

B.Sc. III Paper—II

Organic Chemistry

Unit - I

I **Spectroscopy**

Nuclear magnetic resonance (NMR) spectroscopy, Proton magnetic resonance (^1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of ^1H NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structures elucidation of simple organic compounds using UV, IR and ^1H NMR spectroscopic techniques.

Unit - II

II **Organometallic Compounds**

Organomagnesium compounds: the Grignard reagents, formation, structure and Chemical reactions.

Organozinc compounds: formation and chemical reactions.

Organolithium compounds: formation and chemical reactions.

III **Organosulphur Compounds**

Nomenclature, structural formation, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides & Sulphaguamide.

IV **Heterocyclic Compounds**

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution, Mechanism of nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit - III

V **Carbohydrates**

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers, Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation.

Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

VI **Amino Acids, Peptides, Proteins and Nucleic Acids**

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, Isoelectric point and electrophoresis, Preparation and reactions of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins, Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure, Protein denaturation/renaturation. Nucleic acids: Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Unit - IV

VII **Fats, Oils and Detergents**

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, Saponification value, iodine value, acid value, Soaps, synthetic detergents, alkyl and aryl sulphonates.

VIII **Synthetic Polymers**

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth-polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubber.

IX **Synthetic Dyes**

Colour and constitution (electronic Concept), Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

X **Organic Synthesis via Enolates**

Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation, Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.