PERIYAR UNIVERSITY

SYLLABUS FOR

M.Sc. ORGANIC CHEMISTRY

DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

(For candidates admitted in the Colleges affiliated to Periyar University from 2021 - 20212 onwards)

REGULATIONS

1. OBJECTIVES OF THECOURSE:

The objectives of this course are the following:

(a) To impart knowledge in advanced concepts and applications in various fields of Chemistry.
(b) To provide wide choice of elective subjects with updated and new areas in various branches of Chemistry to meet the needs of all students.

2. COMMENCEMENT OF THISREGULATION:

These regulations shall take effect from the academic year 2021-2022, that is, for students who are admitted to the first year of the course during the academic year 2021-2022 and thereafter.

3. ELIGIBILITY FORADMISSION:

A candidate who has passed B.Sc., Chemistry degree of this University or any other University accepted by the Syndicate equivalent thereto, subject to such condition as may be prescribed therefore are eligible for admission to M.Sc., Degree Programme and shall be permitted to appear and qualify for the Master of Science (M.Sc.) Degree Examination in Organic Chemistry of this University.

4. DURATION OF THECOURSE:

The programme for the degree of Master of Science in Chemistry shall consist of two Academic years divided into four semesters.

5. EXAMINATIONS:

The examination shall be of three hours duration for each course at the end of each semester. The candidate failing in any subject(s) will be permitted to appear in the subsequent examination.

The practical / project should be an individual work. The University examination for practical / project work will be conducted by the internal and external examiners jointly at the end of every year.

COURSE OF STUDY AND SCHEME OF EXAMINATION

S.No.	Course (Paper)	Subject Title	Hours / Week	Work Loadper Semester (Hrs)	Exam Hours	University Examination			Credits
						Internal (25%)	External (75%)	Total	
I SEMESTER									
1.	Core -I Core - II	Organic Chemistry - I	5	75	3	25	75	100	5
2.	Core - III	Inorganic Chemistry -I	5	75	3	25	75	100	5
3.	Elective -I	Physical Chemistry - I	5	75	3	25	75	100	5
4.		Polymer Chemistry/ Nano and Green Chemistry	5	75	3	25	75	100	4
5.	Core Practical - I	Organic Chemistry Practical -I	4	60	-		-	-	-
6.	Core Practical - II	Inorganic Chemistry Practical -I	3	45					-
7.	Core Practical - III	Physical Chemistry Practical – I	3	45		-	-		-
		TOTAL	**30**	**450**			**400**	100	**19**
II SEMESTER									
1.	Core - IV	Organic Chemistry -II	5	75	3	25	75	100	5
2.	Core - V	Inorganic ChemistryII	5	75	3	25	75	100	5
3.	Core - VI	PhysicalChemistry II Extra	5	75	3	25	75	100	5
4.	EDC	Disciplinary course Organic	4	60	3	25	75	100	4
5.	Core Practical - I	Chemistry Practical-I Inorganic Chemistry	3	45	6	40	60	100	3
6.	Core Practical - II	Practical -I Physical Chemistry	3	45	6	40	60	100	3
7.	Core Practical-III	Practical - I HumanRights	3	45	6	40	60	100	3
8.	Common Paper	Chemistry in Health Science	2	30	3	25	75	100	2
9.	Add-on Course		-						
		TOTAL	**30**	**450**				**800**	**30**

Course Paper	Paper Code	Course Title	Hours/ Week	Work Load per sem (Hours)	Credit	Exam Hours	Marks		Total
							Internal	External	
		SEMESTER III							
Core VII		Organic Chemistry – III	5	75	5	3	25	75	100
Core VIII		Bioorganic Chemistry	5	75	5	3	25	75	100
Elective II		Spectroscopy	5	75	4	3	25	75	100
Elective III		Experimental Methods in Chemistry / Electroanalytical Techniques	5	75	4	3	25	75	100
Core Practical IV		Organic Chemistry Practical - II	4	60	-	-	-	-	-
Core Practical V		Organic Chemistry Practical - III	3	45	-	-	-	-	-
Core Practical VI		Organic Chemistry Practical - IV	3	45	-	-	-	-	-
		Total	**30**	**450**	**18**				**400**
		SEMESTER IV							
Core IX		Synthetic and Industrial Organic Chemistry	5	75	5	3	25	75	100
Elective IV		Medicinal chemistry	5	75	4	3	25	75	100
Core Practical IV		Organic Chemistry Practical II	3	45	3	6	40	60	100

Core Practical V		Organic Chemistry Practical III	3	45	3	6	40	60	100
Core Practical VI		Organic Chemistry Practical IV	3	45	3	6	40	60	100
Project		Dissertation /Project work	11	165	7	-	-	-	200
		Total	30	450	25				700
		Grand Total	**120**	**1800**	**92**	**-**	**-**	**-**	**2300**

Core Papers: 9
Core Practicals: 6
Elective papers: 4
EDC: 1
Human Rights: 1
Project: 1

NOTE : II

Distribution of Marks

Theory

University Examination (External) : 75 marks
Internal Assessment : 25marks

Distribution of Internal Assessment mark

Test : 10 marks
Attendance : 5 marks
Assignment : 5 marks
Seminar : 5marks

Total 25marks

Passing Minimum : Internal Assessment :50%- 12 marks
Passing Minimum : External Assessment :50%- 38 marks

Total Passing Minimum - 50 marks

PRACTICALS

University Examination (External) : 60 marks Internal Assessment : 40marks

Calculation of Internal Assessment mark

Number of Experiments: 10marks

Experimental skill: 10 marks

Test : 20marks

Total : 40 marks

Passing Minimum : Internal Assessment :50%- 20marks

Passing Minimum : External Assessment :50% - 30marks

Total Passing Minimum - 50marks

Everything should be supported by proper record separate passing minimum is necessary for Internal and External

QUESTION PAPER PATTERN

Theory

Time: 3Hours Max. Marks :75

Part - A: 15X1 = 15

(Answer all questions)

(Three multiple choice questions from eachunit)

Part - B: 2X5 = 10

(Answer any two questions) (one

question from each unit)

Part – C: 5X10=50

(Answer all questions)

(one question from each unit with internal choice)

Practical

Time: 3Hours Max. marks :75

Distribution of marks for practical

Experiment	:	45 marks
Viva-voce in practical	:	10 marks
Record	:	5marks
Total	:	60marks
Duration	:	6Hours

Project

Dissertation/Project	:	150 marks
Viva-voce	:	50marks
Total	:	200marks

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
CORE I - ORGANIC CHEMISTRY – I
(75 Hours)

OBJECTIVES

1. To learn about the stereochemistry of organic compounds and ORD and CD.
2. To learn about the formation, stability and structure of intermediates and the mechanism of aliphatic electrophilic substitution.
3. To learn about the effect of structure on reactivity.
4. To learn about the mechanism of aliphatic nucleophilic substitution reactions
5. To learn about the structural elucidation of alkaloids, flavones, isoflavones and anthocyanins.

UnitI Stereochemistry, ORD and CD (15Hours)

Wedge, Fischer, Newmann and Saw-horse formulae and their inter conversion, R and S notation, axial chirality (biphenyls, allenes and spiranes), planar chirality(cyclophanes, ansa compounds and trans cyclooctene), chirality due to helical shape, stereo selective and stereo specific reactions, asymmetric synthesis- Cram's rule. Homotopic, enantiotopic and diastereotopic atoms, groups in organic molecules. ORD & CD curves, octant rule, cotton effect, axial halo ketone rule and its applications

UNIT II Reaction intermediates and aliphatic electrophilic substitution (15 Hours)

Reaction intermediates - Formation, stability and structure of carbonium ions, carbanions, carbenes, nitrenes and free radicals

Aliphatic electrophilic substitution- SE1,SE2 and SEi mechanisms and electrophilic substitution by double bond shift, hydrogen electrophile-keto-enol tautamerism, halogen electrophile-halogenation of aldehydes and ketones, nitrogen electrophile- aliphatic diazonium coupling, sulphur electrophile- sulphonation and carbon electrophile- Stork-enaminereaction

Unit III Effect of structure on reactivity (15 Hours)

Resonance and field effects, resonance and steric effects, quantitative treatment- the Hammett equation- linear free energy relationship, substituent constant and reaction constant and limitation of Hammett equation.Taft equation, thermodynamically and kinetically controlled reactions, Hammond's postulate, Non-kinetic methods of determining mechanism- isolation, trapping and detection of intermediates, isotopic labeling, crossover experiments, product analysis, stereo chemical evidence, kinetic method-kinetic isotope effect

Unit IV Aliphatic nucleophilic substitution (15 Hours)

The SN1, SN2, SNi and neighbouring group mechanisms, the neighbouring group participation by pi and sigma bonds, Non classical carbocations, nucleophilic substitution at an allylic, aliphatic trigonal and vinylic carbon. Reactivity- effect of substrates structure, attacking nucleophile, leaving group and reaction medium. Ambident nucleophile, Swain-Scott, Grunwald-Winstein relationship, phase transfer catalysis.

Unit V Alkaloids and Anthocyanins (15 Hours)

Synthesis and structural elucidation of morphine, quinine, papaverine and reserpine. General nature of anthocyanins, structure of anthocyanidins, synthesis of pelargonidin chloride, cyanidin chloride, delphinidin chloride and peonidin chloride.Synthesis and structural elucidation of flavones and isoflavones.

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley &Sons 1992
2. S. Gould, Mechanism and structure in organic chemistry, Rinehart and Winston, INC,1960.
3. Jagdamba Singh and Yadav, Advanced OrganicChemistry, PragatiPrakashan Publications, 6th Edition,2010.
4. Francis A. Carey, Organic Chemistry, Third Edition, The McGraw-Hill Companies, Inc.,1996.
5. P.S. Kalsi, Organic Reactions and Mechanisms, Second Edition, New Age International Publishers,2002.
6. Ernest L. Eliel, Stereochemistry of Carbon Compounds, T.M.H Edition, Tata McGrawHill Publishing Company,1995.
7. P.S. Kalsi, Stereochemistry – Conformation and Mechanism, 6th Edition, Wiley Eastern Limited,2005.
8. I.L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd.,.2000
9. O.P. Agarwal, Chemistry of Organic Natural Products, Volume Iand II, Goel Publishing House,1988

REFERENCE BOOKS

1. P.S. Kalsi, Stereochemistry and Mechanism through solved problems, Second Edition, New Age International Publishers,1994.
2. D. Nasipuri, Stereochemistry of Organic Compounds, 2nd Edition, New Age International Publishers,1994.
3. S.M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, 1st Edition, Macmillan,1976.
4. R.T. Morrison and R.N. Boyd, Organic Chemistry, 6th Edition, Prentice-Hall, 1992.
5. R.O.C.Norman, Principles of Organic Synthesis, Second Edition, Chapman and Hall,1978.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
INORGANIC CHEMISTRY-I

(75 Hours)

OBJECTIVES

1. To understand the basic concepts of Inorganic chemistry.
2. To learn about the structure and bonding of the molecule.
3. To learn the basics of nuclear chemistry and different types of nuclear reactions

UNIT I Structure and Bonding **(15 Hours)**

Hard and Softacids and bases-classifications, Acid-Base strength,hardness, symbiosis,Theoretical basis of Hardness and Softness, applications of HSAB.

