RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)

THANJAVUR – 613 005

(Re-Accredited with 'A' Grade by NAAC & Affiliated to Bharathidasan University)

M.Phil., CHEMISTRY - SYLLABUS

(Under Choice Based Credit System - CBCS)

For Candidates admitted from the year 2018 – 19 onwards

Finalized (for the I to II semester) in the

BOARD OF STUDIES MEETING HELD ON 18.04.2018

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APPROVED BY THE ACADEMIC COUNCIL ON _____

PG & RESEARCH DEPARTMENT OF CHEMISTRY

RAJAH SERFOJI GOVT COLLEGE (AUTOMONOUS), THANJAVUR - 5.

C.B.C.S PATTERN FOR ALL M.Phil. COURSES

SUBJECT: CHEMISTRY

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PART	CODE	COURSE	TITLE	MARKS		TOTAL	EXAM HOURS	CREDIT	PAGE NOS.
			I SEMESTER	IA	WE				
III	S1MCH1	CC1	Research Methodology	25	75	100	3	4	3
III	S1MCH2	CC2	Physical Methods in Chemistry	25	75	100	3	4	6
III	S1MPTL3	CC3	Teaching and Learning Skills	25	75	100	3	4	9
III	S1MCH4A	CC4	1. Principles and advances in medicinal chemistry	25	75	100	3	4	12
	S1MCH4B		2. Synthetic chemistry						14
	S1MCH4C		3. Reaction kinetics and advances in Nano Chemistry						16
	S1MCH4D		4. Organic Reaction Mechanism						18
	S1MCH4E		5. Chemistry of polymers and Deep Eutectic solvents						20
	S1MCH4F		6. Organic synthesis towards Heterocycles						24
	S1MCH4G		7. Crystal Growth and Nonlinear Optics						26
		TOTAL				**400**		**16**	
			II SEMESTER						
				V.V	**Dis.**	**Total**			
III	**S2MCHD**	**CC5**	**Dissertation and viva Voce**	**50**	**150**	**200**		**8**	
		GRAND TOTAL				**600**		**24**	

	No. of papers
Core Courses	**4(each of 4 credits)**
Project	**1 (8 credits)**
Total	**5 (24 credits**

Separate passing minimum is prescribed for Internal and External

a). The passing minimum for CIA shall be 40% out of 25 Marks. (i.e., 10 Marks)

b). The passing minimum for Autonomous Examinations shall be 40% out 75Marks. (i.e. 30 Marks)

c). The passing minimum not Less than 50% in the aggregate

SEMESTER - I

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – I (Major Theory) – CC 1

Credits : 4 **Code: S1MCH1**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PAPER – I: RESEARCH METHODOLOGY

- ❖ To enable the researcher to learn from previous theory on the subject and to illustrate how the subject has been studied previously
- ❖ To impart knowledge on research methodology.
- ❖ To gain the depth knowledge in statistical analysis and instrumental methods.

Learning Outcomes

At the completion of this course the student will be able to **Skills:**be able to formulate research questions and develop a sufficiently coherent research design	➢ be able to assess the appropriateness of different kinds of research designs and methodology, **Competence:**To develop independent thinking for critically analyzing research report

UNIT I

Literature Survey

Source of information: primary, secondary and tertiary – sources: Journals, Abstracts, Current Tiles, Reviews, Monographs and Dictionaries – Information retrievals: using internet and other electronic medias (preparing a review article related to problem of research of the student) E journals and data bases – search engines: Google and Yahoo search and Wikipedia. Reports and research work – laboratory observation – preparation of records and manuscripts – Research paper formats in Indian Journal of Chemistry, Journal of Indian Chemical Society, Journal of American Chemical Society, Tetrahedron Letters, Journal of Chemical Education, etc., - Writing of the project reports of thesis – IUPAC nomenclature of organic & inorganic Compounds.

UNIT II

Error Analysis

Types of Error – Accuracy, precision, significant figures, use of calculus in the estimation of errors – Frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – Describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance,

test for an outlier, testing variances, means t-Test, Paired t-Test – Analysis of variance (ANOVA) – Correlation and Regression– Curve fitting, Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – General polynomial equation fitting, linear zing transformations, exponential function fit – r and its abuse – Multiple linear regression analysis, elementary aspects – Applications of some computer packages like MS-Excel, Origin.

UNIT III

X-ray Spectroscopy

Introduction, Mosley's law, X-ray instrumentation, X-ray absorption X-ray emission methods, X-ray emission vs X-ray absorption, X-ray diffraction, Bragg's law. Automated X-ray diffractometry, Determination of crystal structure, Interpretation of X-ray diffraction pattern, Applications.

Molecular luminescence, Fluorometry and phosphorimetry

Introduction, Principles of fluorescence phosphorescence, Interpretation of fluorescence spectra, Factors, fluorescence intensity and concentration, instrumentation for flouorometry, Types of filter flouorometry, Reporting fluorescence spectra, Applications of flouorometry – Some special determinations.

UNIT IV

Chromatography and Separation Techniques

Solvent extraction – Principles of ion exchange, paper, thin layer and column chromatography – Gas Chromatography techniques – Columns, adsorbents ,methods, Rf values, McReynold's constants and their uses – HPTLC, HPLC techniques – Adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques: methods, principles and uses. Electrophoresis: Principles, factors affecting ionic migration – Effect of pH and ionic strength – Gel electrophoresis.

