PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011

DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR

M.SC. ORGANIC CHEMISTRY

(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar University from 2017-2018 onwards)

REGULATIONS

1. OBJECTIVES OF THE COURSE:

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 THIS REGULATION:

These regulations shall take effect from the academic year 2017-2018, that is, for students who are admitted to the first year of the course during the academic year 2017-2018 and thereafter.

3. ELIGIBILITY FOR ADMISSION:

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 THE COURSE:

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

Course Paper	Paper Code	Course Title	Hours/ Week	Work Load per sem (Hours)	Credit	Exam Hours	Marks		Total
							Internal	External	
SEMESTER I									
Core I		Organic Chemistry - I	5	75	5	3	25	75	100
Core II		Inorganic Chemistry - I	5	75	5	3	25	75	100
Core III		Physical Chemistry - I	5	75	5	3	25	75	100
Elective I		Polymer Chemistry / Conducting Polymers	5	75	4	3	25	75	100
Core I Practical I		Organic Chemistry Practical - I	4	50	-	-	-	-	-
Core Practical II		Inorganic Chemistry Practical - I	3	45	-	-	-	-	-
Core Practical III		Physical Chemistry Practical - I	3	45	-	-	-	-	-
		Total	**30**	**450**	**19**				**400**
SEMESTER II									
Core IV		Organic Chemistry - II	5	75	5	3	25	75	100
Core V		Inorganic Chemistry - II	5	75	5	3	25	75	100
Core VI		Physical Chemistry - II	5	75	5	3	25	75	100
EDC		Extra Disciplinary course	4	60	4	3	25	75	100
Core I Practical I		Organic Chemistry Practical - I	3	45	3	6	40	60	100
Core Pract-II		Inorganic Chemistry Practical - I	3	45	3	6	40	60	100
Core Pract-III		Physical Chemistry Practical - I	3	45	3	6	40	60	100
Common Paper		Human Rights	2	30	2	3	25	75	100
		Total	**30**	**450**	**30**				**800**

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		Organic Chemistry - IV	5	75	5	3	25	75	100
Elective II		Organic Spectroscopy	5	75	4	3	25	75	100
Elective III		Instrumental methods of Analysis	5	75	4	3	25	75	100
Core I 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		Organic Chemistry - V	5	75	5	3	25	75	100
Elective IV		Industrial and Medicinal Organic 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 - IV 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**

NOTE:I

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 : 25 marks

Distribution of Internal Assessment mark

Test	: 10 marks
Attendance	: 5 marks
Assignment	: 5 marks
Seminar	: 5 marks
Total	25 marks

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 : 40 marks

Calculation of Internal Assessment mark

Number of Experiments	:	10 marks
Experimental skill	:	10 marks
Test	:	20 marks
Total	:	40 marks

Passing Minimum : Internal Assessment : 50% - 20 marks
Passing Minimum : External Assessment : 50% - 30 marks
Total Passing Minimum - 50 marks

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

QUESTION PAPER PATTERN

Theory

Time: 3 Hours Max. marks : 75

Part - A : 5X5 = 25

(Answer all questions)

(one question from each unit with internal choice)

Part - B : 5X10 = 50

(Answer all questions)

(one question from each unit with internal choice)

Practical

Distribution of marks for practical

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

Project

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

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

UNIT I Stereochemistry (15 Hours)

Fischer, Newman and Sawhorse projections and their interconversion. Axial chirality – biphenyls, allenes and spiranes – R and S notations. Chirality due to helical shape, planar chirality - Cyclophanes, ansa compounds and trans cyclooctene. Stereospecific and stereoselective synthesis with suitable examples, asymmetric synthesis – Crams rule. Homotopic, enantiotopic, diastereotopic H atoms, groups in organic molecules.

Conformational analysis and stereochemical features of disubstituted cyclohexanes (1,2 ; 1,3 ; 1,4 dialkyl cyclo hexanes), conformation and stereochemistry of cis and trans decalins.

UNIT II Reaction intermediates, Structure and Reactivity (15 Hours)

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

Free radical reactions : Sandmeyer reaction, Gomberg-Bachmann reaction, Pschorr reaction and Ullmann reaction, Hunsdiecker reaction.

Effect of structure on reactivity – resonance and fields effects, steric effects, quantitative treatment – the Hammett equation and linear free energy relationship, substituent and reaction constant, Taft equation. Thermodynamic and kinetic requirements for reactions, thermodynamically and kinetically controlled reactions, Hammonds postulate, transition states and intermediates, Kinetic & non kinetic methods of determining mechanisms, identification of products and determination of the presence of an intermediate, isotopic labeling, kinetic isotope effects.

UNIT III Aliphatic Nucleophilic Substitution Reactions (15 Hours)

The SN1, SN2 & SNi mechanisms. The neighbouring group mechanism, neighbouring group participation by π and σ bonds, anchimeric assistance. Nucleophilic substitution at an allylic, aliphatic trigonal and vinylic carbon.

Reactivity effects of substrates structure, attacking nucleophile, leaving group and reaction medium, ambident nucleophile, regioselectivity. Williamson reaction, Von-braun reaction, hydrolysis of esters, Claisen and Dieckmann condensation.

UNIT IV

Aromatic electrophilc and nucleophilic substitution reactions (15 Hours)

The arenium ion mechanism, typical reactions like nitration, sulphonation, halogenation, Friedel – Crafts alkylation, acylation and diazonium coupling, electrophilic substitution on monosubstituted benzene, orientation and reactivity – ortho, meta and para directing groups, ortho-para ratio, ipso attack, Gatterman, Gatterman- Koch, Vilsmeir, Houben Hoesch reaction.

Aromatic nucleophilic substitution reactions, the SNAr mechanism, the aryl cation mechanism, the benzyne intermediate mechanism, Ziegler alkylation, Chichibabin reaction.

UNIT – V Alkaloids, Flavones and Isoflavones (15 Hours)

Synthesis and Structural elucidation of Quinine, Papaverine, Morphine and Reserpine.

Synthesis and structural elucidation of flavones, isoflavones and anthocyanins.

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley & Sons (1992)
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. Ernest L. Eliel, Stereochemistry of Carbon Compounds, T.M.H Edition, Tata McGraw-Hill Publishing Company, 1995.
5. P.S. Kalsi, Stereochemistry – Conformation and Mechanism, 6th Edition, Wiley Eastern Limited, 2005.
6. I.L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd., (2000)

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.
6. R.M. Acheson, Introduction to Chemistry of Heterocyclic Compounds, 2nd Edition, Interscience Publishers, 1967.
7. J.A. Joule and G.F. Smith, Heterocyclic Chemistry, Van Notrand Reishord Co., London, 1978.

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

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

Van der Waals bonding, Hydrogen bonding; HSAB concept; polyacids - Isopolyacids of V, Cr, Mo and W; Heteropolyacids of Mo and W (only structural aspects). Inorganic polymers - silicates - structure, properties, correlation and application; Molecular sieves; polysulphur nitrogen compounds and polyorganophosphazenes.

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

Boron hydrides, polyhedral boranes, hydroborate ions- a general study of preparation, properties and structure; Carboranes - types such as closo and nido, preparation, properties and structure; Metallo carboranes - a general study; Metal clusters-chemistry of low molecularity metal clusters only, multiple metal-metal bonds.

UNIT III Nuclear Chemistry I **(15 Hours)**

Nuclear structure - stability of nuclei, packing fraction, even-odd nature of nucleons, n/p ratio, nuclear potential, binding energy and exchange forces; shell model and liquid drop model; Decay of radio nuclei - rate of decay; determination of half-life period; Modes of decay - alpha, beta, gamma and orbital electron capture; nuclear isomerism; internal conversions; Q value; nuclear cross section; threshold energy and excitation functions.

UNIT IV Nuclear Chemistry II **(15 Hours)**

Different type of nuclear reactions with natural and accelerated particles-transmutation, stripping and pick-up, spallation, fragmentation, fission; Characteristic of fission reaction, product distribution and theories of fission; fissile and fertile isotopes - U235, U238, Th232 and Pu239; atom bomb; nuclear fusion - steller energy; Synthesis of new elements; principles underlying the usage of radioisotopes in analysis – agriculture, industry, medicine, mechanism of chemical reactions; uses of radioisotopes in analytical chemistry; isotopic dilution analysis; neutron activation analysis and dating methods.

UNIT V Experimental Methods **(15 Hrs)**

Cloud chamber, nuclear emulsion, bubble chamber, proportional counters, G.M. Counter, Scintillation counters and Cherenkov counters. Particle accelerators - Linear accelerator, Cyclotron, Synchrotron, Betatron and Bevatron.

