

Bajaj College of Science, Wardha (Autonomous College)

SUBJECT: CHEMISTRY

Syllabus of M.Sc. II/Semester IV (WEF 2022-23)

Course Code: PG-CHEM(02)-S4-T1-SP1

Paper-XIII : Special I-Organic Chemistry [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit-I

15L

A] Carbanions in organic Chemistry

Ionization of carbon hydrogen bond and prototypy, Base and acid catalysed halogenation of ketones, keto-enol equilibria, structure and rate in enolisation, concerted and carbanion mechanism for tautomerism, geometry of carbanions, kinetic and thermodynamic control in the generation of enolates, LDA, hydrolysis of haloforms, use of malonic and acetoacetic esters, Aldol, Mannich, Cannizzaro, Darzens, Dieckmann, Claisen Baylis-Hillman reactions, Knoevenagel, benzoin condensation, Julia olefination, alkylation of enolates and stereochemistry thereof, Conjugate additions, enamines in organic synthesis

B] Organometallic reagents -I

Synthesis and applications of organo Li and Mg reagents, nucleophilic addition to aldehyde, ketones, ester, epoxide, CO₂, CS₂, isocyanates, ketenes, imines, amides, lactones, Stereochemistry of Grignard addition to carbonyl compounds, *o*-metallation of arenes using organolithium compounds.

Unit-II

15L

A] Organometallic reagents-II

Organozinc reagents: Preparation and applications, Reformatsky reaction, Simon-Smith reaction. Organocopper reagents: Preparation and applications in C-C bond forming reaction, mixed organocuprates, Gilman's reagent. Organo Hg and Cd reagents in organic synthesis.

B] Transition metals in organic synthesis: Transition metal complexes in organic synthesis- Introduction-oxidation states of transition metals, 16-18 rule, dissociation, association, insertion, oxidative addition, reductive elimination of transition metal.

Organopalladium in organic synthesis-Heck reaction, carbonylation, Wacker oxidation, coupling reactions: Kumada Reaction, Stille coupling, Sonogashira, Negishi and Suzuki coupling reactions and their importance

Applications of Co₂(CO)₈, Ni(CO)₄, Fe(CO)₅ in organic synthesis. Wilkinson catalyst of Ruthenium and Rhodium – synthesis and uses its use in hydrogenation reactions-deallylation, C-C, C-O, C-N bond cleavages. Olefin metathesis by Ist and IInd generation catalyst, reaction mechanism and application in the synthesis of homo and heterocyclic compounds.

Unit-III

15L

A] Advanced Stereochemistry: Conformation of sugars, monosaccharides, disaccharides, mutarotation, Recapitulation of Stereochemical concepts- enantiomers, diastereomers, homotopic and heterotopic ligands, Chemo-, regio-, diastereo- and enantio-controlled approaches; Chirality transfer, Stereoselective addition of nucleophiles to carbonyl group: Re-Si face concepts, Cram's rule, Felkin Anh rule, Houk model, Cram's chelate model. Asymmetric synthesis use of chiral auxiliaries, asymmetric hydrogenation, asymmetric epoxidation and asymmetric dihydroxylation.

B] Protection and Deprotection of functional groups: Protection and deprotection of

functional groups like, hydroxyl, amino, carbonyl and carboxylic acids groups, Solid phase peptide synthesis.

Unit-IV: Designing the synthesis based on retrosynthetic analysis **15L**

A) Disconnection Approach: An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclisation reactions, amine synthesis.

B) One Group C-C Disconnections: Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.

Two Group C-C Disconnections: Diels-Alder reaction, 1,3-difunctionalised compounds, α,β -unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds, Michael addition and Robinson annulation, Methods of ring synthesis, Linear and convergent synthesis.