UNIT V

Electro analytical Techniques

Voltammetry – Polarography – Principles and introduction, Current – voltage relationship, Polarogram interpretation. Half wave potential, Reversible and Irreversible waves – residual, Migration and Diffusion currents, the Dropping Mercury Electrode (DME), Advantages of DME – Advantages and Applications of polarography. Amperometric Titrations – Principles, Titrations with two indicators – Instrumentation, Titration procedure, Advantages and Disadvantages, Applications. Ion selective electrodes – Glass – Membrane, Liquid – Membrane, Solid state Membrane, and their applications

References

UNIT I

1. http://www.virtualref.com/govdocs/s189.htm 2. http://www.inflibnet.ac.in

3. http://www.springerlink.com 4. http://rsc.org 5. http://www.pubs.acs.org
6. http://dspace.org 7. http://dspace.bdu.ac.in

UNIT II

1. D. B. Hibbert and J. J. Gooding, Data Analysis for Chemistry, Oxford University Press, 2006.
2. J. Topping, Errors of Observation and Their Treatment, Fourth Edn.,Chapman Hall, London, 1984.
3. S. C. Gupta, Fundamentals of Statistics, Sixth Edn., Himalaya Publ. House,Delhi, 2006.
4. H. E. Solbers, Inaccuracies in Computer Calculation of Standard Deviation,Anal. Chem. 55, 1611 (1983).
5. P. M. Wanek et al., Inaccuracies in the Calculation of Standard Deviation with Electronic Calculators, Anal. Chem. 54, 1877 (1982).

UNIT III

1. A. Sharma, S. G. Schulman, Introduction to Fluorescence Spectroscopy, Wiley-Interscience,New York, 1999.
2. F. Rouessac and A. Rouessac, Chemical Analysis, John Wiley and Sons,Chichester, 2000.
3. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy,4th edn., Tata McGraw-Hill, New Delhi, 1994.
4. Nicolo Omemetto, Analytical Laser Spectroscopy, Vol.50, John-Wiley and Sons, New York, 1979

UNIT IV

1. R. Stock and C. B. F. Rice, Chromatographic Methods, Chapman and Hall,New York. , 1963
2. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, a. R. Tatchell, Vogel's TextBook of Practical Organic Chemistry, 5th Edition, Pearson, New Delhi, 1989
3. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography, S.Chand & Co., New Delhi, 2nd edition, 1981.

UNIT V

1. C. H. Hamann, A. Hamnett and W. Vilelstich, Electrochemistry, Wiley-VCH, 1998.
2. A. J. Bard and L. F. Faulkner, Electrochemical methods – Fundamentals and Applications, 2nd Edn., Wiley-VCH, 1998.
3. A. C. Fisher, Electrode Dynamics, Oxford University Press, 1996.
4. J. Koryta and K. Stulik, Ion-Selective Electrodes, Cambridge University Press, 1983.
5. J. Janata, Principles of Chemical Sensors, Plenum Press, New York, 1989.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – III (Major Theory) – CC2

Credits : 4 **Code: S1MCH2**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PAPER – II: PHYSICAL METHODS IN CHEMISTRY

Objectives
❖ To understand the concepts of different spectral techniques and to apply these techniques for the quantitative and structural analysis of chemical compounds.
Learning Outcomes
❖ Students will be able to understand the most commonly used techniques in structure determination. Students will be able to apply the knowledge they have learned to identify unknown molecules with a given set of characteristic spectra. ❖ Students will use spectroscopic data to make meaningful observations about the chemical properties of compounds.

UNIT I

NMR Spectroscopy: Principles

Definition of nuclear angular momentum and the nuclear magnetic moment Idea about the rotating axis system – Bloch equations – Quantum mechanical description of the NMR experiment, transition probabilities – Relaxation effects – Fourier transform NMR – Measurement of T_1 and T_2 - Effect of quadrupolar nuclei evaluation of thermodynamic and kinetic data using NMR techniques – Second order spectra – Quantum mechanical treatment of coupling effects of relative magnitudes of J on the spectrum of an AB molecule - Spectral simplification and determination of signs of coupling constants. Systems with chemical exchange – Evaluation of thermodynamic parameters in simple systems – Study of fluxional behaviour of molecules an elementary treatment of second order spectra – examples.

NMR Spectroscopy: Applications to Inorganic Systems ^{1}H,^{19}F,^{31}P,^{13}C – Applications in probing inorganic structures, study of fluxional behavior in organometallics,evaluation of thermodynamic parameters – NMR of paramagnetic molecules – isotropic shifts – Contact and pseudo-contact shifts – Lanthanide shift reagents.

UNIT II

NMR Spectroscopy: Proton and Carbon NMR

Examples for different spin systems – Chemical shifts and coupling constants (Spin-spin coupling) involving different nuclei (1H, 19F, 31P, 13C) – interpretation and applications to inorganic compounds – Effect of quadrupole nuclei (^{2}H, ^{10}B, ^{11}B) on the proton NMR spectra – Satellite spectra.

^{1}H NMR Spectroscopy – Coupling constant – First order and second order splitting – Spin-spin splitting – Dependence of J on dihedral angle – Vicinal and geminal coupling constants – Karplus equation – Long range coupling constants - Influence of stereochemical factors on chemical shift of protons – Simplification of complex spectra – Double resonance techniques – Shift reagents – Chemical spin decoupling of rapidly exchangeable protons (OH, SH, COOCH, NH, NH_2) – An elementary treatment of NOE phenomenon – 2D Techniques (COSY, NOESY and ROSY)

Application of Proton NMR in MRI - ^{13}C NMR spectroscopy – Basic theory of FT-NMR – Relaxation – Broad band decoupling – Off resonance decoupling and chemical shift correlations (CH, CH_2, CH_3, aromatic). Identification of structure based on NMR data – Problems.

UNIT III

NQR Spectroscopy

Introduction – Characteristics of quadrupolar nuclei – Effects of field gradient and magnetic field upon quadrupolar energy levels – NQR transitions – Applications of NQR spectroscopy.

Mossbauer Spectroscopy

Introduction – Isomer shift – Magnetic interactions – Mossbauer emission spectroscopy – Applications to iron and tin Compounds.

UNIT IV

Electron Spin Resonance Spectroscopy

Basic concepts of ESR spectroscopy – Spin densities and McConnell equation – Hyperfine splitting –Factors affecting the magnitude of g and A values – Anisotropy in g and A values – ESR spectra of free radicals in solution: methyl, allyl, vinyl and related radicals, benzene anion, p-benzo-semiquinone, pnitrobenzoate dianion – naphthalene dianion, – Spin-trapping – CINDNP and CIDEP techniques – Double resonance in ESR – Advantages of ENDOR spectroscopy.