TEXT BOOKS

1. H.J. Emelius and Sharpe, Modern aspects of Inorganic chemistry, Universal book Stall, New Delhi, 1989.
2. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry- Principles of structure and reactivity, 4th edition, Pearson-Education, 2002.
3. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Wiley Eastern, 5th edition, 1988.
4. S. Glasstone, Source book of atomic Energy, Van Nonstrand Co., 1969.
5. H.J. Arniker, Essentials of nuclear chemistry, 2nd edition Wiley eastern Co.,1987.

REFERENCE BOOKS

1. E.L. Mutteri, Polyhedral boranes, Acadamic press, NY, 1975.
2. N.H. Ray, Inorganic polymers, Academic press, NY, 1975.
3. K.F. Purcell and J.C. Kotz, Inorganic Chemistry, WB Saunders Co. USA 1977.
4. G.S. Manku, Inorganic Chemistry, TMH Co., 1984.
5. A.K. Srivatsava and P.C. Jain, Elements of Nuclear Chemistry, S. Chand and Co., 1989.
6. G. Friedlander, J.W. Kennedy and J.M. Miller, Nuclear and Radiochemistry, Wiley, 1964.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
CORE III - PHYSICAL CHEMISTRY – I

(75 Hours)

UNIT I Group theory-I **(15 Hours)**

Symmetry elements; symmetry operations; point groups - identification and determination; comparison of molecular and crystallographic symmetry; reducible and irreducible representations; direct product representation; orthogonality theorem and its consequences; character table. Hybrid orbitals in non-linear molecules – Examples: H2O, NH3, BF3, CH4 and XeF4. Determination of representations of vibrational modes in non-linear molecules such as water, ammonia, BF3, CH4 and XeF4.

UNIT II Thermodynamics **(15 Hours)**

First law of thermodynamics; temperature dependence of enthalpies; Second law of thermodynamics; Gibbs-Helmholtz equation; Third law of thermodynamics. Free energy and entropy of mixing; chemical potential, partial molar volume and partial molar heat content. Variation of chemical potential with temperature and pressure-Gibbs-Duhem equation. Thermodynamics of ideal and real gases-fugacity, activity and activity coefficient.

UNIT III Statistical thermodynamics **(15 Hours)**

Thermodynamic probability and entropy; Boltzman distribution law; Maxwel-Boltzman, Bose-Einstein and Fermi-Dirac statistics; vibrational, rotational and electronic partition functions; calculation of thermodynamic functions and equilibrium constants; Theories of specific heats of solids; postulates and methodologies of non-equilibrium thermodynamics; linear laws; Gibbs equation;

UNIT-IV Non-equilibrium thermodynamics **(15 Hours)**

Thermodynamic criteria for non-equilibrium states; entropy production and entropy flow; entropy balance equations for different irreversible processes (heat flow, chemical reaction etc.); Non-equilibrium stationary states; microscopic reversibility; Onsager reciprocal theory.

UNIT V Electrochemistry **(15 Hours)**

Mean ionic activity and activity coefficient of electrolytes in solutions; ideal and non-ideal solutions; excess functions; Hydration number; Debye-Huckel treatment of dilute electrolyte solutions; Debye-Huckel limiting law; Electrochemical cell reactions - Electrode-electrolyte interface; electrokinetic phenomina; electrode kinetics; Batteries-primary and secondary; fuel cells; corrosion and its prevention.

TEXT BOOKS

1. V. Ramakrishnan and M.S. Gopinathan, Group theory in Chemistry, Vishal Publications,1988.
2. J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry, Lal Nagin Chand, New Delhi, 1986.
3. M.C. Gupta, Statistical Thermodynamics, Wiley Eastern, New Delhi,1990.
4. J. Rajaram and J.C. Kuriacose, Irreversible Thermodynamics, Lal Nagin Chand, New Delhi, 1989.
5. S.Glasstone, Introduction to Electrochemistry, Affiliated East west Press, New Delhi 1960.

REFERENCE BOOKS

1. F.A. Cotton, Chemical Application of Group Theory, John Wiley and Sons Inc. New York,1971.
2. K.V. Raman, Group theory and its applications to Chemistry, Tata McGraw-Hill Publishing Company,1990.
3. R.P.H.Gasser and W.G.Richards, Introduction to Statistical Thermodynamics, World Scientific, Singapore, 1995.
4. D.R. Crow, Principles and application of Electrochemistry, Chapman and Hall, 1991.
5. J.O.M. Bockris and A.K.N. Reddy, Electrochemistry, Vols. 1 and 2, Plenum, New York, 1977.
6. P.H.Rieger, Electrochemistry, Chapman and Hall, New York, 1994.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
ELECTIVE I - PAPER I - POLYMER CHEMISTRY
(75 Hours)

UNIT I Basic Concepts **(15 Hours)**

Monomers, repeat units, degree of polymerization, Linear, branched and network Polymers. Condensation Polymerization : Mechanism of stepwise polymerization. Kinetics and statistics of linear stepwise polymerization. Addition polymerization : Free radical, cationic and anionic polymerization. Polymerization conditions. Polymerization in homogeneous and heterogeneous systems.

UNIT II Co-ordination Polymerization **(15 Hours)**

Kinetics, mono and bimetallic mechanism of co-ordination polymers. Zeigler Natta catalyst, co-polymerization: Block and graft co-polymers, kinetics of copolymerization. Types of co-polymerization. Reactivity ratio.

UNIT III Molecular Weight and Properties **(15 Hours)**

Polydispersion – average molecular weight concept, number, weight and viscosity average molecular weights. Measurement of molecular weights. Viscosity, light scattering, osmotic and ultracentrifugation methods. Polymer structure and physical properties – crystalline melting point Tm. The glass transition temperature. Determination of Tg. Relationship between Tm and Tg.

UNIT IV Polymer Processing **(15 Hours)**

Plastics, elastomers and fibres. Compounding, processing techniques: calendering, die casting, rotational casting, film casting, injection moulding, blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning.

UNIT – V Properties of Commercial Polymers **(15 Hours)**

Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers, Fire retarding polymers and electrically conducting polymers. Biomedical polymers – contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

TEXT BOOKS

1. F.W. Billmeyer, TextBook of Polymer Science, 3rd Edition, J.Wiley, 2003.
2. V. R. Gowariker, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age Int., 1986.

REFERENCE BOOKS

1. H.R. Alcock and F.W. Lamber, Contemporary Polymer Chemistry, Prentice Hall, 1981.
2. P.J. Flory, Principles of Polymer Chemistry, Cornell University press, New York, 1953.
3. G. Odian, Principles of Polymerization, 2nd Edition, John Wiley & Sons, New York, 1981.

M.Sc. ORGANIC CHEMISTRY
SEMESTER - I
ELECTIVE I - PAPER II - CONDUCTING POLYMERS
(75 Hours)

UNIT I Basic Concepts and Synthetic methods (15 Hours)

Basics of conducting polymers - Organic - conjugated unsaturated hydrocarbons- Chemical Synthesis of conducting polymers – Other synthetic methods

UNIT II Electrochemical Synthesis (15 Hours)

Electrochemical synthesis of conducting polymers – monomers, electrolytic condition, electrodes and mechanism; Electrochemical synthesis of derivatives of poly pyrrole, polythiophene, polyazulene, polycarbazole, polyindole, polyaniline and polyphenylene.

UNIT III Semiconducting and Metallic Polymers (15 Hours)

Structural basis for semiconducting and metallic polymers – introduction; Organic meta polymers - Synthetic route, isomers and electronic structure (polymers like polyacetylene, poly(p-phenylene), polypyrrole, polythiophene, etc.,).

UNIT IV Doping (15 Hours)

Electrochemical doping; deadline to the development of conducting polymers; role of reduction and oxidation potential in doping; polyacetylene as electrode materials.

UNIT V Catalytic Conducting Polymers (15 Hours)

Catalytic properties of conducting polymers; catalysis of electron donor-acceptor complexes; electrocatalysis by semiconducting polymers.

TEXT BOOKS

1) Terje A. Skotheim, Ronald L. Elsenbaumer, John R. Reynolds, Handbook of Conducting Polymers, Second Edition, Marcel Dekkar, 1995.
2) Hari Singh Nalwa (Edn), Handbook of Organic Conductive Molecules and Polymers, Four Volumes, Wiley, 1997

REFERENCE BOOKS

1) Jean-Pierre Farges, Organic Conductors, Marcel Dekkar, 1994
2) David B Cotts, Z Reyes, Electrically Conductive Organic Polymers for Advanced Applications, William Andrew Inc,1987
3) Larry Rupprecht, Conductive Polymers and Plastics, William Andrew Inc, 1999.
4) Raymond B Seymour, New Concepts in Polymer Science, Polymeric Composites, VSP, 1990.
5) Wallace Gordon, Gordon G Wallace, Geoffrey M Spinks, Conductive Electroactive Polymers, CRC Press, 2002

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

CORE IV - ORGANIC CHEMISTRY – II

[75 Hours]

UNIT I Elimination Reactions **(15 Hours)**

E1, E2, E1cB mechanisms, Orientation of the double bond- Hofmann and Saytzeff rule, competition between elimination and substitution, dehydration and dehydrohalogenation reactions, stereochemistry of E2 eliminations in cyclohexane ring systems, mechanism of pyrolytic eliminations, Chugaev reaction and Cope elimination.