Reference books:

- 1] Principle of Organic Synthesis R. O. C. Norman and J. M. Coxon
- 2] Modern Synthetic Reaction. H. O. House and W. A. Benjamin
- 3] Organic Synthesis: The Disconnection Approach-S. Warren
- 4] Designing Organic Synthesis-S. Warren
- 5] Some Modern Methods of Organic Synthesis-W. Carruthers
- 6] Advance Organic Reaction. Mechanism and Structure-Jerry March
- 7] Advance Organic Chemistry Part-B-F. A. Caray and R. J. Sundberg Plenum Press
- 8] Organic Reaction and their Mechanism-P. S. Kalsi
- 9] Protective Groups in Organic Synthesis-T. W. Greene
- 10] The Chemistry of Organo Phosphorous-A. J. Kirby and S. G. Warren
- 11] Organo Silicon Compound-C. Eabon
- 12] Organic Synthesis via Boranes-H. C. Brown 13] Organo Borane Chemistry-T. P. Onak
- 14] Organic Chemistry of Boron-W. Gerrard

Course Code: PG-CHEM(02)-S4-T2-SP2

._Paper-XIV: Special II-Organic Chemistry [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit-I: Enzyme chemistry

15L

A] Enzymes: Introduction, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Nomenclature and classification, Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Baker's yeast catalyzed reactions

B] Mechanism of Enzyme Action: Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Enzyme mechanisms for chymotrypsin, ribonuclease, lysozyme and carboxypeptidase A.

C] Co-Enzyme Chemistry: Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD^+ , NADP^+ , FMN, FAD, lipoic acid, biotin as CO_2 carrier. Mechanisms of reactions catalyzed by the above cofactors.

Unit-II: Heterocycles

15L

A] Azoles: Structural and chemical properties; Synthesis of pyrazole, isothiazole and

isoxazole; Synthesis of imidazoles, thiazoles and oxazoles; Nucleophilic and electrophilic substitutions; Ring cleavages, Carbonyldiimidazole as coupling agent

B] Benzofused heterocycles: Synthesis of indole, benzofuran and benzo-thiophene, quinoline and isoquinoline Nucleophilic, electrophilic and radical substitutions; Addition reactions; Indole rings in biology.

C] Diazines: Structural and chemical properties; Synthesis of pyridazines, pyrimidines, pyrazines; Nucleophilic and electrophilic substitutions.

D] Synthesis of following bioactive compounds: Vitamin B₆, Ondansetron, Serotonin, Indometacin, Cyanamid, fentiazac, trimethoprim, papaverine

Unit-III

15L

A] Nucleic Acids: Primary, secondary and tertiary structure of DNA; DNA replication and heredity; Structure and function of m-RNA, t-RNA and r-RNA. Purines and pyrimidine bases of nucleic acids and their preparation.

B] Lipids: Fatty acids, essential fatty acids, structures and functions of triglycerols, glycerophospho lipids, spingolipids, lipoproteins, composition and function, role in atherosclerosis.

Properties of lipid aggregates, micells, bilayers, liposomes and their biological functions, biological membranes, fluid mosaic model of membrane structure, Lipid metabolism, β -Oxidation of fatty acids

C] Vitamins: Structure determination, and synthesis of vitamin A, E and H.

Unit-IV

15L

A] Dyes: General Introduction, classification on the basis of structure and methods of application dying mechanism, methods of dying, such as direct dying, vat dying, dispersive dying, formation of dye in fibre, dying with reactive dyes, study of quinoline yellow, cyamine dye, ethyl red, methylene blue, Alizarin, cyamine-green, fluorescein, cosin, erythrosine, Rhodomines and Indigo.

B] Pharmaceutical chemistry:

History, medical terms in pharmaceutical chemistry, classification of drugs, antibacterial and antifungal drugs, specific clinical applications, Synthesis and applications of: Benzocaine,

Methyl dopa, dilantin, ciprofloxacin, acyclovir, terfenadine, salbutamol

C] Polymer chemistry: Importance of polymers, Basic concepts: monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization: condensation, addition, radical chain-ionic and co-ordination and co-polymerization and their mechanisms, Polymerization in homogeneous and heterogeneous systems. Ziegler-Natta polymerization with mechanism, Stereo regulated polymers, syndiotactic, isotactic and atactic polymers

Reference books:

- 1] Textbook of Polymer Science, F. W. Billmeyer Jr, Wiley
- 2] Polymer Science, V. R. Gowarikar, N. V. Viswanathan and J. Sreedhar, Wiley-Eastern
- 3] Functional Monomers and Polymers, K. Takemoto, Y. Inaki and R. M. Ottanbrite
- 4] Bioorganic Chemistry: A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag
- 5] Understanding Enzymes, Trevor Palmer, Prentice Hall
- 6] Enzyme Chemistry: Impact and Applications, Ed. Collin J. Suckling, Chapman and Hall
- 7] Enzyme Structure and Mechanism, A. Fersht, W. H. Freeman
- 8] Introduction to Medicinal Chemistry, A. Gringuage, Wiley-VCH
- 9] Wilson and Gisvold's Text Book of Organic Medical and Pharmaceutical Chemistry, Ed Robert F. Dorge
- 10] Burger's Medicinal Chemistry and Drug Discovery, Vol-1, Ed. M. E. Wolff, John Wiley
- 11] Strategies for Organic Drug Synthesis and Design, D. Lednicer, John Wiley
- 12] The Organic Chemistry of Drug Design and Drug Action, R. B. Silverman, Academic Press

Course Code: PG -CHEM(02)-S4-P1

Practical -VII: Special Organic Chemistry Practical II [L-T-P = 0-0-8]

8 h per week

100 Marks

A] Quantitative Analysis based on classical and instrumental technique (any 9-10)

- 1] Estimation of nitrogen.
- 2] Estimation of halogen.
- 3] Estimation of sulphur.

Spectrophotometric/calorimetric and other instrumental methods of estimation

- 1] Estimation of streptomycin sulphate.
- 2] Estimation of vitamin B-12.
- 3] Estimation of amino acids.
- 4] Estimation of proteins.
- 5] Estimation of carbohydrates.
- 6] Estimation of Ascorbic acid.
- 7] Estimation of Aspirin.
- 8] Solvent extraction of oil from oil seeds and determination of saponification value, iodine value of the same oil.

B] Organic multi-step preparations (Two/Three steps): Minimum 10-12 preparations

- [1] Aniline → Diaminoazobenzene → p-aminoazobenzene
- [2] Benzoin → Benzyl → Dibenzyl
- [3] Aniline → acetanilide → p-bromoacetanilide → p-bromoaniline
- [4] Aniline → Acetanilide → p-nitroacetanilide → p-nitroaniline
- [5] Benzaldehyde (thiamine hydrochloride) → benzoin → benzil → benzilic acid

- [6] *p*-Nitrotoluene → *p*-nitrobenzoic acid → PABA → *p*-iodobenzoic acid
- [7] *p*-Cresol → *p*-cresylacetate → 2-hydroxy-5-methyl acetophenone → 2-hydroxy chalcone
- [8] Benzaldehyde → benzilidene acetophenone → 4,5-dihydro-1,3,5-triphenyl-1*H*-pyrazole
- [9] Aniline → phenylthiocarbamide → 2-aminobenzthiazole (Microwave in step I)
- [10] Chlorobenzene → 2,4- Dinitrochlorobenzene → 2,4- Dinitrophenylhydrazine.
- [11] Acetophenone → acetophenone phenyl hydrazone → 2-phenylindole
- [12] Benzoin → benzoin benzoate → 2,4,5-triphenyl oxazole
- [13] Benzophenone → benzpinacol → benzopinacolone (Photochemical preparation)
- [14] Benzophenone → Benzophenone oxime → Benzanilide → Benzoic acid + aniline
- [15] Aniline → aniline hydrogen sulphate → sulphanilic acid → Orange II
- [16] Aniline → N-arylglycine → indoxyl → indigo
- [17] Phthalimide → Anthranilic acid → Phenyl glycine-*o*-carboxylic acid → Indigo
- [18] Phalic anhydride → Phthalimide → Anthranilic acid → *o*-chlorobenzoic acid
- [19] Phalic anhydride → Phthalimide → Anthranilic acid → Diphenic acid
- [20] Ethyl acetoacetate → 3-methyl-pyrazol-5-one → 4,4-dibromo-3-methyl-pyrazol-5-one
Butanoic acid
- [21] Biosynthesis of ethanol from sucrose
- [22] Enzyme catalyzed reactions

[C] SPECTRAL INTERPRETATION

Structure Elucidation of organic compounds on the basis of spectral data (UV, IR, ¹H and ¹³CNMR and Mass) (Minimum 12 compounds are to be analysed during regular practicals).

Course Code: PG -CHEM(02)-S4-T3-EL2

Paper-XV: Elective II - Environmental Chemistry II [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit-I:

15 h

Thermal pollution-sources, harmful effects and prevention of thermal pollution.

Noise pollution- sources, effects and control of noise pollution.