UNIT V

Electron Paramagnetic Resonance Spectroscopy

Applications of EPR to some simple inorganic systems such as Xe^{2+} – Factors affecting the magnitude of g and A tensors in metal complexes – Zero-field splitting and Kramers degeneracy – Spectra of VO(II), Mn(II), Fe(II), Co(II), Ni(II) and Cu(II) complexes – EPR spectra of dinuclear Cu(II) complexes - Applications of EPR to a few metallobiomolecules containing Cu(II) and Fe(III) ions. Basic principles of ENDOR spectroscopy and its applications in inorganic Chemistry.

References

UNIT I

1. E. A. V Ebsworth, David W. H. Rankin and Stephen Cradock, Structural Methods in Inorganic Chemistry, Blackwell Scientific Publications, U. K. 1987

UNIT II

1. W. Kemp, NMR in Chemistry – A Multinuclear Introduction, McMillan,1986.
2. C. D .Becker, High Resolution NMR – Theory andApplications, Academic Press, 2nd Edition, 1980.
3. Silverstein and Webster, Spectrometric Identification of Organic Compounds, Sixth Edition, Wiley, 1998.
4. B. P. Straughan and S. Walker , Spectroscopy Vol. I, Chapman and Hall, 1976.
5. R. S. Drago, Physical Methods in Inorganic Chemistry, 3rd Edition, Wiley Eastern Company.
6. D. L. Pavia, G. M. Lampmann, G. S. Kriz, Introduction to Spectroscopy, Thomson, 3rd edition, 2001.

UNIT III

1. R. S. Drago, Physical Methods in Inorganic Chemistry, 3rd Ed., Wiley Eastern company.
2. T. C. Gibbs, Principles of Mössbauer Spectroscopy, Chapman and Hall, 1976.
3. T. P. Das and E. L. Hah, NQR Spectroscopy, Acad. Press, Ny, 1958.

UNIT IV

1. B. P. Straughan and S. Walker, Spectroscopy, Chapman and Hall, London, vol.1 and 2, 1976.
2. C. N. Banwell, Fundamentals of Molecular Spectroscopy, 3rd edition, Tata- McGraw Hill, New Delhi, 1983.12
3. G. M. Barrow, Introduction to Molecular Spectroscopy, McGraw-Hill, New York, 1964.
4. R. S. Drago, Physical Methods in Chemistry, Saunders, 1977.

UNIT V

1. R. S. Drago, Physical Methods in Inorganic Chemistry, Third Edition, Wilely Eastern,
2. M. C. R. Symons, Chemical and Biochemical Aspects of Electron Spin Resonance Spectroscopy, Van Nostrand Reinhold Co., 1978.
3. J. A. Weil, J. R. Boldton and J. E. Wertz, Electron Paramagnetic Resonance: Elementary Theory and Practical Applications, John Wiley and sons, 1994.
4. F. E. Mabbs and D. Collison, Electron Paramagnetic Resonance of d Transition Metal Compounds, Elsevier, 1992

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – III (Major Theory) – CC 3

Credits : 4 **Code: S1MPTL3**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PAPER – III: TEACHING AND LEARNING SKILLS

Objectives:

- acquaint different parts of computer system and their functions
- understand the operations and use of computers and common Accessories
- develop skills of ICT and apply them in teaching learning context and Research
- appreciate the role of ICT in teaching, learning and Research
- acquire the knowledge of communication skill with special reference to its elements, types, development and styles
- understand the terms communication Technology and Computer mediated teaching and develop multimedia / e- content in their respective subject
- understand the communication process through the web
- acquire the knowledge of Instructional Technology and its Applications
- develop different teaching skills for putting the content across to targeted audience

Unit I – Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and 8 Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II – Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III – Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, Econtent – Satellite-based communication:

EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

Unit IV – Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V – Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi 9
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York
7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad
9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery Publishing Company, New York
10.Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11.Vanaja. M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications, Hyderabad.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4A**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDE:Dr.M.RAVISHANKAR
ASST.PROFESSOR OF CHEMISTRY

PAPER – IV: PRINCIPLES AND ADVANCES IN MEDICINAL CHEMISTRY

Objectives
❖ To understand the basic concept of drugs ❖ To impart knowledge in drug designing ❖ To acquire knowledge of synthesis in currently used drugs and their potential use.
Learning outcomes
At the completion of this course the student will be able to ❖ To understand the nomenclature and mechanism of drugs. ❖ Idea of drug discovery and Drug Design and Pharmacokinetics ❖ Principle of Combinatorial Synthesis ❖ To understand the Application of Drugs for Treatment

UNIT I

Nomenclature and Mechanism of Drugs

Introduction – Study of drugs – Important terminologies in pharmaceutical chemistry – Classification and nomenclature of drugs – Nomenclature of some heterocyclic systems – Mechanism of action of drugs – metabolism of drugs – Absorption of drugs – Assay of drugs.

UNIT II

Drug Discovery and Development

Introduction – Choosing a drug target – Identifying a bioassay – Finding a lead compound – Structure-activity relationship(SAR) – Identification of a pharmacophore – Drug metabolism – Manufacture-synthetic issues – Toxicity – Clinical trials – Patents.

UNIT III

Drug Design and Pharmacokinetics

Drug design: Variation of substituents, chain extension, ring expansions/contractions, ring variations, ring fusions, isosteres, rigidification of the structure, conformational blockers.

Pharmacokinetics: Pharmacokinetics issues in drug design – Solubility and membrane permeability – Resistant to hydrolysis and metabolism – Targeting drugs – Reducing toxicity – Prodrugs – Methods of administration – Formulation.

UNIT IV

Combinatorial Synthesis

Introduction – Combinatorial synthesis for drug discovery – Solid phase techniques – Methods of parallel synthesis – Mixed combinatorial synthesis – Deconvolution – Structure determination of the active compound – Limitations – Examples – Designing a combinatorial synthesis – Testing for activity.