Rings-Phosphazenes-Structure, Craig and Peddock model, Dewar model, polyorganophosphazenes, Polysulphur –nitrogen compounds.

Inorganic polymers-Silicates-structure, Pauling's rule, properties, correlation and application; Molecular sleves.

Polyacids-Isopolyacids of V, Cr, Mo andW; Heteropolyacids of Mo and W(only structural aspects)

UNIT II Boron compounds and Clusters **(15 Hours)**

Boron hydrides – polyhedral boranes, hydroborate ions – a general study of preparation, properties and structure, styx numbers, Wade'srules. Carboranes–types such as closo and nido-preparation, properties and structure. Metallocarboranes – a general study.

Metal clusters – Chemistry of low molecularity metal clusters only– structure of Re_2Cl_8; multiple metal – metal bonds.

UNIT III Solid State **(15 Hours)**

Types of solids-close packing of atoms and ions-bcc, fcc and hcp, voids and their types-Goldschmidt radius ratio-derivation-its influence on structures.

Structures of NaCl, NiAs, CdI_2 ,Pervoskite, rutile, fluorite and antifluorite-zinc blende and wurtzite.

Defects in solids- Point defects, line defects and surface defects; Dislocations-Non-stoichiometric compounds; Use of X-ray powder data in identifying inorganic crystalline solids

UNITIV Nuclear Chemistry–I **(15 Hours)**

The Nucleus-subatomic particles and their properties-mass defect - binding energy - n/p ratio in stable and metastable nuclei-Different types of nuclear forces-Liquid drop model and shell model.Modes of radioactive decay-Theory of alpha decay, beta decay and gamma radiation, Orbital electron capture, nuclear isomerism-internal conversion.

Detection and determination of activity-GM, Scintillation and Cherenkov counters

Particle Accelerators: Linear accelerator- cyclotron, synchrotron, betatron and bevatron.

UNIT V - Nuclear Chemistry – II **(15 Hours)**

Nuclear Reactions: Q-value, columbic barrier- nuclear cross section-different types of nuclear reactions-projectile capture-particle emission, spallation, fission and fusion- product distributions - Theories of fission, use of fission products, fissile and fertile isotopes-U-238,U-235,PU-239,Th232-stellarenergy-synthesis of new elements.

Radio-Isotopes: Applications-isotopes as tracers - neutron activation analysis and isotopic dilution analysis - uses in structure and mechanistic studies - Carbon dating – Radio pharmacology, Radiation protection and safety precautions - Disposal of nuclear waste.

TEXT BOOKS

1. F.A Cotton & Wilkinson, AdvancedChemistry
2. Emelius and Sharpe, Modern Aspects of InorganicChemistry.
3. A.R.West, Basic Solid State Chemistry, JohnWiley,1991
4. J.D. Lee, Concise InorganicChemistry.
5. S.F.A. Kettle, Physical Inorganic Chemistry, OxfordUniversity
6. J.E.Huheey, E.A.Keiter and R.L.Keiter, Inorganic chemistry-principlesof structure and reactivity, 4th edition, Pearson-Education,2002
7. H.J.Arnikar,Essentials of nuclear Chemistry,2nd edition,Wiley easternCo.,1987.
8. S. Glasstone, Source Book on AtomicEnergy

REFERENCE BOOKS

1. H.A.O. Hill and P.Day, Physical methods in advanced Inorganic chemistry, John Wiley,1986.
2. G.S. Manku, Inorganic Chemistry, T.M.H. Co.,1984.
3. K.F.PurcellandJ.C.Kotz,InorganicChemistry,WBSaundersCo.,USA1977.
4. A.K. Srivatsava and P.C. Jain, Elements of Nuclear Chemistry, S.Chand and Co., 1989.
5. G. Friedlander, J.W.Kennedy and J.M. Miller, Nuclear and Radio Chemistry, Wiley.,1964.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
CORE III - PHYSICAL CHEMISTRY – I (75 Hours)

OBJECTIVES

1. To study in detail the basic concepts of classical thermodynamics and statistical thermodynamics
2. To gain knowledge about theories of reaction rates and kinetics of complex and fast reactions
3. To understand the principles of quantum chemistry and group theory

UNIT I Classical Thermodynamics – I (15 Hours)

Concept of chemical Potential-Determination of chemical potential- Direct Method and Method of Intercepts –variation of chemical potential with temperature and pressure-Fugacity –Methods of determination of fugacity – Variation of fugacity with temperature and pressure. Standard states for gases, liquids, solids and components of solutions. Solution of electrolytes – Concept of ionic strength-.mean ionic activity and mean ionic activity coefficient – determination of activity coefficient from freezing point, EMF and solubilitymeasurements

UNIT II Statistical and Irreversible Thermodynamics (15Hours)

Concept of thermodynamical and mathematical probabilities –Distribution of distinguishable and non – distinguishable particles. - microstates and macrostates. Ensembles -Maxwell's distribution law of molecular velocities - Evaluation of average velocity, root mean square velocity and most probable velocity from distribution law of molecular velocities - Maxwell –Boltzmann, Bose-Einstein and Fermi-Dirac statistics -comparisons

Partition functions – rotational, vibrational, translational and electronic partition functions- Expression of thermodynamic properties in terms of partition function – Einstein and Debye theory of heat capacities of solids.

UNIT III Chemical Kinetics – I (15 Hours)

Theories of reaction rates – Arrhenius theory, Hard sphere collision theory and transition state theory of reaction rates– Comparison of collision theory and activated complex theory – Lindemann and Hinshelwood theories of unimolecular reaction rates. Reactions in solutions – comparison between gas phase and solution reactions –influence of solvent, ionic strength, and pressure on reactions in solution.

Kinetics of complex reactions – reversible reactions, consecutive reactions – Parallel reactions and Chain reactions – Rice–Herzfeld mechanism for hydrogen-bromine, gas phase pyrolysis of methane and formation of phosgene reactions- explosion limits. Study of fast reactions: Relaxation

methods-temperature and pressure jump methods -Stopped flow technique, flash photolysis and Crossed molecular beam method.

UNIT IV Quantum Chemistry – I (15 Hours)

Planck's theory of black body radiation – Photoelectric effect; de – Broglie equation –Heisenberg uncertainty principle – Compton effect- quantum mechanical postulates – Schrodinger equation and its solution to the problem of a particle in one and three dimensional boxes – the harmonic oscillator- Application of Schrödinger equation to rigid rotator and hydrogen atom –origin of quantum numbers – probability distribution of electrons. Approximation methods –Perturbation and Variation methods – Slater determinant -application to hydrogen and helium atom — Spin - orbit interaction – LS coupling and JJ coupling – ground state term symbols for simple atoms.

UNIT V Group Theory – I (15 Hours)

Symmetry elements and symmetry operations – Point groups – identification and representation of groups –comparison of molecular and crystallographic symmetry –Reducible and irreducible representation – Direct product representation - Great orthogonality theorem and its consequences – Character table and its uses.

TEXT BOOKS:

1. S.Glasstone, Thermodynamics for chemists, Affiliated East West press, New Delhi,1960.
2. J. Rajaram and J.C. Kuriacose, Thermodynamics for students of chemistry, Lal NaginChand, New Delhi,1986.
3. J. Rajaram and J.C. Kuriacose, Kinetics and mechanism of chemical transformation,Macmillan India Ltd.,1993.
4. , D.N Bajpai, Advanced Physical Chemistry, S.Chand publishing Compan New Delhi, 1992K.J.Laidler, Chemical Kinetics, Harper and Row, Newyork,1987.
5. R.K. Prasad, Quantum Chemistry, Wiley Eastern, New Delhi,1992.
6. V.Ramakrishnan and M.S.Gopinathan, Group theory in chemistry, VishalPublications,1988.
7. K.V.Raman, Group theory and its application to chemistry, Tata McGraw HillPublishing Co.,1990.
8. Gurudeep raj, Advanced Physical Chemistry, Goel Publishing House,Meerut

REFERENCE BOOKS:

1. W.J. Moore, Physical Chemistry, Orient Longman, London,1972.

2. J.W. Moore and R.G. Pearson, Kinetics and Mechanism,1981.

3. A.K. Chandra, Introductory Quantum Chemistry, Tata Mc Graw Hill.

4. P.W.Atkins, Molecular Quantum Mechanics, Oxford University Press, Oxford.,1983

5. I.N.Levine, Quantum chemistry, Allyn and Bacon, Boston,1983.

6. F.A. Cotton, Chemical Application of Group Theory, John Wiley and Sons Inc.,Newyork,1971.

M.Sc. ORGANIC CHEMISTRY SEMESTER - I
ELECTIVE I

Paper I - POLYMER CHEMISTRY (75 Hours)

OBJECTIVES

1. To study the basic concepts in Polymer chemistry.
2. To study the determination of molecular weight and properties of polymers.
3. To know about the polymer processing and polymerization techniques.
4. To learn about the synthesis and applications of commercial polymers and conducting polymers.

UNIT 1 Basic Concepts (15 Hours)

Monomers, repeat units, degree of polymerization, Linear, branched and network polymers, Addition polymerization, Condensation polymerization, Mechanism of free radical, cationic and anionic polymerization and co-ordination polymerization. Ziegler- Natta catalyst. Kinetics of free radical, cationic, anionic and co-polymerisation. Determination of Reactivity ratio, Reactivity ratio and co-polymerisation behavior.

UNIT2 Molecular Weight and Physical Properties (15Hours)

Concept of Average molecular weight, number- average, weight- average molecular weight and viscosity- average molecular weights. Determination of molecular weight - viscosity, light scattering, osmotic and ultracentrifugation methods. Physical properties- crystalline melting point, glass transition temperature, relationship between Tm and Tg and Determination of Tg.

UNIT3 Polymer Processing and Polymerization Techniques (15Hours)

Polymers processing- Plastics, elastomers and fibres. Compounding, Processing techniques- calendaring, die casting, injection molding, thermofoaming and fibre spinning. Polymerization techniques- Bulk polymerization, solution polymerization, suspension polymerization, emulsion polymerization and melt polycondesation.

