

Satyaniketan's

Adv. M. N. Deshmukh Arts, Science and Commerce College,
Rajur, Tal. Akole, Dist. Ahilyanagar

Department of Chemistry

ANNUAL TEACHING PLANNING

2024-2025

Class- S. Y. B. Sc.

(Choice Based Credit System [CBCS]

2019 Pattern)

Semester- III

Subject-

CH-302: Inorganic and Organic Chemistry

Month	Chapter	Number of Periods
July	Chapter 1 : Aromatic Hydrocarbons: Introduction and IUPAC nomenclature, preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (up to 4 carbons on benzene). Side chain oxidation of alkyl benzenes (up to 4 carbons on benzene)	05
August	Chapter 2 : Alkyl and Aryl Halides Alkyl Halides (up to 5 Carbons): Introduction and IUPAC nomenclature, Types of Nucleophilic Substitution (SN1 , SN2 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro	07

	formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution. Aryl Halides: Introduction and IUPAC nomenclature, Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer and Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.	
September	Chapter 3 : Alcohols, Phenols and Ethers (Up to 5 Carbons): Alcohols: Introduction and IUPAC nomenclature, Preparation: Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, ester hydrolysis, reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: with sodium, HX (Lucas test), esterification, oxidation (with PCC, alc. KMnO_4, acidic dichromate, conc. HNO_3). Oppeneauer oxidation Diols: (Up to 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement. Phenols (Phenol case): Introduction and IUPAC nomenclature, Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann Reaction, Houben–Hoesch Condensation, Schotten–Baumann Reaction. Ethers (aliphatic and aromatic): Cleavage of ethers with HI.	06
October	Revision	

Semester- IV

CH-402: Inorganic and Organic Chemistry

Month	Chapter	Number of Periods
January	Chapter 1: Aldehydes and Ketones (aliphatic and aromatic) (Formaldehyde, acetaldehyde, acetone and benzaldehyde) Introduction and IUPAC nomenclature, Preparation: from acid chlorides and from nitriles. Reactions – Reaction with HCN, ROH, NaHSO ₃ , NH ₂ -G derivatives. Iodoform test, Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation, Clemenson reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.	05
February	Chapter 2: Carboxylic acids and their derivatives Carboxylic acids (aliphatic and aromatic): Introduction and IUPAC nomenclature, Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell–Vohlard - Zelinsky Reaction. Carboxylic acid derivatives (aliphatic): (up to 5 carbons) Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their inter conversion. Reaction: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.	05
March	Chapter 3: Amines and Diazonium Salts: Amines (Aliphatic and Aromatic): Introduction and IUPAC nomenclature, Preparation from alkyl halides, Gabriel's	

	Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Electrophilic substitution (Case Aniline): nitration, bromination, sulphonation.	04
April	Chapter 4: Stereochemistry of Cyclohexane: Bayer's strain theory, heat of combustion of cycloalkanes, structure of cyclohexane, axial and equatorial H atoms, conformations of cycloalkane, stability of conformations of cyclohexane, methyl and t-butyl monosubstituted cyclohexane, 1,1 and 1,2 dimethyl cyclohexane and their stability.	04

Class- **T. Y. B. Sc.**
 (Choice Based Credit System [CBCS]
 2019 Pattern)
Semester- V
 Subject-
DSEC-I: CH-502: Analytical Chemistry- I

Month	Chapter	Number of Periods
July	Chapter 1: Gravimetry Introduction to gravimetric analysis; Precipitation methods; The colloidal state; Supersaturation and precipitate formation; The purity of the precipitate: Co-precipitation; ; Conditions of precipitation; Precipitation from homogeneous solution; Washing the precipitate; Ignition of the precipitate: quantitative separations based upon precipitation methods: Fractional precipitation; Organic precipitants (8-hydroxyquinoline, DMG, Cupferron, Nitron, and Benzoin-alfa oxime, Anthanilic acid), Gravimetric Calculations—How Much Analyte is there (Ref-3) Applications of Gravimetry: Determination of Al(III) by 8-hydroxyquoline, Determination of calcium as oxalate; Determination of potassium as potassium tetraphenylborate, Determination of phosphate as ammonium molybdophosphate, Numericals,	09
August	Chapter 2: Inorganic Qualitative Analysis	