UNIT V

Application of Drugs for Treatment

Structure, properties and mechanism of action of the following: Antibacterial drugs – Sulpha drugs: Sulphanilamide, Sulphadiazine, Suphapyridine. Antibiotics – Chloramphenical, Pencillin, Streptomycin. Antiseptics and disinfectants: Phenol and its derivatives, Halogen compounds and organic mercurials. Analgesics: Morphine, Heroin, Pethidine, Morphinan. Anticonvulsant: Barbiturates, Oxazolindiones. Diabetes: Control of diabetes, Insulin. Cancer and anti neo plastic drugs: Allylating agents, Anti metabolites, Plant products. Cardio vascular drugs: Anti arrhythemic drugs, Anti hypertension drugs.

Textbooks and Reference books

1. G. L. Patrick, An Introduction to Medicinal Chemistry, Oxford University Press, 2nd Edition,2001.

2. J. Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand and Co., New Delhi, 2006.

3. A. Kar, Medicinal Chemistry, New Age International (P) Ltd, Delhi, 1997.

Question Paper Pattern
Maximum Marks: 75
Exam duration: Three Hours
Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4B**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PAPER – IV: SYNTHETIC CHEMISTRY

GUIDES: 1.Dr.N.INGARSAL, 2.PROF. K. VIJAYALAKSHMI, 3.Dr.C.KATHIRAVAN

AND 4. Dr.J.ELONGOVAN

ASST.PROFESSORS OF CHEMISTRY

Objectives: To know the common Laboratory practices, some pharmacologically active molecules, their synthetic methdology with characterization techniques and antimicrobial activities of the synthesized molecules.

Outcomes: To identify, construct and synthesize the medicinally important new targets and theirby screen their antimicrobial activities.

UNIT-1

Laboratory Techniques

Documentation and records. Cleaning of glassware and apparatus in chemistry lab, assembling the apparatus, use of inert atmosphere, measurement and control of basic reaction parameters, addition of reagents, concentration and isolation of products. Safety-Accident management, personal protective equipment, identification of chemicals-Chemical spillage, electrical shock, eye injuries, ingestion and inhalation of chemicals. Collection and disposal of waste and hazardous chemicals.

UNIT-1I

Synthesis and Characterization

Synthesis of 1,4-benzodiazepine, 1,5-benzodiazepine, diazepinols and diazepinones - Characterisation. Synthesis and antimicrobial studies of 1,3-thiazines and Pyrimidine derivatives - Characterisation. Applications of benzodiazepine, thiazines and pyrimidine derivatives.

UNIT-III

Multicomponent Reactions

Reaction pathway of Biginelli, Hantzsch, Mannich, Passerini and Ugi multicomponent reactions – mechanisms based on Knoevenagel, Enamine formations, urea and thiourea additions, iminium intermediates, Lewis acid and base catalyzed reactions – synthetic utility and important features of multicomponent reactions.

UNIT-IV

Novel Pyrazoline Derivatives

Nomenclature of different substituted pyrazoline derivatives. Synthesis of 4, 5-dihydropyrazolines carrying pyrimidine moiety and 2-pyrazoline derivatives carrying other heterocyclic moiety through microwave, conventional and grinding methods. Mechanism of formation of different 2-pyrazoline compounds and their spectral characterizations by using FT-IR, ^{1}H NMR, ^{13}C-NMR and ESI-MS techniques.

UNIT-V

Transition Metal Complexes

Synthesis, Spectroscopy, Thermal Analysis, Magnetic Properties and Biological studies of some transition metal complexes with organic ligands. Like Zu(II), Ni(II) and Co(II) Complexes with Schiff Base Ligands.

References

1.R.Gopalan, K.Rangarajan and P.S.Subramanian,Elements of Analytical Chemistry, Third Edition,Sultan Chand and Sons

2. X.Q.Pan, J.P.Zou, Z.H.Huang and W.Zhang, *Tetrahedron Lett.*, 49, 5302-5308, **2008**.

3. H.G.Bonacorso, R.V.Lourega, E.D.Deon, N.Zanatta and A.P.Martns, *Tetrahedron Lett.*, 48, 4835-4838, **2007**.

4. K.Kim,S.K.Volkman and J.A.Ellman, *J. Braz. Chem. Soc.*, 9 (4), 375-379,**1998**.

5. D.Giles, K.Roopa, F.R.Sheeba, P.M.Gurubasavarajaswamy, G.Divakar and T.Vidhya, *Eur. J. Med. Chem.*, 58, 478-484, **2012**.

6. M.Koketsu, K.Tanaka, Y.Takenaka, C.D.Kwong and H.Ishihara, *Eur. J. Pharm. Sci.*, 15 , 307-310, **2002**.

7. A.Nagaraj and C.Sanjeeva Reddy, J.Iran. Chem. Soc., 5 (2), 262-267, **2008**.

8. H.G.O.Alvim, E.N.Da Silva Junior and B.A.D.Neto, *RSC Advances*, 00, 1-3, 1-19, **2013**. DOI:10.1039/XOXXOOOOOX.

9. A.Adhikari, B.Kalluraya, K.V.Sujith, K.Gouthamchandra, R.Jairam., *Eur. J. Med. Chem.*, 55, 467-474, **2012**.

10. A.Ozdem, I.R.Gulhan, T.Zitouni, Z.A.Kaplancikli, *Turk J. Chem.*, 32, 529- 538, 2008.

11. B. Ramesh and T.Sumana., *E-Journal of Chemistry*, 7(2), 514-516, **2010**.

12. S.B.Zangade, S.S.Mokle, A.T.Shinde, B.Yeshwant, *Green Chem. Lett. Revi*., 6, (2), 123127, **2013**.

13. R.A.Ahmadi and S.Amani, *Molecules*, 17, 6434-6448, **2012**. DOI: 10.3390/molecules17066434.

14. A.R.Bendale, R.Bhatt, A.Nagar, A.G.Jadhav and G.Vidyasagar, ***Der*** *Pharma Chemica*, 3 (2), 34-38, **2011**.

15. P.R.Patel, B.T.Thaker and S.Zele, *Ind. J. Chem*., 38A, 563, **1999**.

16. L.Mitu, M.Ilis, N.Raman, M.Imran, S.Ravichandran, *E-J. Chem.*, 9, 365-372, **2012**.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4C**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDE:Dr.M.VELLAISAMY

ASST.PROFESSOR OF CHEMISTRY

PAPER – IV: REACTION KINETICS AND ADVANCES IN NANO CHEMISTRY

Objectives

- To study the structure and reactivity relationship using LFER
- To understand the kinetics and mechanistic aspects of oxidation reaction
- To fair knowledge about the importance of characterization of nano materials
- To have an idea about green synthesis and nanomaterials.
- To study the photocatalytic degradation of dyes by nanomaterials.

