Course No: PGCHM17C102

Title: Organic Chemistry (04 Credits)

Max. Marks: *100* ***Course Duration:*** *64 Contact hours*

Continuous Assessment: 20 *End Term Assessment: 80*

Unit –I Reactive Intermediates and Determination of Reaction Mechanism (16 Contact hours)

Reactive Intermediates: Generation, Structure, fate and stability of Carbocations (Classical and Non- Classical), Carbanions, Free radicals, Carbenes, Nitrenes, Arynes and Radical ions.

Determination of Reaction Mechanism: A general concept of types of reactions & mechanisms. Methods of Determining Reaction Mechanism: Structure of Product, Transition states & Intermediates (Hammond postulate), Catalysis including acid and base catalysis, Isotope Labelling, Stereo chemical course of reaction. Thermodynamic and kinetic evidences. Correlation of structure – reactivity.

Unit-II Stereochemistry-I: (16 Contact hours)

Chirality: Introduction, Chirality due to chiral centre. Molecules with more than one Chiral centres, Threo and Erythro isomers. Convention for of assigning D, L & R, S configurations. Optical activity due to chiral axis, chiral plane and helicity. Chirality involving atoms other than carbon. Chirality in metallic complexes. Sterogenesis and interconversion of projections.

Conformations: Origin of conformational energy. Angle and Pitzer strain. Conformational analysis of cycloalkanes, Mono and Disubstituted Cyclohexanes (1-2. 1-3, and 1-4), decalines, steroid nucleous and bridged alkaloids. Effect of conformation on reactivity in acyclic and cyclic systems. Conformation of sugars & anomeric effect. Conformation of rings containing sp^2 hybridised carbon atoms-cyclohexene, cyclohexanones, multiple rings- and bicycloheptane, bicyclooctane, camphor, norborane.

Unit III Stereochemistry-I I (16 Contact hours)

Asymmetric Synthesis: Introduction and principle of asymmetric synthesis.

Sterospecific and steroselective reactions, chemoselectivity, regioselectivity, enantiomeric excess, optical purity. Diastereotopic and Enantiotopic atoms, groups and faces.

Principal categories of asymmetric synthesis: Use of chiral substrates, Nucleophilic addition on acyclic chiral carbonyl compounds, Cram's rule, Diastero-selectivity in Aldol reactions. Use of chiral auxillaries- alkylation of chiral enolates, Use of chiral reagents/Catalysts: hydroboration, hydrogenation, epoxidation, dihydoxylation

Unit-IV Aliphatic Nucleophilic Substitutions: (16 Contact hours)

Mechanism and stereochemical implications of SN_1, SN_2, SN_i and Neighbouring Group Participation involving (π and σ-bonds). Comparison of SN_1 and SN_2 reactions. Effect of substrate structure, attacking nucleophile, leaving group and solvent on the rates of SN_1 and SN_2 reactions. Mixed SN_1 and SN_2 reactions. Nucleophilic substitution at allylic, benzylic, aliphatic trigonal and vinylic carbons. Nucleophilic substitution in alcohols, Mitsunobu reactions.

Elimination reactions Factors affecting elimination reactions, Mechanism of E1, E2, E1cB and E2C reactions. Competition between substitution and elimination reactions. Stereochemistry and regioselectivity of E2 eliminations, Elimination in cyclic systems and vinyl halides. Mechanism and orientation in pyrolytic eliminations, Shapiro reaction.

Books Recommended:

1. March's Advanced Organic Chemistry Reactions, Mechanism and Structure, 6th Ed., Smith, M.B. (Wiley-2014)
2. Organic Chemistry 8th Ed. - F. A. Carey and Robert M. Giuliano (McGraw Hill-2012).
3. Reaction Mechanism in Organic Chemistry 3rd Ed., S.M. Mukherjee and S.P. Singh. (Macmillan- 1998).
4. Stereochemistry of Organic Compounds 2nd Ed., D. Nasipuri. (New Age Inter.- 2008)
5. Stereochemistry of Carbon Compounds - E.L.Eliel. (TMH -2007)
6. Stereochemistry of Organic Compounds 7th Ed. - P.S. Kalsi. (New Age Inter.- 2012).
7. Organic Chemistry - 2nd Ed., J. Hornback. (Brooks/Cole- 2006.
8. Organic Chemistry, 5th Ed., John McMurry. (Brooks/Cole-2000).
9. Advanced Organic Chemistry, 5th Ed., F.A Carey & R.J Sundberg (Springer-2007).
10. Organic Chemistry, 2nd Ed., Jonathan Clayden (OUP-2012)
11. Organic Chemistry, 11th Ed., Solomons, T.W.G., (Wiley-2015).
12. Advanced Organic Chemistry, Reaction Mechamisms; Reinhard Bruckner, Academic press, Elsevier.S