

MASTER OF SCIENCES

CHEMISTRY

SYLLABUS & REGULATIONS
WITH EFFECT FROM 2024-2025

M.Sc. CHEMISTRY
P.G. Degree Programme (CBCS) Regulations-2016
Amended as per NEP-2020
(with effect from the batch admitted in the academic year 2024-25)
CHOICE BASED CREDIT SYSTEM (CBCS)



CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
SRI VENKATESWARA UNIVERSITY
Accredited by "NAAC" with A+ Grade
Tirupati, Andhra Pradesh - 517502

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF CHEMISTRY

(Revised Scheme of Instruction and Examination, Syllabus etc., (with effect from the Academic Years 2024-2025))

M.Sc., CHEMISTRY

Semester-I

Sl. no	Code	Title of the course	Hrs/ week	No. of Credits	Uni. Exams (Hour)	IA	Semester end exam	Total Marks
1.	CHE-101	Polymers and Bio-Polymers	6	4	3	20	80	100
2.	CHE-102	Organic Chemistry	6	4	3	20	80	100
3.	CHE-103	Natural Products	6	4	3	20	80	100
4.	CHE-104	Heterocyclic Chemistry Chemotherapy and Prostaglandins	6	4	3	20	80	100
5.	CHE-105	Practical - I	6	4	3	20	80	100
6.	CHE-106	Practical - II	6	4	3	20	80	100
		TOTAL	36	24		120	480	600

Semester-II

Sl. no	Code	Title of the course	Hrs/ week	No. of Credits	Uni. Exams (Hour)	IA	Semester end exam	Total Marks
1.	CHE-201	Quantitative Data, Analytical, Electro Chemical and Separation Techniques	6	4	3	20	80	100
2.	CHE-202	Organic Spectroscopy, Drug Design, Conformational Analysis, & Heterocyclic Compounds	6	4	3	20	80	100
3.	CHE-203	Organic Photochemistry, Pericyclic Reactions & Organic Synthesis	6	4	3	20	80	100
4.	CHE-204	Advanced Natural Products	6	4	3	20	80	100
5.	CHE-205	Practical - I	6	4	3	20	80	100
6.	CHE-206	Practical - II	6	4	3	20	80	100
		TOTAL	36	24		120	480	600

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**M.Sc. CHEMISTRY
Semester-I**

CHE 101: Polymers and Bio-Polymers

UNIT – 1: Polymers

Importance of polymers, Fundamentals of polymers-monomers, repeat units, degree of polymerization, linear, branched and network polymers. Classification of polymers based on molecular forces, polymerization-condensation, addition, free radical, ionic, Ziegler-Natta catalyst, co-ordination polymerization. Synthesis and applications of Nylons, vinyl polymers-polyvinyl chloride (PVC), diene polymers-buna S. phenol-formaldehyde.

UNIT – II: Polypeptides and Proteins

Methods of peptide synthesis-solid phase peptide synthesis, C- & B-terminal residue determination, Classification, properties, structure and conformation-primary, secondary, tertiary and quaternary structure.

UNIT – III: Nucleic Acids

Pyrimidine bases, Purine bases and Nucleosides-DNA, RNA-Structure and conformations, outlines of protein synthesis-replication, transcription and translation.

UNIT – IV: Enzymes

Introduction, nomenclature, classification with examples, functions and their uses.

Co-Enzymes

Pyridoxal phosphate, transamination, decarboxylation reactions of amino acids. Nicotinamide dinucleotides and flavin co-enzymes-in biological oxidation-reduction reactions.

UNIT – V: Complex Molecules

Importance, functions and synthesis of complex molecules-vitamin D, 11-oxoprogesterone.

Books Suggested:

1. A Text book of Polymer science, Billmeyer.
2. Polymer Chemistry – G. S. Mishra
3. Advanced Organic Chemistry-Reactions, Mechanism and Structure, J.March, John
4. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
5. Organic Chemistry, R.T Morrison and R.N. Boyd, Prentice – Hall.

6. Principles of Organic Synthesis, R.O.C Norman and J.M. Coxon, Blackie Academic & Professional.
7. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, New Age International.

CHE 102: ORGANIC CHEMISTRY

UNIT – I: Nature of Bonding in Organic Molecules and Aromaticity

Delocalized chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, tautomerism. Huckel's rule and the concept of aromaticity. Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, metallocenes – Ferrocene, Azulenes, Fluvenes. Annulenes, anti-Aromaticity, pseudo-aromaticity, homo-aromaticity.

