M.Sc. (PREVIOUS) CHEMISTRY
Paper- III: ORGANIC CHEMISTRY-I Semester-I
(Effective from 2022-2023 admitted batch)

Course Outcomes (COs)/Course Specific Outcomes (CSOs):

CO 1: Acquire the knowledge of aromaticity, anti-aromaticity, non-benzenoid compounds and reactive intermediates.
CO 2: Acquire the knowledge of nucleophilic substitution reactions at aliphatic, allylic, trigonal and Vinylic carbons and neighboring group participation. Also develop knowledge on Aromatic nucleophilic substitution reactions.
CO 3: Acquire the knowledge of Electrophilic substitution reactions at aliphatic and Aromatic centers.
CO 4: Acquire the Knowledge of Stereochemistry of conformations and configurations. Know the utility of stereochemistry in synthesis.
CO 5: Develop interest chemistry of heterocyclic compounds in Structure, reactivity and synthesis of various sizes.

Course learning outcome (LOs):

Upon completion of the course the students should be able to:
LO 1: Basic aspects of aromaticity and mechanism in organic chemistry
LO 2: Different nucleophilic substitution reactions and their importance in organic synthesis
LO 3: Different electrophilic substitution reactions and their importance in organic synthesis
LO 4: To determine the stereochemistry of different organic molecules and various possible conformations of organic compounds
LO 5: Structure, synthesis, and reactivity of various heterocyclic compounds.
LO 6: Explain aliphatic nucleophilic, electrophilic substitution reactions, stereochemistry and conformational analysis and chemistry of heterocyclic compounds

UNIT-I: Aromaticity [12 Hours]

A) Aromaticity: Concept of Aromaticity, Aromaticity of five membered, six membered and fused systems - non-benzenoid aromatic compounds: cyclopropenylcation, cyclobutadienyldication, cyclopentadienyl anion – tropyliumcation and cyclooctatetraenyl di anion –annulenes. Homo aromaticity, Anti aromaticity and Pseudo aromaticity.

Reactive Intermediates and Name Reactions

B) Reactive Intermediates: Generation, structure, stability and reactivity of Reactive intermediates: carbanion, carbocation, free radicals, carbenes and nitrenes.

UNIT-II [12 Hours]

A) Aliphatic Nucleophilic Substitutions: The SN_1, SN_2, SN_i and SET mechanisms. Substitution reactions of ambident nucleophiles, anchimeric

assistance, the neighboring group mechanism: neighboring group participation by O, N, S, halogens, aryl groups, alkyl and cycloalkyl groups in nucleophilic substitution reactions. Sigma, Pi bond participation in acylic and bicyclic systems (non-classic carbocations). Nucleophilic Substitution at allylic, trigonal and Vinylic carbons. Effect of substrate, attacking nucleophile, leaving group and reaction medium.

B) Aromatic Nucleophilic Substitutions: The SNAr, SN_1, and benzyne Aryne mechanisms. Reactivity: Effect of substrate, leaving group and attacking nucleophile.

UNIT-III **[12 Hours]**

A) Aliphatic Electrophilic Substitutions: SE1 SE2 and SEi mechanisms. Reactivity- effects of substrate, leaving group and solvent. Reactions- hydrogen exchange, migration of double bonds, halogenation of aldehydes, ketones, carboxylic acids, acyl halides, sulphoxides and sulphones.

B) Aromatic electrophilic substitutions: Alkylation, acylation, nitration, sulfonation, halogenation.

UNIT-IV **[12 Hours]**

Stereochemistry and Conformational Analysis: Optical Isomerism: optical activity, molecular dissymmetry and chirality - elements of symmetry. Fisher's projection D,L. and R,S. configurations - relative and absolute configurations optical isomerism due to asymmetric carbon atoms - optical isomerism in biphenyls, allenes and spirans- optical isomerism of nitrogenous compounds, racemization and resolution.

Geometrical isomerism: E, Z -configurations, properties of geometrical isomers. Conformational analysis: Conformations of acyclic molecules –alkanes and substituted alkanes- compounds having intramolecular hydrogen bonding. Conformations of cyclohexane, mono and disubstituted cyclohexanes and decalins.

UNIT-V **[12 Hours]**

Chemistry of Heterocyclic Compounds: Structure, reactivity and synthesis of three membered Heterocycles: (a) Oxirane: Shi epoxidation, Jacobsen epoxidation, etc, (b) Aziridine; four membered Heterocycles: (a) Oxetane (b) Azetine; five membered Heterocycles: (a) Pyrrole: Paal Knorr, Hantzsch Methods, etc, (b) Thiophene: Paal Knorr, Hinsberg method, etc. (c) Furan: Paal Knorr, Fiest-Benary, Industrial Method, etc.; (d) Pyrazole, (e) Imidazole, (f) Oxazole, (g) Thiazole; Six membered Heterocycles: (a) Pyridine, (b)Pyridazine,(c) pyrimidine and (d) Pyrazine; Aromatic heterocyclics: a) Indole: Fischer indole synthesis, and Bischler synthesis(b) Quinoline and Isoquinoline.

Reference Books

1. Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
2. Organic Chemistry Vol. I (Sixth Ed.) and Vol. II (Fifth Ed.) by I L Finar ELBS.
3. Organic Chemistry (fifth Ed.,) by Morrison and Boyd, PHI, India.
4. Organic Chemistry (fifth edition) by Francis A. Carey Tata McGraw Hill publishing Company Limited, New Delhi.
5. Stereochemistry of Organic compounds by Ernest L. Eliel, Samuel H. Wilen

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