Learning Outcomes

- Understand about the LFER,Taft equation and Yukawa Tsuno equation.
- Will have an idea about oxidation reaction and reaction mechanism.
- Will be aware of green synthesis and nano materials.
- Will be comprehend the structural characterization chemical and surface characterization
- Will gain research knowledge about the photocatalytic degradation of dyes by nanomaterials

UNIT - I

Quantitative structure and Reactivity Relationships

The linear free energy principle – (LFER) linear relationship involving difference reaction - The Hammett equation – steric effects – resonance interaction - normal substituent constants – σ^-, σ^+ constants – inadequancy of dual hypothesis – regularities in the resonance effect – the Yukawa Tsuno equation –systematic deviation – steric inhibition of resonance – Taft equation- correlation of aliphatic and aromatic relativities.

UNIT – II

Research Articles for Kinetic study on oxidation reaction

Kinetics and mechanism of oxidation of aromatic aldehyde by imidazolium dichromate in aqueous acetic acid medium : Kinetics and mechanism of oxidative decolorization of azo dye acid orange 8 by sodium N –halo-p-tolunesulfonamides in acid medium : Kinetics and mechanism of oxidation of aniline and substituted anilines by isoquilinium bromochromate in aqueous acetic acid.

UNIT - III

Nanomaterials synthesis

Top – down approach (physical vapour deposition, chemical vapour deposition, lithographic method and high energy method) – bottom – up approach (sol – gel, co –

precipitation, microemulsions, hydrothermal ,solvothermal methods, template synthesis and green synthesis) – growth mechanism (vapor – liquid – solid, solid – liquid – solid).

UNIT - IV

Nanomaterials characterizations

Structural characterization (XRD, SEM, TEM, EDX) – chemical characterization (optical spectroscopy, electronspectrometry, ionic spectroscopy) – surface characterization .

UNIT – V

Research Articles for green synthesis of Nano particles and photocatalytic degradation of dyes

Synthesis, characterization and photo catalytic degradation of malachite green dye using titanium dioxide nanoparticles : Photo-catalytic degradation of organic dyes with different chromophores by synthesized Nano size TiO_2 particles : Photocatalytic degradation of Methylene blue over ferric Tungstate.

Recommended Text Books

1. K.J.Laidler chemical kinetics, 2nd Ed. Tata Mc .Graw Hill (1975) (Unit I, II, IV).
2. Louis P.Hammett, Physical organic chemistry, Mc.Graw Hill Ltd., Tokyo (Unit III).
3. Gabor L.Hornyak, Joydeep Dutta, Harry F. Tibbals and Anil K.Rao, Introduction to nanosciences, CRC press, Taylor and Francis (2008).
4. GuoZhong Gao, Nanostructures and nanomaterials : synthesis, properties and applications, Imperial college press (2004).

References

1. S.W.Bension, "The Foundation of chemical Kinetics" Mc.Graw Hill, 1960.
2. Amdur and Hammes Chemical Kinetics – Mc.Graw Hill.
3. S. Sheik mansoor and S.Syed Shafi, E-Journal of Chemistry, 6(S1), S522(2009)
4. J.P.Shubha, K.Vinutha, M.Dinamani and Puttaswamy, IOSR Journal of Applied Chemistry, 7, 40 (2014)
5. S.B.Patwari., S.V.Khansole and Y.B.vibhute, J.iran chem soc., 6, 399 (2009)
6. Didier Astruc, Nanoparticles and catalysis, wiley – VCH (2008).
7. Thomos Varghese and K.M.Balakrishnan, 'Nanotechnology', Atlantic publishers, 2012.
8. T.Suresh and G.Annadurai, International journal of research in environmental science and technology (2013).
9. Azarmidokhi Hosseinnia, Mansoor keyanpour – Rad and mohammed pazouki, world applied sciences journal 8 (11), 1327 (2000).
10. Ankita Ameta , Rakshit Ameta and Mamta Ahuja 3(3),172 (2013).

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4D**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDE: Dr.R.CHITHIRAVEL,
ASST.PROFESSOR OF CHEMISTRY

PAPER – IV: ORGANIC REACTION MECHANISM

Objectives

- To state the Hard and Soft Acid Base principles in synthetic organic chemistry
- To describe a "reactive intermediate" in organic synthesis
- To identify the stereochemical and conformational effect
- To illustrate the molecular rearrangement involving electron deficient atom
- To study how the functional group rearrangements involved in various steps

Learning Outcomes

- Use curly arrow reaction mechanisms and knowledge of the relative stability of intermediates to predict and / or account for the products of reactions.
- Recognize the functional group transformation
- Design experiments to probe asymmetric induction mechanisms
- Recognize principle of stereochemistry
- Combine reactions to achieve simple synthesis of target molecules.

UNIT I: Basic concepts in organic chemistry

Hard and Soft Acid Base principles - Types of organic reactions – substitution, elimination and addition reactions – Reactive intermediates – stereochemical and conformational effects on reactivity and specificity; reaction with diboranes and peracids - Michael reaction- Robinson annulation – Reactivity umpolung – acyl anion equivalent- Molecular rearrangements involving electron deficient atoms.

UNIT II: Reagents and reactions

Functional group transformations – 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 – 1,3-dithiane – Trimethyl silyl iodide – Wilkinson's catalyst – OsO_4 – DDQ – SeO_2.

UNIT III: Asymmetric synthesis

Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.

UNIT IV: Principles of stereochemistry

Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.

UNIT V: Heterocyclic compounds

Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).