Radioactive Pollution- Introduction to radiation chemistry, sources of radioactive pollution, effects of radioactive pollution, nuclear disasters in the two decades, protection from radiation, control of radiation.

Unit-II: Solid waste pollution

15 h

Sources, types and consequences, classification of wastes- domestic, industrial, municipal, hospital, nuclear and agricultural. Impact of solid waste on environment, human and plant health; effect of solid waste and industrial effluent discharge on water quality and aquatic life.

Solid waste Management: Different techniques used in collection, storage, transportation and disposal of solid waste (domestic, industrial and agricultural).

Unit-III:

15 h

Waste water treatment & management: Wastewater Treatment: Primary, Secondary and Advanced treatment methods. Common effluent treatment plant. Drinking water treatment, Coagulation and flocculation, Sedimentation and Filtration, Disinfection and Softening. Removal of hardness by lime-soda process, Zeolite process and synthetic ion-exchange resins. Principle, instrumentation and comparison of these three processes. Numericals based on hardness removal. Desalination of sea- water.

Unit-IV:

15 h

Soil analysis: Physical properties – texture, bulk density, permeability chemical properties—Ion exchange capacity, soil pH and micro and macro nutrient availability.

Analysis of constituents such as nitrogen, phosphorous, potassium and microconstituents (Zn and Cu)

Air pollution analysis— Sampling of aerosols and gaseous pollutants and their effects, SO₂, NO₂, CO, CO₂, particulates-SPM, RSPM, High Volume Sampler, Fabric Filters, Cyclones (direct and Reverse), ESP, ozone layer.

Reference books:

1. Water analysis : J. Rodier
2. A Text book of Inorganic Analysis : A.I.Vogel
3. Colorimetric Determination of metals : E.B.Sandell
4. Environmental Chemistry : Moore J W and Moore E A. Academic Press, New York, 1976.
5. Environment and Man Vol VII: The Chemical Environment Edited by J Lenihar and W Fleecher Vlackie Publication, 1977.
6. The Chemistry of Environment: R A Horne, Wiley Interscience Publication 1978.
7. Fundamentals of Air Pollution: A C Stern
8. Instrumental Methods of Analysis: Willard, Merrit and Dean
9. Analytical Chemistry: Meites and Thomas

10. Standard Methods for Examination of water and waste water: A E Greenberg, A D Eaton, APHA, AWWA, WEF
11. Chemistry for Environmental Engineering and Science: C N Sawyer, P L McCarty and G F Parkin
12. Laboratory Manual for the Examination of Water, waste water and soil: H H Rupa and H Krist, V C H Publication
13. Manual on Water and Waste water analysis: D S Ramteke and C A Moghe, NEERI
14. Environmental Chemistry: B K Sharma and H Kaur
15. Environmental Chemistry: A K De
16. Environmental Pollution- Management and control for sustainable Development: R K Khatoliya
17. Environmental Chemistry: A K Bhagi and G R Chatwal
18. Environmental Chemistry : P.S. Sindhu

Course Code: PG -CHEM(02)-S4-T3-EL2

Paper-XV: Elective II - Polymer Chemistry II [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit-I: Polymerization

15h

Importance, basic concepts, raw materials for polymers, concept of functionality, comparison of chain and step-growth, examples of polymerization reactions (polyadditions, polycondensations) constitution of polymers, homopolymers and copolymers, polymer architectures (graft copolymers, star-branched, hyperbranched and dendrimers), configuration and conformation of polymers, coil formation, mobility in polymers, glass transition temperature, rubber elasticity, molecular weight distribution.

Unit-II: Techniques of polymerization

15h

Techniques of polymerization-suspension, emulsion and bulk polymerization, coordination, polymerization mechanism of Ziegler Natta polymerization, stereospecific polymerization, interfacial polycondensation, mechanism of polymerization.

Unit III: Characterization of polymers

15h

Spectroscopic techniques: Fundamentals, experimental and applications to polymers of the following techniques: UV-visible spectroscopy, IR and Raman spectroscopy, Nuclear Magnetic (proton, carbon), resonance spectroscopy, NMR of polymers in the solid state, two dimensional NMR spectroscopy, pyrolysis GC-MS.

Thermal methods-TGA, DTA, DSC,

Thermomechanical and X-ray diffraction study, Block and Graft copolymers, random, block, graft co-polymers, methods of copolymerization.

