Course Code: PGCHM17C302

Photochemistry and Organic Synthesis (4 Credits)

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

Continuous Internal Assessment: 20 Marks *End Semester: 80 Marks*

Unit-1 Photochemistry-I. (16 Contact hours)

Photochemical Reactions: Interaction of electromagnetic radiation with matter. Types of excitations. Singlet and triplet states and their lifetime. Fate of excited molecule; Physical and chemical processes. Transfer of excitation energy; Sensitization and Quenching. Quantum yield. Types of photochemical reactions. Photochemistry of alkenes Geometrical isomerisations, cyclisation and dimerisation reactions. Photochemical reactions of 1,3-butadiene (excluding pericyclic reactions). Rearrangements of 1,4 and 1,5- dienes. 4 Photochemistry of saturated carbonyl compounds Intramolecular reactions of saturated acyclic and cyclic carbonyl compounds. (Norrish typeI and Norrish type-II processess). Intermolecular cycloaddition reactions (Paterno- Buchi reaction).

Unit-II Photochemistry –II. (16 Contact hours)

Photochemistry of unsaturated carbonyl compounds Photochemical reactions of α, β-unsaturated carbonyl compounds. (H-Abstraction and isomerisation to β, γ-unsaturated carbonyl compounds). Photolysis of cyclic α, β- unsaturated ketones (dimerisation and lumiketone rearrangement) and cyclohexadienones. Photochemistry of Aromatic compounds Photoinduced isomerisations of benzene and its alkyl derivatives. 1-2, 1-3 and 1-4 photoaddition reactions of benzene. Nueleophilic photosubstitution reactions in aromatic compounds. Photo Fries-rearrangement of aryl esters and anilides. Miscellaneous Photochemical reaction Photolysis of organic nitrites and their synthetic utility (Barton reaction). Photochemistry of vision.

Unit-III Oxidation Reactions: (16 Contact hours)

Aromatisation of cycloalkanes and alkenes using metal catalysts and DDQ, Oxidation with Cr and Mn reagents, Oxidation with LTA, DDQ, PDC, PCC and SeO_2, Oxidation using DMSO with DCC Ac_2O, Oxalyl chloride, Dess Martin reagent, Hydrogen peroxide, Fenton's reagent. Hydroxylation of olefinic double bonds (OsO_4, $KMnO_4$), swern reagent, Woodward and

Prevost oxidation, Epoxidation using peracids including Sharpless epoxidation, Baeyer Villiger Oxidation, Ozonolysis.

Unit-III Reduction Reactions: (16 Contact hours)

Reduction with $NaBH_4$, $NaCNBH_4$, $LiAlH_4$, Li(tBuO)AlH, DIBAL-H, Red-Al, Et_3SiH and Bu_3SnH, Reduction using selectrides, Birch, Clemenson, Wolfkishner and Bovveault-Blanc Reductions. Meerwein-Ponndrof Reduction, Catalytic hydrogenation (homogenous and heterogeneous), hydration of carbon-carbon double and triple bonds. Asymmetric reduction of carbonyl functions (Corey's procedure)

Books Recommended:

1. Intoductory Photochemistry, A.Cox and T.Kemp (McGraw Hall-1971)
2. Organic Photochemistry, 2nd Ed., J.Coxon, and B.Halton (2nd Ed. Cambridge University press1987)
3. Fundamentals of photochemistry, Rohtagi & Mukherjee (Wiley Eastern-1992)
4. Photochemistry and Pericyclic Reactions, 3rd Ed., Jagdamba Singh and Jaya Singh, New Age International Publishers
5. Organic Reaction Mechanism, 4th Ed., V. K. Ahluwalia, Rakesh Kumar Parashar, Narosa Publications
6. Reduction in Organic Synthesis, V. K. Ahuliwalia, CRC Press
7. Advanced Organic Chemistry, Reactions, Mechanisms, and Structure, 6th Ed., Micheal B. Smith and Jerry March, Wiley
8. Advanced Organic Chemistry: Part B: Reaction and Synthesis, 5th Ed. Francis A. Carey, and Richard J. Sundberg, Springer
9. Name Reactions and Reagents in Organic Synthesis; 2nd Ed., Breadford P. Mundy, Michael G. Ellerd, Frank G. Favaloro Jr., Wiley