ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER   **CHEMISTRY** TIME:3HRS/WEEK

CH-Ma2-3201(3) **ORGANIC CHEMISTRY** MARKS:100

w.e.f 2024-2025 (23AK Batch) **(HALOGEN AND OXYGEN CONTAINING ORGANIC COMPOUNDS)**

**SYLLABUS**

**Course Objective:** The objective of the course is to introduce the students to the structure, properties and reactivity of aliphatic and aromatic halogenated hydrocarbons, alcohols, carbonyl compounds, carboxylic acids and acid derivatives

**Course outcomes:** By the end of the course, the student will be able to:

1. Correlate SN1, SN2 and SNi mechanisms to nucleophilic substitution reactions in alkyl

halides & alcohols

1. Describe the reactivity of alcohols and phenols
2. Sketch the mechanistic pathways for selected named reactions of carbonyl compounds
3. Identify the synthetic applications of carboxylic acids & their derivatives and
4. Design pathways for the interconversion of monosaccharides.

**UNIT – I: HALOGEN COMPOUNDS ( 9 h)**

Alkyl halides: Preparation of alkyl halides from i) alkanes, ii) alkenes and iii) alcohols. Properties - nucleophilic substitution reactions–SN1and SN2 and SNi mechanisms with energy profile diagrams, stereo chemical aspects and effect of solvent. Williamson’s synthesis.

**Aryl halides:** Preparation i) from phenols ii) Sandmeyer’s reaction, nucleophilic aromatic substitution (Benzyne mechanism);relative reactivity of alkyl, allyl, vinyl and benzyl, aryl halides towards nucleophilic substitution reactions.

### **UNIT – II: ALCOHOLS AND PHENOLS ( 9 H )**

**Alcohols:** Preparation of 10,20,30alcohols from Grignard’s reagent, Bouveault–Blanc Reduction; Chemical properties – substitution of –OH by using PCl5, PCl3, PBr3, SOCl2 and with HX / ZnCl2, Oxidation of alcohols with PCC, PDC; Oxidation of diols by HIO4 and Pb(OAc)4, Pinacol Pinacolone arrangement with mechanism, relative reactivity of 1°, 2°, 3°alcohols.

**Phenols :** Preparation from diazonium salt and Cumene. Reactions and mechanism–Reimer– Tiemann**,**Kolbe–Schmitt Reactions, Fries and Claisen rearrangement.

**UNIT – III: CARBONYL COMPOUNDS ( 9 H )** Preparation from-Acid chlorides,1,3-dithiane and nitriles; Structure and reactivity of carbonyl group, Nucleophilic addition reactions with HCN, NaHSO3 and alcohols. addition-elimination reactions with hydroxylamine, hydrazine, phenyl hydrazine, 2,4DNP, semicarbazide. Oxidations and reductions (Clemmensen’s, Wolf–Kishner’s, withLiAlH4 & NaBH4).

**Reaction & Mechanism**- Aldol condensation, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Claisen-Schmidt reaction, Haloform reaction

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### **UNIT-IV: CARBOXYLIC ACID AND ACTIVE METHYLENE COMPOUNDS (9H )**

**Carboxylic Acids:** Preparation from Grignard reagent and hydrolysis of nitriles, Reactions of monocarboxylic acids- Reactions involving -H, -OH and-COOHgroups, formation of salts, esters, acidchlorides, amides and anhydrides. Degradation of carboxylic acids by Huns- Diecker’s reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction. Mechanisms of acidic and alkaline hydrolysis of esters, Reformatsky reactions, Curtius rearrangement.

**Active methylene compounds**: Ketoenol tautomerism, preparation of Aceto Acetic Ester(AAE) by Claisen condensation with mechanism,synthetic applications of AAE in the preparation of mono carboxylic acids, di carboxylic acids, α,β-unsaturated acids and heterocyclic compounds.

### **UNIT – V: Carbohydrates ( 9 h )** Classification and their biological importance, Monosaccharides: Structural elucidation of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides– Haworth structure of maltose, lactose and sucrose.

### **List of Reference Books:**

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

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

3. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6th edition,1985

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