Reactivity of Ether Linkage
	13 MCH 104 C	Course – C4: Advanced Studies of Macrocyclic Complexes
	13 MCH 104 D	Course – C4: Organic Reaction Mechanism
	13 MCH 104 E	Course – C4: Physical Methods in Inorganic Chemistry
	13 MCH 104 F	Course – C4: Corrosion Inhibition on Metals
	13 MCH 104 G	Course – C4: Kinetics and Catalysis
	13 MCH 104 H	Course – C4: Natural Products Chemistry
	13 MCH 104 I	Course – C4: Organometallic Compounds
	13 MCH 104 J	Course – C4: Physical Methods in Inorganic Chemistry
	13 MCH 104 K	Course – C4: Advanced Coordination Chemistry
	13 MCH 104 L	Course – C4: Thermodynamics of Liquid Solutions
	13 MCH 104 M	Course – C4: Electroorganic Chemistry
13 MCH 104 N	Course – C4: Advanced Coordination Chemistry	
13 MCH 104 O	Course – C4: Advanced Studies of Macrocyclic Complexes	
13 MCH 104 P	Course – C4: Organic Reaction Mechanism	
II	13 MCH 205	Course – C5 : Dissertation

Objectives

1. To enhance the employability of the students by empowering them with soft skills.
2. To provide students a theoretical background of educational psychology and its important concepts.
3. To help them understand the application of theories of educational psychology in education practice.
4. To enable them to understand the nature of growth and development, learning, motivation and its various educational implications.

Unit I SOFT SKILLS

- (a) Communication skills –Oral –Written –Verbal –Non verbal –Aids and blocks- Intrapersonal and Interpersonal communication- Effective communication.
- (b) Behavioral skills – attitudes-Time management – Leadership-Team building
- (c) Lateral thinking –conventional teacher and lateral teacher –Creativity and innovation.
- (d) Facing interviews –Different types of interviews –Dress code-Do's and Don'ts- Frequently asked questions –Preparing a resume- Mock interviews.
- (e) Group dynamics –Knowledge –Leadership-Thinking – Listening –Mock GD's

Unit II e-LEARNING AND e-TEACHING

An overview of Microsoft office -2007: MS WORD-2007- MS-Excel -2007-MS PowerPoint-2007, Concepts in e-Resources and e-design: World Wide Web Concepts – Making use of Web Resources-Web site creation concepts – Creating Web Page Editors- Creating Web Graphics –Creating Web Audio Files.

Unit III: ELEMENTS OF TECHNOLOGY OF TEACHING AND LEARNING

Psychology –Meaning Branches Scope and Methods –E merging areas of Educational Psychology – Kinds and levels of learning –Different theories of Learning – Factors affecting learning – Motivation -Intrinsic and Extrinsic Motivations , Memory and Forgetting – Approaches to learning (Pavlov , Skinner) –Creative thinking – Theories of intelligence

Unit IV: MATERIAL RESOURCES FOR CLASS ROOM TEACHING

Referencing of books, journals, etc.- internet resources-preparation of lecture materials – questions and exercises – preparation of question banks- documentation of the material resources in hard and soft forms.

Unit V: CLASS ROOM TEACHING

Presentation skill- dress code – body language – eye contact – voice modulation – clarity of expression – black board writing – use of tools like charts , models , power point materials , hand outs , etc, - motivation of students – group discussions – problem solving sessions – short tests.

REFEENCES

1. For unit 1 Success through soft skills by G. Ravindran , Dr. S.P.B . Elango and Dr. L. Arockiam .
2. Soft skills by Dr. K. Alex
3. Lateral Thinking by Edward De Bono
4. Step by 2007 Microsoft Office System , by Joyce Cox
5. Internet: The complete Reference , by Margaret Levine young.
6. Educational psychology in class room by Lindaren Hendry.
7. Psychology of classroom learning – Holt Richard

Unit I: Information Retrieval & Documentation

Sources of information -Primary, secondary, tertiary Sources-Journals-Abstracts-Current Titles-Reviews-Monographs-Dictionaries-Information retrievals using internet and other electronic medias [Preparing a review Article related to the problem of Research of the student]. Reports of Research Work - Laboratory Observation- Preparation of Records- *Manuscripts-Research Paper formats in open access journals, Acs, RSC, Wiley , ElseVier, Springer , linker, Indian J.Chemistry., J.Indian Chem.Soc., J.Am.Chem.Soc. J.Chem.Soc-Dalton Trans, Faraday trans,Perkin Trans., Tetrahedron. Anal.Chem. J.Chem. Education, , Writing of the project report or thesis..*

Unit II Statistical Tools of research

Error Analysis- Errors-Types-Precision, and accuracy - Significant figures-Tests for accuracy of results-Positive and negative deviation from accuracy-Distributions: Binomial, Gaussian,etc.,- The normal distribution of random errors -mean value- Variance-standard deviation – reliability interval- t- test, F- test- Regression-standard deviation- Correlation coefficient- Multiple linear Regression- Observation, Inference- Hypothesis generation- Testing of Hypothesis- Evolving and modifying Rules & Theories. ANOVA .

Unit III: Computers in Chemistry

Introduction to computers- history of development of computers, Main frame, mini, micro and super computer systems-computer hard ware CPU, input, output devices, auxiliary storage devices, interpreter, compiler, machine language, assembly language, high level languages- Operating systems, MS Dos, windows, UNIX, basic ideas in LINUX -Languages- C

Language & Programming- Constants, variables, function- Logical & Arithmetic statements-simple programming examples from chemistry ‘Temperature conversion, Rate constants of I & II order reactions, $t_{1/2}$ of I, II & III order reactions, Calculation of Arrhenius Parameters, Calculation of Modes of Vibration.

Chem Draw: Tables , Structure constructions , formation of chemical equations , prediction of NMR and IR.