UNIT II Aromaticity **(15 Hours)**

Aromatic character: Five-, six-, seven-, and eight-membered rings - other systems with aromatic sextets - Huckel's theory of aromaticity, concept of homoaromaticity and antiaromaticity.

Electron occupancy in MO's and aromaticity - NMR concept of aromaticity and antiaromaticity, systems with 2,4,8 and 10 electrons, systems of more than 10 electrons (annulenes), Mobius aromaticity.

Bonding properties of systems with (4n+2)π-electrons and 4nπ - electrons, alternant and non-alternant hydrocarbons (azulene type) - aromaticity in heteroaromatic molecules, sydnones and fullerenes.

UNIT III Organic Photochemistry **(15 Hours)**

Photochemical reactions : Fate of excited molecules, Jablonski diagram, Norrish Type I and Norrish Type II reactions, photoreduction of ketone, photoaddition reactions, Paterno Buchi reaction, di –pi methane rearrangement, photochemistry of arenes, Photooxidation (Formation of peroxy compounds), Photoisomerization (Cis – trans isomerization), Photo addition of olefins and amines to aromatic compounds, Photo rearrangements: Photo – Fries rearrangement and Photo rearrangement of 2,5 – Cyclohexadienones.

UNIT IV Pericyclic Reactions **(15 Hours)**

Pericyclic reactions, classification, orbital symmetry, Woodward Hofmann rules, selection rules and stereochemistry of electrocyclic reactions, cycloaddition and sigmatropic shifts, analysis by correlaton diagram method and Frontier molecular orbital method, Sommelet-Hauser, Cope and Claisen rearrangements.

UNIT V Reagents in Organic Synthesis **(15 Hours)**

Reagents and their uses: DCC, DDQ, DBU, DIBAL, 9BBN, NBS, 1,3 – dithiane (umpolung), n-Butyl Lithium, trimethyl silyl iodide, trimethyl silyl chloride, Lithium dimethyl cuprate, Baker's yeast and Gilman's reagent.

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley & Sons (1992)

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. P.S. Kalsi, Stereochemistry – Conformation and Mechanism, 6th Edition, Wiley Eastern Limited, 2005.

5. I.L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd., (2000)

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, 1st Edition, Macmillan, 1976.

3. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice-Hall, 1992.

4. R.O.C. Norman, Principles of Organic Synthesis, Second Edition, Chapman and Hall, 1978.

5. S.M. Mukherji and S.P. Singh, Reaction Mechanism in Organic Chemistry, III Edn. 1984. MacMillan.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

CORE V - INORGANIC CHEMISTRY -II

[75 Hours)

UNIT I Metal-Ligand Bonding (15 Hours)

18 Electron rule; EAN rule, theories of coordination compounds - valence bond theory, crystal field theory - splitting of d-orbitals in different symmetries, crystal field stabilization energy, factors affecting the magnitude of 10 Dq, evidence for crystal field stabilization, spectrochemical series, site selection in spinels, tetragonal distortion from octahedral symmetry, Jahn-Teller distortion; Molecular Orbital Theory - octahedral complexes, tetrahedral and square planar complexes, pi bonding and molecular orbital theory, experimental evidence for pi-bonding.

UNIT II Electronic Spectra and Magnetic Properties (15 Hours)

Term states of dn ions - microstates and their classifications, electronic spectra of coordination compounds - selection rules, band intensities and band widths; energy level diagrams of Orgel and Tanabe - Sugano diagram; spectra of Ti3+, V3+, Ni2+, Cr3+, Co2+, Cr2+ and Fe2+; calculation of 10Dq and B for V3+ (oct) and Ni2+ (oct) complexes.

Magnetic properties of coordination compounds - change in magnetic properties of complexes in terms of spin-orbit coupling; spin only moments of dn systems; temperature independent paramagnetism; spin cross over phenomena.

UNIT III Structure of Coordination Complexes (15 Hours)

Structure of coordination compounds with reference to the existence of various coordination numbers - complexes with coordination number two, complexes with coordination number three, complexes with coordination number four - tetrahedral and square planar complexes, complexes with coordination number five - regular trigonal bipyramidal and square pyramidal; site preference in trigonal bipyramidal complexes, site preference in square planar complexes; coordination number six - distortion from perfect octahedral symmetry, trigonal prism; stereoselectivity and conformation of chelate rings; coordination number seven and eight.

UNIT IV 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. (simple complexes).

UNIT V Reaction Mechanism of transition metal 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.

TEXT BOOKS

1. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry- Principles of structure and reactivity, 4th edition, Pearson-Education, 2002.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Wiley Eastern 1988.
3. S.F.A. Kettle, Co-ordination compounds, ELBS, 1973.
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., NY. 1974.
5. K.F. Purcell and J.C. Kotz, Inorganic Chemistry, WB. Sanders Co., USA 1977.
6. D. F. Shriver, P. W. Atkins and C.H. Longford, Inorganic Chemistry, ELBS, 2nd edition, 1994.
7. R.B. Heslop and K. Jones, Inorganic Chemistry, Elsevier, 1976.

REFERENCE BOOKS

1. D. Bannerjea, Co-ordination Chemistry, Tata-McGraw Hill, 1993.
2. M.L. Tobe, Inorganic Reaction Mechanism, Nelson, 1972.
3. K. Burger, Coordination Chemistry Experimental Methods, Butterworths, 1973.
4. B.N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, New Delhi, 1976.
5. F. Basolo and R.G. Pearson, Mechanism of Inorganic Reactions, Wiley Eastern, 1967.

M.Sc. ORGANIC CHEMISTRY
SEMESTER II
CORE VI - PHYSICAL CHEMISTRY – II
[75 Hours]

UNIT I Quantum Chemistry-I **(15 Hours)**

Planck's Quantum theory - wave particle duality, Uncertainity principle; Operators and commutation relations- Linear and Hermitian operators. Postulates of quantum mechanics; The Schrodinger equation-Particle in a box (one, two and three dimensional systems).

UNIT II Quantum chemistry –II **(15 Hours)**

Applications of quantum mechanics - harmonic oscillator, rigid rotator, hydrogen atom; Approximation methods-variation and perturbation methods, application to helium atom.

UNIT III Quantum Chemistry-III **(15 Hours)**

Born-Oppenheimer approximation- VB and MO treatments of hydrogen molecule; MO for polyatomic molecules; Concept of hybridization-sp, sp2 and sp3; Huckel pi-electron theory and its applications to ethylene, butadiene and benzene; Idea of self consistent fields.

UNIT-IV Surface Chemistry **(15 Hours)**

Surface tension; solid-liquid interfaces; contact angle and wetting; Solid-gas interface; Adsorption of gases on solids-Freundlich, Gibbs, Langmuir, Temkin and BET adsorption isotherm; Surface area determination; electrical phenomena at interfaces; micelles and reverse micelles - solublization and microemulsion.

UNIT-V Chemical Kinetics **(15 Hours)**

Methods of determining rate laws; Theories of reaction rates - simple collision theory, ARR theory; treatment of unimolecular reactions (Lindemann-Hinselwood and Rice-Ramsperger-Kassel-Marcus[RRKM] theories); termolecular reactions; chain reactions; explosive reactions; Arrhenius and Eyring equations; Reaction rates in solution; salt effect and solvent dielectric constant; Homogeneous and heterogeneous catalysis; Enzyme catalysis- Michaelis-Menton kinetics; Fast reactions- study of kinetics by stopped flow technique, relaxation method, flash photolysis and magnetic resonance method.

TEXT BOOKS

1. D.A. McQuarrie, Quantum Chemistry, University Science Books, Mill Valley, California, 1983.
2. J. Rajaram and J.C. Kuriacose, Kinetics and Mechanism of Chemical Transformations, MacMillan India Ltd. 1993.
3. P.W.Atkins, Physical Chemistry, Oxford University Press, Oxford, 1990.
4. D.A. McQuarrie, Text Book of Physical Chemistry, University Science Books, Mill Valley, California, 1983.
5. R.A. Alberty and R.J.Silbey, Physical Chemistry, John Wiley and Sons, New York, 1992
6. A.W.Adamson, Physical Chemistry of surfaces, 4th edn., Wiley - Interscience, Newyork, 1982.