UNIT 4 Commercial Polymers (15 Hours)

Synthesis and applications of polyethylene, polyvinyl chloride, polyamide, polyester, phenol resins, epoxy resins, silicone polymers, polybenoxazoles, polyimidazole, polyurethane, polymethylmethacrylate, poly(tetrafluoro ethylene) and polyacrylonitrile.

UNIT 5 Conducting Polymers (15 Hours)

Conducting polymers- Introduction, Electrochemical doping, Electrochemical synthesis and applications of polypyrrole, polythiophene, polyindole, polyaniline, polyacetylene and poly(p-phenylene).

REFERENCE BOOKS

1. F.W. Billmeyer,Textbook of Polymer Science,Wiley Student Edition, 3rdEdition.

2. L. Gupta,Polymer Science, Pragathi PrakashanPublication.

3. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar,Polymer Science, New Age International Private Limited,1986.

4. P.J. Flory,Principles of Polymer Chemistry, Asian Books, 1stEdition,2006.

5. George Odian, Principles of Polymerization, John Wiley, 4th Edition,2007.

6. V.K.Ahluwalia & Anuradha Mishra,Polymer Science: A Text Book, Ane Books, 1stEdition,2008.

7. A. Skotheim, L. Elsenbaumer, R. Reynolds,Handbook of Conducting Polymers, Second Edition,1997.

8. Hari SinghNalwa, Textbook of Organic Conductive Molecules and Polymers.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
ELECTIVE I

Paper-II - NANO AND GREEN CHEMISTRY (75 Hours)

OBJECTIVES

1. To learn about the synthesis, properties and applications of Nanomaterials.
2. To learn the tools for Characterisation of Nanomaterials.
3. To understand the green concept of organic reactions.

UNIT I Introduction and Synthesis of Nano materials (15 Hours)

Definition - Classification –Historical perspective-synthetic approaches –physical methods– electricarcmethod–laserablation–physicalvapourdeposition–sputtering
- chemical methods – reduction of metal ions - solvo thermal synthesis – photo chemical synthesis – electro chemical methods (anodic and cathodic process)– thermolysis – sonochemical routes –synthesis of semiconductor nano materials –sol – gel methods and biological methods of synthesis.

Unit II Properties and applications of Nanomaterials (15 Hours)

Properties -Nanoclusters- Catalytic, electrical and optical and magnetic properties of nanomaterials. Applications- Nano catalyst-Nano sensors-Nano medicines- Bioimaging with quantum dots, Cancer Therapy-nano particles in environmental remedy-Removal of toxins-water treatment.

UNIT-III Tools for Characterisation of Nano Materials (15 Hours)

Electron microscope–SEM –TEM –STM –AFM – X-ray Diffraction.

Spectroscopy: UV-visible spectroscopy- FTIR –Raman spectroscopy-x-ray photo electron spectroscopy-Luminescence-Photoluminescence

Tools for nano structures: Nanolithography-Electron beam-Ion beam- Nanosphere-self-assembled monolayers–Coreshell–Nanoshells

Unit IV Introduction to Green chemistry (15 Hours)

Choice of starting materials, Choice of reagents, Choice of catalysts- biocatalyst, polymer supported catalysts, Choice of solvents. Synthesis involving basic principles of green chemistry, examples- Synthesis of Adipic acid, Methylmethacrylate, Paracetamol. Ultrasound assisted reactions- Esterification, Reductions, Coupling reactions, Strecker synthesis and Reformatsky reactions.

Unit V Solvent free organic synthesis (15 Hours)

Reactions on solid supports, Phase transfer catalysis, Solvent free esters saponifcation, Reactions without support or catalyst- examples, Microwave assisted reactions in water- Oxidation of toluene to benzoic acid, Microwave assisted reactions in organic solvent- Diel's - Alder reaction, Coupling reactions (Stille, Suzuki,Heck, Sonogashira), Solvent free microwave assisted organic synthesis, Microwave activation and heating, Advantages of microwave exposure and specific effects of microwaves, Organic synthesis under microwaves- benefits and limitations.

REFERENCE BOOK

1. T. Pradeep, NANO: The Essentials, Tata McGraw Hill Education Private Limited,2012
2. B. S. Murty, P. Shankar et al, Textbook of Nanoscience and Nanotechnology, Universities Press (INDIA) Private Limited ,2012
3. SulabhaK.Kulkarni,Nanotechnolgy:PrinciplesandPractices,Springer,2015
4. RashmiSanghi, M.M.Srivastava, Green chemistry, Environment friendly Alternatives, Narosa Publishing house,2007.
5. V. Kumar, An Introduction to Green chemistry, Vishal Publishing Co. Jalandhar, 2007.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II

CORE IV - ORGANIC CHEMISTRY – II (75 Hours)

OBJECTIVES

1. To understand the basic concepts of aromaticity.
2. To learn the mechanism of Elimination reaction and free radical reactions.
3. To study the mechanism of Aromatic electrophilic and Nucleophilic substitution reactions
4. To know the effects of light in organic reactions.
5. To study the concepts of pericyclic reactions

Unit I Aromaticity (15 Hours)

Aromaticity-Aromaticity in benzenoid, nonbenzoid, [2, 6, 10 & 18] electrons systems and hetero cyclic compounds. NMR concept of Aromaticity and non-aromaticity, systems of 10 electrons and more than 10 electrons [14, 18] annulunes, concept of antiaromaticity and homoaromaticity,antiaromaticity in [12, 16]annulunes, non- aromaticity, alternate and non-alternant hydrocarbons, Aromaticity in fullerenes and Mobius Aromaticity.

Unit II Elimination and Free radicals (15 Hours)

The E1, E2,E1CB mechanisms, orientation of the double bond- Hofmann, Zaitsev'sand Bredt rules, competition between Elimination and substitution, mechanism of pyrolytic elimination, Chugaev and Cope Eliminationreactions.

Reactions of free radicals- polymerization, addition, halogenation, aromatic substitution and rearrangement. Reactivity - reactivity on aliphatic, aromatic substrate, reactivity in the attacking radical and effect of solvents.

Unit III Aromatic electrophilic and nucleophilic substitution (15 Hours)

The arenium ion mechanism, orientation and reactivity in monosubstituted benzene ring-o, m, p-directing groups, ortho, para ratio, ipso attack, Vilsmeier- Haack, Jacobson and Scholl's reactions. The SNAr,SN1 and benzene mechanisms, Reactivity - effect of substrate structure, leaving group and attacking nucleophiles.

UNIT IV Organic Photo chemistry (15 Hours)

The fate of excited molecules, Jablonski diagram, Norrish type I and type II reactions, photo reduction of ketones, Paterno-Buchi reactions, photo chemistry of arenes, photo oxidation (formation of peroxy compounds), photo isomerisation (cis- trans), photo addition of olefin and amines to aromatic compounds. Fries, di-pi methane rearrangements, rearrangementof 4,4-diphenylcyclohexadienone.

Unit V Pericyclic reactions (15 Hours)

Pericyclic reactions -Classification, basic concept of orbital symmetry,Woodward- Hofmann rules. Electrocyclic reactions- concept of con and disrotation, cyclisation of butadiene and 1,3,5-hexatriene- correlation diagram and FMO approach. Cycloaddition reactions- superafacial and antarafacial addition, theory of (2+2) and (4+2) cycloaddition reactions- correlation diagram and FMO approach. Sigmatropic migration of hydrogen and carbon, Sommelet-Hauser, Cope and Claise rearrangements.

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley & Sons1992
2. Francis A. Carey, Organic Chemistry, Third Edition, The McGraw-Hill Companies, Inc.,1996.
3. P.S. Kalsi, Organic Reactions and Mechanisms, Second Edition, New Age International Publishers,2002.
4. Charles H.Depuy, molecular reactions and photochemistry, Orville L.Chapman.Prentice Hall of India Pvt Ltd. New Delhi1988.
5. S.M. Mukherji and S.P. Singh, Reaction Mechanism in Organic Chemistry, IIIEdn. MacMillan, 1984.
6. V.K. Ahluwalia, Organic Reaction Mechanism, Narosa Publishing House, 4th Edition,2013.

REFERENCE BOOKS

1. S. H. Pine, J.B. Hendrickson, D.J. Cram and G.S. Hammond, Organic Chemistry, IV Edn., McGraw Hill Company,1980.
2. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice-Hall,1992.
3. R.O.C. Norman, Principles of Organic Synthesis, Second Edition, Chapman and Hall, 1978.
4. L.F. Fieser and M. Fieser, Organic Chemistry, Asia Publishing House, Bombay,2000.
5. R.K. Bansal, Organic Reaction Mechanism, Tata McGraw Hill Publications, 3rd Edition, 2006.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II

CORE V - INORGANIC CHEMISTRY -II
[75 Hours]

OBJECTIVES

1. To learn the various theories of coordination compounds
2. To study the various reaction of coordination compounds
3. To understand the basics behind the origin and principle of electronic spectra

Unit I Theories of coordination compounds: (15 Hours)

VB theory-CFT-Splitting of d orbital in ligand field and different symmetries-CFSE-Factors affecting the magnitude of 10 Dq-Evidence for crystal field stabilization (Structural and thermodynamic effects) - Spectrochemical series – Site selection in spinels - tetragonal distortion from octahedral symmetry-John Teller distortion – Nephelauxetic effect-MO theory octahedral-tetrahedral and Square planar complexes-pi bonding and molecular orbital theory-experimental evidence for pi bonding.

UNIT II Stability and Stereochemical Aspects (15 Hours)

Stability of complexes - thermodynamic aspects of complex formation- factors affecting stability stability correlations- statistical and chelate effects- Determination of stability constants - polarographic, photometric and potentiometric methods.

Stereochemical aspects -stereoisomerism in inorganic complexes, isomerism arising out of ligand distribution and ligand conformation,chirality.

Macrocyclic ligand types - porphyrins, corrins, Schiff bases, crown ethers, cryptates and catenands. (simplecomplexes).

UNIT III Reaction Mechanism of transitionmetal complexes (15 Hours)

Energy profile of a reaction- reactivity of metal complexes- inert and labile complexes- kinetic application of valence bond and crystal field theories- kinetics of octahedral substitutions- acid hydrolysis- factors affecting acid hydrolysis- base hydrolysis- conjugate base mechanism- direct and indirect evidences in favour of conjugate mechanism- anation reactions- reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes- the trans effect-mechanism of the substitution reactions. Redox reactions- electron transfer reactions-mechanism of one electron transfer reactions- outer sphere type reactions- cross reactions and Marcus- Hush theory- inner sphere type reactions.