Unit IV: Specific polymers

15h

A) Biomedical polymers: Contact lens, dental polymers, artificial heart, kidney and skin.

B) Inorganic polymers: Synthesis and application of silicon, phosphorous and sulphur containing polymers.

C) Coordination polymers: Synthesis and applications of coordination polymers.

D) Diene-based polymers: Polyisoprene, polybutadiene.

Reference books:

1. Textbook of polymer science: F.W. Billmayer Jr. Wiley.
2. Polymer science: V.R. Gowarikar, N. V. Viswanathan and J. Sreedhar, Wiley-Eastern.
3. Fractional monomers and polymers: K Takemoto, Y. Inaki, and R.M. Ottam Brite.
4. Contemporaty polymer chemistry: H.R. Alcock and F. W. Lambe, Prentice Hall.
5. Principles of polymer Chemistry: Flory, Cornell Univ. press.
6. Introduction to polymer chemistry: R. B. Seymour, McGraw Hill.
7. Principles of polymerization: Odian.
8. A first course in polymer chemistry: A. Strepikheyew, V. Derevistkay and G. Slonimasky, Mir Publishers, Moscow.
9. Laboratory preparation of macro chemistry: EMM effery, McGraw Hill Co.
10. A practical course in polymer chemistry: S. J. Punea , Pergamon Press.

Course Code: PG -CHEM(02)-S4-T3-EL2

Paper-XV: Elective II - Medicinal Chemistry II [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

UNIT-I: 15 h

A] Drug rules and drug acts, Overview of Intellectual property right, Indian and International framework for patent protection.

B] Statistical method: For sampling and interpretation of results, Statistic in quality control, T-Test, F-Test, Validation of analytical methods as defined proceeding USP Radio immune analysis, Investigational drugs.

C] Antidiabetic Agents- Type-I and Type-II diabetes, Insulin, thiazolidinediones, Synthesis of ciglitazone.

UNIT-II: 15 h

A] Anti-Viral agents: Introduction, viral diseases, viral replication, and transformation of cells, investigation of antiviral agents,. Chemotherapy for HIV. Synthesis of: Idoxuridine, acyclovir, amantadine and cytarabine.

B] Anti-malarial agents: Introduction, malarial parasite, and its life cycle, development of antimalarials, chemotherapy of malaria. Synthesis of: Chloroquin, primaquin, proguanil, and Quinacrine

C] Local Anti-infective drug: Introduction and general mode of action. Synthesis of sulphonamides, ciprofloxacin, norfloxacin, dapsone ,amino salicylic acid, isoniazid, ethionamide, ethambutal, econazole, griseofulvin.

UNIT-III: 15 h

A) Histamines and Antihistamic agents: Introduction, histamine H1-receptor antagonists. Inhibitors of histamine release. Synthesis of: alkyl amines, phenothiazines, piperazines derivatives.

B) Antibiotics: Introduction, β -lactam antibiotics, classification, SAR and chemical degradation of penicillin, cephalosporins-classification, tetracycline antibiotics-SAR, miscellaneous antibiotics. Synthesis of ampicillin, cephradine, methacycline, chloramphenicol.

UNIT-IV: 15 h

A)Anthelminitics and antiamoebic drugs: Introduction to Helminthiasis, Anthelminitics, drugs used in cestode infection, drugs used in trematode infection, origin of antiamoebic drug, drugs used in nematode infection. Synthesis of: Clioquinol, Iodoquinol, Haloquinol, Dichlorphen, Niclosamide.

Anti-inflammatory drugs: Introduction, etiology of inflammatory diseases. The inflammatory response, biochemical response. Synthesis of: Phenyl butazone and its derivatives, pyrazolone derivatives, pyrole and indole acetic acid derivatives.