References:

1. Advanced Organic Chemistry by J. March, 1992, Fourth edition, New York, John Wiley and Sons.

2. Organic Chemistry by J. Clayden, N. Greeves and S. Warren.

3. Mechanism and Structure in Organic Chemistry by Gould ES, 1959, Now York, Holt Rinehart and Winston.

4. Principles of Asymmetric Synthesis by R. E. Gawley and J. Aube

5. Stereochemistry of Carbon Compounds by E. L. Eliel

6. Stereochemistry of Organic Compound by D. Nasipuri

7. Organic Chemistry Vol. II and I by I. L. Finar

<u>Question Paper Pattern</u>
Maximum Marks: 75
Exam duration: Three Hours
Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4E**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDES: Dr. D. ILANGESWARAN and **Dr. T. RAJKUMAR**
ASST.PROFESSORS OF CHEMISTRY

PAPER – IV: CHEMISTRY OF POLYMERS AND DEEP EUTECTIC SOLVENTS

Objectives

- To understand the different types of polymerization to have an idea about synthesis and characterization of polymers. To learn about DES

Learning outcomes

- To have an about different types of polymer synthesis and its characterization
- Will be able comprehend the applications of DES in Nano technology

UNIT 1

General procedures in chain-growth polymerization:

Free-radical chain polymerization - Anionic polymerization - Ring-opening polymerizations initiated by anionic reagents - Coordination polymers

Step-growth polymerization—basics and development of new materials:

The synthesis of an aromatic polyamide - Preparation of a main-chain liquid crystalline poly(ester ether) with a flexible side-chain - Non-periodic crystallization from a side-chain bearing copolyester - A comparison of melt polymerization of an aromatic di-acid containing an ethyleneglycol spacer with polymerization in a solvent and dispersion in an inorganic medium - Synthesis and extraction of cyclic oligomers of poly(ether ketone) - Synthesis of some sulfone-linked paracyclophanes from macrocyclic thioethers

UNIT 2

The synthesis of conducting polymers based on heterocyclic compounds:

Introduction - Electrochemical synthesis - Synthesis of polypyrrole - Synthesis of polyaniline - Synthesis of polythiophene

Chemical Synthesis of polymers:

Nitrogen-containing mesoporous polymers - synthesis of sulfonated block copolymers - poly(4-aminodiphenylamine)/Ag nanocomposite - Polydiphenylamine/carbon nanotube composites - polystyrene-graft-palmitic acid copolymers - poly(propylene imine) dendrimer-Polypyrrole.

Mechanochemical Preparation of Polymers: Polydiphenylamine - polypyrrole nanospheres.

UNIT 3

Polymer characterization:

Introduction - Synthetic routes to polymers - Molecular weight determination - Composition and microstructure - Optical microscopy - Electron microscopy - Analytical microscopy - Scanning probe microscopy - Thermal analysis - Molecular relaxation spectroscopy - X-ray and neutron scattering methods

UNIT 4

Polymers Characterization Using FTIR and NMR Spectra:

poly(MA-alt-NIPA) copolymer – copolymer matrix of P(MMA-MAh) - copolymerization study of o-toluidine and o-aminophenol - Copolymerization of aniline with m-nitroaniline - properties of soluble sulfonated polybenzimidazoles - Poly(benzoxazine-co-urethane)s - characterization of an electrochromic material from poly(1,4-bis(3-methylthiophen-2-yl)benzene)

UNIT 5

Deep Eutectic Solvents (DES):

Deep Eutectic Solvents - Synthesis, Properties and Applications; Role of DES in the synthesis of Polymers and related materials; Applications of DES in nano-technology

References

Unit1 : Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Unit 2: Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Research Articles:

1. Direct triblock-copolymer-templating synthesis of ordered nitrogen-containing mesoporous polymers, Jianping Yang, Yunpu Zhai, Yonghui Deng, Dong Gu, Qiang Li, Qingling Wu, Yan Huang, Bo Tu, Dongyuan Zhao, *Journal of Colloid and Interface Science* 342 (2010) 579-585.
2. Controlled synthesis of sulfonated block copolymers having thermoresponsive property by RAFT polymerization of vinyl sulfonate esters, Hideharu Mori, Yosuke Saito, Eri Takahashi, Kazuhiro Nakabayashi, Atsuhiko Onuma, Makoto Morishima, *Polymer* 53 (2012) 3861-3877.
3. Course of poly(4-aminodiphenylamine)/Ag nanocomposite formation through UV–vis spectroscopy, Starlet Thanjam, M. Francklin Philips, S. Komathi, P. Manisankar, C. Sivakumar, A. Gopalan, Kwang-Pill Lee, *Spectrochimica Acta Part A* 79 (2011) 1256-1266.
4. Polydiphenylamine/carbon nanotube composites for applications in rechargeable lithium batteries, Mihaela Baibaraca, Ioan Baltog, Serge Lefrant, Pedro Gomez-Romero, *Materials Science and Engineering* B176 (2011) 110-120.
5. Synthesis and thermal energy storage characteristics of polystyrene-graft-palmitic acid copolymers as solid–solid phase change materials, Ahmet Sarı, Cemil Alkan, Alper Bicer, Ali Karaipekli, *Solar Energy Materials & Solar Cells* 95 (2011) 3195-3201.
6. Synthesis and characterization of poly(propylene imine) dendrimer – Polypyrrole conducting star copolymer, Abd Almonam A. Baleg, Nazeem M. Jahed, Omotayo A. Arotiba, Stephen N. Mailu,

Nicolette R. Hendricks, Priscilla G. Baker, Emmanuel I. Iwuoha, *Journal of Electroanalytical Chemistry* 652 (2011) 18-25.

7. Mechanochemical preparation of polydiphenylamine and its electrochemical performance in hybrid supercapacitors, SP. Palaniappan, P. Manisankar, *Electrochimica Acta* 56 (2011) 6123-6130.
8. Rapid synthesis of polypyrrole nanospheres by greener mechanochemical route, SP. Palaniappan, P. Manisankar, *Materials Chemistry and Physics*122 (2010) 15-17.