UNIT IV Electronic SpectraofComplexes (15 Hours)

Spectroscopic Term symbols for d_n ions – derivation of term symbols and ground stateterm symbol-Hund's rule; Selection rules – break down of selection rules,spin-orbit

coupling- band intensities- weak and strong field limits- correlation diagram; Energy level diagrams; Orgel and Tanabe - Sugano diagrams; effect of distortion and spin orbit coupling on spectra; Evaluation of Dq and B values for octahedral complexes of Nickel; Charge transfer spectra. Spectral properties of Lanthanides and Actinides.

UNIT V Bonding in Organometallic Complexes and metal carbonyls (15 Hours)

Definition of organometallic compound - 18 electron rule - effective atomic numberrule - classification of organometallic compounds- the metal carbon bond types – ionic bond – sigma covalent bond - electron deficient bond - delocalised bond - dativebond -metal carbonyl complexes - synthesis - structure and reactions of metal carbonyls -the nature of M-CO bonding- binding mode of CO and IR spectra of metal carbonyl- metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters – Wades rule and isolobal relationship.

TEXT BOOKS

1. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry – Principles of structureandreactivity,4thEdition,Pearson–Education,2002.
2. S.F.A. Kettle, Coordination compounds, ELBS, 1973.
3. Basic organometallic chemistry, J. Haiduc and J. J. Zuckerman, Walter de Gruyter, Brelin,1985.
4. A.W.AdamsonandP.Fleischauer,ConceptsofInorganicPhotochemistry,Wiley, 1975.
5. K.F.PurcellandJ.C.Kotz,InorganicChemistry,WB.SandersCo.USA.1977.
6. D.F. Shriver, P. W. Atkins and C.H. Longford, Inorganic Chemistry, ELBS, 2nd Edition,1994.
7. C.N.R. Rao and J.R. Ferraro, Spectroscopy in Inorganic Chemistry, Vol I and Vol II, Academic Press,1970.

REFERENCE BOOKS

1. Organometallics 1, complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications, Oxford,1996.
2. Organometallics 2, complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications, Oxford,1996.
3. G.W. King, Spectroscopy and Molecular Structure, Holt Rienehart and Winston, 1964.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II

COREVI PHYSICAL CHEMISTRY –II

[75 Hours]

OBJECTIVES

1. To impart knowledge on quantum chemistry, group theory and spectroscopy
2. To study the concepts and principles of surface chemistry and cataysis
3. To understand theoretical electrochemistry and to learn the applications of electrochemical cells

UNIT I Quantum Chemistry – II (15 Hours)

Theory of chemical bonding – Born – Oppenheimer approximation – LCAO- MO approximation for hydrogen molecule ion and hydrogen molecule – Valence Bond theory of hydrogen molecule – Concept of hybridisation – sp, sp^2 and sp^3 – hybridisation – Huckel Molecular orbital (HMO) theory for conjugated π- systems application to ethylene, butadiene and benzene – Self consistent field approximation–Hartree and Hartree – Fock self consistant field theory .

UNIT II Group Theory – II (15 Hours)

Symmetry selection rules for vibrational, Electronic and Raman Spectra –determination of vibrational modes in non-linear molecules such as H_2O, NH_3, CH_4 , XeF_4, – symmetry of hybrid orbitals in non-linear molecules (H_2O, NH_3, CH_4, XeF_4,PCl_5) -Electronic spectra of formaldehyde.

Spectroscopy Rotational spectroscopy- Rigid Rotor – Intensity of spectral lines – Effect of isotopic substitution on the rotation spectra. Vibrational spectroscopy – harmonic oscillator –anharmonic oscillator – Hot bands – selection rules – Overtones and combination frequencies – Fermi Resonance. Raman spectroscopy – Raman effect (quantum theory) - Rotational and Vibrational Raman Spectra – Mutual Exclusion Rule. Electronic spectroscopy – Electronic spectra of diatomic molecules – vibrational coarse structure – Franck – Condon Principle

UNIT III Surface Chemistry and Catalysis (15 Hours)

Adsorption - Physical and chemical adsorption – adsorption isotherms – Langmuir, Freundlich and B.E.T adsorption isotherms – measurement of surface area from BET- Catalysis-acid–base catalysis– heterogeneous catalytsis-Enzyme catalysis–effect of substrate concentration- Michaelis – Menton equation-effect of pH and temperature.

UNIT IV Electrochemistry – I (15 Hours)

Ions in solutions – Debye – Huckel theory of strong electrolytes – Debye – Huckel –Onsager equation – verification and limitation – Debye – Huckel limiting law and its extension. Electrode – Electrolyte interface - adsorption at electrified interface –electrokinetic phenomena – Tiselius method of separation of proteins – Membrane potential- Lippmann capillary equation – Electrical double layers – Helmholtz Perrin, Gouy- Chapman and Stern models.

UNIT -V Electrochemistry – II (15 Hours)

Polarisation and over voltage -Butler Volmer equation- diffusion current-exchange and equilibrium current density-Hydrogen and oxygen evolution reactions. Corrosion and passivation of metals – Pourbaix and Evans diagrams – Prevention of corrosion -Electrochemical energy systems – Primary and secondary batteries – (dry cells, lead acid storage batteries, silver- zinc cell- nickel- cadmium battery) – Fuel cells - Electrodeposition –principles and applications.

TEXT BOOKS

1.R.K. Prasad, Quantum Chemistry, Wiley Eastern, NewDelhi, 1992.

2. M.W. Hanna, Quantum Mechanics in Chemistry, W.A. Benjamin Inc, London1965.

3. K.V.Raman, Group theory and its application to chemistry, Tata McGraw Hill Publishing Co.,1990.

4. K. Veera Reddy, Symmetry and Spectrocopy of molecules, New Age Science, 2nd edition2010

5. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Mc Graw Hill,Newyork,1966.

6. K.J.Laidler, Chemical Kinetics, Harper and Row, Newyork,1987.

7. S. Glasstone, Introduction to Electrochemistry, Affiliated East West Press, NewDelhi,1960.

8. D.R. Craw, Principles and applications of Electrochemistry, Chapman andHall,1991.

9. J. Robbins, Ions in solution – An Introduction to Electro chemistry, Clarendon Press,Oxford1972.

REFERENCE BOOKS

1. A.K. Chandra, Introductory Quantum Chemistry, Tata McGrawHill.

2. P.W. Atkins, Molecular Quantum Mechanics, Oxford University Press, Oxford,1983.

3. Raymond chang, Basic Principles of Spectroscopy, McGraw Hill Ltd., New York(1971).

4. G.M. Barrow, Introduction to Molecular Spectroscopy, McGraw Hill, New York,1962.

5. J.O.M. Bockris and A.K.N. Reddy, Electrochemistry, Vols, 1 and 2, Plenum, NewYork.1977.

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M.Sc. ORGANIC CHEMISTRY
SEMESTER II

COREPRACTICALI

ORGANICCHEMISTRYPRACTICAL-I

OBJECTIVES

To develop analytical skill in

1. Separation of organic mixture
2. Organic qualitative analysis
3. Preparation of organic compounds involved in single stage

I. Identification of components in a two component mixture and preparation of their derivatives. Determination of boiling point/melting point for components and melting point for their derivatives.

II. Preparation.

1. Beta naphthyl methyl ether from betanaphthol
2. s-Benzyl isothiuronium chloride from benzylchloride
3. Beta glucose penta acetate from glucose
4. ortho-Benzoyl benzoic acid from phthalicanhydride
5. Resacetophenone from resorcinol
6. para-nitrobenzoic acid from para-nitrotoluene
7. meta-nitroaniline from meta -dinitrobenzene
8. Methyl orange from sulphanilicacid
9. Anthraquinone from anthracene
10. Benzhydrol from benzophenone

REFERENCE BOOKS

1. B.S.Furniss, A.J.Hannaford, P.W.G.Smith and A.R.Tatchell, Vogel's Practical Organic Chemistry.5th Edn., ELBS,1989.
2. Raj K.Bansal, Laboratory manual of Organic Chemistry, III Edn., New Age International (P)Ltd.1996.
3. Gnanapragasam, Ramamurthy, Organic lab Manual, Viswanathan, S., Printers & Publishers Pvt Ltd, 2009.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II

CORE PRACTICAL-II

INORGANIC CHEMISTRY PRACTICAL-I

OBJECTIVES

1. To improve the skill in the qualitative analysis of mixture of four cations containing two common and two rare.
2. To impart the skill in estimation of metal ions by colorimetric method.

Part I

Semimicro qualitative analysis of mixtures containing the following cations to be tested

W, Tl, Pb, Se, Te, Mo, Cu, Bi, Cd, Tl, Ce, Th, Zr, V, Cr, Fe, Ti,Zn, Ni, Co, Mn, Ca,

Ba, Sr, Li andMg.

Part II

Colorimetric analysis

Visual and Photometric determination of Iron, Nickel, Manganese and Copper

REFERENCE BOOKS

1. G.Svehla, Vogel's qualitative Inorganic analysis, VI Edition, Orient Longman,1987.
2. V.V.Ramanujam, Inorganic Semimicro Qualitative analysis, National Publishing Co.,1971.

M.Sc. CHEMISTRY
SEMESTER-II

CORE PRACTICAL –III

Physical chemistry practical-I (135Hrs)

OBJECTIVES

1. To perform experiments in potentiometry, Electrochemistry and Chemical kinetics

List of Experiments

1. **Viscosity:** Variation of viscosity of liquids with temperature
2. Determination of the partial molar volume of glycine /methanol/ formic acid /sulphuric acid by graphical method and by determining the densities of the solutions of different compositions.
3. Study the surface tension-concentration relationship of solutions (Gibb'sequation)
4. **Electromotive Force**:

   i) Determination of Standard Potentials (Cu, Ag andZn)

   ii) Determination of PH and PKa values using Quinhydron eelectrodes

   iii) Determination of dissociation constant of acetic acid by titrating it with sodium hydroxide using quinhydrone as an indicator electrode and calomel as a reference electrode.

   5) Potentiometric Titrations:

   i) Titration of mixture of acids against strong base

   ii)Titration of Ferrous ammonium sulphate against potassium permanganate.

   iii)Titration of mixture of halides Vs $AgNO_3$

   6) ChemicalKinetics:

   i) Determination of rate constant and order of reaction between potassium persulphate and potassium iodide and determine the temperature coefficient and energy of activation of the reaction.

   ii) Study the primary salt effect on the kinetics of ionic reactions and test the bronsted relationship (iodide ion is oxidsed by persulphate ion)

   iii. Study the kinetics of acid hydrolysis of the ethyl acetate determine the activation energy and temperature coefficient of the reaction.

   iv. Study the kinetics of the reaction between acetone and iodine in acidic medium and determine the order with respect to iodine and acetone.