Reference books:

1. Text book of organic medicinal chemistry-Wilson,Geswold
2. Medicinal chemistry Vol I and II-Burger
3. A textbook of pharmaceutical chemistry-Jayshree Ghosh
4. Introduction to medicinal chemistry-A Gringuadje
5. Wilson and Gisvold text book of organic medicinal and pharmaceutical chemistry-Ed. Robert F Dorge
6. An introduction to drug design-S S Pandey, and JR Demmock
7. Goodman and Gilman's pharmacological basis of therapeutics- Strategies for organic drug

- synthesis and design-D Lednicer
8. Textbook of Medicinal Chemistry- A. Kar
9. Medicinal Chemistry – D Sriram and P. Yogeeswari

Course Code: PG –CHEM(02)-S4-T4

Paper–XVI: Spectroscopy – II (Core Subject Centric) [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit I:

15 h

A] Ultraviolet and visible spectroscopy: Natural line width, line broadening, transition probability, Born-Oppenheimer approximation, rotational, vibrational and electronic energy levels. General nature of band spectra. Beer- Lambert Law, limitations, Frank-Condon principle, various electronic transitions, effect of solvent and conjugation on electronic transitions, Fiesher Woodward rules for dienes, aldehydes and ketones. Structure differentiation of organic molecules by UV Spectroscopy

B] Photoelectron spectroscopy: Basic principles, photoelectric effect, ionization process, Koopman theorem, PES and XPES, PES of simple molecules, ESCA, chemical information from ESCA, Auger electron spectroscopy.

Unit II:

A] ESR spectroscopy: Introduction, principle of ESR, ESR spectrometer, hyperfine coupling, zero field splitting, factors affecting g values, Kramer's degeneracy, application of ESR spectra to study free radicals like hydrogen, methyl radical, 1,4-semibenzoquinone, naphthalene, transition metal complexes, biological systems.

B] Mass spectrometry:

Theory, ion production (EI, CI, FD, FAB), ion analysis, ion abundance, isotopic contribution, N-rule, types of fission processes, high resolution mass spectrometry, metastable peak, molecular ion peak, McLafferty rearrangement, mass spectral fragmentation of organic compounds alkanes, alkenes, alkynes, alcohols, amines, amides, acids, aldehydes, ketones, halides, Structure determination of organic molecules by mass spectrometry, problem based on mass spectral data.

Unit III:

15 h

Nuclear magnetic Resonance Spectroscopy

15 h

Magnetic properties of nuclei, resonance condition, NMR instrumentation, chemical shift, spin spin interaction, shielding mechanism, factors affecting chemical shift, PMR spectra for different types of organic molecules, effect of deuteration, complex spin spin interaction (1st order spectra), stereochemistry, variations of coupling constant with dihedral angle, electronegativity, Karplus equation etc., classification of molecules as AX, AX₂, AMX, A₂B₂, Shift reagents. NMR studies of ¹³C, chemical shift in aliphatic, olefinic, alkyne, aromatic, heteroatomic and carbonyl compounds, ¹⁹F, ³¹P. Structure determination of organic molecules by NMR spectroscopy

Unit IV:

15 h

A] Application of NMR spectroscopy: FT-NMR, advantages of FT-NMR, two dimensional NMR spectroscopy-COSY, HETCOR, NOSEY, DEPT, INEPT, APT, INADEQUATE techniques, Nuclear overhauser effect, use of NMR in medical diagnosis

B] Problems based on structure determination of organic molecules by using NMR (^1H and ^{13}C nuclei) data, Structure elucidation using combined techniques including UV, IR, NMR and mass spectrometry (based on data and copies of the spectra)

Reference books:

- 1] Spectroscopic identification of organic compound-RM Silverstein,GC Bassler and TC Morrill, John Wally
- 2] Introduction to NMR spectroscopy-R. J. Abraham, J. Fisher and P Loftus Wiely
- 3] Application of Spectroscopy to Organic Compound-J. R. Dyer, Printice Hall
- 4] Organic Spectroscopy-William Kemp, ELBS with McMillan
- 5] Spectroscopy of Organic Molecule-PS Kalsi, Wiley, Esterna, New Delhi
- 6] Practical NMR Spectroscopy-ML Martin, JJ Delpenck, and DJ Martyin
- 7] Spectroscopic Methods in Organic Chemistry-DH Willson, I Fleming
- 8] Fundamentals of Molecular Spectroscopy-CN Banwell
- 9] Spectroscopy in Organic Chemistry-CNR Rao and JR Ferraro
- 10]Photoelectron Spectroscopy-Baber and Betteridge
- 11]Electron Spin Resonance Spectroscopy-J Wertz and JR Bolten
- 12]NMR –Basic Principle and Application-H Guntur
- 13]Interpretation of NMR spectra-Roy H Bible
- 14]Interpretation of IR spectra-NB Coulthop
- 15]Electron Spin Resonance Theory and Applications-W gordy
- 16]Mass Spectrometry Organic Chemical Applications, JH Banyon
- 17]Spectroscopy- H. Kaur