Unit IV: Methods of organic synthesis

Synthons – Synthetic equivalents. Introduction of F unctional Groups- Interconversion of functional groups like C=O, -CHO, -OH, -SH, -COOH,-NH₂, -COOR, -CONHR, C=C . Protection of some functional groups Regio selective, Regio specific & stereo selective alkylation of cyclic Ketones & enones - enamines and selective alkylation- - Olefination of Carbonyl compounds-Wittig reaction. Retro synthetic Analysis of simple organic compounds- mono & bi-functional open chain target molecules mono & bicyclic target molecules. Multi-step organic synthesis. Applications of the Reagents: Collin’s reagent, PCC DDQ, DIBAL, LDA, PCC, Sia₂BH, Simmons-Smith reagent, Wilkinson catalyst, ,Weinraeb reagent. Al(-OBu-t)₃H, NaCNBH₃, CrO₂Cl₂, SeO₂,

Unit V: Methods of separation

Distinction between separation and purification – b asic principles of separation techniques – filtration, crystallization, fractional crystallization, solvent extraction, distillation Chromatography – paper, column, ion-exchange, GC an d HPLC techniques and applications

Text Books

1. March J, 1996, "Advanced Organic Chemistry Reaction s, Mechanisms and Structure." 5th ed, New York, Wiley.
2. Stewart Warren, Designing Organic Synthesis: The disconnection approach, Wiley, New Delhi(1984)
3. Drago R.S., 1971, "Physical Methods in Inorganic Chemistry", 3rd ed., New Delhi, Wiley Eastern Company.
4. Banwell C.N., 1983, "Fundamentals of Molecular Spectroscopy", 3rd ed., New Delhi. Mc Graw Hill.
5. Kemp W, 1993, Organic Spectroscopy, 3rd edition, London, ELBS with Macmillan.
6. Raman K.V., 1993, "Computers in chemistry", 1st ed, New Delhi, Tata Mc Graw Hill,.
7. Budhiraja, 2007, Separation Chemistry, 2nd Edition, New Age International (P) Ltd, New Delhi
8. Vogel A I, 1961, Qualitative Inorganic Analysis, 3rd Edition, ELBS and Longmann, London

References

1. Silverstein and Webster: 1998, "Spectrometric identification of Organic Compounds", sixth Edition, New York, Wiley.
2. Vogel A. I., 1961, "Quantitative Inorganic Analysis". 3rd ED., London ELBS Longman.
3. Pine S.H., Hendrickson J.B., Cram D.J. and Hammond G.S., 1980, "Organic Chemistry," 4th ed, Mc Graw Hill.
4. Lowry T.H. and Richardson K.S., 1976, "Mechanism and Theory in Organic Chemistry", Harper and Row.
5. Adamson A.W., "Physical Chemistry of Surfaces", 4th ed., John Wiley.
6. Trapnell B.M.W., 1955, "Chemisorptions", New York, Academic Press,.
7. Drago R.S., 1992, "Physical Methods in Chemistry ", 3rd ed, Philadelphia, London, W.B. Saunders Company.
8. Wheatly P.J., 1959, "The Determination of Molecular Structure", London, Oxford at the Clarendon Press.
9. Ebsworth E.A.V., 1987 "Structural Methods in Inorganic Chemistry", 3rd ed, Great Britain, ELBS.
10. Gibbs T.C., 1976 "Principles of Mossbauer Spectroscopy," London, Chapman and Hall.
11. Barrow G., 1964, "Introduction to Molecular Spectroscopy," 2nd ed, NY, McGraw Hill.
12. Ghosh P.K., 1989, "Introduction to Photoelectron Spectroscopy," New York, John Wiley.
13. Becker C.D., 1980, "High Resolution NMR-Theory and Applications", 2nd ed., London, Academic Press.
14. Straughan B. P. and Walker S. 1976, "Spectroscopy Vol 1", London, Chapman & Hall,
15. Eckschlager K., 1969, "Errors, Measurement and results in chemical analysis", London, Van Nostrand Reinhold company, chapters-I, IV, V.
16. E. Balagurusamy, 1995, "C++" 1st ed, New Delhi, Tata Mc Graw Hill.
17. Merrit W Dean and Settle, 1986, " Instrumental methods of analysis", 6th ed., New York, CBS Publishers and distributors,
18. Mackie R.K. and Smith D.M., 1982 "Guide book to organic synthesis" London, ELBS,.

13MCH103 C3: SELECTED TOPICS IN CHEMISTRY

Unit I

Visible Spectroscopy: Microstates-Term Symbols and energy levels for d^1 - d^9 systems – Electronic spectra of transition metal complexes (from d^1 to d^9 configurations) - intensity of bands- effect of distortion and spin orbit coupling on spectra – Evaluation of $10 Dq$ and β values for octahedral complexes of cobalt and nickel- Charge transfer spectra

IR and Raman Spectroscopy: Sampling Techniques – combined applications of IR and Raman Spectroscopy in structural elucidation of simple molecules like N_2O , ClF_3 , NO_3^- , ClO_4^- . Effect of coordination on ligand vibrations-uses of group vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate, nitrate, sulphate and DMSO- effect of isotopic substitution on vibrational spectra of metal carbonyls with reference to the nature of bonding, geometry and number of C-O stretching vibrations (group theoretical treatment) – Applications of Raman Spectroscopy.

Mass Spectroscopy: Isomer shifts - magnetic interactions – Mass Spectrometry emission spectroscopy – application to iron and its compounds.

Unit II

NMR spectroscopy: Sampling techniques, factors influencing group frequencies of both internal and external quantitative studies- hydrogen bonding (inter- & intramolecular)- conformational studies on 1,2- & 1,3 –diols- PMR spectroscopy- first and second order splitting – factors affecting coupling constants- long range coupling – double resonance techniques – lanthanide shift reagents – decoupling of exchangeable protons – NOE phenomenon - 2D NMR – COSY, NOESY & ROESY – $C-13$ NMR spectroscopy – DEPT.