Phase diagram

Construction of phase diagram for a simple binary system (naphthalene - phenanthrene or benzophenone - diphenylamine).

7) ConductivityExperiments

i) Determination of equivalent conductance of a weak acid at different concentrations and verify Oswald's dilution law and calculation of the dissociation constant of theacid.

ii) Determination of equivalent conductance of a strong electrolyte at different concentrations and examine the validity of the Onsager's equation.

iii) Titration of a mixture of HCl and CH_3COOH against NaOH

REFERENCE BOOKS

1) B.P. Levitt, Findlay's Practical Physical Chemistry, Longman Publications, 1973, 9thEdition
2) G.Palmer, Experimental Physical Chemistry, Cambridge University Press, 1964, 1stEdition
3) B.Viswanathan& P.S. Raghavan, Practical Physical Chemistry, Viva Books, 2009,3rdEdition

EXTRA DISCIPLINARY COURSES

LIST OF EXTRA DISCIPLINARY COURSE PAPERS

I. Industrial Chemistry

II. Agricultural Chemistry

III. Food and Medicinal Chemistry

IV. Water Chemistry

M.Sc. CHEMISTRY SEMESTER
II
EXTRA DISCIPLINARY COURSE
PAPER-I- INDUSTRIAL CHEMISTRY

(60 Hours)

OBJECTIVES

1. To learn the basic concepts of Glass, Ceramics and Cement and its manufacture.
2. To gain the knowledge of Dyes, Paints, Synthetic fibers, Plastics, Oils, Fats and Waxes and their applications.

UNIT I Glass and Ceramics **(12Hours)**

Glass: Introduction. Raw materials, manufacture and applications. Some special glasses-fused silica glass, optical glass, glass wool, photosensitive glass-composition and uses.

Ceramics: Definition. Manufacture and applications.

UNIT II Cement **(12Hours)**

Cement: Introduction, Types of cement- High alumina cement, Slag cement, Acid resisting cement, White cement, Types of Portland cement, Raw materials, Manufacture of cement, Setting of cement, factors affecting quality of cement, Cement industries in Tamilnadu.

UNIT III Dyes and Paints **(12Hours)**

Dyes: Classifications of dyes, application of dyes in other areas-medicine, chemical analysis, cosmetics, colouring agents, Food and beverages.

Paints: Constituents of paints, Manufacture of paints, Setting of paints, requirement of a good paint, paintfailure.

UNIT IV Synthetic fibres and Plastics **(12Hours)**

Synthetic fibres: Difference between natural and synthetic fibres, Synthesis and applications of Viscose rayon, Terylene, Nylon and Taflon.

Plastics: Classification, properties and applications of plastics.

UNTI V Oils, Fats and Waxes **(12Hours)**

Classification of oils, fats and waxes, distinction between oils, fats and waxes, Uses of essential oils and fats. Soap and its manufacture - toilet and transparent soaps, cleansing action of soap. Detergent – classification and uses.

TEXT BOOKS

1. B.K.Sharma,IndustrialChemistry,GoelPublishingHousePvtLtd.1999.
2. M.G. Arora and M. Singh, Industrial Chemistry, Anmol Publications,1st edition.
3. G.N.Pandey, A Textbook of Chemical Technology. Vol. I and I I, Vikas Publishing House Pvt Ltd.1997.

REFERENCE BOOKS

1. B.K. Chakrabarty, Industrial Chemistry, Oxford &IBM Publishing CO. Pvt Ltd. 1991.
2. V. Subrahmaniyan, S. Renganathan. K.Ganesan, S.Ganesh, Applied Chemistry, Scitcch Publications,1998.
3. J.E.KuriaCose and J.Rajaram, Chemistry in Engineering & Technology.Vol.1 &II , Tata Mc Craw Hill. 1984.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II
EXTRA DISCIPLINARY COURSE
PAPER- II- AGRICULTURAL CHEMISTRY

(60 Hours)

OBJECTIVES

1. To learn the Analysis of Water and Soil.
2. To gain the knowledge of Soil treatment, Irrigation, Fertilizer, Pesticides and Insecticides.

UNIT I Water analysis and water treatment (12hours)

Water analysis and water treatment-acidity, alkalinity, pH, Biological oxygen demand (BOD). Chemical oxygen demand (COD) and their determinations, Recycling of water and water management.

UNIT II Chemistry of soil (12 Hours)

Definition, classification and properties of soil, Soil fertility, Soil organic matter and their influence on soil properties, Soil reactions- soil pH, acidity, alkalinity, buffering of soils and its effect on the availability of N, P, R, Ca and Mg.

UNIT III Soil treatment and Irrigation (12 Hours)

Soil treatment-Soil erosion- causes and prevention, soil reclamation, alkali soil, saline soils, methods for soil reclamation, Environmental degradation- causes and prevention, Methods of irrigation and Irrigation projects.

UN1T IV Fertilizers (12 Hours)

Fertilizers: Effect of Nitrogen, potassium and phosphorous on plant growth. Secondary nutrients – micronutrients- their functions in plants, classification of fertilizers, natural fertilizers, artificial fertilizers, phosphate fertilizers; Manufacture of urea and triple super phosphate

Manures: Bulky organic manures- Farm yard manure- handling and storage, oil cakes. Blood meal, fish manures.

UNIT V Pesticides and Insecticides (12Hours)

Pesticides; Classification of Insecticides, fungicides herbicides as organic and inorganic, general methods of application and toxicity, safety measures when using pesticides. Insecticides- Plant products-Nicotine, pyrethrin, Inorganic pesticides- borates, organic pesticides - D.D.T and BHC. Fungicide: Sulphur compounds, copper coumpounds, Bordeaux mixture. Herbicides- Acaricides- Rodenticides- Attractants- Repellants- Preservation of seeds.

TEXT BOOKS

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House,14th Edition, 2008.
2. N.C. Brady, The nature and properties of soils, Eurasia publishing House, New Delhi.1977.
3. V.S,Jones.Fertilizersandsoilfertility,PrenticeHallofIndia,NewDelhi,1993.
4. D.E.H.Freer,Chemistryofpesticides,D.VanNostrandCo,Reinhold,1969.
5. A.K. De. Environmental Chemistry, Wiley Eastern.1989.

REFERENCE BOOKS

1. A. Sankara. SoilsScience.
2. R.C. Palful. K. Goel. R.K. Gupta, Insecticides, Pesticides and Agro based Industries.

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER- III- FOOD AND MEDICINAL CHEMISTRY

(60 Hours)

OBJECTIVES

1. To understand the importance of Food, its constituents, Food poisoning, Food preservatives, Vitamins and Minerals.
2. To gain the knowledge of various types of Drugs, AIDS and Medicinal plants.

UNITI FOOD AND ITS CONSTITUENTS (12Hours)

Sources of food, types, advantages and disadvantages, constituents of foods, carbohydrates, proteins, fats and oils, colours, flavours, natural toxicants. Food poisoning-Sources, causes and remedy. Causes and remedies for acidity, gastritis, indigestion and constipation. Food spoilage, causes of food spoilage, types of food spoilage, food preservation.

UNIT II Vitamins and minerals (12 Hours)

Vitamins: Sources, requirement, deficiency diseases of A, B, C, H and K.
Minerals: Mineral elements in food-principal mineral elements - Source- Function - Deficiency and daily requirements- Na, K, Mg, Fe, S, P and I.

UNIT III Antibiotics, Sulphonaamides and Analegics (12 Hours)

Antibiotics: Definition, Classification as broad and narrow spectrum, mode of action and uses of penicillin, Chloramphenicol, tetracyclines, ciphalosporin, ampicillin and erythromycin.

Sulphonamides: Mechanism and action of sulpha drugs, preparation and uses of sulphadiazine, sulphathiazole, sulphapyridine andsulphafurazole.

Analgesics- definition- narcotic and non-narcotic- morphine and its derivatives- pethidine and methodone - pharmacological action- uses and abuses. Heroin and codinine. Antipyretic analgesics- Preparation and uses of aspirin and paraacetamol.

UNIT IV Antiseptics, Disinfectants and Anaesthetics (12 Hours)

Antiseptics and disinfectants- definition and distinction- phenol coefficient, phenol as disinfectant, chlorhexidine, formaldehyde and nitrofurazone-uses.

Anaesthetics- definition- classification- local and general- volatile, nitrous oxide, ether, chloroform, cyclopropane- uses and disadvantages- nonvolatile- intravenous- thiopental sodium, methohexitone, propanidid, local anaesthetics- cocaine and benzocaine- uses and disadvantages.

UNITV (12Hours)

Drugs affecting CNS- Definition and one example for tranquilisers, sedatives, hypnotics, psychedelic drugs- chlorpromazine and barbitone-uses

Hypoglycemic agents- Diabetes-types-causes-symptoms-Insulin-uses.

Oral hypoglycemic agents- sulphonyl ureas- action and uses.

Antineoplastic drugs- Causes of cancer, Antineoplastic agents, cytotoxic. anti-metabolites, plant products, harmones- one example and uses

AIDS-causes, prevention and control.

Indian medicinal plants and uses- tulasi, kilanelli, mango, semparuthi, adadodai and thoothuvalai.

TEXT BOOKS

1. Seema Yadav. Food Chemistry. Anmol publishing (P) Ltd, NewDelhi.
2. B.SriLakshmi, Food Science, New Age InternationalPublishers.
3. T.C. Daniels and E.C. Jorgensen. Text book of organic medicinal and pharmaceutical chemistry, J.B. Lippincott, Philadelphia.1997.
4. AshutoshKar, Medicinal Chemistry, New Age International,1996.

REFERENCE BOOKS

1. S. Lakshmi. Pharmaceutical Chemistry, Sultan Chand & Sons, NewDelhi.
2. A. Singh and V.K. Kapoor, Organic PharmaceuticalChemistry.
3. I.L. Firnar, OrganicChemistry,VoI-II.
4. Albert Lehninger. BioChemistry.
5. G.R. Chatwal, Pharmaceutical Chemistry Organic.Vol-II,
6. G.R. Chatwal, Pharmaceutical Chemistry Inorganic,Vol-I.

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER-IV WATER CHEMISTRY (60 Hours)

OBJECTIVES

To gain the knowledge of Characteristics of water, Analysis of water, Treatment of industrial water and Treatment plants

Unit I Introduction (12 Hours)

Sources of Water; Physical and chemical characteristics of water; Water analysis; Potable water – WTO standard: uses of water

Unit II Water Pollution (12 Hours)

Water pollution – wastewater generation - classification of water pollutants; constituents and characteristics of wastewater; measurement techniques – sampling, colour & odour, dissolved oxygen, BOD, COD, TOC, N& P, suspended solids and bacteriological measurements.