OR

Course Code: PG –CHEM(02)-S4-T4

Paper–XVI: (Foundation Course-II) Applied Analytical Chemistry–II [L-T-P = 4-0-0]

60 h (4 h per week): 15 h per unit

80 Marks

Unit-I: Water treatment

15h

Hardness of water and types of hardness. Problems due to hardness. Removal of hardness by lime- soda process, Zeolite process and synthetic ion-exchange resins. Principle, instrumentation and comparison of these three processes. Numericals based on hardness removal. Desalination of sea- water.

Unit-II: Polymer chemistry and leather analysis

15h

Polymer chemistry: Definition, classification, co-polymers, conducting polymers, determination of acid value, saponification value, iodine value, molar mass by end group analysis- amide and hydroxyl, molecular weight by viscosity method, glass transition temperature of polymers, TGA and DTA studies of polymers.

Analysis of leather: Determination of moisture, acid, free sulphur, total ash, chromic oxide in leather, tensile strength and stretch of leather.

Unit-III: Metallurgy

15h

Ores and minerals, General principles of extraction of metals from ores. Steps involved in metallurgical extraction. Purification and concentration of ores. Extraction of crude metal from concentrated ore-pyrometallurgy, hydrometallurgy and electrolytic processes. Refining of metal. Thermodynamic aspects of metallurgical processes and Ellingham diagram. Furnaces in metallurgy. Metallurgy of Cu, Ag, Au, Al and Fe.

Unit-IV: Clinical analysis**15h**

General composition of blood, Collection and storage of blood samples, Estimation of chloride, calcium, sodium, potassium and bicarbonate in blood sample. Qualitative tests for reducing sugar. Estimation of blood glucose, urea, uric acid, blood urea-nitrogen, total serum protein, serum albumin, serum creatinine, serum phosphate, serum bilirubin, serum cholesterol. Radioimmunoassay (RIA).

Reference books:

1. Textbook of polymer science: F.W. Billmeyer Jr. Wiley.
2. Polymer science: V.R. Gowarikar, N. V. Viswanathan and J. Sreedhar, Wiley-Eastern.
3. Fractional monomers and polymers: K Takemoto, Y. Inaki, and R.M. Ottam Brite.
4. Chemistry for Environmental Engineering and Science: C N Sawyer, P L McCarty and G F Parkin
5. Vogel's Text Book of Quantitative Inorganic Analysis-Bassett, Denney, Jeffery and Mendham (ELBS)
6. Analytical Chemistry: Gary D. Christian (Wiley India).
7. Instrumental Methods of Analysis: Willard, Merrit, Dean, Settle (CBS Publishers, Delhi, 1986)
8. Water analysis : J. Rodier
9. A Text book of Inorganic Analysis : A.I.Vogel

Unit-IV: Clinical analysis

15h

General composition of blood, Collection and storage of blood sample. Estimation of chloride, calcium, sodium, potassium and bicarbonate in blood sample. Qualitative tests for reducing sugar. Estimation of blood glucose, urea, uric acid, blood urea-nitrogen, total serum protein, serum albumin, serum creatinine, serum phosphate, serum bilirubin, serum cholesterol. Radioimmunoassay (RIA).

Reference books:

1. Textbook of polymer science: F.W. Billmeyer Jr. Wiley.
2. Polymer science: V.R. Gowarikar, N. V. Viswanathan and J. Sreedhar, Wiley-Eastern.
3. Fractional monomers and polymers: K Takemoto, Y. Inaki, and R.M. Ottam Brite.
4. Chemistry for Environmental Engineering and Science: C N Sawyer, P L McCarty and G F Parkin
5. Vogel's Text Book of Quantitative Inorganic Analysis-Bassett, Denney, Jeffery and Mendham (ELBS)
6. Analytical Chemistry: Gary D. Christian (Wiley India).
7. Instrumental Methods of Analysis: Willard, Merrit, Dean, Settle (CBS Publishers. Delhi, 1986)
8. Water analysis : J. Rodier
9. A Text book of Inorganic Analysis : A.I.Vogel



INCHARGE
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