EPR Spectroscopy: Factors affecting magnitudes of g and A tensors in metal species – zero field splitting and Kramer's degeneracy – spectra of $V(II)$, $Mn(II)$, $Fe(II)$, $Co(II)$, $Ni(II)$ & $Cu(II)$ complexes – applications to biological systems containing $Fe(II)/ (III)$ & $Cu(II)$.

Mass spectroscopy: CI, EI & FAB fragmentation- Recognition of molecular peak – Importance of meta-stable peak - pattern of fragmentations – nitrogen rule - McLafferty rearrangement- Determination of structure of the compound using uv-vis, nmr and mass spectra.

Unit – III

Nano Chemistry: Introduction to nanotechnology and nanomachines– molecular nanotechnology- Methods of synthesis of nano materials- plasma arching, sol gels – electro deposition – ball milling – analytical tools to study nano materials (SEM, TEM & SPM) applications of nano chemistry – CNT, molecular switches – rotaxanes – catenanes – lithography – nanobiometrics – metal nano clusters – nano crystals – nano structured ferromagnetism – quantum wells, dots,wires etc – biological materials – nano machines - future applications.

Sono Chemistry: Fundamentals of ultrasound – cavitation -Instrumentation- homogeneous and heterogeneous systems in synthesis – physical and chemical effects – uses in chemistry, material science, medicine and life - synthetic applications – esterification, saponification, hydrolysis, substitution, Cannizzaro reaction, Strecker's synthesis - Sonoluminescence – Sonocatalyst

Unit- IV

Microwave assisted synthesis: Instrumentation - microwave assisted synthesis in water (Hoffmann elimination, hydrolysis, oxidation of toluene) and in organic solvents (esterification, Fries rearrangement, Deils Alder reaction, decarboxylation). Solvent free microwave reactions: deacylation, deprotonation, saponification of esters.

Macrocyclic Chemistry

Design and synthesis of macrocyclic ligands (1+1 & 2+2) - Direct macrocyclic synthesis – template synthesis - thermodynamic and kinetic effects on synthesis – binucleating macrocycles – compartmental ligands – natural macro cyclic systems – Host-Guest chemistry – sequestration

Unit V

Cheminformatics:

Definition – Scope – Use of Cheminformatics – evolu tion- History - applications of Cheminformatics I – CHUCKLES(Monomer level description of molecules)- CHORTLES (Regular mixtures)- CHARTS (Searchins) - Contour of drugs –Drug dynamics and Kinetics- drug action drug interaction- drug abuse – drug adm inistration, distributions and elimination- pharmacodynamics – development of new drugs- econom ics of drug discovery – drug design with the help of computer tools- use of silica chips to find lead molecules - chemical parameters in drug design – physico chemical parame ters in drug design – structure based drug design – drug design- drug discovery.

Reference:

1. Kemp W, *Organic Spectroscopy*, 3rd ed., ELBS with Macmillan, London, 1993.
2. Cotton F A, Wilkinson G, Murrillo C A and Bochman, *Advance Inorganic Chemistry*, 6th ed., John-Wiley and Sons Inc., New York, 2003.
3. Sutton D, *Electronic Spectra of Transition Metal Complexes*, Narosa Pub. House, 2000.
4. Bancroft M, *Mossbuaer Spectroscopy*, Tata McGraw-Hill Pub., 1973.
5. Wheatly P J, *The Determination of Molecular Structure*, Oxford Press, London, 1959.
6. Mich Wilson, Kamali Kannangari, Geoff Smith, *Nanotechnology – Basic Science and Emerging Technologies*, Overseas Press India (Pvt) Ltd., 2005.
7. Ahluwalia V K and Kidwai M, *New Trends in Chemsitry*, 2nd ed. Anamaya Publishers, New Delhi, 2006.
8. Ahluwalia V K and Renu Aggarwal, *Organic Synthesis – Special Techniques* , New Trends in Chemsitry, 2nd ed. Narosa Pub. New Delhi, 2006.
9. Lindoy L F, *The Chemistry of Macrocyclic Ligand Complexes*, Cambridge Uni. Press, 1989.
10. Alexander V, *Chemical Reviews*, 95 (2), 1995, pp273-673.
11. Study Materials, Institute of Cheminformatics Studies, New Delhi.
12. “ABCs of FT-NMR,” Roberts, John D. (QD96 N8 R63 2000).
13. R. M. Silverstein, G. C. Bassler and T. C. Morrill, *Spectrometric Identification of Organic Compounds*, 5th Ed., Wiley, 1991.

Dr S R Bheeter

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colourimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - σ donor and ϕ acceptor ligands - Carbonyls - Nitrosyls - Cyanides - Triphenyl phosphine complexes - Organo metallic compounds - Allene, alkyne and allyl complexes

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Moss baur spectra – PES

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN1, SN2, SNCB mechanisms - Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Transition metal ion in biology - Iron enzymes - structure and their functions - Model system for molecular activation and corresponding biochemical system.

Text Books

1. Kettle SFA, Physical Inorganic Chemistry: A Coordination chemistry Approach, 1996, Oxford, Spektrum.
2. Drago R.S., 1977, Physical methods in inorganic chemistry, London, Saunders Golden Sunburst Series, W.B.Saunders Company.
3. Lewis J and Wilkinson RG (Editors), 1960, Modern coordination chemistry, Principles and Methods, New York, Interscience Publishers, Inc.

References

1. Lee JD, 1988, *Concise inorganic chemistry*, (sixth edition) London, ELBS.
2. Huheey JE., 1972, *Inorganic chemistry Principle structure and reactivity*, (second edition), New York, Harper & Row publishers.
3. Cotton F.A. and Wilkinson G., 1988, *Advanced inorganic chemistry*, (Third Edition) London, John Wiley & sons.