	beam spectrophotometers, Choice solvent, general procedure for colorimetric estimation, simultaneous analysis,	
November	Applications: Estimation of metal ions from aqueous solution: Boron in steel, Chromium in steel with diphenyl carbazide reagent, ammonia in water, Chloride, Primary amine, Determination of phenol, spectrophotometric titration (example Cu(II) with EDTA), Determination of pK _a value of indicator, Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method., Numericals	05

Semester- V

DSEC-III: CH-508: Chemistry of Biomolecules

Month	Chapter	Number of Periods
July	Chapter 1: Introduction to molecular logic of life Unicellular and multicellular organisms, prokaryotes and eukaryotes. List of cell organelles and its functions. Molecules that constitute the organisation of cell and its organelles. types of bonds in biomolecules	03
August	Chapter 2: Carbohydrates Introduction, classification of carbohydrates, their structures and biological significance. Concept of anomers, epimers, reducing and non-reducing sugars, mutarotation, inversion. Reactions of glucose with acid, base, phenyl hydrazine, oxidizing agents, reducing agents and its significance, Glycosidic bonds.	07
September	Chapter 3: Lipids Introduction, classification of lipids, their structures and biological significance. Reactions of Lipids-Saponification Hydrolysis, emulsification, oxidation. Concept of saponification number, acid number, iodine number and their significance. Rancidity. Types of Lipoproteins and their significance. Blood group substances.	06
October	Chapter 4: Amino acids and Proteins	

	Amino acids: classification of amino acids. Concept of ampholytes, isoelectric pH, zwitter ions, titration curve of glycine. Reactions of amino acid with Ninhydrin, Sanger's, Dansyl chloride, Dabsyl chloride and Edmann's reagents and their significance. Peptide bond and its features. Proteins: Classification based on function, nutrition and composition. Structural organization of proteins- primary, secondary, tertiary and quaternary structures Chapter 4: Enzymes Classification of enzymes. Features of active site. ES complex formation, Enzyme specificity, Factors affecting enzyme activity. Basics of Enzyme kinetics. MM and LB equation and Significance of K_m.	08 06
November	Chapter 4: Hormones Introduction to endocrine glands and their hormones. Biochemical nature of hormones, Mechanism of action of lipophilic and hydrophilic hormones	05

Semester-VI

SEC-IV: CH-610: Skill Enhancing Course-IV

CH-611(A): Analytical Chemistry-II

Month	Chapter	Number of Periods
December	Chapter 1 : Solvent extraction Introduction to solvent extraction, organic phase, Partition the theory of extraction (distribution coefficient, Distribution ratio, solute remaining unextracted, Separation coefficient), Factors favoring solvent extraction, Quantitative treatment to solvent extraction equilibrium, Ion association complexes, synergic extraction, some extraction reagent specifically used for inorganic ions (Acetylacetone, 8-Hydroxyquinoline, Diphenylthiocarbazone, Sodium diethyldithiocarbamate, Ammonium pyrrolidine dithiocarbamate), some practical aspects, Applications: determination of copper as the diethyldithiocarbamate complex, Determination of Fe(III) with 8-hydroxyquinoline, determination of nickel by synergistic extraction. Solid phase extraction (Ref-3) Numerical	08
January	Chapter 2 : Instrumental Methods of Chromatographic Analysis Principles of Chromatographic Separations, classification, Theory of Column Efficiency in Chromatography, (theoretical plate, rate theory of chromatography - the Van Deemter equation, efficiency and particle size in HPLC, retention factor efficiency and resolution, Key Reference -4: 603-617, Supplementary reference-3: 547-556. Chapter 3: High Performance Liquid Chromatography	04

