

Organic Chemistry

Functional Groups and Reaction Mechanisms Quiz

Instructions:

- Answer all questions.
- For Questions 1–5, choose the best option.
- For Questions 6–8, mark True or False.
- For Questions 9–10, write detailed answers with mechanisms where appropriate.

1. Which functional group is characterized by a carbonyl group bonded to a hydroxyl group?
 - (A) Aldehyde
 - (B) Ketone
 - (C) Carboxylic acid
 - (D) Ester
2. In an S_N2 reaction, the rate depends on:
 - (A) Concentration of substrate only
 - (B) Concentration of nucleophile only
 - (C) Concentration of both substrate and nucleophile
 - (D) Temperature only
3. Which of the following is the most stable carbocation?
 - (A) Methyl carbocation
 - (B) Primary carbocation
 - (C) Secondary carbocation
 - (D) Tertiary carbocation
4. Markovnikov's rule predicts that in the addition of HBr to propene, the bromine will attach to:
 - (A) The terminal carbon (C1)
 - (B) The middle carbon (C2)
 - (C) Both carbons equally

- (D) Neither carbon
5. Which reagent is commonly used to reduce a ketone to a secondary alcohol?
- (A) KMnO_4
- (B) NaBH_4
- (C) H_2SO_4
- (D) PCC
6. Enantiomers have identical physical properties except for the direction they rotate plane-polarized light. (True/False)
7. An $\text{S}_{\text{N}}1$ reaction proceeds with inversion of configuration at the stereocenter. (True/False)
8. Aromatic compounds are more reactive than alkenes in electrophilic addition reactions. (True/False)
9. Compare and contrast $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ nucleophilic substitution mechanisms. Discuss the factors that favor each pathway, including substrate structure, nucleophile strength, and solvent effects.
10. Explain the concept of aromaticity and Hückel's rule. Why is benzene unusually stable compared to hypothetical cyclohexatriene? Describe how electrophilic aromatic substitution preserves aromaticity.