REFERENCE BOOKS

1. P.W. Atkins, Molecular Quantum Mechanics, Oxford University Press, Oxford, 1983
2. M.W.Hanna, Quantum Mechanics in Chemistry, W.A.Benjamin Inc. London 1965
3. S. Glasstone, Thermodynamics for Chemists, Affiliated East West Press, New Delhi 1960.
4. K.J.Laidler, Chemical Kinetics, Harper and Row, New York,1987.
5. R.G. Frost and Pearson, Kinetics and Mechanism, Wiley New York, 1961
6. R.K.Prasad, Quantum Chemistry, Wiley Eastern, New Delhi,1992.
7. A.W.Anderson, Physical Chemistry of Surfaces, Wiley - Interscience, Newyork, 1990.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II
CORE PRACTICAL I
ORGANIC CHEMISTRY PRACTICAL I

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 beta naphthol
2. s-Benzyl isothiuronium chloride from benzylchloride
3. Beta glucose penta acetate from glucose
4. ortho-Benzoyl benzoic acid from phthalic anhydride
5. Resacetophenone from resorcinol
6. para-Nitrobenzoic acid from para nitrotoluene
7. meta-Nitroaniline from meta dinitrobenzene
8. Methyl orange from sulphanilic acid
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.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II
CORE PRACTICAL II
INORGANIC CHEMISTRY PRACTICAL I

Part I

Semimicro qualitative analysis of mixtures containing two common and two rare cations. The following are the cations to be included: W, Tl, Mo, Te, Se, Ce, Th, Be, Zr, V, U and Li..

Part II

a) Colorimetric analysis : Visual and Photometric; determination of iron, nickel, manganese and copper.

b) Preparation of the following:

a) Potassium trioxalatoaluminate (III) trihydrate

b) Tristhioureacopper(I) chloride

c) Potassium trioxalatochromate (III) trihydrate

d) Sodium bis (thiosulphato) cuprate (I)

e) Tetramminecopper (II) sulphate

f) Potassium Tetrachlorocuprate (II)

REFERENCES 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. ORGANIC CHEMISTRY
SEMESTER II
CORE PRACTICAL III
PHYSICAL CHEMISTRY PRACTICAL I

LIST OF EXPERIMENTS

1. Study the kinetics of acid hydrolysis of an ester, determination of the temperature coefficient of the reaction and determination of the activation energy of the hydrolysis of ethylacetate.
2. Study the kinetics of the reaction between acetone and iodine in acidic medium by half life method and determine the order with respect to iodine and acetone.
3. Construction of phase diagram for a simple binary system (naphthalene – phenanthrene and benzophenone – diphenylamine).
4. Determination of the rate constant and order of reaction between potassium persulphate and potassium iodide and determine the temperature coefficient and energy of activation of the reaction.
5. Determination of equivalent conductance of a weak acid at different concentrations and verify Ostwald's dilution law and calculation of the dissociation constant of the acid.
6. Determination of equivalent conductivity of a strong electrolyte at different concentrations and examine the validity of the Onsager's theory as limiting law at high dilutions.
7. Conductometric titrations of a mixture of HCl and CH3COOH against Sodium hydroxide
8. Determination of the activity coefficient of an electrolyte at different molalities by emf measurements.
9. Determination of the dissociation constant of acetic acid by titrating it with sodium hydroxide using quinhydrone as an indicator electrode and calomel as a reference electrode.
10. Determination of the PH of a given solution by emf method using hydrogen electrode and quinhydrone electrode.
11. 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.
12. Study the surface tension – concentration relationship of solution (Gibb's equation)
13. Determination of the viscosities of mixtures of different composition of liquids and find the composition of a given mixture.

REFERENCE BOOKS:

1. B.P.Levitt (Ed.). Findlay's Practical Physical Chemistry, 9th Edn., Longman, London, 1985.
2. J.N.Gurtu and R.Kapoor, Advanced Experimental Chemistry, Vol I.S.Chand & Co. Ltd., New Delhi, 1980.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSES

LIST OF EXTRA DISCIPLINARY COURSE PAPERS

I. Industrial Chemistry

II. Agricultural Chemistry

III. Food and Medicinal Chemistry

IV. Pharmaceutical Chemistry

V. Dye Chemistry

VI. Water Chemistry

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER-I- INDUSTRIAL CHEMISTRY

(60 Hours)

UNIT-I Glass and Ceramics (12 Hours)

1.1 Glass: Introduction. Raw materials, manufacture and applications. Some special glasses-fused si l i ca glass, optical glass, glass wool, photosensitive glass-composition and uses.

1.2 Ceramics: Definition. Manufacture and applications.

UNIT-II Cement (12 Hours)

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 (12 Hours)

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

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

UNIT-IV Synthetic fibres and Plastics (12 Hours)

4 .1 Synthetic fibres: Difference between natural and synthetic fibres, Applications of synthetic fibres-Rayon, Terylone, Nylon. Taflon.

4 .2 Plastics: Domestic and industrial applications of all types of plastics.

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

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 so ap Detergent – classification and uses.

TEXT BOOKS

1. B.K. Shanna, Industrial Chemistry, Goel Publishing House Pvt Ltd. 1999.
2. M.G. Arora and M. Sin«h, Industrial Chemistry. Anmol Publications, 1st edition, 1994.
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.Kuria Cose and J.Rajaram,Chemistry in Engineering & Technology. Vol.1 & I I , T a t a Mc Craw Hill. 1984.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER- II- AGRICULTURAL CHEMISTRY

(60 Hours)

UNIT-I Water source for Agriculture (12 hours)

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

UNIT - II Chemistry of soil, soil classification and soil analysis (12 Hours)

Definition, classification and properties of soil, Soil erosion, 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 Irrigation (12 Hours)

Crop Seasons-seed, seed development organization, natural seeds projects phase-III, new policy on seed development; Soil- soil reclamation, alkali soil, saline soils, methods for soil reclamation; Irrigation Environmental degradation and Irrigation projects.

UN1T-IV Fertilizers (12 Hours)

4.1 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

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

UNIT-V Pesticides and Insecticides (12 Hours)

5.1 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 pesticidesborates organic pesticides - D.D.T and BMC.

5.2 Fungicide and Herbicides:

Fungicide: Sulphur compounds, copper coumpounds, Bordeaux mixture,

Herbicides: Acaricides- Rodenticides, Attractants- Repellants, Preservation of seeds.

TEXT BOOKS

1. N.C. Brady, The nature and properties of soils, Eurasia publishing House, New Delhi. 1977.
2. V.S, Jones. Fertilizers and soil fertility, Prentice Hall of India, New Delhi, 1993.
3. D.E.H. Freer, Chemistry of pesticides, D. Van Nostrand Co, Reinhold, 1969.
4. A.K. De. Environmental Chemistry, Wiley Eastern. 1989.

REFERENCE BOOKS

1. A. Sankara. Soils Science.
2. R.C. Palful. K. Goel. R.K. Gupta, Insecticides, Pesticides and Agro based Industries.
3. B.K. Sharma, Industrial Chemistry.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER- III- FOOD AND MEDICINAL CHEMISTRY

(60 Hours)

UNI I -I Food (12 Hours)

1.1 Food Adulteration

Sources of food, types, advantages and disadvantages, constituents of foods, carbohydrates, proteins, fats and oils, colours, flavours, natural toxicants.

1.2 Food poisoning

Sources, causes and remedy- Causes and remedies for acidity, gastritis, indigestion and constipation.

1.3 Food preservation

Food spoilage, causes of food spoilage, types o flood spoilage, food preservation.

UNIT-II Vitamins and minerals (12 Hours)

2.1 Vitamins: Sources, requirement, deficiency diseases of A. B. C. H and K.

2.2 Minerals: Mineral elements in food-principal mineral elements - Source- Function - Deficiency and daily requirements- Na, K. Mg. Fe, S. P and I.

UNIT-III (12 Hours)

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

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

3.3 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 (12 Hours)

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

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

UNIT-V (12 Hours)

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

5.2 Hypoglycemic agents- Diabetes- types- causes- symptoms- Insulin- uses. Oral hypoglycemic agents- sulphonyl ureas- action and uses.

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

5.4 AIDS-causes, prevention and control.

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

TEXT HOOKS

1. Seema Yadav. Food Chemistry. Anmol publishing (P) Ltd, New Delhi.
2. T.C. Daniels and E.C. Jorgensen. Text book of organic medicinal and pharmaceutical chemistry, J.B. Lippincott, Philadelphia. 1997.
3. Ashutosh Kar, Medicinal Chemistry, New Age International, 1996.
4. Bentley & Drivers. Text Book of Pharmaceutical Chemistry.