Dr K Joseph Santharaj

Unit I

Electro negativity order of elements - acid, base concepts - Lewis concept of acids and bases - reaction intermediates - formation and stability of carbocation and carbonium - reactions of carbocations by abstracting hydride - electronic and steric effect - concept of oxidation - reduction electronic concept - effect of polarity of solvents on type of reactions - purification of organic solvent like benzene, nitro benzene and acetonitrile

Unit II

Aromatic electrophilic substitution reaction - formation of π -complexes and σ -complexes - electrophilic substitution in different homo-aromatic and Hetero aromatic compounds - aliphatic electrophilic substitution reactions - S_Ni mechanism - mechanism of elimination reaction E1, E2 and E1cB.

Unit III

IR, NMR spectroscopy in structural determination of organic compounds - Principles of TLC, thin layer chromatography and column chromatography and techniques for separating the different components present in the organic mixture - Principle of using different solvents of varying polarity.

Unit IV

Different methods of formation of acetal - mechanism of acetal formation - stability of acetals - oxidation of ether by KMnO₄, KBrO₃ alkalies - metal halides.

Unit V

Mechanism of action of N₂O₅ on methyl phenethyl ether - mechanism of reaction of hypochlorous acid on anisole - migration of halogen in ortho rearrangement - action of SnCl₄ on acetals - Hunsdiecker reaction - mechanism evidence and limitations of Hunsdiecker reaction.

Text Books

1. March J, 1992, *Advanced Organic Chemistry* (Fourth Edition), New York, John Wiley & sons.
2. Kemp W, 1993, *Organic Spectroscopy*, 3rd edition, London, ELBS with Macmillan.

References

1. Gould, E.S, 1959, *Mechanism and Structure in Organic Chemistry*, New York, Holt Rinehart and Winston.
2. Pine S.H.et,al, 1986, *Organic Chemistry* (Fourth Edition), Singapore, McGraw-Hill Book Company.
3. Dyer JR, 1984, *Applications of Absorption Spectroscopy of organic compounds*, New Delhi, Prentice Hall of India.

13MCH104C C4: ADVANCED STUDIES OF MACROCYCLIC COMPLEXES

Dr M Amaladasan

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colourimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - Macrocycles and their classifications - Synthesis of Macrocycles - Properties and applications

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Mossbauer spectra – PES

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN^1 , SN^2 , SN^1CB mechanisms

- Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Transition metal ions in biology - Iron enzymes - structure and their functions - Model system for molecular activation and corresponding biochemical system.

Text Books

1. Lee JD, 1998, *Concise inorganic chemistry*, (sixth edition), London, ELBS.
2. Huheey JE., 1972, *Inorganic chemistry Principle structure and reactivity*, (second edition), New York, Harper & Row publishers.
3. Drago RS., 1977, *Physical methods in inorganic chemistry*, London, Saunders Golden Sunburst Series, W.B.Saunders Company.

References

1. Cotton FA and Wilkinson G., 1988, *Advanced inorganic chemistry*, (Third Edition), London, John Wiley & sons.

Dr N Xavier

Unit I: Basic concepts in organic chemistry

Hard and Soft Acid Base principles - Types of organic reactions - substitution, elimination and addition reactions - Reactive intermediates - reaction of diboranes and peracids - Michael reaction-Robinson annulation – Synthon, Synthetic equivalent and umpolung reactions.

Unit II: Reagents and reactions

Reagents for the inter conversion of various groups - Special and specific oxidizing agents, reducing agents and organo metallic compounds for the inter conversions - The survey of reactions and reagents - Gilman's reagent - LDA – DCC - Wilkinson's catalyst - OsO₄ - DDQ.

Unit III: Organometallics in organic synthesis

Palladium based organic synthesis – Heck reaction – Stille coupling – Suzuki coupling – Sonogashira coupling – Wacker oxidation – Fukuyama coupling . **Nickel** based reactions – Negishi coupling – Kumada coupling . **Copper** based reactions – Chan-Lam coupling - Hiyama coupling – Corey-Fuchs reaction

Unit IV: Name Reactions and Rearrangements Bamford-Stevens reaction – Mukaiyama

Aldol reaction – Ene reactions – Mitsunobu reaction

– Weinrub ketone synthesis – Hosomi-Sakurai reaction Molecular rearrangements involving electron deficient atoms – Favorskii, Baeyer-Villiger, Neber, Dienone-Phenol and Beckmann

Unit V: Organic Functional Group Interconversions

Interconversion of organic functional groups – introducing, removing and interconverting functional groups in organic synthesis – problems involving prediction of products of organic reactions

Text Books

1. March J, 1992, *Advanced Organic Chemistry*, Fourth edition, New York, John Wiley and sons.
2. J.Clayden, N.Greeves, S. Wren and P.Wothers, *Organic Chemistry*, Holt-Reinhart and Winston, New York.2001.

References

1. Pine SH et al., 1986, *Organic Chemistry*, Fourth edition, Singapore, McGraw Hill Book Company.

Dr A Paul Raj

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colourimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - σ donor and π acceptor ligands - Carbonyls - Nitrosyls - Cyanides - Triphenyl phosphine complexes - Organo metallic compounds - Allene, alkyne and allyl complexes

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Mossbauer spectra – PES

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN^1 , SN^2 , SN_1CB mechanisms
- Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Transition metal ion in biology - Iron enzymes - structure and their functions - Model system for molecular activation and corresponding biochemical system.

Text Book

1. Drago R.S., 1977, *Physical methods in inorganic chemistry*, London, Saunders Golden Sunburst Series, W.B.Saunders Company.

References

1. Lee JD, 1988, *Concise inorganic chemistry*, (sixth edition) London, ELBS.
2. Huheey JE., 1972, *Inorganic chemistry Principle structure and reactivity*, (second edition), New York, Harper & Row publishers.
3. Cotton F.A. and Wilkinson G., 1988, *Advanced inorganic chemistry*, (Third Edition) London, John Wiley & sons.