Unit 3

Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Unit 4

Research Articles:

1. The synthesis of poly(MA-alt-NIPA) copolymer, spectroscopic characterization, and the investigation of solubility profile-viscosity behavior, D. Demircan, G. Kibarer, A.Gu¨ner, Z.M.O. Rzaev, E. Ersoy, *Carbohydrate Polymers* 72 (2008) 682-694.
2. Analysis of the interaction using FTIR within the components of OREC composite GPE based on the synthesized copolymer matrix of P(MMA-MAh), Yun Huang, Xiaoyan Ma, Guozheng Liang, Shuhui Wang, Qilu Zhang, *Polymer* 49 (2008) 2085-2094.
3. Electrochemical copolymerization study of o-toluidine and o-aminophenol by the simultaneous EQCM and in situ FTIR spectroelectrochemisty, Qin Yanga, Youyu Zhang, Haitao Li, Yuqin Zhang, Meiling Liu, Jiao Luo, Liang Tan, Hao Tang, Shouzhuo Yao, *Talanta* 81 (2010) 664–672.
4. Copolymerization of aniline with m-nitroaniline and removal of m-nitroaniline from aqueous solutions using a polyaniline-modified electrode: A comparative study, Liang Dinga, Qin Li, Dandan Zhou, Hao Cui, Rong Tang, Jianping Zhai, *Electrochimica Acta* 77 (2012) 302-308.
5. Synthesis and properties of soluble sulfonated polybenzimidazoles, Shengbo Qing, Wei Huang, Deyue Yan, *Reactive & Functional Polymers* 66 (2006) 219-227.
6. Poly(benzoxazine-co-urethane)s: A new concept for phenolic/urethane copolymers via one-pot method, Mohamed Baqara, Tarek Agag, Hatsuo Ishida, Syed Qutubuddin, *Polymer* 52 (2011) 307-317.
7. Electrosynthesis and characterization of an electrochromic material from poly(1,4-bis(3-methylthiophen-2-yl)benzene) and its application in electrochromic device, Bin Wang, Jinsheng Zhao, Chuansheng Cui, Jifeng Liu, Qingpeng He, *Solar Energy Materials & Solar Cells* 98 (2012) 161-167.
8. Electrochemical synthesis and spectroelectrochemical behavior of poly (diphenylamine-co-4,4’-diaminodiphenyl sulfone), P. Manisankar, D. Ilangeswaran, *Electrochimica Acta* 55 (2010) 6546-6552.
9. Electrochemical Synthesis, Characterization and Electrochromic Behavior of Poly(4-Aminodiphenylamine-co-4,4’-Diaminodiphenyl Sulfone), D. Ilangeswaran and P. Manisankar, *Electrochimica Acta* In Press, 87 (2013) 895–904.

Unit 5

Review Articles

1. Deep eutectic solvents: syntheses, properties and applications, Qinghua Zhang, Karine De Oliveira Vigier, Se´ bastien Royer and Franc¸ ois Je´ roˆ me, Che. Soc. Rev., 2012, 41, 7108-7146.
2. Deep-eutectic solvents playing multiple roles in the synthesis of polymers and related materials, Daniel Carriazo, Marı´a Concepcio´ n Serrano, Marı´a Concepcio´ n Gutie´ rrez, Marı´a Luisa Ferrer and Francisco del Monte, Chem. Soc. Rev., 2012, 41, 4996–5014.
3. Potential applications of deep eutectic solvents in nanotechnology, Ali Abo-Hamad, Maan Hayyan, Mohammed AbdulHakim AlSaadi, Mohd Ali Hashim, Chemical Engineering Journal 273 (2015) 551–567.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4F**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDE: Dr. K.BABU

ASST.PROFESSOR OF CHEMISTRY

PAPER – IV: ORGANIC SYNTHESIS TOWARDS HETEROCYCLES

OBJECTIVES

1. To rationalize the reactivity of hetero aromatic compounds.
2. To learn the preparations of five and six membered fused rings.
3. To learn the nomenclature of Heterocycles.
4. To understand the reaction mechanism of heterocyclic compounds.

UNIT-1

Basic concepts of Heterocycles:

Introduction, Structure of different heterocycles, Systematic nomenclature, Physical and chemical properties of heterocycles. Comparism of basic nature and aromatic character of different heterocycles. The difference between heterocyclic and carbocyclic compounds.

UNIT-2

Isolated Heterocycles:

The heterocycles with one and more than one hetero atoms: Structure, Nucleophilic and Electrophilic attack on heterocycles, Preparation, properties and uses of some simple five, six and seven membered heterocyclic systems.

UNIT-3

Fused heterocycles: Condensed five membered heterocycles: Synthesis, Properties and spectral studies of Benzoxazole, Benzthiazole, Benzimidazole. Condensed six membered heterocycles: Synthesis, Properties and spectral studies of Benzopyran, Benzopyrone (Coumarin, Chromone, Flavanoid, Isoflavanoid).

UNIT-4

Novel Pyrazoline and Pyrimidine derivatives:

Structure, Isomeric structures and Reactivity of pyrazoline. Comparism of aromatic and basic character of pyrazoline heterocycles. Various synthetic methods, Spectral characterization and Biological activities.

UNIT-5

Various Heterocyclic Schiff bases:

Different methods such as, microwave, conventional and green chemistry approach for synthesis of various Schiff bases. Studies about schiff bases consisting Pyrimidine, Pyrazoline and Thiazine heterocycles. Mechanism of the formation of Schiff bases, Properties, spectral characterizations by using FT-IR, ^{1}H NMR, ^{13}C-NMR and ESI-MS techniques. The biological and medicinal applications of various schiff bases.

