

## Organic Chemistry

Time-3 Hrs.

M.M. 50

**NOTE :** The paper will be divided into **THREE** sections.

**Section-A** Ten questions (short type answer) two from each Unit will be asked. Each question will be of half mark and the candidates are required to attempt all questions.

**Total 5 marks**

**Section-B** Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 5 marks.

**Total 25 marks**

**Section-C** Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any **TWO** questions. Each question will be of 10 marks.

**Total 20 marks**

**UNIT-I**

**Electromagnetic Spectrum : Absorption Spectra -** Ultraviolet (UV) absorption spectroscopy- absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of

electronic transition, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Infrared (IR) absorption spectroscopy- molecular vibrations, Hooke's, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

**Nuclear Magnetic Resonance (NMR) spectroscopy:** Proton Magnetic Resonance (PMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

Problem pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

#### UNIT-II

**Heterocyclic compounds** - Introduction, molecular orbital picture and aromatic characteristics of pyrrole, furane, thiophene and pyridine, method of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine

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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 Fischer Indole synthesis, Skraup's synthesis and Bischler - Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

**Photochemistry:** Principles: electronic excitation, excited states, modes of dissipation of energy, energy transfer and quantum efficiency, photoreduction and photochemistry of butadienes

#### UNIT - III

**Organic synthesis via Enolates** - Acidity of alpha hydrogen, alkylation of diethylmalonate and ethylacetoacetate, synthesis of ethyl acetoacetate, Claisen condensation. Keto - Enol tautomerism of ethyl acetoacetate, alkylation of 1,3-dithianes, alkylation and acylation of enamines.

**Carbohydrates** - Classification and nomenclature, monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses, configuration of glucose and fructose, erythro and threo diastereomers. Conversion of glucose into mannose, formation of glycosides, ether and esters. Determination

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of ring size of glucose and fructose. Cyclic structure of D (+) - glucose. Mechanism of mutarotation.

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

#### UNIT - IV

**Amino Acids, Peptides, Proteins and Nucleic Acids** - Classification, structure and stereochemistry of amino acids, acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of  $\alpha$ -amino acids.

Structure and nomenclature of peptides and proteins, classification of proteins, peptide structure determination, and group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptide 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.

**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 sulphates.

#### UNIT-V

**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 rubbers.

**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.

#### Books Recommended:

1. Organic chemistry, Volume I and II S. M. Mukherji, S. P. Singh and R. P. Kapoor, Wiley Eastern Ltd.
2. A Text Book, of Organic chemistry, Volume I & II - K. S. Tewari, S. N. Mehrotra & N. K. Vishnoi.
3. Organic chemistry, M. K. Jain and S. Sharma
4. A Text Book. of Organic Chemistry, Vol. I & II, O. P. Agarwal,
5. A Text Book of Organic Chemistry, Raj. K. Bansal.
6. Organic Chemistry. Vol. I & II: I. L. Finar,
7. Organic Reaction and their Mechanisms, P. S. Kalsi.