Dr A Peter Pascal Regis

Unit I

Corrosion - definition- costs of corrosion - economic losses - Human life and safety – Types of corrosion: dry corrosion - wet corrosion - mechanisms - galvanic corrosion, concentration cell corrosion, atmospheric corrosion, soil corrosion, pitting corrosion, inter granular corrosion, waterline corrosion, stress corrosion, microbial corrosion

Unit II

Factors influencing corrosion: Nature of metals: Position in galvanic series - over voltage - relative areas of anodic and cathodic parts - purity of metals - physical state of metal – nature of surface film - solubility of corrosion products. Nature of corroding environment temperature - Humidity - presence of impurities in atmosphere - influence of pH - nature of ions present conduction of the corroding medium - formation of oxygen concentration cell.

Unit III

Corrosion control: Proper designing - use of pure metals - using metal alloys – cathodic protection -sacrificial anodic protection method - impressed current cathodic protection Use of inhibitors: inhibitors - definition - classification - due to Putilova - due to Deano - anodic - cathodic – mixed

Unit IV

Theories of inhibition of corrosion: Adsorption theory and molecular structure - hydrogen over potential theory, film formation theory - synergistic effect - example - corrosion inhibition in neutral gaseous environments - chromate, molybdates, nitrite, phosphate, silicate, cations, organic inhibitors carboxylate and tannins.

Unit V

Phosphates as inhibitors: Phosphonates: definition - reasons for using Phosphonates as inhibitors - Use of HEDP, ATMP, ethyl phosphonic acid, 2-carboxyethyl phosphonic acid as corrosion inhibitors.

Text Books

1. Antropov.L., 1972, *Theoretical electro chemistry*, Moscow, Mir Publishers.

References

1. Bockris.J.O.M. and Reddy A.K.N, 1970, *Modern Electro chemistry* Volume I and II, New York, Plenum Press.

Dr.A.Peter Pascal Regis

Unit-I Factors influencing the rate of a reaction. Methods of determining order of a reaction. Mechanism of complex reactions –Equilibrium approximation –Steady state approximation-Product study –stoichiometry- Isokinetic relation –Isokinetic temperature-Exner plot-Nature of reaction series and selectivity.

Unit-II Arrhenius equation –Activated complex theory- Chain reaction(Photo Chemical and thermal reaction)-Chain initiation process-Hydrogen-halogen reaction-Branching chain reaction-Gas phase combustion H_2O_2 reaction-Explosive reaction

Unit-III Application of ARRT in solution kinetics –Factors affecting reaction rate in solution Influence of internal pressure – influence of solvent dielectric constant-influence of ionic strength ion dipole and dipole –dipole reactions - influence of hydrostatic pressure – Vant Hoff equation and volume of activation Kinetic isotope effect-Primary and Secondary isotope effect

Unit-IV Acid-base catalysis - Mechanism of acid base catalysis – Vant Hoff intermediate, Arrhenius intermediate protolytic and prototropic mechanism - Catalysis law. Acidity functions - Hammett-Zucker hypothesis –catalysis in biological systems –Enzyme catalysis - Michaelis-Menten equation-Line -Weaver-Burk and Eadie-Hofster Plots - influence of substrate concentration - influence of pH - influence of temperature-influence of substituents on reaction rates –Hammett and Taft equations-Linear free energy relationships-kinetics of biological oxidation reaction and mechanism

Unit-V Surface phenomena-Adsorption and free energy relations at interface - Gibbs adsorption isotherm-physical and chemical adsorption - Langmuir adsorption isotherm - BET isotherm-Measurement of surface area - Heterogeneous catalysis - Role of surface in catalysis-Mechanism of Heterogeneous catalysis-Langmuir-Hinshelwood mechanism of bimolecular reaction - Langmuir-Rideal mechanism of bimolecular reaction

Reference:

- 1.Chemical kinetics-Laidler.K.J
- 2.Investigations of Rates and mechanism of Reaction PartI-Edward.S.Lewis
- 3.Kinetics and Mechanism-Frost.A and Pearson.R.C
- 4.Kinetics and Mechanism of Chemical transformation –Kuriacose J.C. and Rajaram
- 5.Radiation chemistry-Hughes.G.

Dr V Alex Ramani

Unit I: Plants and Plant Products

Classification of Plants - Nomenclature - Cells - Tissues - Structures and Functions of Cells and tissues - Primary Metabolites - Secondary Metabolites - Microorganism- Types - Microbes and Man - Biological Activities - Microbial Studies - Techniques - Interpretation of Results

Unit II: Methods of Plant Analysis I

Methods of Extraction - Cold Percolation Method - Soxhlet Method - Methods of Isolation - Methods of Separation Chromatography - Paper Chromatography - Column Chromatography - Thin layer Chromatography - Gas Chromatography - High performance Liquid Chromatography Electro phoresis - Paper and Gel Electrophoresis - Distillations - Steam Distillation - Fractional Distillation - Vacuum Distillation - Crystallization Techniques

Unit III: Methods of Plant Analysis II

UV-VIS spectroscopy - IR Spectroscopy - Proton and Carbon-13 NMR Spectroscopy – Mass Spectroscopy - X-ray and Neutron Diffraction studies - Optical studies - Qualitative and Quantitative Analyses - Interpretation of Results

Unit IV: Phenolic Compounds and Terpenoids

Methods of separation, isolation and identification - Phenolics - Phenyl propanoids - Anthocyanins - Flavonoids - Xanthenes - Stilbenes - Chemical conversions of these compounds - Structure Elucidation of Quercetin, Vitexin and Naringin Methods of separation, isolation and identification - Monoterpenes - Sesquiterpenes - Diterpenes - Triterpenoids - Steroids - Carotenoids - Chemical conversions of these compounds - Structure Elucidation of Menthol and Carotol.

