OC H 512: REAGENTS FOR ORGANIC SYNTHESIS

Course Outcome

- Students will learn the preparation, properties, reactions and uses of organometallic reagents in organic synthesis.
- Students will know the uses of Gillman's reagent, LDA, DCC, 1,3-dithiane, TMSI, DDQ, SeO_2, Wilkinson's catalyst, PTCs, Baker's yeast, PPA, TMS-CN, Hydrosilane, Chloramines-T, Woodward-Prevost hydroxylation, Zeigler-Natta catalyst, and crown ethers in organic synthesis and functional group transformation.
- 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.

UNIT-I Reagents in Organic Synthesis-I **[12 Hours]**

Organometallic Reagents: Preparation, properties and uses of Organolithium, organomagnesium, Organozinc, Organocadmium, Organomercury, Organoindium, Organoaluminium and Organotellurium compounds.

Silicon containing Reagents: Preparation and reactions; Peterson reaction.

Boron containing Reagents: Preparation of organoboranes-Hydroboration, Reactions of Organoboranes-Isomerization, oxidation, protonolysis, carbonylation, cyanidation. Synthesis of esters, E and Z alkenes, conjugated dienes and alkynes.

Organotin Compounds: Synthesis of Organostannanes and their utility in C-C bond forming reactions. Barton decarboxylation reaction, Barton deoxygenation, Stelly-Kelly coupling reaction.

UNIT-II Reagents in Organic Synthesis-II **[12 Hours]**

Use of the following reagents in Organic synthesis and functional group transformation: Gillman's reagent, Lithium diisopropylamide (LDA), Tri-n-butyl tin hydride, Hydrosilanes, Dicyclohexyl carbodiimide (DCC), 1,3-dithiane, Trimethyl silyliodide, Trimethyl silyl cyanide, DDQ, Selenium dioxide, Baker's yeast, Polyphosphoric acid. Chloramine-T, Aluminium *iso*-propoxide. Woodward and Prevost hydroxylation.

UNIT-III **[12 Hours]**

Reduction Reactions: Catalytic hydrogenation-Catalysts and solvents employed, reduction of functional groups, mechanisms and stereochemistry of catalytic hydrogenations, Hydrogenolysis, homogeneous catalytic hydrogenation.

Metal hydride reduction: Reduction with $LiAlH_4$, $NaBH_4$, BH_3 and DIBAL. Stereochemistry of reduction, Reduction in Biological systems-NADH, FAD.

Dissolving Metal Reductions: Mechanisms of reduction of conjugated system and carbonylcompounds(including Birch, Benkeser, Clemmensen reductions), Bimolecular reductions of esters, Birch reduction, Reduction with hydrazine and its derivatives, Wolf-Kishner reduction,

McMurry reaction, Pummer, Willgerdot, Corey-Bakshi-Shibata and Tishchenkoreactions. Reduction with arene sulphonyl derivative of hydrazine and Reaction with diimide.

UNIT-IV **[12 Hours]**

Oxidation Reactions: Oxidation with chromium salts- Jones, Sarett and Collins reagents, Oxidation with PCC & PDC; manganese salts and MnO_2. Oxidations with Ozone, Osmium tetroxide, periodic acid, Lead tetra acetate, peracids and peresters, Dess-Martin periodinane, TEMPO, Swern oxidation and their synthetic importance in functional group transformation.

Halogenation Reactions: Halogenation of carbonyl compounds, Benzylic and Allylic halogenation, Dehydrogenation with S, Se and Pd.

References

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