Unit III Wastewater Treatment (12Hours)

Wastewater treatment: Pretreatment –screening, grit removal and pre- chlorination; Primary treatment – settling and sedimentation; Secondary treatment
– trickling filter process, activated sludge process; Aeration.

Unit IV Industrial Wastewater Treatment (12Hours)

Industrial wastewater treatment: Activated sludge treatment plants – mass balances, with and without recycle plants; Types of plants – single tank, contact stabilization, biosorption plants.

Biofilters: Hydraulic film diffusion, two component diffusion; Types of plants –trickling filters, submerged filters and rotating disc; removal of particulate organic matter.

Unit V Treatment Plants (12Hours)

Treatment plants for nitrification – mass balances, nitrifying plants and types of plants.

Treatment plant for denitrification - mass balances, denitrifying plants and types of plants; redox zones in the biomass.

TEXT BOOKS

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House,14th Edition,2008.
2. A.K.De, Environmental Chemistry, Wiley Eastern,1989.
3. S.K.Banerji, Environmental Chemisty, Prentice Hall of India, New Delhi, 2003.

REFERENCE BOOKS

1. L.Winther, Wastewater Engineering, PolytekniskForlag, Lyngby,1978.
2. M.Henze, P.Harremoes, J.C.Jansen and E.Arvin, (Ed.), Wastewater treatment, Springer Verlag, New York,1995.
3. P.Harremoes, Water Chemistry, PolytekniskForlag, Lyngby,1989.

CHEMISTRY IN HEALTH SCIENCE

OBJECTIVE

- To acquire knowledge about good physique fitness, skin care, hair care, clinical chemistry and diagnostic tools.

UNIT I

HEALTH MAINTENANCE (7 hours)

Health maintenance – Height, Weight and Body Mass Index - causes and hazardness of obesity. Healthy bones – Role of enzymes and hormones in health. Chemistry of maintaining body structure and appearance - food habits and diets.

UNIT II

SKIN CAREAND HAIR CARE (8 hours)

Skin Care - Structure and functions of skin - Skin care products - raw materials - its characterisation and formulation. Herbal extracts and essential oils in skin care.

Hair Care – Structure - Types and functions - characterisation and formulation of shampoo and anti-dandruff shampoos- classification and formulation of hair colorants.

UNIT III

CLINICAL CHEMISTRY (8 hours)

Determination of sugar in serum and urine - detection of cholesterol - estimation of red cell count, Na, K, Ca, bicarbonates and phosphates in serum and their significance. Reason for abnormal value of sugar, cholesterol, urea, creatinine - control measures.

UNIT IV

DIAGNOSTIC TOOLS (7 hours)

Principle and uses of Microscopy, Endoscopy, Differential cell counter, X-Ray, ECG, Scanning, Ultrasound, Echo, CT and MRI.

References.

1. B. M. Mithal and R. N. Saha, A handbook of cosmetics, Vallabh Prakashan publication, New Delhi, 2000.
2. John V. Simmons, Science of Cosmetics, Science and the beauty business, Vol-I Macmillan education, 1989.
3. G. L. David krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Drugs, University Press (India) Ltd, Orient Longman, First Edn, 2001.
4. Ramnik Sood, Medical Laboratory Technology: Methods and Interpretation, 3rd Edn, Jaypee Brothers medical publishers, 1995.
5. Evelyn C Pearce, General Text Book of Nursing ECBS 1990.
6. Jayashree Ghosh, Applied Chemistry, 1st Edn, S. Chand and company pvt Ltd, 2016.

M.Sc. ORGANIC CHEMISTRY
SEMESTER III
CORE VII - ORGANIC CHEMISTRY – III (75 Hours)

OBJECTIVES

1. To learn the mechanism of addition to Carbon - Carbon and Carbon - Hetero atom multiple bonds.
2. To learn the mechanism of molecular rearrangements and oxidation and reduction reactions
3. To study the structural elucidation of steroids.
4. To learn the uses of reagents in organic synthesis.

Unit I Addition to carbon-carbon and carbon-hetero multiple bonds(15 Hours)

Electrophilic addition to carbon-carbon multiple bonds- Hydroboration, Addition of NOCl to olefins, Michael addition, 1,3-dipolar addition, carbine and their addition and Diel's-Alder reaction

Nucleophilic addition to C=O bond-Mechanism and application of Mannich, Stobbe, Darzen glycidic ester condensation, Benzoin condensation, Peterson olefination, Wittig, Wittig-Horner, Thrope, Ritterand Prins reactions

Unit II Molecular rearrangements (15 Hours)

Study of the following rearrangements with mechanism-Wagner- Meerwin, Demjanov, Dienone-phenol, Favorski, Baeyer-Villiger, Wolff, Stevens, Von-Richter,Beckmann,Smiles, Neber and Hofmann- Martius

Unit III Oxidation and reduction reactions (15 Hours)

Study of the following reactions with mechanism- Oxidation of alcohols by CrO_3, $K_2Cr_2O_7$, CrO_2Cl_2, DCC, $KMnO_4$, MnO_2, DMSO alone, DMSO in combination with DCC, Acetic anhydride and oxalyl chloride, Oxidation of aryl methane, oxidation of methylene group alpha to carbonyl, allylic oxidation of olefins, oxidative cleavage of glycols, ozonolysis, hydroxylation of olefins -OsO_4, $KMnO_4$, Prevost and Woodward dihydroxylation.

Catalytic hydrogenation, Homogenous and heterogenous catalytic reductions, Dissolving metal reductions including Birch reduction, Bouveault-Blanc

reduction, Metal hydride reductions- $NaBH_4$, $LiAlH_4$, LTBA, BH_3, Bu_3SnH and Sodium cyano borohydride.

Unit IV Steroids and steroid hormones (15 Hours)

Structural elucidation of cholesterol, ergosterol, oesterone, testosterone and progesterone. Conversion of cholesterol into oesteron, testosterone and progesterone. Artificial hormones-stilbestrol and hexoestrol.

Unit V Reagents in organic chemistry (15 Hours)

Reagents and their uses – LDA, DCC, DDQ, DBU, DIBAL, 9-BBN, NBS, 1,3- dithiane (umpolug), trimethylsilylchloride, trimetylsilyliodide, Baker's yeast, Gilman's reagent and Wilkinson's catalyst

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley & Sons1992
2. Francis A. Carey, Organic Chemistry, Third Edition, The McGraw-Hill Companies, Inc.,1996.
3. P.S. Kalsi, Organic Reactions and Mechanisms, Second Edition, New Age International Publishers,2002.
4. V.K.Ahluwalia, Organic Reaction Mechanism, Narosa Publishing House, 4thEdition,2013.
5. Mary Fieser and Louis Fieser, Reagents in Organic Synthesis, Wiley Interscience, Volume 26,2011.
6. I.L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd.,2000
7. G. Chatwal, Organic Chemistry of Natural Products, Vol I & II, Himalaya Publishing House,1988.

REFERENCE BOOKS

1. S. H. Pine, J.B. Hendrickson, D.J. Cram and G.S. Hammond, Organic Chemistry, IV Edn., McGraw Hill Company,1980.
2. S.M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry,5th Edition, Macmillan,1984.
3. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice-Hall, VI Edition, 1992.
4. NeilIssac,PhysicalOrganicChemistry,J.Wiley,NewYork,1987.
5. PauldeMayo,MolecularRearrangements,VolI,VolII,Interscience,NY. 1963.
6. Fisher and Fisher, Steroids, Reinhold,1959.
7. O.P. Agarwal, Chemistry of Organic Natural Products, Vol I & II, Goel Publishing House,1988.
8. R.O.C.Norman, Principles of Organic Synthesis, 2nd Edition, Chapman andHall,1978.

M.Sc. ORGANIC CHEMISTRY

SEMESTER III

CORE VIII BIOORGANIC CHEMISTRY (75 Hours)

OBJECTIVES

1. To know about the structure of mono saccharides and disacccharides
2. To understand the structure of Vitamins, Terpenoids, Carotenoids and Nucleicacids
3. To know about the basic concepts of Nucleic acids, Lipids, Proteins, Enzymes and Coenzymes.

Unit I Carbohydrates (15 Hours)

Introduction, Classification, Determination of configuration and ring size of D- glucose and D-fructose, Ferrier, Hanesian reactions and Ferrier rearrangement, Determination of structure and ring size of sucrose and maltose, Structure and biological functions of starch and cellulose.

Unit II Vitamins (15 Hours)

Vitamins-Structural elucidation and synthesis of Retinol, Thiamine, Riboflavin, Pyridoxin, Pantothenic acid, Ascorbic acid, Tocopherols, Vitamin K, Cyanocobalamine.

Unit III Terpenoids and Carotenoids (15 Hours)

Terpenoids – Structural elucidation and synthesis of Menthol, Abietic acid, Squalene and Phytol. Carotenoids – Synthesis of Alpha Carotene, Beta Carotene and Vitamin A2.

Unit IV Nucleic acid and Lipids (15 Hours)

Nucleic acid – Structure and synthesis of Nucleosides and Nucleotides, Primary, Secondary and Tertiary structure of DNA, Types of RNA and their structures, Replication, Transcription, Translation, Genetic code and Finger printing.

Lipids – Introduction, Classification, Chemical synthesis and Biosynthesis of Phospholipids and Glycolipids.

Unit V Proteins, Enzymes and Coenzymes (15 Hours)

Proteins- Biological importance, Peptide synthesis by solid phase and solution phase methods. Enzymes- Definition, Classification, Mechanism of enzyme action- lock & key model, induced Fit theory and substate strain theory and Mechanism of enzyme catalysis. Coenzymes- Introduction, Classification, Structure and biological functions of Coenzyme A, Thiamine pyrophosphate (TPP), Pyridoxal phosphate (PLP), Flavin adenine nucleotide FAD, FADH2 and Adenosine triphosphate (ATP)

Reference Books

1. G. Chatwal, Organic Chemistry of Natural Products, Volume I and II, Himalaya Publishing House,1988.

2. O.P. Agarwal, Chemistry of Organic Natural Products, Volume I and II, Goel Publishing House,1988.

3. I.L. Finar, Organic Chemistry, Volume II, 5th Edition, First Indian reprint, Pearson Education Asia Private Ltd.,2000.