UNIT-II: Stereochemistry and Conformational Analysis

Optical Isomerism: Molecular symmetry and Chirality – Stereoisomers- Classification, Configuration – *R*, *S* – nomenclature – Axial Chirality – Stereochemistry of allenes, spiranes – biphenyl derivatives and atropisomerism – Planar chirality – Ansa compounds.

Geometrical isomerism: *E*, *Z* – nomenclature – Physical and Chemical methods of determining the configuration of geometrical isomers – stereoisomerism in cyclic compounds.

Conformational Analysis: Conformations of acyclic molecules – alkenes and substituted alkanes – Compounds having intramolecular hydrogen bonding. Conformations of Cyclohexane – mono and disubstituted cyclohexanes.

UNIT- III: Reactive Intermediates

Generation, structure, stability, and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes and arynes.

UNIT-IV: Substitution Reactions

- (i) **Aliphatic Nucleophilic substitutions:** The S_N^1 , S_N^2 mechanisms. The neighbouring group mechanism, neighbouring group participation by σ and π - bonds, anchimeric assistance. Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements – primary, secondary and tertiary. The S_N^1 mechanism. Reactivity effects of substrate, attacking nucleophile leaving group and reaction medium.
- (ii) **Aromatic Nucleophilic Substitution:** The S_N^1Ar , S_N^1 and benzyne mechanisms. Reactivity- effect of substrate, structure, leaving group and attacking nucleophile. The Sommelet- Hauser and Smiles Rearrangements.
- (iii) **Elimination Reactions:** Type of elimination reactions, mechanisms, Stereochemistry and Orientation, Hoffmann and Saytzeff rules, Syn elimination versus anti-elimination, competition between elimination and substitution, factors influencing elimination and substitution reaction, dehydration, dehydrogenation, dehalogenation, decarboxylative eliminations.

UNIT-V: Addition Reactions

- (i) **Addition to Carbon – Carbon Multiple Bonds:** Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals. Region and chemoselectivity, orientation and reactivity, Hydrogenation of double bond and triple bonds, hydrogenation of aromatic rings, Hydroboration. Michael addition reaction.
- (ii) **Addition to C=O:** Cram's rule, Claisen – Schmidt, Claisen, Dieckman, Benzoin and Wittig reaction.

Books Suggested for Paper-II: Organic Chemistry

1. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg, Plenum.
3. A Guide Book to Mechanisms in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K.Ingold, Cornell University Press.
5. Organic Chemistry, R.T.Morrison and R.N.Boyd, Prentice- Hall.
6. Modern Organic Reactions, H.O.House, Benjamin.
7. Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blackie Academic & Professional.
8. Reaction mechanism in organic chemistry, P.S.Kalsi, New Age International.
9. Stereochemistry to organic compounds, E.L.Eliel and others, John Wiley.
10. Stereochemistry to organic compounds, D.Nasipuri, New Age International.
11. Stereochemistry, P.S.Kalsi, Wiley Eastern.
12. Text book of organic chemistry, Mc.Murry.
13. Textbook of Organic chemistry, T.W.Soloman.
14. Organic chemistry. Volumes I and II, I.L.Finar.
15. Organic Chemistry, Paula Yurkanis Bruice, Printice Hall.
16. Organic Chemistry, L.G.Wade, Prentice Hall.
17. Mechanism and theory in organic chemistry, Thomas S Lowry, Addison Wesley
18. Introduction to Organic Chemistry, Andrew Streitweiser and Elaton H. Heath cock, Prentice Hall.
19. Advanced Organic Chemistry, Reactions and Mechanisms, Bernard Miller.
20. Chemistry for changing times, 8th Edition, John W. Hill, Doris K. Kolb, Printice Hall.

CHE103: Natural Products

UNIT – I: Alkaloids

Occurrence, isolation, general methods of structure elucidation and physiological action, degradation, structure, stereochemistry, synthesis of Atropine, quinine and piperine.

UNIT – II: Terpenoids

Occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, and synthesis of the following representative molecules: α -Terpenol, geraniol and abietic acid.

UNIT – III: Steroids

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon, structure determination of Cholesterol and ergosterol (Synthesis not expected)

UNIT – IV: Hormones and Bile acids

Structure and synthesis of Androsterone, Estrone, α -Cholanic acid β -Cholanic acid.