Unit V: Nitrogen Compounds, Sugars, Lipids and other related Compounds

Methods of separation, isolation and identification - Amino acids - Proteins - Peptides - Amines - Alkaloids - Cyanogenic glycosides - Purines - Pyrimidines - Cytokinins - Chlorophylls - Chemical conversions of these compounds - Structure Elucidation of Nicotine and Cytisin. Methods of separation, isolation and identification - Monosaccharide - Disaccharide - Polysaccharides - Shikimic acids - Quinic acid - Fatty acids - Polyacetylenes – Sulfur compounds - Chemical conversions of these compounds - Structure Elucidation of Shikimic acid and Rhanmonse.

Text Books

1. Peach K and Tracey MV (eds.), 1956-1964, *Moderne der pflanzenanalyse*, Berlin, Spinger verlag.
2. Krishnasamy N.R, 1999, *Chemistry or Natural Products*, Hyderabad, University Press.
3. Boyer RF, 1993, *Modern Experimental Biochemistry*, II Ed., California, The Benjamin Cummings publishing company Inc.
4. Furniss BS, Hannaford AJ, Smith PWG and Tatchell AR, 1989, *Vogel's Text book of Practical Organic Chemistry*, V Ed., Essex, England, ELBS with Longman.
5. Harborne JB, 1988, *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*, II Ed., London and New York, Chapman and Hall.

References

1. Finar I.L. *Organic Chemistry*, Vol. 2. ELBS London.
2. Raphael Ikan, 1969, *Natural Products: A Laboratory Guide*, Jerusalem, Israel University Press.
3. Jeffrey C, 1982, *An Introduction Plant Taxonomy*, II Ed., Cambridge, Cambridge University Press.
4. William J and Sham M, 1976, *Microorganisms*, London, Mills and Boon Limited.
5. Ari Koskinen, 1993, *Asymmetric Synthesis of Natural Products*, Chichester, New York, Brisbane, Toronto, Singapore, John Wiley and Sons.

Dr S. Joseph Selvaraj

Unit I:

Organometallic compounds-Olefine complexes, and cyclopentadienyl complexes, Bonding in ferrocene compounds, Arene metal complexes, Alkyne complexes Fluxnol organometallic compounds and its identifications

Unit II:

Reactions of organometallic compounds-Homogenous Catalytic reactions, Stereochemistry and mechanism of addition reactions, hydrogenation of alkenes ,formylation and polymerization reactions.

Unit III:

Organometallic reagents-Leadtetra acetate, sodium ethoxide, Aluminium iso-propoxide, Dess Martine reagent, silver , palladium and platinum compounds, Role of organometallic compounds in organic synthesis.

Unit IV:

Theory, instrumentation and applications of UV-spectroscopy, Instrumentation and Applications of IR spectroscopy with reference to organometallic compounds, NMR applications.

Unit V:

Applications of 2D-NMR techniques like COSY, HMQC, HMBC, and NOESY. Applications of C -13 NMR spectroscopy, Mass spectral technique and its applications. Theory instrumentation and applications of Thermal experiments-TG, DTA, and DSC

REFERENCES

1. V.K. Ahluvalia, Renu Aggarwal, Organic synthesis, Second Edition, (Narosa Publications)
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Third Edition.
3. Robert M Silverstein and Francis X Webster, Spectroscopic identification of organic compounds, Sixth Edition, John Wiley and Sons.

Prof. S. Denis Arockiaraj

Unit I

Methods of preparation of complexes-physical methods of determination of molecular formula-conductance, magnetic measurements.

Unit II

Theories of coordination compounds-VBT, CFT, MOT, LFT-merits and demerits. Sigma donor and pi-acceptor ligands-carbonyls, nitrosyls, cyanides, triphenylphosphine complexes

Unit III

Applications of NMR, IR, Mossbauer, PES, ESR spectroscopic methods in the study of coordination complexes

Unit IV

Kinetics and reaction mechanism in coordination complexes-SN1, SN2, SN1CB. Theories and applications of trans effect-inner sphere and outer sphere electron transfer reactions-two electron transfer reactions-catalysis by organometallic compounds

Unit V

Bioinorganic chemistry-structure and functions of chlorophyll, haemoglobin, myoglobin, cytochromes and iron enzymes

References

1. Drago R S. 1977, Physical Methods in Inorganic Chemistry, London, Saunders Golden Sunburst Series, W.B Saunders Company
2. Lee J D. 1988, Concise Inorganic Chemistry (Sixth Edition), London, ELBS.
3. Huheey J E. 1972 Inorganic Chemistry Principles of Structure and Reactivity (Second Edition), New York, Harper and Row Publishers.
4. Cotton F A and Wilkinson G. 1988, Advanced Inorganic Chemistry (Third Edition), London, John-Wiley & Sons.

Dr A N Paul Angelo

Unit I: Synthesis of Novel Coordination Compound

Design and Synthesis of macrocyclic Ligands - Synthetic Procedures - Direct Macrocyclic synthesis, Microwave assisted synthesis - Metal ion template synthesis - Macrocyclic systems Macrocycles with pendant functional group - Catenands, Cage macrocycles, Cryptands and Crown Polyethers - Binucleating macrocycles - Compartmental Ligands. Natural macrocycles - Host-guest chemistry- macrocyclic host and non-metallic guests.

Unit-II Theories of Coordination Compounds and Mechanisms

Crystal Field , Ligand Field, Molecular Orbital Theories and Angular Overlap – Model Mechanism of Electron Transfer Reactions - Innersphere and Outer sphere electron - transfer mechanisms - Substitution reaction in square planar complexes, trans effect - Oxidative addition and insertion reactions.