4. V.K. Ahluwalia, Chemistry of Natural Products, Ane Books Pvt.Ltd, 1st Edition,2006.

5. U. Satyanaraya, Biochemistry, Uppala Author- Publisher Interlinks, Vijayawada 2nd Edition,2003.

6. J.L.Jain,FundamentalofBiochemistry,S.ChandandCo,NewDelhi,2007.

M.Sc. ORGANIC CHEMISTRY
SEMESTER III ELECTIVE PAPER - II
SPECTROSCOPY
[75 HOURS]

OBJECTIVES

1. To study in detail about UV-VIS, IR, NMR, 13C NMR, EPR, Mossbauer spectroscopic and Mass spectrometry techniques

2. To develop problem solving skills from various type of spectra

UNIT I UV-VIS ANDIRSPECTROSCOPY (15Hours)

UV-VIS: The nature of the electronic excitations, origin of UV band structure and the principle of absorption, chromophores and auxochromes, factors affecting intensity- solvent effects and position of absorption bands- dienes, polyenes and enones. Woodward- Fisher rules for dienes, enones and aromatics-calculation of λmax for organic molecules- applications of UV-spectroscopy.

IR: IR absorption process, modes of stretching and bending vibrations, bond properties and their relations to absorption frequencies, Characteristics. group frequencies of aliphatic and aromatic organic molecules, carbonyl, carboxylic acid, ester, alcohol, phenol and amides. Factors influencing vibrational frequencies, interpretation of IR spectra of organic molecules- applications of IR-spectroscopy.

UNIT II NMR SPECTRSCOPY–I (15 Hours)

^{1}H NMR- principle - Shielding and deshielding - chemical shift, factors influencing chemical shift – magnetic anisotropy- Spin – spin splitting- (n+1rule), Coupling constant –Pascal's triangle, calculation of coupling constants, mechanism of coupling (one bond, germinal, vicinal and long range coupling), First order & non first order spectra - Chemical and magnetic equivalence, shift reagents, NMR instrumentation– Applications

UNIT III NMR SPECTROSCOPY – II (15 Hours)

^{13}C NMR - The ^{13}C nucleus – Chemical shifts –Modes of couplings and multiplicity- proton coupled ^{13}C spectra, Homonuclear and heteronuclear decoupling – NOE- Broad band decoupling – Off resonance decoupling – intensity of signals, Chemical shift equivalence, equivalent carbons, chemical shifts of ^{13}C nuclei, DEPT technique, comparison of ^{1}H and ^{13}C NMR, 2D NMR-COSY and HETCOR techniques-simple molecules and applications of ^{13}CNMR.

UNIT IV EPR AND MOSSBAUER SPECTROSCOPY (15 Hours)

EPR-Introduction, factors affecting the g-value, limitations, instrumentation, electron nucleus interaction, hyperfine interactions-isotropic and anisotropic coupling constants–spin Hamiltonian-applications

Mossbauer spectroscopy –Principle, Instrumentation, Doppler shift, Isomer shift, Quadrupole splitting, Magnetic interaction, Magnetic hyperfine splitting and selection rules. Applications-Mossbouer spectra of high and low spin Fe and Sn compounds.

UNIT V MASS SPECTROMETRY AND SPECTROSCOPIC APPLICATIONS (15 Hours)

Mass spectra- Basic principle, molecular ion peak, base peak, meta stable ion peak, isotopic peaks, Nitrogen rule, ring rule, Mc-Lafferty rearrangement, rules for fragmentation pattern, Examples of mass spectral fragmentation of organic compounds (alkanes, aromatic hydrocarbons, alkyl halides, aldehydes, ketones, alcohols, acids and esters).

Spectroscopic applications: Structural elucidation of simple organic molecules using UV-VIS, IR, Proton NMR spectroscopy and Mass spectrometry

REFERENCE BOOKS

1. William Kemp Organic Spectroscopy,3rd edition, ELBS Publications,1975.
2. Jag Mohan, Organic Spectroscopy, Narosa Publishing House, 2nd Edition, 2009.
3. B.K.Sharma, Spectroscopy, Goel Publishing House,2011
4. G.W.Ewing, Instrumental methods of chemical analysis, Mcgraw hill Pub,1975
5. P.S.Kalsi,Spectroscopy,NewAgeInternational(P)Ltd,reprint2009
6. D. L. Pavia, G.M. Lampman & G.S.Kriz Introduction to Spectroscopy, 3rd Edition, Brooks/Cole Publications,2008.
7. R.M.Silverstein,F.X.Webster,SpectrometricIdentificationofOrganic Compounds, 6th Edition, John Wiley Publications,2009
8. R.S. Drago, Physical Methods in Inorganic Chemistry, Reinhold Saunders College Publishing,1977

M.Sc. ORGANIC CHEMISTRY SEMESTER III

ELECTIVE III

PAPER I - EXPERIMENTAL METHODS IN CHEMISTRY (75 Hours)

OBJECTIVES

1. To study in detail the fundamental aspects of various experimental and instrumental methods in chemistry
2. To understand the principles and instrumentation of destructive and non-destructive techniques
3. To understand the various techniques in Chromatography

UNIT I SURFACE IMAGING (15 Hours)

Basic concepts in surface imaging – Principle, Instrumentation and Applications – secondary electron microscopy(SEM), secondary Auger microscopy(SAM), scanning probe microscopy(SPM), scanning tunneling microscopy(STM), transmission electron microscopy(TEM).

UNIT II CHEMICAL ANALYSIS (15 Hours)

Non-destructive techniques – X-ray absorption, Diffraction and fluorescence spectroscopy – theory, instrumentation and applications.

Destructive technique – Atomic absorption spectroscopy – principle, instrumentation –EMR sources – cells – furnaces – detectors – interferences and their corrections – applications of AAS.

UNIT III ELECTROANALYTICAL TECHNIQUES (15 Hours)

Polarography – Theory, apparatus, DME, diffusion, kinetic and catalytic currents, current voltage curves for reversible and irreversible systems, qualitative and quantitative applications to inorganic systems.

Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes , applications – Complexometric titrations – chelating agents, types of EDTA titration – direct and back titrations, replacement titrations – masking and demasking reagents.

UNIT IV SEPARATION METHODS - I (15Hours)

Normal and Reversed-phase liquid chromatography – Theory and applications – HPLC – principle, instrumentation, apparatus and materials, column efficiency and selectivity, applications – GC chromatography – principle, instrumentation, retention volume, resolution and applications.

UNIT V SEPARATION METHODS – II (15Hours)

Gel chromatography or Gel Permeation Chromatography– Principle, Materials, Gel preparation, column Packing and Detectors – applications and advantages of gel chromatography.

Ion Exchange Chromatography – Definition, Principle, cation and anion exchangers – regeneration - column used in separations -Ion exchange capacity and techniques - Applications

REFERENCE BOOKS

1. R.Wiesendanger, scanning probe microscopy and spectroscopy, Cambridge university press,1994
2. Frank A.Settle, Handbook of instrumental techniques for analytical chemistry, Prince Hall , New jersey,1997
3. Gurdeep R. Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya PublishingHouse,2011
4. Willard, Merit, Dean, Settle, Instrumental Methods of Analysis,6th Edition,CBS Publishers and Distributors,1986
5. Mahinder Singh, Analytical Chemistry-Instrumental Techniques, Dominant Publishers & Distributers, New Delhi, 1st Edition,2003.
6. D.A. Skoog and D.M. west,Fundamental of Analytical Chemistry, Holt Rinehart and Winston Publications, 4th Edition,1982.
7. H. Kaur, Instrumental Methods of Chemical analysis, Pragati Publishers, 2006..
8. B.K. Sharma, Instrumental Methods of Chemical Analysis, Goel Publications,15th Edition,1996.

M.Sc. ORGANIC CHEMISTRY
SEMESTER III
ELECTIVE III
PAPER II - ELECTROANALYTICAL TECHNIQUES (75 Hours)

OBJECTIVES

1. To understand the basic concepts of electroanalytical chemistry
2. To study the principles and instrumentation of various electroanalytical techniques

UNIT I Basic Electrochemical principles (15 Hours)

Mass transfer processes – migration, diffusion and convection– planar and spherical diffusion – Reversible and Irreversible processes.

UNITII Methods Based on Diffusion (15 Hours)

Principle, instrumentation and applications of the following techniques: Chronoamperometry; Polarography - Ilkovic equation - Square wave polarography; Linear Sweep voltammetry – Randles Sevrik equation; Cyclic voltammetry - Normal pulse, Differential pulse and Square wave voltammetry.

UNIT III Coulometric and Potentiometric Methods (15 Hours)

Galvanostatic and potentiostatic methods. Principle, instrumentation and applications of the following techniques: Controlled potential coulometry and electrolysis; Chronocoulometry; Potentiometry and Chronopotentiometry.

UNIT IV Stripping voltammetry (15 Hours)

Principle, instrumentation and applications of Anodic stripping voltammetry, Cathodic stripping voltammetry and Adsorptive stripping voltammetry.

UNIT V Sine wave methods (Electrochemical Impedance Spectroscopy) (15 Hours)

Principle of Impedance technique - Analysis of Faradaic impedance – Bode Diagrams. Dynamic electrode techniques, Principle, instrumentation and applications of RDE and RRDE techniques.

TEXT BOOKS

1. D.A.Skoog and D.M.West, Fundamentals of Analytical Chemistry, Holt Rinehart and Winston Publications, IV Edn,1982.
2. Willard, Merit, Dean and Settle, Instrumental Methods of Analysis, CBS Publishersand Distributors, IV Edn.1986

REFERENCE BOOKS

1. B. H. Vassos and G.W. Ewing, Electroanalytical Chemistry, John Wiley and Sons, NY,1983.
2. A. J. Bard and L.R. Faulkner, Electrochemical methods; Fundamentals and applications, J. Wiley and Sons, NY,1980,
3. J.Wang, Stripping Analysis, VCH Publications,1985.
4. A.M. Bond, Modern Polarographic methods in analytical chemistry, Macel Decker Inc.,1980.

M.Sc. ORGANIC CHEMISTRY SEMESTER IV

CORE IX

SYNTHETIC AND INDUSTRIAL ORGANIC CHEMISTRY (75 Hours)

OBJECTIVES

1. To study about heterocyclic compounds containing two heteroatoms
2. To study about retro synthesis and protecting groups
3. To learn about named reactions and their applications
4. To gain knowledge of petrochemicals, paints and dyes

Unit I Heterocyclic Compounds (15 Hours)

5-Membered heterocyclic with 2-heteroatoms -Synthesis and reactivity of Pyrazole, Imidazole, Oxazole, Thiazole, Isoxazole and Isothiazole. 6-Membered heterocyclic with 2 or more atoms- Synthesis and reactions of Diazines (Pyridazine, Pyrimidine and Pyrazine), Synthesis and reactions of Purines and Pteridines, Synthesis of Caffeine, Theobromine and Theophylline.