REFERENCE BOOKS

1. S. Lakshmi. **Pharmaceutical Chemistry,** Sultan Chand & Sons, New Delhi.
2. Car H. Synder, **The Extraordinary Chemistry for ordinary things.** John Wiley & Sons inc.,, New York, 1992.
3. A. Singh and V.K. Kapoor, **Organic Pharmaceutical Chemistry.**
4. I.L. Firnar, **Organic Chemistry,**VoI-II.
5. SJ. Bown and C.W.J. Scaife, **Chemistry & Life Science Approach.**
6. Albert Lehninger. **Bio Chemistry.**
7. G.R. Chatwal, **Pharmaceutical Chemistry Organic.** Vol-II,
8. G.R. Chatwal, **Pharmaceutical Chemistry Inorganic,** Vol-I.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER-IV-PHARMACEUTICAL CHEMISTRY

(60 Hours)

UNIT -I (l2Hours)

Inroduction: Importance ofChemistry in pharmacy. Important terminologies used, their meaning- molecular pharmacology, pharmacodynamics, phamacophore, metabolites, antimetabolites, bacteria, virus, fungi, actinomycetes.

Names of drugs: Code no. Chemical, proprietary, trivial, trade, non-proprietary names- meaning only. Assay- biological, chemical, immunorological - statement only. Mechanism, metabolism of drugs and their effect on pharmacological activity. Absorption of drugs.

Drug delivery systems, sustained release of drugs. Physiological effects of different functional groups in drugs.

UNIT-II (12 Hours)

2.1 Indian Medicinal plants and trees- adathoda, tulsi, thoothuvalai, shoeflower, neem. mango, kizhanelli. Ocimum, grass and greens.

2.2 Antibiotics: Definition. Structure- uses of chlorarnphenicol- ampicillin. streptomycin, tetracyeline- ritaniycin, Macrolidcs- Erythromycin- properties and uses.

Structural features- SAR- functional group responsible for drug action. Structural modification that changes the potency of the above drugs. Conditions for their use as therapeutic agents. Fields of application.

2.3 Sulphonamides: Substituents in the amide group. General properties and drug action. Preparation and uses of sulphadiazine, sulphapyridine, sulphathiazole, sulphafurazole and prontosil.

UNIT-III (12 Hours)

3.1 Antineoplastic drugs: Causes for cancer, Antineoplastic agents, cytotoxic. antimetabolites, plant products, harmones.

3.2 Antipyretic, analgesics, anti-inflammatory agents: Classification. Action of analgesics. Narcotic analgesics- Morphine and its derivatives. SAR.

Synthetic analgesics- pethidine and methadones.

Salicylic acid and its derivaties, indolyl derivatives, aryl-acetic acid derivatives, pyrazole. p-aminophenol derivatives- mechanism of action.

3.3 Antiseptics and disinfectants: Definition. Standardizalion of disinfectants, Use of phenols, dyes, chloramines, chlorohexadiene, Organomercurials, Dequalinium chloride, formaldehyde. Cationic surface active reagents, chloraminet-nitrofurazone.

Distinction between antiseptics and disinfectants.

UNIT – IV (12 Hours)

4.1 Hypoglycemic drugs: Diabetes-types-causes. Contol symptoms. Control, Insulin-preparation, uses. Oral Hypoglycemic agents, Sulphonylureas.

4.2 Anaesthetics: Definition, Classification. Uses of volatile anaesthetics - nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloroethylene, ethyl chloride - storage, advantages and disadvantages, intravenous anaesthetics-thiopenta! sodium, methohexitone, propanidide.

Local anaesthetics: requisites. Uses of esters - cocaine, benzocaine, procaine, amethocaine. Proxymelacaine, Amides- Lignocnine, cinchocaine hydrochloride.

UNIT-V (12 Hours)

5.1 Haematological agents: Coagulants and anticoagulants; Coagulants: vitamin K, Protamine sulphate, dried thrombin, Proteins, amino acids, Anticoagulants - Coumarins, indanediols. citric acid, 2-sulphonyl acids, quinoxaline, throm lodyn, Haemostatics - amino caproic acid, transexamic acid, Anaemia: Causes, detection, antianaemic drugs.

5.2 Cardio Vascular drugs: Cardiac glycosides, antiarrhythmic drugs, antihypertension drugs, antianginal agents, vasodilators, lipid lowering agents. One example for each.

TEXT BOOKS

1. T.C. Daniels and E.C. Jorgensen. Text book of organic medicinal and pharmaceutical chemistry, J.B. Lippincott, Philadelphia, 1997.
2. Ashutosh Kar, Medicinal Chemistry, Ne\v Age International. 1996.
3. Bentley & Drivers, Text Book of Pharmaceutical Chemistry.

REFERENCE BOOKS

1. S.Lakshmi, Pharmaceutical Chemistry. Sultan Chand & Sons, New Delhi.
2. A. Singh and V.K. Kapoor, Organic Pharmaceutical Chemistry.
3. l . L.Finar, Organic Chemistry. Vol-Il.
4. S.J. Bown and C.W.J. Scaife, Chemistry & Life Science Approach.
5. Albert Lehninger. Bio Chemistry.
6. G.R. Chatwal, Pharniaeentical Chemistry Organic. Vol-II.
7. G.R. Chatual, Pharmaceutical Chemistry Inorganic, Vol-I.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER-V- DYE CHEMISTRY

(60 Hours)

Unit I Introduction (12 Hours)

Colour and chemical constitution - chromophore, auxochrome and resonance, various theories; History of natural and synthetic dyes; Names of commercial dyes; Study of raw materials and dyestuff intermediates; Unit operations - nitration, sulphonation, halogenation, amination, diazotisation and alkali fusion; Colour index and its significance; Classification of dyes based on chemical constitution and method of applications; General properties - linearity, coplanarity and fastness.

Unit II Direct, Acid and Basic Dyes (12 Hours)

Direct cotton dyes (substantive dyes) – Classification, properties, structure and mechanism of dyeing, post treatment of dyeing; Acid dyes and Basic dyes – Classification, Characteristics, trade names, Mechanism of dyeing, Nature of affinity on cellulose and protein fibres.

Unit III Mordant, Azo and Vat Dyes (12 Hours)

Mordant dyes – classification, methods of application; Metal complex dyes – types of bond formation between dye and various fibres; Azo dyes – Azoic coupling components, protective colloids, electrolytes, stabilisation of diazonium salts, principles and application; Vat dyes and solubilised vat dyes – classification, methods of application, trade names, principles and application, Stripping agents and correction of faulty dyeing.

Unit IV Other Dyes (12 Hours)

Chemistry involved in the production of Aniline black; Prussian black; Sulphur colours; phthalocyanines; Disperse dyes - classification based on chemical structure, properties and principles of application; Solvent soluble dyes - Nigrosines and Indulines; Cyanine dyes.

Unit V Colour and Brightening (12 Hours)

Fluorescent brightening agents (FBA) - Theory and applications; Identification and estimation of dyes on fibres; The action of light on dyes and dyed fibres; Mechanism of fading.

TEXT BOOKS:

1. K. Venkataraman, The chemistry of synthetic dyes Part I & II, Academic Press, New York, 1952.
2. V. A. Shenai, Introduction to Chemistry of Dyesuffs, Sevak Prakashan Pub., Mumbai, 1991.

REFERENCE BOOKS:

1. V. A. Shenai, Chemistry of Dyes and Principles of Dyeing Vol.-II, Sevak Prakashan, Mumbai, 1987.
2. V. A. Shenai, Ecology and Textiles, Sevak Publications, Mumbai, 1997.
3. D. M. Nunn, The Dyeing of Synthetic Polymer and Acetate Fibres, Dyers Company, Publication Trust, 1979.
4. V. A. Shenai, Toxicity of Dyes and Intermediates, Sevak Publications, Mumbai, 1998.
5. Directory of safe dyes conforming to German Consumer Goods Ordinances, The Dyestuff Manufacturers Association of India, 1996.

M.Sc. ORGANIC CHEMISTRY

SEMESTER II

EXTRA DISCIPLINARY COURSE

PAPER-VI- WATER CHEMISTRY

(60 Hours)

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 (12 Hours)

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 (12 Hours)

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 (12 Hours)

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.

Anaerobic wastewater treatment: Plant types – pretreatment, plant with suspended sludge and filter process.

TEXT BOOKS

1. A.K.De, Environmental Chemistry, Wiley Eastern, 1989.
2. S.K.Banerji, Environmental Chemisty, Prentice Hall of India, New Delhi, 2003.

