

**GOVERNMENT DEGREE COLLEGE,
NANDIKOTKUR
DEPARTMENT OF CHEMISTRY
FUNDAMENTALS IN ORGANIC CHEMISTRY
SEM III PAPER -2**

Unit 1: Structural Theory in Organic Chemistry

Short Questions:

1. What are electrophilic reagents? Give examples.
2. Define nucleophilic reagents with examples.
3. What are free radicals in organic chemistry? Provide examples.
4. Explain bond polarization and factors influencing it.
5. How does the inductive effect influence the acidity of carboxylic acids?
6. What is resonance or mesomeric effect? Explain its application to phenol.
7. Define hyperconjugation and its effect on the stability of carbocations.
8. How do free radicals and alkenes interact in chemical reactions?

Long Questions:

1. Explain the types of reagents in organic chemistry: electrophilic, nucleophilic, and free radicals.
2. Discuss the reaction intermediates: carbocations, carbanions, and free radicals.
3. Explain the application of inductive effect in the acidity of carboxylic acids and stability of carbocations.
4. Discuss resonance (mesomeric effect) and its effect on the acidity of phenol and carboxylic acids.
5. Explain hyperconjugation and its application to the stability of carbocations, free radicals, and alkenes.

Unit 2: Saturated Hydrocarbons (Alkanes and Cycloalkanes)

Short Questions:

1. What is the Wurtz reaction for the preparation of alkanes?
2. Define Corey-House synthesis and its role in alkane preparation.
3. Describe the conformational analysis of ethane.
4. What is the Baeyer-Struve theory for cycloalkanes?
5. Discuss the relative stability of cyclohexane and its conformations.

Long Questions:

1. Discuss the general methods of preparation of alkanes and their physical and chemical properties.
2. Explain the conformational analysis of alkanes with energy diagrams for ethane, propane, and butane.
3. Describe the molecular formulae of cycloalkanes and their relative stability.
4. Explain Baeyer-Struve theory and discuss the conformations of cyclohexane with energy diagrams.
5. Describe the properties and reactions of cycloalkanes with emphasis on cyclohexane conformations.

Unit 3: Unsaturated Hydrocarbons (Alkenes and Alkynes)

Short Questions:

1. What are Saytzeff and Hofmann eliminations?
2. Explain the mechanism of electrophilic addition to alkenes (HX addition).
3. What is ozonolysis, and how is it applied to alkenes?
4. Describe the Diels-Alder reaction.
5. How does the addition of HX to alkenes differ in terms of syn and anti additions?

Long Questions:

1. Discuss the general methods of preparation, physical, and chemical properties of alkenes.

- 2.Explain the mechanism of electrophilic addition reactions, including Markovnikov and anti-Markovnikov additions.
- 3.Describe the Saytzeff and Hofmann elimination mechanisms with suitable examples.
- 4.Discuss the various addition reactions of conjugated dienes, including 1,2- and 1,4-addition.
- 5.Explain the reactions of alkynes, focusing on their acidity, electrophilic and nucleophilic additions, and hydration to form carbonyl compounds.

Unit 4: Benzene and its Reactivity

Short Questions:

- 1.What is the structure of benzene?
- 2.How is benzene prepared from acetylene?
- 3.Describe the mechanism of electrophilic aromatic substitution.
- 4.Explain Friedel-Crafts alkylation and acylation with examples.
- 5.What is the mechanism of nitration of benzene?

Long Questions:

- 1.Explain the structure of benzene and its resonance.
- 2.Discuss the preparation of benzene from acetylene and the mechanism of polymerization.
- 3.Describe the mechanism of electrophilic aromatic substitution with specific examples of halogenation and nitration.
- 4.Discuss Friedel-Crafts alkylation and acylation reactions with examples.
- 5.Explain the various reactions of benzene and their mechanisms, including halogenation and nitration.

Unit 5: Orientation of Aromatic Substitution

Short Questions:

- 1.What is aromaticity? Explain Huckel's rule.

2. Describe the concept of ortho, para, and meta directing groups in aromatic substitution.
3. What are ring-activating and deactivating groups? Provide examples.
4. How do amino, methoxy, and methyl groups affect the orientation of aromatic substitution?
5. Explain the effect of nitro, carboxyl, and sulfonic acid groups on aromatic substitution.

Long Questions:

1. Discuss the concept of aromaticity and explain Huckel's rule with examples of benzenoid and non-benzenoid compounds.
2. Explain the orientation of aromatic substitution with respect to activating and deactivating groups.
3. Discuss the influence of amino, methoxy, and methyl groups on the orientation of aromatic substitution.
4. Explain the effects of nitro, carboxyl, nitrile, carbonyl, and sulfonic acid groups on aromatic substitution.