References:

1. Joule, J. A.; Mills, K.; Heterocyclic chemistry; 4th ed.; Blackwell Science: Oxford, 2000.
2. Heterocyclic Chemistry -T. Gilchrist
3. Heterocyclic Chemistry- J A Joule and K Mills
4. Principles of modern heterocyclic chemistry- A Paquette
5. Handbook of Heterocyclic Chemistry- A R Katritzky, A F Pozharskii
6. Heterocyclic Chemistry-II- R R Gupta, M Kumar, V Gupta, Springer
7. Adithya Adhikari [a], Balakrishna Kalluraya [a],*, Kizhakke Veedu Sujith, Kuluvar Gouthamchandra [b], Ravikumar Jairam., *European Journal of Medicinal Chemistry.*, 55 (2012) 467e474.
8. Ahmet¨ OZDEM˙ IR*,G¨ulhan TURAN-ZITOUNI, Zafer Asım KAPLANCIKLI., *Turk J Chem.*, 32 (2008) , 529 – 538.
9. Babu.K, P. Pitchai*, M. Sathiyaseelan and A. Nepolraj., Der Pharma Chemica, 2015, 7(6):95-98

10. Babu K., Pitchai P and Gengan R. M., Journal of Chemical and Pharmaceutical Research, 2015, 7(12):275-278
11. K. Babu, D. Selvi and P. Pitchai., Der Pharma Chemica, 2015, 7(10):89-92
12. Babu.K and K.Tharini., Asian Journal of Chemistry., 2017,29,1,187-190
13. K Babu and N Deepa; Journal of Chemical and Pharmaceutical Research, 2017, 9(11):122-124
14. K. Babu., Asian Journal of Research in Chemistry, 2018, 12, 1.
15. K.Babu., Heterocyclic letters., 2018, 8,1.
16. Aromatic Heterocyclic Chemistry (Oxford Chemistry Primers) by David T. Davies.
17. The Chemistry of Heterocycles: Structure, Reactions, Syntheses and Applications by Theophil Eicher and Siegfried Hauptmann.
18. Modern Heterocyclic Chemistry., Julia Alvarez Builla, Juan.
19. Heterocycles in Life and Society., A.F.Pozharskii, A.T.Soldatenkov, A.R.Katritzky.
20. Heterocyclic chemistry., R.K.Bansal
21. Fundamentals of Heterocyclic Chemistry., Louis D. Quin., John.A.Tyrell.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – IV (Major Theory) – CC 4

Credits : 4 **Code: S1MCH4G**

Hours / Week : 4

Medium of Instruction : English

SEMESTER – I

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

GUIDE: Dr. K.RAJARAJAN

ASST.PROFESSOR OF CHEMISTRY

PAPER – IV: CRYSTAL GROWTH AND NONLINEAR OPTICS.

OBJECTIVES:

- To understand the theoretical concepts involved in crystal growth and basic processes and features of nonlinear optical materials and to learn the basic characterizing techniques of materials.

UNIT I: Basic Concepts Nucleation and Kinetics of Growth

Ambient phase equilibrium – Super saturation – Equilibrium of finite phases -Equation of Thomson-Gibbs – Types of nucleation – Formation of critical nucleus – Classical theory of nucleation – Homo and heterogeneous formation of 3D nuclei – Rate of nucleation – Growth from vapor phase, solutions and melts – Epitaxial growth – Growth mechanism and classification – Kinetics of growth of epitaxial films – Mechanisms and controls for nanostructures in 0 and 1 dimensions.

UNIT II: Crystallization Principles and Growth Techniques

Classes of crystal system – Crystal symmetry – Solvents and solutions –Solubility diagram – Super solubility – Expression for super saturation – Metastable zone and induction period – Miers TC diagram – Solution growth – Low and high temperatures solution growth – Slow cooling and solvent evaporation methods – Constant temperature bath as a crystallizer.

UNIT III: Gel, Melt and Vapor Growth Techniques

Principle of gel technique – Various types of gel -- Structure and importance of gel – Methods of gel growth and advantages -- Melt technique – Czochralski growth – Floating zone – Bridgeman method – Horizontal gradient freeze – Flux growth – Hydrothermal growth – Vapor-phase growth – Physical vapor deposition – Chemical vapor deposition – Stoichiometry.

UNIT: IV Characterization Techniques

X–ray diffraction – Powder and single crystal – Fourier transform infrared analysis – Elemental dispersive X-ray analysis – Transmission and scanning electron microscopy – UV-vis-NIR spectrometer – Chemical etching –Vickers micro hardness – Basic principles and operations of AFM and STM --X-ray photoelectron spectroscopy for chemical analysis – Ultraviolet photoemission spectroscopy analysis for work function of the material Photoluminescence – Thermoluminescence.

UNIT V: Basics of Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light– Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching –Semiorganics – Thio urea complex – Laser induced surface damage threshold.

Books for Study

1. I.V. Markov, Crystal Growth for Beginners: Fundamentals of Nucleation, Crystal Growth and Epitaxy (2004) 2nd edition.

2. P. Santhanaragavan and P. Ramasamy, Crystal Growth Process and Methods (KRU Publications, Kumbakonam, 2001).

3. H.H. Willard, L.L. Meritt, J.A. Dean, F.A. Sette, Instrumental Methods of Analysis (CBS Publishers, New Delhi, 1986).

4. S. Zhang, L. Li and A. Kumar, Materials Characterization Techniques (CRC Press, Bota Racon, 2009).

Books for Reference

1. J.C. Brice, Crystal Growth Process (John Wiley, New York, 1986).

2. E. N. Kaufmann, Characterization of Materials, Volume-I (John Wiley, New Jersey, 2012).

3. R.W. Boyd, Nonlinear Optics, 2nd Edn. (Academic Press, New York, 2003)

4. D.L. Mills, Nonlinear Optics – Basic Concepts (Springer, Berlin, 1998).

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

M.Phil., Chemistry – CBCS Pattern (From the academic year 2018 – 19

Core Course – V (Major Theory) – CC 5

Credits : 8 **Code: S2MCHD**

SEMESTER – II

(Applicable to the Students admitted from the academic year 2018-2019 onwards)

PAPER – V: DISSERTATION AND VIVA VOCE.

Objectives
❖ To gain the depth knowledge in laboratory Field (Chemical handling) ❖ To gain the basic principles of research ❖ To apply the various spectra to analyze the compounds
Learning outcomes
❖ To understand the principles of research ❖ To understand the concepts of laboratory instruments and techniques

Signature of the HOD