Unit-III Determination of Electronic Structure and Geometry of Coordination Compounds-I

Electronic spectroscopy: Electronic states and spectra of T_d and O_h complexes, charge transfer spectra LMCT, MLCT, crystal field spectra. Evaluation of values in $Co(III)$ O_h and $Ni(II)$ O_h complexes D_{4h} and D_{4d} in tetragonally distorted cobalt(II) octahedral complexes. Infrared and Raman spectroscopy: Structural diagnosis: IR spectral assignment of coordinated ligands in metal complexes and differentiation of isomers (CN/NC, OCN/NCO, SCN/NCS, CNO/ONC, NO₂/ONO NMR Spectroscopy - Application of spin-spin coupling to structure determination. NMR of paramagnetic transition metal ion complexes , scalar shift and covalency. Lanthanide shift reagents. ESR anisotropy in the g-value, hyperfine and zero-field effect on the spectrum, Survey of the EPR spectrum of first row transition metals.

Unit-IV Determination of Electronic Structure and Geometry of Coordination Compounds-II

Magnetic Behaviour of Coordination Compounds. Methods of determining magnetic susceptibility, and electron states - Electrochemical methods of studying coordination compounds. Electrochemical and electrochemical reversibility. Pulse polarography, AC Polarography, Cyclic voltammetry. Electrochemical synthesis of complexes. Coupled chemical reactions - EC, CE and ECE mechanisms. Photoelectron spectroscopy and X-PES - Study of chiral coordination compounds by ORD and CD - Mass Spectroscopy - CIMS, EIMS and FAB-MS.

Unit-V: Catalysis of Organometallic compounds and Bio-inorganics

Ziegler - Natta polymerization, cyclooligomerization , olefin isomerization, metathesis and polymer bound catalysis. The oxygen carriers- hemoglobin and myoglobin and synthetic oxygen carriers. Electron transfer agents - Cytochromes, iron-sulphur proteins. Mechanism of electron transfer reactions. Nitrogen Fixation. Essential and trace elements in biological systems. Chelate therapy. Applications.

References

1. Lindoy.L.F, 1989, The Chemistry of Macrocyclic Ligand Complexes, Cambridge University Press, N.Y.
2. Huheey J.E., 1988, Inorganic Chemistry, 4th Edition . Harper and Row, NY
3. Cotton.F.A and Wilkinson, G 2001Advanced Inorganic Chemistry, 6th Ed., Wilrey Interscience, NY,
4. Purcell.K.F and Kotz. J.C. 1976, Inorganic Chemistry, Saunders.
5. Lever.A.B.P, 1984, Inorganic Electronic Sptroscopy, 2nd Ed., Elsevier Publishing Company, Amsterdam
6. Nakamoto. K, 1986, Infrared and Raman Spectra of Inorganic and Coordination Compounds, 4th Ed., Eiley Interscience
7. Basolo F and Pearson .R.G, 1967, Mechanism of Inorganic reactions, 2nd Ed., Wiley Eastern. New Delhi.
8. Kissinger.P.T, and Heineman.W.B, 1984, Laboratory Techniques in Electroanalytical Chemistry, Editors, Marcel Dekker, Inc., New York
9. Drago R.S., 1977, Physical Methods in Chemistry, Saunders, Amsterdam.
10. J. Chem. Educn., 1983, 60, 252-308.
11. J. Chem. Educn., 1983, 60, 687-706.
12. Eichhorn G.L., Ed., 1976, Inorganic Biochemistry, Elsevier, Amsterdam.

Dr A Rose Venis

Unit I: Chemistry Of Solutions

Concentration units- molarity, molality, mole fraction, volume fraction, percentage by weight and volume. Ideal and non-ideal solutions-Raoult's law, Henry's law, models in ideal and non-ideal solutions, their miscibility's, thermal properties, Binary and ternary liquid mixtures.

Unit II: Theories of Liquid Mixtures

Cell theory, Hole theory, lattice model, Prigogine's model, Flory theory, scaled particle theory, free length theory, Khsarare equation, Kalidoss-Jacobson theory. Types of interactions in solutions.

Unit III: Review on Thermodynamic Properties

Review of thermodynamic properties of solutions. Liquid solutions of non-electrolytes and electrolytes- activity coefficient- Deby- Huckel theory and its implications- thermodynamics of mixing. Measurement of density, viscosity, heat of solution, heat of mixing and vapour pressure.

Unit IV: Ultrasonic Studies in Liquid Mixtures

Ultrasonic interferometer- principle, instrumentation, generation of ultrasonic waves, measurement of velocity, ultrasonic transducers. Calculation of excess volume, internal pressure, isentropic compressibility and its deviation, free volume, free length, relative association, acoustic impedance, molar sound speed, isothermal compressibility, thermal expansion coefficient, partial and apparent molar volume, excess viscosity, excess molar Gibbs free energy of activation, stability constants of complexes. Relation of ultrasonic velocity with hydrogen bonding, phases, boiling points, molecular interactions and electrolytes.

Unit V Applications of Ultrasonic Sound Waves

Ultrasonic testing - Laser ultrasonic- ultrasonic's in medicine, biology and industry. Sonochemistry and ionic liquids.

Text Books

1. Gupta MC, 1990, Statistical Thermodynamics, Madras, Wiley Eastern Ltd.
2. Glasstone S, 2002, Thermodynamics for Chemists, New Delhi, East-West Press Ltd.
3. Sindhu Sadu, Ultrasonic velocity studies in liquids and their correlation with structural aspects, New Delhi, Publishing House.

References

1. Rowlinson JS, 1971, Liquids and liquid mixtures, London, Butterworth.
2. Findlay A, Practical Physical chemistry.
3. Srivastava KC, 2001, Hand book of Ultrasonic testing, International Inspection services, 1st ed.
4. Kinsler LE and Frey AR, 1991, Fundamentals of Acoustics, 2nd ed, Wiley Eastern Ltd.

