Name: _____ **Date:** _____

Bonding Brilliance: 12th Grade Organic Synthesis Quiz

Scholars analyze complex reaction mechanisms, steric hindrance in nucleophilic substitutions, and the resonance stability of aromatic intermediates.

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1. A student attempts to synthesize an ether using the Williamson ether synthesis. If they react potassium tert-butoxide with 2-bromo-2-methylpropane, what is the primary organic product observed?

A. Di-tert-butyl ether
B. 2-methylpropene
C. 2-methyl-2-butanol
D. Isobutane

2. In the electrophilic aromatic substitution of nitrobenzene, the nitro group acts as a(n) _____ director for the incoming electrophile.

A. ortho
B. para
C. meta
D. ortho/para

3. The Enantiomeric Excess (ee) of a racemic mixture is 0%.

A. True
B. False

4. Which of the following describes the first step of the Grignard reaction between methylmagnesium bromide and pentan-3-one?

A. Nucleophilic attack on the carbonyl oxygen
B. Proton abstraction from the alpha-carbon
C. Nucleophilic attack on the carbonyl carbon
D. Electrophilic addition to the C=O bond

5. The reduction of a nitrile (R-CN) using Lithium Aluminum Hydride ($LiAlH_4$) followed by an acid workup yields a(n) _____.

A. Amide
B. Primary amine
C. Secondary amine
D. Carboxylic acid

6. The Sn1 reaction mechanism involves a pentacoordinate transition state.

A. True
B. False

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7. According to Hückel's Rule, which of the following criteria must a molecule meet to be considered aromatic?

A. A cyclic, planar system with 4n pi electrons
B. A cyclic, non-planar system with 4n+2 pi electrons
C. A cyclic, planar system with 4n+2 pi electrons
D. Any conjugated system with alternating double bonds

8. In the acid-catalyzed dehydration of alcohols, the rate-determining step for 2-methyl-2-propanol is the formation of a _____.

A. Oxonium ion
B. Carbanion
C. Carbocation
D. Pi complex

9. Equatorial substituents in a cyclohexane chair conformation are generally more stable than axial substituents due to the relief of 1,3-diaxial interactions.

A. True
B. False

10. Predict the major product of the hydroboration-oxidation of 1-methylcyclopentene.

A. 1-methylcyclopentanol (Markovnikov addition)
B. trans-2-methylcyclopentanol (Anti-Markovnikov, Syn-addition)
C. cis-2-methylcyclopentanol (Markovnikov, Anti-addition)
D. 1,2-dimethylcyclopentane