

## **SEMESTER – II**

**Course II – (Organic & General Chemistry) 60 hrs (4h/w)**

**ORGANIC CHEMISTRY** **36h**

### **UNIT-I**

#### **Recapitulation of Basics of Organic Chemistry**

**Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)** **12h**

General methods of preparation of alkanes- Wurtz and WurtzFittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties, Free radical substitutions; Halogenation, concept of relative reactivity v/s selectivity. Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of monosubstituted cyclohexane.

### **UNIT-II**

**Carbon-Carbon pi Bonds (Alkenes and Alkynes)** **12h**

General methods of preparation, physical and chemical properties. Mechanism of E1, E2, E1cb reactions, Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism (Markownikoff /Anti markownikoff addition) with suitable examples, *syn* and *anti*-addition; addition of H<sub>2</sub>, X<sub>2</sub>, HX. oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, hydroxylation, Diels Alderreaction, 1,2- and 1,4-addition reactions in conjugated dienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

### **UNIT-III**

**Benzene and its reactivity** **12h**

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedel- Craft's alkylation and acylation. Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO<sub>2</sub> and Phenolic). Orientation of (i) Amino,

methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups  
(iii) Halogens

(Explanation by taking minimum of one example from each type)

## **GENERAL CHEMISTRY**

**24 h**

### **UNIT-IV**

#### **1. Surface chemistry and chemical bonding**

##### **Surface chemistry**

**6h**

**Colloids-** Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.

**Adsorption-** Physical and chemical adsorption, Langmuir adsorption isotherm, applications of adsorption.

#### **2. Chemical Bonding**

**6h**

Valence bond theory, hybridization, VB theory as applied to  $\text{ClF}_3$ ,  $\text{Ni}(\text{CO})_4$ , Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{CO}$  and  $\text{NO}$ ).

#### **3. HSAB**

**2h**

Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

### **UNIT-V**

#### **Stereochemistry of carbon compounds**

**10h**

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.

Chiral molecules- definition and criteria (Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D, L, R, S and E, Z- configuration with examples.

Definition of Racemic mixture – Resolution of racemic mixtures (any 3 techniques)

teachersthroughoutthesemester.

### **List of Reference Books**

#### **Theory:**

Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.

Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

**Practical:**

Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)

**LABORATORY COURSE-II**

**30hrs (2 h / w)**

**Practical-II Volumetric Analysis**

(At the end of Semester-II)

**Volumetric analysis**

**50 M**

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using  $\text{KMnO}_4$  with oxalic acid as primary standard.
3. Determination of Cu (II) using  $\text{Na}_2\text{S}_2\text{O}_3$  with  $\text{K}_2\text{Cr}_2\text{O}_7$  as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with  $\text{KMnO}_4$