UNIT – V: Flavonoids and Isoflavonoids

Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Quercetin, Daidzein, Biosynthesis of flavonoids. Acetate Pathway and Shikimic acid Pathway. Biological importance of flavonoids.

Books Suggested:

1. Natural Products: Chemistry and Biological Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Bantrophe and J.B. Harborne, Longman, Essex.
2. Organic Chemistry, Vol.2, I. L. Finar, ELBS.
3. Introduction to Flavonoids, T.A. Geissman.
4. Chemistry of Natural Products P.S. Kalsi, Kalyani Publishers.
5. The biosynthesis of secondary metabolites, R.D. Herbert, Chapman & Hall.
6. Chemistry of Organic Natural Products, O.P. Agrawal, Vols. 1 & 2, Goel Pubs.
7. Natural Products Chemistry K.B.G. Torssell, John Wiley, 1983.
8. The Biosynthesis of Secondary Metabolites, R.D. Herberet, Sec.edn, Chapman & Hall, 1984.

CHE 104 : Heterocyclic Chemistry Chemotherapy and Prostaglandins

PAPER – II

UNIT – I: Heterocycles

Nomenclature, synthesis and reactions of three membered heterocycles-oxirane, four membered heterocycles-thietane, five membered heterocycles-pyrazole and Benzofused heterocycles-Indole.

UNIT – II: Antimalarials

Chemotherapy, synthesis and activity of antimalarial drugs-quinoline group-quinine, acridine group-quinacrine and guanidine group-paludrine.

UNIT – III: Antibiotics

General characteristics, structure-activity relationships, synthesis and activity of antibiotics-Penicillin and Tetracyclins.

UNIT – IV: Vitamins

Definitions, occurrence, structural formulae and physiological functions of Vitamin A, B2, B6, Nicotinic acid.

UNIT – V: Prostaglandins

Occurrence, nomenclature, classification, physiological effects of prostaglandins, structure and synthesis of PGE1, PGE2.

Books Suggested:

1. Heterocyclic chemistry Vol. 1-3 R.R. Gupta, M. Kumar and V. Gupta, Springer Verlag.
2. Heterocyclic chemistry, R.K. Bansal, II Edition, New Age International.
3. Heterocyclic chemistry, J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
4. Heterocyclic chemistry, T.L. Gilchrist Longman Scientific Technical.
5. An introduction to the Heterocyclic compounds, R.M. Acheson, John Wiley.
6. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, Eds. Pergamon Press.
7. Vitamins – Biochemistry – Conn & Stumpf
8. 2,1 L. Finar, ELBS
9. Chemistry of Natural Products, P.S. Kalsi, Kalyani Publishers.
10. Organic Natural Products, O.P. Agarwal, Vols., 1 & 2, Geol Pubs.
11. Natural products chemistry K.B.G. Torssell, John Wiley, 1983.
12. The biosynthesis of secondary metabolites, R.D. Herbert, Second Edn, Chapman Hall 1984.

M.Sc. CHEMISTRY

Semester-II

CHE 201 : Quantitative Data, Analytical, Electro Chemical and Separation Techniques

Unit 1: STATISTICAL TREATMENT OF DATA

Definition of error and uncertainty; Types of errors; Distribution of random errors; Precision and Accuracy; Standard deviation, Relative standard deviation; Confidential limit; Statistical treatment of data – F test, T test and Q test; Method of least squares; Significant figures, uncertainty evaluation, use of spread sheets in analytical chemistry and reporting data.

UNIT-2: SOLVENT EXTRACTION AND ION EXCHANGE

A. Solvent Extraction - General introduction -factors favouring solvent extraction. Quantitative treatment of solvent extraction - Extraction reagents. Applications:

- (1). Determination of ferric ion as chloride.
- (2). Determination of Molybdenum by thiocyanate method.
- (3). Determination of silver by extraction as its ion association complex with 1,10-phenanthroline and pyrogallol red.

B. Ion exchange chromatography

General introduction. Action of ion exchange resins. Ion exchange chromatography. Ion exchange equilibria. Ion exchange capacity and its determination. Applications :

- (1). Determination of the total cation concentration in water.
- (2). Separation of the fluoride with the aid of cation exchanger.
- (3). Separation of Cl^- and Br^- using anion exchanger

UNIT-3: CHROMATOGRAPHIC METHODS

Introduction, Definitions, Classifications in Chromatography.

