

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Shatter Stereocenters: Senior Synthetic Chemistry Quiz

Can you predict regioselectivity in complex aromatic substitutions? Solve advanced mechanisms involving resonance effects and Baldwin's rules.

---

**1. When subjecting 1-methylcyclohexene to hydroboration-oxidation, which specific stereochemical and regiochemical outcome is observed?**

- A. Markovnikov addition with syn-stereochemistry
- B. Anti-Markovnikov addition with syn-stereochemistry
- C. Markovnikov addition with anti-stereochemistry
- D. Anti-Markovnikov addition with anti-stereochemistry

**2. According to Hückel's Rule, the cyclopentadienyl anion ( $C_5H_5^-$ ) is considered aromatic because it possesses 6 pi electrons in a planar, cyclic conjugated system.**

- A. True
- B. False

**3. In the Electrophilic Aromatic Substitution (EAS) of nitrobenzene, the nitro group acts as a strongly deactivating group and directs the incoming electrophile to the \_\_\_\_\_ position.**

- A. Ortho
- B. Para
- C. Meta
- D. Ipso

**4. Identify the primary product formed when (S)-2-bromobutane undergoes an  $S_N2$  reaction with sodium ethoxide ( $NaOEt$ ) in ethanol.**

- A. (R)-2-ethoxybutane
- B. (S)-2-ethoxybutane
- C. Racemic 2-ethoxybutane
- D. 1-butene

**5. The Claisen Rearrangement is a powerful synthetic tool classified as a [3,3]-\_\_\_\_\_ reaction.**

- A. Electrocyclic
- B. Sigmatropic
- C. Cycloaddition
- D. Nucleophilic

**6. The  $E2$  elimination mechanism requires a periplanar transition state, preferably 'anti-periplanar', for the base to successfully abstract a proton and expel the leaving group.**

- A. True
- B. False

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**7. Which of the following compounds would exhibit the highest frequency for the carbonyl (C=O) stretch in an IR spectrum?**

- A. Formaldehyde
- B. Acetone
- C. Acetaldehyde
- D. Benzophenone

**8. In Proton NMR ( $^1\text{H}$  NMR) spectroscopy, a signal that appears as a septet integrated for 1H, coupled with a doublet integrated for 6H, is highly characteristic of a(n) \_\_\_\_\_ group.**

- A. Ethyl
- B. n-Propyl
- C. Isopropyl
- D. tert-Butyl

**9. A Friedel-Crafts Alkylation can be performed on an aniline molecule (phenylamine) using  $\text{AlCl}_3$  as a catalyst to add an alkyl chain to the ring.**

- A. True
- B. False

**10. During the acid-catalyzed dehydration of 3,3-dimethyl-2-butanol, what is the most likely major product formed after carbocation rearrangement?**

- A. 3,3-dimethyl-1-butene
- B. 2,3-dimethyl-2-butene
- C. 2,3-dimethyl-1-butene
- D. 3,3-dimethyl-2-butene