REFERENCE BOOKS

1. L.Winther, Wastewater Engineering, Polyteknisk Forlag, 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, Polyteknisk Forlag, Lyngby, 1989.

Model question paper

(For the candidates admitted from 2012-2013 onwards) M.Sc/ M.A/ M.Com/ M.C.A Degree Examinations Second Semester

EDC - PAPER-I - INDUSTRIAL CHEMISTRY

Time: 3hrs Maximum: 75 marks

PART-A

Answer all questions, either (a) or (b)

1. a) Write an account of optical glass and photosensitive glass (Or)
   b) Explain the raw materials used in the manufacture of glass
2. a) Explain the theory of setting of cement (Or)
   b) What is Portland cement? Give its rough composition
3. a) Mow are dyes classified? (Or)
   b) What are paints? Discuss the essential components of a good paint.
4. a) Distinguish between natural fibres and synthetic fibres? (Or)
   b) Write notes on Rayon and Nylon.
5. a) i) What are essential oils? Give an example.
   ii) Give two examples for waxes. (Or)
   b) Explain the cleansing action of soaps.

PART-B (10x5-50 Marks)

Answer alt questions, either (a) or (b)

6. a) How is glass manufactured? (Or)
   b) Discuss the manufacture and uses of ceramics.
7. a) How is cement manufactured? (Or)
   b) i) What are the types of cement ((4)
   i i) Write an account of the factors affecting the quality of cement(6)
8. a) Give an account of the application of dyes (Or)
   b) i) How is paint manufactured? (6)
   ii) What arc the qualities of good paint?-(4)
9. a) Write notes on synthetic fibres (Or)
   b) Describe in detail the applications of plastics.
10. a) i) How are waxes classified?(3)
   ii) Discuss the steps involved in the process of soap making(7) (Or)
   b) i) Distinguish between soups and detergents(6)
   i i) Write briefly about the various types of soaps.*(4)*

Model Question Paper
M.Sc. Organic Chemistry
First Semester
Core Paper - I Organic Chemistry - I

Time : 3 hours Maximum : 75 marks

PART - A (5X5=25 Marks)

Answer all the questions

1. a) Discuss briefly the optical activity of allenes and spiranes. (or)
   b) Discuss the conformation and stability of decalins.
2. a) Discuss the mechanism of sandmeyer reaction. (or)
   b) State and explain Hammonds postulate with potential energy diagram.
3. a) What are known as ambident nucleophiles? Mention some important ambident nucleophiles. (or)
   b) Explain the nature of attacking nucleophile and mention the important principles.
4. a) What is Zeigler alkylation? Comment on the uses of this reaction. (or)
   b) Explain the mechanism of vilsmeir reaction.
5. a) How is the position of methoxy group in reserpine estabilished? (or)
   b) Give the synthesis of Anthocyanins.

PART - B (5X10=50 Marks)

Answer all the questions

6. a) Explain the homotopic, enantiotopic and diastereotopic H atoms and groups in organic molecules. (10)
   b) Discuss the conformation, relative stability and optical activity of 1,2 and 1,3 dimethyl cyclohexanes. (10)
7. a) i) Explain Fischer projection with an example.
      ii) Discuss the optical activity of biphenyls. (5+5) (or)
   b) Discuss the mechanism of the following reactions
      i) Pschorr reaction ii)Hunsdiecker reaction. (5+5)
8. a) Explain SN1 and SN2 mechanism with suitable examples. (10) (or)
   b) Describe the mechanism of the following reactions.
      i) Williamson's reaction ii) Dieckmann condensation
      iii) Von - braun reaction (3+4+3)
9. a) Explain arenium ion mechanism with evidences and energy profile diagram. (10) (or)
   b) Explain the mechanism of the following reactions
      i) Chichibabin ii)Benzyne intermediate mechanism (10)
10. a) Elucidate the structure of Papaverine. (10) (or)
    b) Elucidate the structure of flavones. (10)

M.Sc. ORGANIC CHEMISTRY

SEMESTER III

CORE VII - ORGANIC CHEMISTRY - III

[75 Hours]

UNIT I

Addition to Carbon Carbon and Carbon–Hetero atom multiple bonds.(15 Hrs)

Addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation-cishydroxylation (OsO_4 & $KMnO_4$), transhydroxylation (Prevost reaction and Woodward modification), epoxidation, Michael addition, 1,3 dipolar addition, carbenes and their additions, Diels- Alder reaction.

Mechanism and applications of Mannich, Stobbe, Darzen Glycidic ester condensation. Benzoin condensation, Peterson olefination (Silyl Wittig reaction), Strecker synthesis, Wittig, Wittig - Horner, Perkin, Thorpe, Ritter, Prins reactions.

UNIT II Molecular Rearrangements (15 Hours)

A detailed study of the mechanism of the following rearrangements. Wagner – Meerwin, Demyanov, Dienone- Phenol, Favorski, Baeyer – Villiger, Wolff, Stevens, Von – Richter, Beckmann, Hydroperoxide, Smiles, Jacobsen, Hofmann - Martius rearrangements (a few examples in each rearrangement are to be studied).

UNIT III Oxidation and Reduction Reactions (15 Hours)

Study of the following oxidation reactions with mechanism: Oxidation of alcohols by CrO_3, DMSO alone, DMSO in combination with DCC; acetic anhydride and oxalyl chloride, oxidation of arylmethane, oxidation of methylene alpha to carbonyl, allylic oxidation of olefins, oxidative cleavage of glycols, oxidative cleavage of double bonds by ozonolysis.

Study of the following reduction reactions with mechanism; Reduction of carbonyl compounds by complex metal hydrides (LAH, $NaBH_4$, $NaBH_3CN$), clemmensen and Wolff Kishner reductions, Birch reduction, MPV reduction.

UNIT IV Steroids (15 Hours)

Structure and Stereochemistry of Cholesterol. Total synthesis of Cholesterol and oestrone. Reactions of Oestrone, Conversion of cholesterol into progesterone, testosterone and oestrone. Artificial hormones – Stilboestrol and Hexoestrol.

UNIT V ORD, CD and Mass Spectrometry (15 Hours)

ORD-CD: Definition, deduction of absolute configuration, octant rule for ketones, Cotton effect-axial haloketone rule.

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

TEXT BOOKS

1. Jerry March, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, Fourth Edition, John Wiley & Sons (1992)
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. I.L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian reprint, Pearson Education Asia Pte. Ltd., (2000)
5. 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,

   Edition, Macmillan, 1984.
3. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice-Hall, VI Edition, 1992.
4. Neil Issac, Physical Organic Chemistry, J. Wiley, New York, 1987.
5. Paul de Mayo, Molecular Rearrangements, Vol I, Vol II, Interscience, NY. 1963.
6. S.W. Pelletier, Van Nostrand, Chemistry of Alkaloids, Reinhold, 1970.
7. Hendry, The Plant Alkaloids, Churchill Publishers, IV Edn., 1949.
8. Fisher and Fisher, Steroids, Reinhold, 1959.
9. O.P. Agarwal, Chemistry of Organic Natural Products, Vol I & II, Goel Publishing House, 1988.

M.Sc. ORGANIC CHEMISTRY

SEMESTER III

CORE VIII - ORGANIC CHEMISTRY – IV

[75 Hours]

UNIT I Carbohydrates (15 Hours)

Introduction, definition and classification; Monosaccharides – configuration of aldotrioses, aldotetroses, aldopentoses, aldohexoses, Ketohexoses; Deoxy – sugars; Ring structure of monosaccharides; mutarotation; a brief introduction on the structure of disaccharides (sucrose and maltose as representative examples) and polysaccharides (starch, cellulose and cyclodextrins as representative examples).

UNIT II Vitamin (15 Hours)

Structure and synthesis of the following : Retinol, thiamine, riboflavin, pyridoxine, pantothenic acid, ascorbic acid, tocopherols, vitamin K and cyanocobalamine.

UNIT III Name Reactions (15 Hours)

A study of the following reactions: Dieckmann cyclization, Shapiro reaction, Stork enamine, Barton and ene reactions; Sharpless asymmetric epoxidation, Robinson annulation; Grignard reactions, Duff reactions, Simmons Smith reaction, Chichibabin reaction, Hoffmann – Loffler – Freytag reaction.