A. Adsorption column chromatography: Types of columns, Experimental requirements, Development of column, Factors affecting column efficiency, Applications and experiments , Separation of (1) Methylene Blue and malachite green ; (2) Metal ions and ; (3) Chlorophylls and carotenoids.

B. Paper Chromatography :Theory, Principles and techniques. Development of chromatogram (Ascending and Descending), Two dimensional and Multi dimensional paper Chromatography, Measurement of R_f values, Applications and experiments , Separation of : (1) Amino acids (2) Cations and (3) Complexes.

C. Thin layer Chromatography : Preparation and development of plates. Advantages of TLC, Applications and Experiments – Separation of : (1) Ink Pigments (2) Dyes and (3) Amino acids. High Performance , Thin Layer Chromatography (HPTLC), Features and Applications.

D. Gas Chromatography: Principles and theory, Instrumentation – Columns and detectors, Types of chromatograms. Analysis of elution peaks, Applications in qualitative and quantitative analysis.

E. High Performance Liquid Chromatography: Introduction, characteristic features of HPLC, comparison of super critical fluid, fluid chromatography with HPLC and GLC; Principle of HPLC, Instrumentation; Components, Types of detectors. Applications HPLC on the separation of inorganic, Organic and Pharmaceutical compounds.

UNIT-4. ELECTROANALYTICAL TECHNIQUES

A. Polarography: Principle, Advantages of Dropping Mercury Electrode, diffusion current, migration current, half wave potential, ilkovic equation, reversible and irreversible polarographic processes, Quantitative polarographic analysis

B. Amperometric titrations: Principle – Determination of lead using oxalic acid titration curves, Determination of nickel using dimethylglyoxime

C. Cyclic Voltammetry: Principle, Randles-Sevcik equation (only statement and no derivation), Criteria for the cyclic voltammograms for reversible, irreversible, quasi-reversible waves, Identification of intermediates in organic reactions using cyclic voltammetry.

UNIT – 5 : ANALYTICAL SPECTROSCOPY

(a) Spectrophotometry, Beer -Lambert law, Method of analysis and applications - examples

(b) Spectrofluorimetry -Basics of the Method and Applications -Examples

(c) Flame photometry and Flame Emission Spectroscopy, Principles, Types of flames and types of burners. Types of instruments used, flame photometer and experimental technique, Interferences: chemical reactions in flames. Dissociation equilibria, ionization in flames, use of organic solvents. Applications, advantages & disadvantages, limitations. –Example of Water analysis

(d) Atomic Absorption Spectroscopy, Introduction, Principles, relation between flame emission and atomic absorption. Instrumentation, Interferences, background correction, Applications.

CHE 202 : ORGANIC SPECTROSCOPY, DRUG DESIGN, CONFORMATIONAL ANALYSIS, & HETEROCYCLIC COMPOUNDS

UNIT - 1: ^{13}C - NMR SPECTROSCOPY

^{13}C NMR – Spectroscopy – CW and PFT techniques. Types of CMR spectra—undecoupled proton decoupled. Off-resonance decoupled (SFORD): ^{13}C -chemical shifts, factors affecting the chemical shifts Homonuclear ($^{13}\text{C} - ^{13}\text{C}$ J), and heteronuclear ($^{13}\text{C}-^1\text{H}$, $^{13}\text{C}-^2\text{H}$) couplings. Applications of ^{13}C -NMR Spectroscopy in confirmation of structure and stereochemistry of organic molecules and in determining the reaction mechanism and dynamic processes of organic reactions – examples. Multipulse techniques : HOMO and HETERO – 2D–J– resolved spectra. Explanation of the principle, application to structure elucidation of simple organic molecules.

UNIT - 2: APPLICATIONS OF MASS SPECTROMETRY AND OPTICAL ROTATORY DISPERSION

Mass Spectroscopy : Basic principles-instrumentation-magnetic sector instruments. Ion production electron impact ionization –chemical ionization. Mass spectra-Molecular ion –types of ions in mass spectra. Effect of isotopes on mass spectra. Mc Lafferty rearrangement. Ortho effect – Meta stable ions. Nitrogen rule. General fragmentation modes. Mass spectral fragmentation of some classes of organic compounds.

