

CH H 562: ORGANIC SYNTHETIC METHODS

Course Outcome

Enable the students:

- To acquire knowledge on the various reagents employed for oxidation and reduction of various kinds of organic molecules.
- To understand the various methods of halogenations of carbonyl compounds, benzylic and allylic halogenations.
- Students will understand the systematic nomenclature of various types of heterocyclic compounds with multiple examples.
- Students will get the sound knowledge on the structure, synthesis and reactions of various three, four, five, six and fused heterocyclic compounds.
- To understand the synthetic design with diverse chemical reactions, planning of organic synthesis and functionality.
- To learn the principles and technologies used in disconnection approach, the utility of protecting group strategy in organic synthesis and retrosynthetic analysis.

UNIT-I

[12 Hours]

Reduction Reactions: Catalytic hydrogenation-catalysts and solvents, mechanisms and stereochemistry. Hydrogenolysis and homogeneous catalytic hydrogenation.

Metal hydride reduction: Reduction with LiAlH_4 and NaBH_4 , Stereo chemistry of reduction, Reduction with diborane.

Dissolving Metal Reductions: Mechanisms of reduction of carbonyl compounds, Bimolecular reductions of esters, Birch reduction. Wolf-Kishner reduction and reduction with diimide.

Oxidation reactions: Mechanism of oxidation with chromium and manganese salts, Osmium tetroxide, peracids, periodic acid and Lead tetra acetate.

Halogenation: Halogenation of carbonyl compounds. Benzylic and Allylic halogenations.

UNIT-II

[12 Hours]

Heterocyclic Chemistry: Hantzsch-Widman system of nomenclature for monocyclic, fused and bridged heterocycles. Structure, synthesis and reactions of aziridines, episulfides, azetidines, thietanes, furan, pyrrole, thiophene, oxazoles, imidazoles, thiazoles, pyridine, pyrimidine and fused heterocycles-Indoles, benzofurans and quinolines.

UNIT- III

[12 Hours]

Synthetic Design: Classification of carbon-carbon single bond and double bond forming reaction and their use in carbon skeleton ring formation. Ring forming and ring cleaving reactions, use of Thorpe condensation, Carbene insertion reaction, 1,3-dipolar addition and Ene reaction in ring formation.

Planning of Organic Synthesis: Selection of starting materials and key intermediates during the synthesis. Use of Robinson annulation, Dieckmann cyclisation, Arndt-Eistert synthesis, Diel's-Alder reaction in organic synthesis, Synthesis of Cubane and Iswarane.

Functionality: Synthesis of 6 and 7-methoxytetralones, biotin and penicillin-V with special reference to the introduction of functional groups.

UNIT- IV

[12 Hours]

General introduction to disconnection approach. Synthons and synthetic equivalents. Interconversion of functional groups. One group C-X and two group C-X disconnections. **Use of C-C one group and C-C two group disconnections in the synthesis** of 1,2; 1,3 and 1,5-difunctionalised compounds.

Protecting groups: Protection of hydroxyl, amino, carboxylic and carbonyl groups.

Retrosynthetic analysis: Analysis of alcohols, carbonyl compounds, benzocaine, *p*-methoxy acetophenone, 2-methyl-6-methoxy-indole-3-acetic acid, & 1-phenyl-4-*p*-methoxyphenyl-1,3-butadiene. Illustrative synthesis of Limonene, Benziodarone, Nitrofurazone, Warfarin, Juvabione and Longifolene.

References

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