

**ORGANIC: AROMATIC HYDROCARBONS, HALOGENATED HYDROCARBONS,
ALCOHOLS AND PHENOLS****THEORY****Unit I: Aromatic Hydrocarbons**

Benzene: Kekule structure, stability of benzene, resonance energy.

Aromaticity: Hückel's rule, aromaticity in benzene and other cyclic systems with examples of aromatic, non-aromatic and antiaromatic systems of cyclic hydrocarbons (C₃ to C₈) excluding heterocyclic compounds.

Properties of benzene: Electrophilic substitution reactions: halogenation, nitration, sulphonation, Friedel–Crafts alkylation and its limitations, Friedel Crafts acylation.

Addition reactions: Addition of chlorine and hydrogen.

Oxidation reactions: With oxygen and ozone, mercuration and Birch reduction.

Effect of substituents on electrophilic substitution reactions, orientation and reactivity in monosubstituted and disubstituted benzene.

Oxidation and halogenation (ring vs side chain) of alkylbenzenes.

Toxicity of benzene vs toluene.

Unit II: Chemistry of Halogenated Hydrocarbons

Alkyl halides: Preparation, physical properties, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanism with stereochemical aspects, factors affecting nucleophilic substitution, elimination vs substitution, nucleophilicity vs basicity.

Aryl halides: Preparation, physical properties and nucleophilic aromatic substitution: S_NAr, elimination-addition mechanism.

Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Organometallic compounds of Mg and Li: synthetic uses.

Unit III: Alcohols, Phenols, Ethers and Epoxides

Alcohols: Preparation, relative reactivity of primary, secondary and tertiary alcohols. Alcohols as acids and bases.

Reactions of alcohols: With hydrogen halides, phosphorous halides, thionyl chloride and ammonia.

Oxidation of alcohols: Dehydrogenation and dehydration, Lucas reagent test, Victor Meyer test and Iodoform test.

Glycols: Preparation and reactions: Oxidation, Pinacol–Pinacolone rearrangement.

Phenols: Preparation and reactions: Acidity and factors affecting acidity of phenols.

Acylation of phenol, ring substitution reactions, Riemer–Tiemann reaction, Kolbe reaction, Fries and Claisen rearrangements.

Ethers and Epoxides: Preparation and reactions with acid. Acid and base catalysed ring opening of epoxides.

Recommended Texts:

1. Morrison, Robert Thornton & Boyd, Robert Neilson *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
2. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
3. Graham Solomons, T.W., Craig B. Fryhle *Organic Chemistry*, Seventh edition John Wiley & Sons, Inc. 2000.

PRACTICAL

ORGANIC: FUNCTIONAL GROUP DETECTION AND ORGANIC PREPARATION

1. Functional group tests for alcohols and phenols.
2. Organic preparations:
 - i. Acetylation of one of the following compounds: amines (aniline, *o*-,*m*-,*p*-toluidines and *o*-,*m*-,*p*-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method:
 - a. Using conventional method.
 - b. Using green approach
 - ii. Benzoylation of one of the following amines (aniline, *o*-,*m*-,*p*-toluidines and *o*-,*m*-,*p*-anisidine) and one of the following phenols (β -naphthol, resorcinol, *p*-cresol) by Schotten-Baumann reaction.
 - iii. Oxidation of ethanol/ isopropanol (Iodoform reaction).
 - iv. Bromination of any one of the following:
 - a. Acetanilide by conventional methods
 - b. Acetanilide using green approach (Bromate-bromide method)
 - v. Nitration of any one of the following:
 - a. Acetanilide/nitrobenzene by conventional method
 - b. Salicylic acid by green approach (using ceric ammonium nitrate).
 - vi. Selective reduction of meta dinitrobenzene to *m*-nitroaniline.
 - vii. Reduction of *p*-nitrobenzaldehyde by sodium borohydride.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may used for recrystallization, melting point and TLC.

Recommended Texts:

1. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education 2009.
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson 2012.
3. Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*, University Press 2000.
4. Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, University Press 2000.