Optical Rotatory Dispersion : Optical rotation. Circular birefringence, circular dichroism and cotton effect. Plain curves and anomalous curves and their applications. Axial halo keto rule and octant rule. Application to the study of configuration and conformations of organic molecules.

UNIT-3: DRUG DESIGN

Introduction to drug discovery. Drug discovery without lead – serendipity – Pencillins as example. Lead discovery – random and non-random screening of natural products – medical folklore, synthetic banks. Existing drugs from natural ligand or modular combinatorial synthesis. Computer aided designing (introductory treatment only). Drug metabolism studies – Phase I and Phase II metabolism. Clinical observations. Phase – I, Phase – II, Phase – III and Phase – IV trials (introductory treatment only).

Principle of drug design against agonist, antagonist drugs.

UNIT-4: CONFORMATIONAL ANALYSIS

Introduction to conformational isomerism and the concept of dynamic stereochemistry. Study of conformations in ethane and 1,2-disubstituted ethane derivatives like butane, dihalobutanes, halohydrin, ethylene glycol, butane-2,3-diol, amino alcohols and 1,1,2,2-tetrahydrobutanes. Klyne-Prelog terminology for conformers and torsion angles. Conformations of unsaturated acyclic compounds (1-butene, propionaldehyde and butanone). Conformational diastereoisomers and conformational enantiomers. Factors affecting the conformational stability and conformational equilibrium-attractive and repulsive interactions. Use of physical and spectral methods in conformational analysis. Conformation effects on the stability and reactivity of acyclic diastereoisomers-steric and stereo electronic factors-examples. Conformation and reactivity: The Winstein-Holness equation and the Curtin-Hammett principle. Conformations of cyclohexanes, mono and di substituted cyclohexanes. Stereochemistry of decalins. Factors governing the reactivity of axial and equatorial substituents in cyclohexanes. Stereochemistry of addition to the carbonyl group of rigid cyclohexane ring.

UNIT -5: HETEROCYCLIC COMPOUNDS

Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Synthesis and reactivity of Pyridine, Quinoline, Isoquinoline, Indole, Benzofuran, Benzothiophene, Pyrazole, Thiazole, Oxazole and Pyrimidine.

CHE 203 : ORGANIC PHOTOCHEMISTRY, PERICYCLIC REACTIONS & ORGANIC SYNTHESIS

UNIT - I: Organic Photochemistry

Organic Photochemistry: Molecular orbitals, carbonyl chromophore-triplet states, Jablonski diagram, inter-system crossing. Energy transfer. Energies properties and reaction of singlet and triplet states of and transitions.

Photochemical Reactions: Photoreduction, Paterno-Buchi reaction, Norrish type I cleavage and Norrish type II cleavage, Photo Fries rearrangement. Photochemistry of unsaturated systems – Olefins, cis-trans isomerisation and dimerisation. Photochemistry of 1,3-butadienes.

UNIT - II: Pericyclic Reactions

Characteristics-Types of pericyclic reactions-Electrocyclic, cycloaddition-cycloreversion and sigmatropic reactions-examples. $4n$ and $4n+2$ electron type-stereo specificity. Theories involved in understanding pericyclic reactions-

- Frontier Molecular Orbital theory concept-Woodward-Hoffmann selection rules for electrocyclic, cycloaddition-cycloreversion and sigmatropic reactions based on FMO approach.
- Conservation of Molecular Orbital theory concept-Framing of Woodward-Hoffmann selection rules for electrocyclic, cycloaddition and cycloreversions based on conservation of Molecular Orbital approach.
- Aromatic Transition state theory-concept-Woodward-Hoffmann selection rules for electrocyclic reactions, cycloaddition-cycloreversions and sigmatropic reactions based on ATS aromatic transition state (Huckel-Mobius) approach.

UNIT-III: Synthetic Strategies and Protecting Groups

Introduction to organic synthesis. Disconnection approach – examples – Terminology – Definition of target molecule, functional group interconversion (FGI), disconnection product, disconnection, synthons, reagents and retrosynthesis. Linear and convergent synthesis. Importance of order of events in organic synthesis – examples. Synthesis of Benzocaine, paracetamol, (+) – disparlure. Principles of Protection of alcohols, carboxylic acids, amines and carbonyl groups

UNIT IV: Reagents of Synthetic Importance (Oxidations and Reductions)

- Oxidations:** (i) Alcohols to carbonyls : Cr(VI) oxidants, Swern oxidation, Silver Carbonate. (ii) Prevost and Woodward oxidation. (iii) Oxidations of allylic and benzylic C-H bonds: DDQ and SeO_2 .
- Reductions:** (i) Catalytic hydrogenation. (ii) Homogeneous hydrogenation-Use of Wilkinsons catalyst. (iii) Dissolving metal reductions including Birch reduction. (iv) Nucleophilic metal hydrides : LiAlH_4 , NaBH_4 . Electrophilic metal hydrides: BH_3 , AlH_3 . (v) Hydrogenolysis-use of tri-n-butyltin hydride.