UNIT IV Green Chemistry I (15 Hours)

Introduction –Need for green chemistry – twelve principles of green chemistry - Designing a green synthesis: Green starting materials, green reagents, green solvents and reaction conditions, green catalysts. Use of the following in green synthesis with suitable examples:

a) Green reagents: dimethylcarbonate, polymer supported reagents.

b) Green catalysts: Acid catalysts, oxidation catalysts, basic catalysts, phase transfer catalysts, crown ethers, biocatalysts.

c) Green solvents: water, ionic liquids, supercritical carbon dioxide.

d) Solid state reactions: solid phase synthesis, solid supported synthesis

UNIT Green Chemistry II (15 Hours)

Microwave assisted synthesis: Microwave equipment, activation-benefits, limitations, microwave effects. Reactions in water, reactions in organic solvents, solvent free reactions. Michael addition in aqueous medium and solid state.

Ultrasound assisted reactions- Reformatsky reaction and Strecker synthesis.

Comparison of traditional processes versus green processes in the syntheses of ibuprofen, adipic acid, 4-aminodiphenylamine, p-bromotoluene and benzimidazole.

TEXT BOOKS

1. L. Finar, Organic Chemistry, Vol II, 5th Edn. Pearson Education Asian Pvt. Ltd. 2000.
2. Atta-Ur-Rahman and M.I. Choudhary, New Trends in Natural Product Chemistry, Gordon & Breach Science Publishers, I Edn., 1998.
3. Jerry March, Advanced Organic Chemistry Reactions, Mechanisms and Structure, 4th Edition, John Wiley & Sons, 1992.
4. G. Chatwal, Organic Chemistry of Natural Products, Vol I & II, Himalaya Publishing House, 1988.
5. Organic reaction mechanisms, K. Ahluvalia, R.K. Parashar, Narosa Publishing House.
6. Ahluwalia, Kidwai New Trendr in Green Chemistry, Second Edition- Ariamage Publishers, New Delhi

REFERENCE BOOKS:

1. O.P. Agarwal, Chemistry of Organic Natural Products, Vol I & II, Goel Publishing House, 1988
2. S.M. Mukherji and S.P. Singh, Reaction Mechanism in Organic Chemistry, III Edn, 1984. Macmillan.

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

UNIT I UV – VIS **(15 Hours)**

UV – VIS: Laws of light absorption – chromophores and auxochromes – types of electronic transitions – bathochromic, hypsochromic, hypochromic and hyperchromic effects; Applications of UV – VIS spectroscopy – use of model compounds and additivity – dienes, polyenes and α, β – unsaturated carbonyl compounds – Woodward – Fieser rules – Calculation of λmax for organic molecules; absorption spectra of polynes, polynes and aromatic compounds; stereochemical factors in electronic spectroscopy; charge transfer complexes.

UNIT II IR and Raman **(15 Hours)**

IR : Molecular vibrations – stretching and bending vibrations, Hooks law – Overtone and combination bands; Factors influencing vibrational frequencies – effect of substituents, conjugation, distortion, geometry, hydrogen bonding – Fermi resonance; Characteristic group frequencies of organic molecules; interpretation of IR spectra of organic molecules.

Raman : Theory, application of Raman spectra to organic, inorganic and biological species, quantitative applications, Resonance Raman spectroscopy.

UNIT III ^{1}H NMR **(15 Hours)**

Origin – relaxation and saturation; Chemical shift, factors influencing chemical shift; magnetic equivalence – homotopic, enantiotopic and diastereotopic protons; spin – spin coupling – Criteria for first order and non – first order spectra – representation of non-equivalent hydrogens by alphabets; geminal, vicinal and long range couplings – Karplus equation – NMR of simple AX and AMX type organic molecules, identification of H in various chemical environments to assign structure to the organic molecules using chemical shift values and coupling.

Simplification of spectra – high fields, deuterium exchange, shift reagents – satellite spectra – multiple resonance – spin decoupling, spin tickling and INDOR.

UNIT IV ^{13}C NMR **(15 Hours)**

^{13}C NMR : Distinction between 1H and 13C NMR – theory and experiment – factors affecting intensity of signals – Nuclear Overhauser effect – chemical shift and its dependence on polar and steric effects (gamma gauche effect); additivity relationships - C-C and C-H couplings – off resonance, gated and single frequency decouplings – relationship between coupling constant and 's' character; effect of shift reagents on 13C chemical shifts; applications of 13C NMR to find the different carbon functional groups.

UNIT ESR and conjoined problems **(15 Hours)**

ESR Spectroscopy; Basic principles, zero field splitting and Kramer's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants. Applications of ESR spectroscopy.

Conjoined problems: Structural elucidation of organic compounds using a combination of all the above spectral methods – a problem solving approach.

TEXT BOOKS

1. William Kemp, Organic Spectroscopy, ELBS II Edition, Spectroscopy of organic compounds.
2. P.S. Kalsi, Organic Spectroscopy, Wiley Eastern Ltd, Madras.
3. R.M. Silverstein, C.G. Bassler and Monsil, Spectrometric identification of organic compounds, John Wiley & Sons, New York.
4. Donald L.Pavia & Gary M Lampman, Introduction to Spectroscopy, Cengage Learning India Pvt Ltd, New Delhi, 5th Edition.

REFERENCE BOOKS:

1. J. Dyer, Application of absorption spectroscopy of organic compounds, Prentice Hall of India Pvt. Ltd., New Delhi.
2. W.Kemp, NMR in Chemistry, MacMillan Ltd, 1986.
3. J.B. Lambert, H.F. Shunnel, L. Verbit, R.G. Cooks and G.H. Stout, Organic structural analysis, MacMillan, 1976.
4. G.C. Levy and G.L. Nelson, Carbon – 13 Nuclear Magnetic Resonance for organic chemists, Wiley – Interscience, 1972.
5. R.J. Abraham and P. Loftus, Proton and carbon – 13 spectroscopy, Heydon & Sons., 1978.
6. D.H. Williams and I.Fleming, Spectroscopic methods in organic chemistry, Tata McGraw Hill, 4th Edition, 1988.

M.Sc. ORGANIC CHEMISTRY
SEMESTER III
ELECTIVE PAPER - III
INSTRUMENTAL METHODS OF ANALYSIS
[75Hours]

UNIT I Absorption, Emission and Reflection Spectroscopy (15 Hours)

Absorption spectrometry – Beer Lamberts law; Principles of UV visible spectroscopy – photometric titrations; Principles and applications of Fluorimetry, turbidimetry and nephelometry.

Flame PhotometrAy – Theory, instrumentation and a few important applications; Atomic absorption spectroscopy (AAS) – Theory, instrumentation and applications; Atomic fluorescence.

UNIT II Thermal and Magnetic Methods of Analysis (15 Hours)

DTA/DSC – Principle and instrumentation, Different techniques. Application to organic and inorganic compounds.

TGA – Principle, instrumentation of TGA curves, Application to organic and inorganic compounds.

Magneto chemical Analysis – Magnetic susceptibility and its measurements, Guoy's, Quink's curie's, and Ranking's balances. Application to simple compounds and ranking's transition metal complexes, Lanthanides and Actinides.

UNIT III Characterisation of Nanoscale Materials (15 Hours)

Principles and instumentation of Atomic Force Microscopy (AFM) – Transmission Electron Microscopy(TEM) Resolution and Scanning Transmission Electron Microscopy (STEM) – Scanning Tunneling Microscopy (STM) – Scanning Nearfield Optical Microscopy (SNOM). Scanning ion conductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

UNIT IV Polarography and Amperometry (15 Hours)

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

Amperometric titrations – Theory, apparatus, types of titration curves, successive titrations and two indicator electrodes – applications.

UNIT Chromatography (15 Hours)

Principle, method and applications of column and thin layer chromatographies; Gas liquid chromatography – principle, retention time values, instrumentation, carrier gas, column, detectors – thermal conductivity, flame ionization and electron capture; few applications of GLC; HPLC – theory, instrumentation and applications.

TEXT BOOKS

1. Williard, Merit, Dean and Settle, Instrumental Methods of Analysis, CBS Publishers and Distributors, IV Edn. 1986.
2. Skoog, Holler, Nieman, Principles of Instrumental Analysis, Thomson Asia Pvt Ltd., Singapore. 2004.
3. D.A. Skoog, Principles of Instrumental Analysis, Saunders College Pub. Co, III Edn., 1985.
4. A.I. Vogel, Text Book of Quantitative Inorganic Analysis. ELBS III Edn, 1987.
5. J.O.M. Bockris and AKN Reddy, Modern Electrochemistry, Plenum, 1970.
6. D.A. Skoog and D.M.West, Fundamentals of Analytical Chemistry, Holt Rinehart and Winston Publications, IV Edn, 2004.
7. W.Kemp, NMR in Chemistry, MacMillan Ltd, 1986.
8. Kenneth.klabunde, Nanoscale Materials in Chemistry, John Wiley & Sons, Inc.2002
9. Mark Ratner,Daniel Ratner, Nanotechnology,Pearson Education,Inc.2007

REFERENCE BOOKS:

1. Albert Paul Malvino, Electronic Principles, PMH Publishers, III Edn, 1984.
2. J.G. Dick, Analytical Chemistry, McGraw Hill Publishers, 1974.
3. G.W. Ewing, Instrumental Methods of Chemical Analysis, McGraw Hill Pub, 1975.
4. B.H. Vassos and G.W. Ewing, Electroanalytical Chemistry, John Wiley and Sons, NY, 1983.
5. R. Greef, R.Peat, L.M. Peter, D. Pletcher and J.Robinson, Instrumental methods in Electrochemistry, Ellis Horwood, Chichester, 1985.
6. A.J. Bard and L.R. Faulkner, Electrochemical methods; Fundamentals and applications, J. Wiley and Sons, NY, 1980.