Mr. S. Antony Sakthi

Unit I: Basic concepts of electroorganic chemistry

The contents of an electrolytic cell, electrode materials, anodes, cathodes. Electrolytic media-aqueous and non-aqueous media, Reference electrodes, salt bridges, Liquid-Junction potentials. Application of reference electrodes, diaphragms, permeable membranes and semi-permeable membranes. Designing of simple and special cells.

Unit II: Electrochemical oxidation of organic compounds

Oxidation of phenols, alcohols and glycols. Kolbe reaction, oxidation of carbonyl compounds - aldehydes, ketones, esters and lactones.

Unit III: Electrochemical reduction of organic compounds

Carbon-Carbon bond formation reactions- acid and base catalyzed condensations. Carbon heteroatom bond formation reactions-Pericyclic reactions

Unit IV: Aromatic substitution reactions

Concepts of aromaticity, electrophilic substitution of aromatic compounds (like chlorination, bromination and sulphonation). Substituent effects on aromatic electrophilic substitution. Nucleophilic aromatic substitution of aromatic compounds.

Unit V: Separation and characterization techniques

Chromatographic techniques - TLC, column chromatography, paper chromatography, high performance liquid chromatography (HPLC)-principle, methods and applications of ^1H NMR, ^{13}C NMR, FT-IR, UV and mass spectroscopy.

References

1. Norman L. Weinberg, Techniques of electroorganic synthesis. Part I and Part II, 1975, John Wiley and Sons.
2. Mollwo Perkin F, Practical methods of electro organic chemistry, 1905, Longmans, Green and Co.
3. March J. 1992, Advance Organic Chemistry (Fourth Edition), New York, John-Wiley & Sons.

Dr A. Edwin Vasu

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colorimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - σ donor and π acceptor ligands - Carbonyls - Nitrosyls - Cyanides - Triphenyl phosphine complexes - Organo metallic compounds - Allene, alkyne and allyl complexes

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Mossbauer spectra - Photoelectron spectroscopy

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN1, SN2, SNCB mechanisms - Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Transition metal ion in biology - Iron enzymes - structure and their functions - Model system for molecular activation and corresponding biochemical system.

References

1. Kettle S F A, Physical Inorganic Chemistry: A Coordination chemistry Approach, Oxford, Spektrum (1996)
2. Drago R S, Physical methods in inorganic chemistry, London, Saunders Golden Sunburst Series, W.B.Saunders Company (1977)
3. Lewis J and Wilkinson RG (Editors), Modern coordination chemistry, Principles and Methods, New York, Interscience Publishers, Inc. (1960)
4. Purcell K F, Kotz J C, Inorganic Chemistry, Saunders, Philadelphia (1976)
5. Huheey J E, Inorganic Chemistry, 4th Edition . Harper and Row, NY (1988)
6. Cotton F A and Wilkinson G, *Advanced inorganic chemistry*, (Third Edition), London, John Wiley & sons (1988)

13MCH1040 C4: ADVANCED STUDIES OF MACROCYCLIC COMPLEXES

Prof. A.S. Stella Shalini

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colourimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - Macrocycles and their classifications - Synthesis of Macrocycles - Properties and applications

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Mossbauer spectra – PES

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN^1 , SN^2 , SN^1CB mechanisms - Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Transition metal ions in biology - Iron enzymes - structure and their functions - Model system for molecular activation and corresponding biochemical system.

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1. Lee JD, 1998, *Concise inorganic chemistry*, (sixth edition), London, ELBS.
2. Huheey JE., 1972, *Inorganic chemistry Principle structure and reactivity*, (second edition), New York, Harper & Row publishers.
3. Drago RS., 1977, *Physical methods in inorganic chemistry*, London, Saunders Golden Sunburst Series, W.B.Saunders Company.

References

1. Cotton FA and Wilkinson G., 1988, *Advanced inorganic chemistry*, (Third Edition), London, John Wiley & sons.

Mr. M. Jerald Antony Joseph

Unit - I: Basic concepts in organic chemistry

Acid Base concept - Hard and Soft Acid Base principle - Types of organic reaction - substitution, elimination and addition reactions - Reactive intermediates - stereochemical and conformational effects on reactivity and specificity - Reactions with peracids – Molecular rearrangements involving electron deficient atoms

Unit - II: Reagents and reactions

Functional group transformation - Reagents for the inter conversion of various groups - special and specific oxidizing agents, reducing agents and organo metallic compounds for the inter conversions - the survey of reactions and reagents - Gilman's reagent - LDA – DCC - Wilkinson's catalyst - DDQ - AS - PTS - AP - SeO₂ – Zeolites

Unit - III: Aromatic character and Aromatic substitution reactions

Concepts of aromaticity - Reactions of aromatic compounds - Aromatic electrophilic and nucleophilic substitution reactions - substituent effects on aromatic substitution reactions.

Unit - IV: Synthesis and Reactions of Acetal

Methods of preparation of acetal - mechanism of acetal formation - stability of aliphatic and aromatic acetals and their derivatives - Reaction of acetal with AS, AP, Zeolites etc - Oxidation of ether by various oxidation agents.

Unit - V: Instrumental Techniques

Spectrometric methods for determining the structure of Acetal and their derivatives - FT-IR, NMR, and Mass - Methods of purification, separation-principles of Paper, TLC, Column, HPLC and gas chromatographic techniques-Microwave assisted reactions of acetal

Text Books

1. March J. 1992, Advance Organic Chemistry (Fourth Edition), New York, John-Wiley & Sons.
2. Gould E S. 1959, Mechanism and Structure in Organic Chemistry, New York, Holt-Reinhart and Winston

References

1. Warren S. 1988, Organic Synthesis: The disconnection Approach. New York, John-Wiley.
2. Pine SH et al., 1986, Organic chemistry, Fourth edition, Singapore, McGraw Hill Book company.