(c) **Organometallic Reagents:** Preparation and application of the following in organic synthesis: (a) Grignard reagents, Organo Lithium and Organo copper reagents.

UNIT -V: Asymmetric Synthesis

Introduction and terminology : Topicity in molecules Homotopic, stereoheterotopic (enantiotopic and diastereotopic) groups and faces – symmetry, substitution and addition criteria.

Prochirality nomenclature : Pro-R Pro-S, Re and Si. Methodology of asymmetric synthesis-1.

1. Substrate controlled asymmetric synthesis : Nucleophilic addition to chiral carbonyl compounds. 1,2-asymmetric induction, Cram's rule and Felkin-Anh model.
2. Chiral auxiliary controlled asymmetric synthesis : Use of chiral auxiliaries in Diels-Alder.
3. Chiral reagent controlled asymmetric synthesis : Asymmetric reduction using BINAL-H. Asymmetric hydroboration using IPC_2BH and IPCBH_2 .
4. Chiral catalyst controlled asymmetric synthesis : Sharpless and Jacobsen epoxidations.
5. Asymmetric aldol reaction, Diastereoselective aldol reaction and its explanation by Zimmerman-Traxel model.

CHE 204 : ADVANCED NATURAL PRODUCTS

UNIT- I: CARBOHYDRATES AND PROTEINS

Carbohydrates: Occurrence, importance and synthesis of monosaccharides containing functional groups such as amino, halo and sulphur. Structure elucidation and synthesis of sucrose. Conformational structures of D(+)-ribose, 2-deoxy D-ribose, sucrose, lactose, maltose and cellobiose. Structural features of starch, cellulose and chitin (structure elucidation not expected).

Proteins: Acid and enzymatic hydrolysis of proteins. Determination of amino acid sequence in polypeptides by end group analysis. Chemical synthesis of di and tri peptides.

UNIT-II: TERPENOIDS

Classification – isoprene and special isoprene rules. Occurrence, isolation, structure elucidation, stereochemistry and total synthesis of (i) santonin (ii) abietic acid and (iii) β -carotene. Biosynthesis of mono and diterpenoids.

UNIT- III: ALKOLOIDS

Definition, medicinal importance occurrence and classification of alkaloids. General methods used for structural determination of alkaloids. Isolation, structural elucidation, stereochemistry and total synthesis of (i) Quinine (ii) Morphine (iii) Reserpine. Biosynthesis of morphine.

UNIT-IV: STERIODS, HARMONES AND PROSTAGLANDINS

Occurrence, isolation, structure determination, stereo chemistry and total synthesis of (i) cholesterol (ii) androsterone (iii) testosterone (iv) estrone and (v) progesterone. Biosynthesis of cholesterol.

Occurrence, classification and physiological activity of prostaglandins. Structure determination and synthesis of PGE₁ and PGE₂.

UNIT-V: NUCLEIC ACIDS AND ENZYMES


Nucleic Acids: Primary, secondary and tertiary structure of DNA, Types of RNA - mRNA, tRNA and rRNA. Replication, transcription and translation. Genetic code. Protein biosynthesis.


Enzymes: Definition, Classification based on mode of action. Mechanism of enzyme catalysis. Lock and Key model and Induced-Fit model. Factors affecting enzyme catalysis. Enzyme

inhibition–reversible and irreversible inhibition. Enzymes in organic synthesis. Immobilized enzymes.

Recommended Books

1. Comprehensive Organic Chemistry by D.R. Barton and W.D. Ollis.
2. Standard methods in plant analysis by Reach and Tracey
3. Natural production by Kalsi.
4. Text book of Organic Chemistry Vol II by I. L. Finar.
5. An introduction to the chemistry of terpenoids and Steroids by William templeton.
6. Systematic identification of flavonoid compounds by Mabry & Markhan.


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