Unit II Retrosynthesis and Protecting groups (15 Hours)

Retrosynthetic Analysis – Definition, Synthon approach, Synthetic equivalent reagent, Functional group interconversion, Linear and Convergent method in organic synthesis. Disconnection approach – one group disconnection. Retro synthesis of Alcohols, Olefins, Aliphatic and Aromatic Ketones and Retro Diels
– Alder reaction Producting groups – Production of Alcohols, 1, 2 – diols, Amines, Carbonyls and Carboxylic acids.

Unit III Named reactions and applications in organic chemistry (15 Hours)

Dieckmann cyclization, Shapiro, Stork enamine, Sharpless asymmetric epoxidation, Robinson annulation, Duff, Simmons-Smith, Hoffman - Loffler- Freytag, Bamford-Stevens, Henry, Ugi, Wadsworth-Emmons, Barton and ene reactions.

Unit IV Petrochemicals (15 Hours)

Origin of petroleum, Products from fractional distillation, classification, composition of petroleum, fuel gases, knocking, octane number, cetane number, lubricating oils, greases and waxes. Cracking, types of cracking, hydrocarbons from petroleum and LPG. Manufacturer and uses of acetaldehyde, acetic acid, formaldehyde, ethylene glycol, 1, 3 – butadiene and styrene. Chemical processing of aromatic hydrocarbons.

Unit V Paints and Dyes **(15 Hours)**

Paints – composition, pigments, binders, extenders, thinners and surface- active agents, functions of the ingredients, paint formulations. Importance of PVC, alkyds, epoxy and polyurethane resins. Dyes – Color and chemical constitution, Classification, brightening agents, cyanine dyes, chemistry of color developer, instant color processes, synthesisand applications of congo red, crystal violet, malachite green and RhodamineB.

REFERENCE BOOKS

1. G. Chatwal, Organic Chemistry of Natural Products, Vol. I & II, Himalaya Publishing House,1988.

2. 1. T.L. Gilchrist, Heterocyclic Chemistry 33rd Edition, Prentice Hall, New Jersey,1997.

3. R.K. Bansal, Heterocyclic Chemistry, 3rd Edition, Wiley Eastern Limited,1999.

4. I.L. Finar, Organic Chemistry, Volume II, 5th Edition, First Indian reprint, Pearson Education Asia Private Ltd,2000.

5. Jerry March, Advanced Organic Chemistry - Reactions, Mechanism and Structure,4thEdition,JohnWileyandSons,1992.

6. F.A. Carey and R.J. Sandberg, Advanced Organic Chemistry, Part A & B, 5th Edition, Springer, Germany,2008.

7. V.K. Ahluwalia, Organic Reaction Mechanism, Narosa Publishing House, 4th Edition,2013.

8. B.K. Sharma, Industrial Chemistry, Goel Publishing House, 14th Edition, 2008

9. P.C.Jain& Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co, Private Ltd, 16th Edition,2016

M.Sc. ORGANIC CHEMISTRY

SEMESTER IV

ELECTIVE PAPER-IV

MEDICINAL CHEMISTRY (75 Hours)

OBJECTIVES

1. To understand the basic concepts of the drugs.
2. To study the classification, synthesis and mode of action of various types of drugs.

UNIT I Basic Concepts of Drugs (15 Hours)

Drug design- analogues and pro- analogues, factors governing drug design, rational approach, method of variation and tailoring of drugs. Classification of drugs, mechanism of action of drugs, metabolism of drugs, absorption of drugs, factors affecting adsorption of drugs and SAR relationships.

UNIT II Drugs Acting on CNS (15 Hours)

Anaesthetics -Classification, synthesis and mode of action of Halothane, Thiopental sodium, Methohexitone, Procaine hydrochloride and Lignocaine hydrochloride. Analgesics - Classification, mode of action and SAR of Morphine. Synthesis and mode of action of Pethidine and Fentanyl citrate. Sedatives and Hypnotics- Classification, synthesis and mode of action of Barbiturates and Diazepam. Antipsychotics drugs- Classification, synthesis and mode of action of Chlorpromazine hydrochloride and Thioridazine. Anticonvulsants- Classification, synthesis and mode of action of Phenytoin and Ethosuximide.

UNITIII Drugs Affecting the Cardiovascular System (15 Hours)

Antiarrhythmic drugs - Classification, synthesis and mode of action of Quinidine sulphate and Procainamide hydrochloride. Vasodilator- Classification, synthesis and mode of action of Hydralazine hydrochloride and sodiumnitroprusside.

Coagulants- Mode of action of Vitamin K and Protamine Anticoagulants- Mode of action of Thromboplastin and Prothrombin. Antihypertensive agents- Classification, synthesis and mode of action of Methyl dopate hydrochloride and Clonidine. Diuretics- Classification, synthesis and mode of action of Acetazolamide and Chlorthiazide.

UNIT IV Drugs Affecting the Harmonal System and Immune System

(15 Hours)

Drugs affecting the Hormonal systems and immune systems.Drugs affecting hormonal systems Hypoglycemic drugs - Causes of diabetes, classification, synthesis and mode of action of Insulin, Tolbutamide and Glipizide. Thyroid drugs- Mode of action of thyroid hormones, Synthesis and uses of Thyroxine and Propyl thiouracil. Drugs affecting the immune systems. Non - steroidal anti inflammatory drugs - Classification, synthesis and mode of action of Flurbiprofen and Indomethacin. Antihistamics (Antiallergic agents) - Histamine, Classification, SAR amongst H1-receptor blockers, prevention of histamine release, synthesis and mode of action of Diphenhydramine hydrochloride and Promethazine hydrochloride. Antiulcers- Histamine H2 Receptor Antagonists,SAR, synthesis and Characteristic features of Cimetidine and Ranitidine.

UNIT V Chemotherapeutic Agents **(15 Hours)**

Antibiotics- Classification, synthesis and mode of action of Penicillins, Chloramphenicol and Azithromycin. Sulpha drugs- Classification, SAR and mode of action of sulphonamides. Synthesis and uses of Sulfacetamide and sulpha guanidine. Antiviral drugs- Classification, synthesis and mode of action of Acyclovir and Methiazone. Antimyco bacterial drugs- Classification, synthesis and mode of action of Pyrazinamide and Ciprofloxacin hydrochloride. Anthelmintics- Types of warm parasites, classification, synthesis and mode of action of Albendazole and Mebendazole. Antineoplastic drugs- Causes of cancer, classification, synthesis and mode of action of Melphalan and Methotrexate.

TEXT BOOKS

1. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S.Chand& Company Ltd, Reprint2012.
2. AshutarKar,Medicinal Chemistry, 6th Edition,2015.
3. K. Elango, P. Valentina,Textbook of Medicinal Chemistry, 2ndEdition.
4. SurendraNath Pandey, SanjayPandey. Textbook of Medicinal Chemistry.
5. D. Sriram, P. Yogeshwari, Medicinal Chemistry, 2ndEdition.
6. Chatwal, Medicinal Chemistry.

REFERENCE BOOKS

1. Foye's Principles of Medicinal Chemistry, 3rdEdition.
2. Wilson and Gisvold,Textbook of Organic Medicinal and Pharmaceutical Chemistry, 11thEdition.

M.Sc. ORGANIC CHEMISTRY SEMESTER IV
CORE PRACTICAL - IV
ORGANIC CHEMISTRY PRACTICAL II

OBJECTIVES

To develop analytical skill in

i) Organic quantitative analysis.

ii) Preparation of organic compounds involving two stages.

I. ORGANICESTIMATION

1. Phenol
2. Aniline
3. Methyl Ketone
4. Glucose
5. Iodine value of an oil
6. Saponification value of anoil.

II. ORGANIC PREPARATION INVOLVING TWOSTAGES

1. Sym-tribromobenzene from aniline.
2. m- Nitrobenzoic acid from methylbenzoate
3. para – Nitroaniline from acetanilide.
4. Benzanilide from benzophenone.
5. Aspirin from methylsalicylate
6. Anthraquinone from phthalicanhydride.

REFERENCE BOOKS

1. B.S. Furniss, A.J. Hannaford., P.W.G. Smith and A.R. Tatchell, Vogel's Practical Organic Chemistry, 5th edn. ELBS,1989.
2. Raj K. Bansal, Laboratory manual of Organic Chemistry, III Edn., New Age International (P) Ltd.,1996.

M.SC. ORGANIC CHEMISTRYIV

CORE PRACTICAL – V
ORGANIC CHEMISTRY PRACTICAL III

OBJECTIVES

To develop analytical skill in

1. Estimation of functional group

2. Preparation of organic compounds involving multistages

1) ESTIMATION OF THEFOLLOWING

1. Hydroxyl group

2. Amino group

3. Amide group

4. Glycine

5. Ascorbic acid

6. COD

II. MULTISTAGE PREPARATION INVOLVING OXIDATIONS AND REDUCTIONS

1. Preparation of cyclohexanone (Oxidation)

2. Preparation of adipic acid (Oxidation)

3. Preparation of trimethyl acetic acid(Oxidation)

4. Preparation of ethyl benzene (Wolff- Kishner reduction)

5. Preparation of benzhydrol (Reduction)

6. Preparation and stereochemistry of azobenzene (Reduction).

REFERENCE BOOKS

1. Raj K. Bansal, Laboratory manual of Organic Chemistry, III Edn., New Age International (P) Ltd.,1996.

2. B.S. Furniss, A.J. Hannaford., P.W.G. Smith and A.R. Tatchell, Vogel's Practical Organic Chemistry, 5th edn. ELBS,1989.

M.Sc. ORGANIC CHEMISTRY
SEMESTER IV
CORE PRACTICAL – VI

ORGANICCHEMISTRYPRACTICAL IV

OBJECTIVES

To understand the techniques involved in

1.Extraction of natural products

2. Separation of mixture of organic products

2. Apply knowledge about spectra to identify the structure of unknown organic compounds.

1. Extraction of natural products such as caffeine, embelin, piperine, stigmasterol and β -carotene.
2. Separation and identification of aminoacids and sugars by paper and thin layer chromatography.
3. Column chromatographic separation of mixture of organic compounds

(a) Purification of anthracene

(b) Separation of aminoacids

(c) Separation of benzoic acid from benzaldehyde.

4. Elucidation of the structure of an organic compound from the spectra provided.

REFERENCE BOOKS

1. Raj K. Bansal, Laboratory manual of Organic Chemistry, III Edn., New Age International (P) Ltd.,1996.
2. B.S. Furniss, A.J. Hannaford., P.W.G. Smith and A.R. Tatchell, Vogel's Practical Organic Chemistry, 5th edn. ELBS,1989.
3. ArunSethi, Lab experiments in organic chemistry, New Age International Publishers