	Introduction, Types of liquid chromatography (liquid-solid, liquid-liquid, bonded phases), Choice of mode of separation, Equipment for HPLC: mobile phase, sample injection and column design (mobile phase, optimization of mobile phase, gradient elution, solvent delivery and sample injection, sample injection system, the column (effect of column length and column diameter), Choosing the Detector, Ultraviolet detector, Luminescence detector, RI detector, electrochemical detector, Column efficiency, HPLC chromatogram and its characteristics (retention time, peak height, peak area), method of quantitative analysis by HPLC, Example: determination of aspirin, phenacetin and caffeine in a mixture, numerical	06
February	Chapter 3: Gas Chromatography Introduction, Apparatus: A supply of carrier gas from a high-pressure cylinder, Sample injection system and derivatization, the column (Packed columns, Open tubular columns), the detector (properties, hot wire detector or TCD, FID, ECD), Quantitative analysis by GC (Area normalization method and internal standard addition method), Elemental analysis, numerical	06
March	Chapter 4 : Atomic Absorption Spectroscopy Introduction, Elementary theory, Instrumentation, flames, the nebulizer-burner system, nonflame techniques, (graphite furnace, cold vapour technique), resonance line sources, monochromator, detectors, interferences, chemical interferences, background correction methods, Atomic absorption spectrophotometers, Experimental preliminaries (calibration curve methods, standard addition method) Preparation of sample (wet ashing, fusion, Dry ashing, microwave dissolution, concentration	08

	procedures), Detection limits, Estimation of Ca and Mg in water	
April	Chapter 5: Flame Emission Spectroscopy Introduction, emission spectra, flame emission spectroscopy, flame photometers. Evaluation methods, calibration curve procedure, the standard addition technique, Applications: determination of alkali metals by flame photometry, determination of trace elements in contaminated soil by AAS. Numerical,	04

Semester-VI

DSEC-VI: CH-608: Organic Chemistry-III

Month	Chapter	Number of Periods
December	Chapter 1 : Retrosynthetic Analysis and Applications Introduction, Different terms used – Disconnection, Synthons, Synthetic equivalence, FGI, TM. One group disconnection, Retrosynthesis and Synthesis of target molecules: Acetophenone, Crotonaldehyde, Cyclohexene, Benzylbenzoate, and Benzyl diethyl malonate.	06
January	Chapter 2 : Organic Reaction Mechanism and Synthetic Applications 1. Chemistry of reactive intermediates (carbocations, carbanions, free radicals, carbenes, nitrenes, benzyne etc...); 2. Wolff rearrangement (Step up), 3. Hofmann rearrangement (Step down), 4. Simmons-Smith reaction, 5. Michael reaction, 6. Wittig reaction and McMurry reaction, 7. Diels-Alder reaction, 8. Functional group interconversions and structural problems using chemical reactions	12
February	Chapter 3: Reagents in Organic Synthesis Reagents- Preparation and Applications of following reagents. Reducing Reagents: Ref 2 Pages Nos. 226, 828, 131-132, 26, 39, 537 Lithium aluminium hydride LiAlH_4 , NaBH_4 , DIBAL-H, $\text{Li}(\text{tBuO})_3\text{AlH}$ & Raney Nickel. Oxidizing Reagents: Ref. 2 Page Nos. 545, 1123-1126, 919, 764 1. DMSO either with DCC or Ac_2O , Dess Martin reagent, Osmium tetroxide, Selenium dioxide- (SeO_2) , DDQ.	10
March	Chapter 4 : Natural Products Ref 2: Page Nos. 1413-1447 Terpenoids: Introduction, Isolation, Classification. Citral-	

	structure determination using chemical and spectral methods, Synthesis of Citral by Barbier and Bouveault Synthesis. Alkaloids: Introduction, extraction, Purification, Some examples of alkaloids and their natural resources. Ephedrine- structure determination using chemical methods.Synthesis of Ephedrine by Nagai.	08
April	Revision	