M.Sc. ORGANIC CHEMISTRY
SEMESTER IV
CORE IX - ORGANIC CHEMISTRY V
(Heterocyclic Compounds and Biomolecules) [75 Hours]

UNIT I Five membered heterocyclics with two hetero atoms (15 Hours)

Synthesis, reactivity, aromatic character and importance of the following heterocycles:

Pyrazole, imidazole, oxazole, thiazole, isoxazole, isothiazole

Heterocyclics with two or more hetero atoms

Six Membered heterocycles with two or more heteroatoms: Synthesis and reactions of diazines (pyridazine, pyrimidine & pyrazine)

Synthesis and importance of purines and pteridines: Syntheis of Caffeine, theobromine and theophylline.

UNIT II Retro synthesis (15 Hours)

Retro synthetic analysis – definition; synthon approach – synthetic equivalent, reagent, functional group interconversions; Linear and convergent method in organic synthesis; Disconnection approach – one group disconnection; retro synthesis of alcohols; retro Diels – Alder reaction; retro synthesis of olefins, aliphatic and aromatic ketones; protective groups in organic synthesis.

UNIT III Terpenoids and Carotenoids (15 Hours)

Terpenoids: Isoprene rule – special isoprene rule, classification of terpenoids with few examples. Structural elucidation and synthesis of menthol, abietic acid, squalene and phytol.

Carotenoids: Synthesis of α – carotene, β – carotene, Vitamin A1 and Vitamin A2.

UNIT IV Polarography and Amperometry (15 Hours)

Peptides– Peptide linkage –proteins-classification, structure, conformation and properties. Synthesis of peptides by Merrifield solid phase synthesis. Primary Structure of proteins - sequence determination, structure of oxytocin – secondary and tertiary structure of proteins.

UNIT Chromatography (15 Hours)

Nucleotides, nucleosides and heterocyclic bases-Chemical synthesis of nucleosides and nucleotides. Primary, secondary and tertiary structure of DNA. Types of RNA-mRNA, tRNA and rRNA. Replication, transcription and translation- Genetic code.

TEXT BOOKS

1. I. L. Finar, Organic Chemistry, Volume II, Fifth Edition, First Indian Reprint, Pearson Education Asia Pvt Ltd., 2000.
2. G. Chatwal, Organic Chemistry of Natural Products, Vol. I & II, Himalaya Publishing House, 1988.
3. Atta – Ur – Rahman and M.I. Choudhary, New Trends in Natural Product chemistry, Gordon & Breach Science Publishers, I Edn. 1998.

REFERENCE BOOKS:

1. O.P. Agarwal, Chemistry of Organic Natural Products, Vol I & II, Goel Publishing House, 1988.
2. Fisher and Fisher, Steroids, Reinhold, 1959.
3. R.M. Acheson, Introduction to Chemistry of Heterocyclic Compounds, 2nd Edition, Interscience Publishers, 1967.
4. J.A. Joule and G.F. Smith, Heterocyclic Chemistry, Van Notrand Reishord Co., London, 1978.

M.Sc. ORGANIC CHEMISTRY
SEMESTER IV
ELECTIVE PAPER - IV
INDUSTRIAL AND MEDICINAL ORGANIC CHEMISTRY [75 Hours]

UNIT I 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 – C2H4, C2H2, C6H6 and LPG.

Manufacture and uses of acetaldehyde, acetic acid, formaldehyde, ethylene glycol, 1,3-butadiene, styrene; chemical processing of aromatic hydrocarbons.

UNIT II Paints and Dyes (15 Hours)

Paints : Compositions – pigments, binders, extender, thinner and surface active agents; functions of the ingredients; Paint formulations; Importance of PVC, alkyds, epoxy and polyurethane resins.

Dyes: Colour and chemical constitutions; classification; brightening agents; cyanine dyes; chemistry of colour developer – instant colour processes; synthesis and applications of congo red, crystal violet, malachite green and Rhodamine B.

UNIT III Antibiotics Analgesics and Antiseptics (15 Hours)

Antibiotics – synthesis, assay and structure and uses of penicilline, chloramphenicol and tetracyclines. Sulphonamides – mechanism and action of sulpha drugs, preparation and uses of sulphadiazine, sulphapyridine, sulphathiazole and sulphafurazole.

Narcotic analgesics – isolation, pharmacological action and uses of morphine, heroin and codeine; Synthetic analgesics – pethidine and methodone; Antipyretic analgesics – synthesis and structure and action of methyl salicylate, aspirin, paracetamol and phenacetin; Antiseptics and disinfectants – phenol as disinfectant and phenol coefficient; dyes and organo mercurials and cationic surfactants.

UNIT IV Anaesthetics, Tranquilisers and Antineoplastics (15 Hours)

Anaesthetics – classification as general, local and intravenous anaesthetics, chemistry of anaesthetic ether, nitrous oxide, halothane, chloroform, thiopental sodium methohexitone, cocaine and benzocaine, Alkaloids – detection of alkaloids, colour reagents; Isolation, colour reaction and SAR of quinine; Tranquilisers, hypnotics and sedatives; Antineoplastic and hypoglycemic agents – detection of sugar and serum in urine; cause and control of diabetes; Oral hypoglycemic agents; causes and control of cancer; Preparation and uses of thiotepa and cyclophosphoramide.

UNIT V Organic Pharmaceutical Aids and Blood Chemistry (15 Hours)

Nucleotides, nucleosides and heterocyclic bases-Chemical synthesis of nucleosides and nucleotides. Primary, secondary and tertiary structure of DNA. Types of RNA-mRNA, tRNA and rRNA. Replication, transcription and translation- Genetic code.

TEXT BOOKS

1. T.C. Daniels and E.C. Jorgensen, Text book of organic medicinal and pharmaceutical chemistry, J.B. Lippincott, Philadelphia, 1977.
2. Ashutosh Kar, Medicinal Chemistry, New Age International, 1996.
3. B.K. Sharma, Industrial Chemistry, Goel Publications, Meerut, 1992.

REFERENCE BOOKS:

1. M. Gordon, Psychopharmacological agents, Academic press, New York, 1965.
2. J.M. Ritchie and P.J. Cohen, The pharmacological basis of therapautics, 5th Edn., Macmillan, New York, 1975.
3. D. Lednicer and L.A. Mitscher, Organic Chemistry of drug synthesis, John Wiley & Sons, New York, 1959.
4. J.E. Hoover, Remington's Pharmaceutical sciences, 15th Edn. Mack Publ. Company, Easton, 1975.
5. B.N. Chakrabarthy, Industrial Chemistry, Oxford and IBH, New Delhi, 1981.
6. M.G. Arora and M. Singh, Industrial Chemistry, Anmol Publications, I edition, 1994.
7. K.Venkataraman, The Chemistry of synthetic dyes, Part I & II, Academic Press, New York, 1952.
8. V.A. Shenai, Introduction to Chemistry of Dyestuffs, Sevak Prakashan Pub., Mumbai, 1991.

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

ORGANIC CHEMISTRY PRACTICAL II

I. ORGANIC ESTIMATION

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

II. ORGANIC PREPARATION INVOLVING TWO STAGES

1. Sym-tribromobenzene from aniline.
2. m- Nitrobenzoic acid from methyl benzoate
3. para – Nitroaniline from acetanilide.
4. Benzanilide from benzophenone.
5. Aspirin from methyl salicylate
6. Anthraquinone from phthalic anhydride.

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 CHEMISTRY
SEMESTER IV
CORE PRACTICAL - V

ORGANIC CHEMISTRY PRACTICAL III

1) ESTIMATION OF THE FOLLOWING:

1.Hydroxyl group

2. Amino group

3. Amide group

4. Glycin

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

ORGANIC CHEMISTRY PRACTICAL IV

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. Arun Sethi, Lab experiments in organic chemistry, New Age International Publishers.