

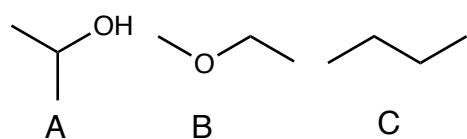
CHM 224
Test 2
Chapters 13, 14, organometallics, 20

NAME:

1. Answer the following 3 questions:

- A. Brandy is 80 proof. What is its percent alcohol? 40% (% x 2 = proof)
- B. This alcohol has been used as a fuel in race cars: methanol
- C. The alcohol found in beer and wines is: ethanol

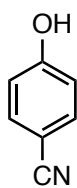
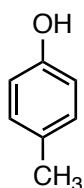
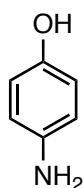
2. The three compounds below have nearly identical molecular weights. Arrange them according to their expected boiling points from highest >>> lowest.



A > B > C

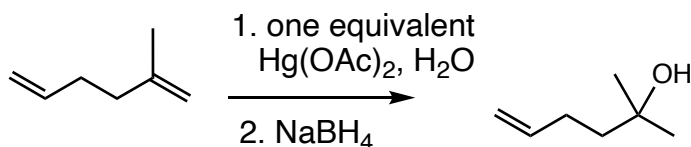
A is polar, hydrogen bonding
 B is polar and hydrogen bonding
 C is nonpolar

3. Match the pKa values with the compounds provided: pKa's = 8.0, 10.1, 10.3



• the pKa is determined by the nature of the substituent on the benzene ring. Electron withdrawing groups stabilize the negatively charged conjugate base (making them more acidic, i.e. lower pKa) while electron donor groups destabilize the conjugate base (making them less acidic, i.e. higher pKa)
 • NH₂ is a stronger electron donating group than CH₃, while CN is an electron withdrawing group

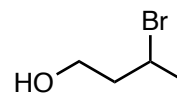
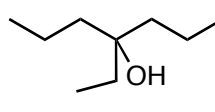
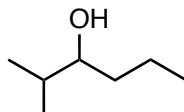
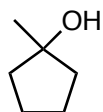
4. What is the expected major product of the following reaction?



• disubstituted C=C bonds are more reactive towards electrophiles than monosubstituted bonds. Hence, reaction occurs at the right most bond
 • The reaction conditions reflect Markovnikov hydration, i.e., addition of H-OH across the C=C bond such that the OH group ends up at the more substituted carbon of the C=C bond

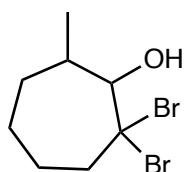
5. Which of the following compounds is expected to undergo reaction with KMnO₄ (may be more than one)?

- A. 1-methylcyclopentanol
 B. 2-methyl-3-hexanol
 C. 4-ethyl-4-heptanol
 D. 3-bromo-1-butanol



1° alcohols are oxidized to carboxylic acids
 2° alcohols are oxidized to ketones
 3° alcohols will not be oxidized by KMnO₄

6. Provide the IUPAC name for the following compound:

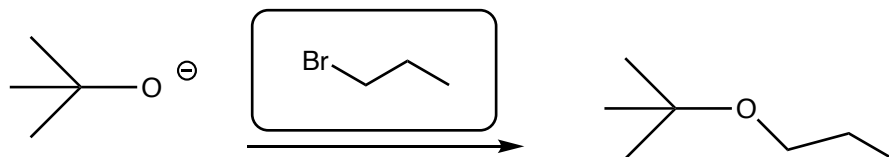


2,2-dibromo-7-methylcycloheptanol

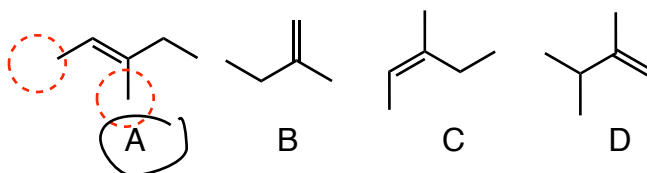
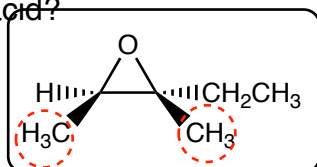
7. Which ONE of the following statements is true?

- A. ethers are generally water soluble, flammable, and reactive with strong bases
- B. ethers are generally water insoluble, not flammable, and reactive with strong acids
- C. ethers are generally water soluble, not flammable, and reactive with strong bases
- D. ethers are generally water insoluble, flammable, and reactive with strong acids

8. In the box, provide the compound required to complete the Williamson ether synthesis below:



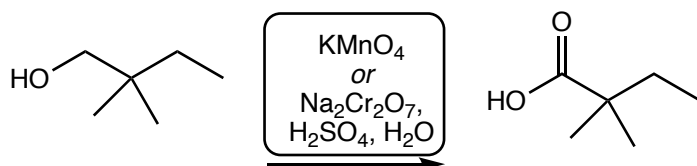
9. Which one of the following alkenes will form the epoxide below upon treatment with a peroxyacid?



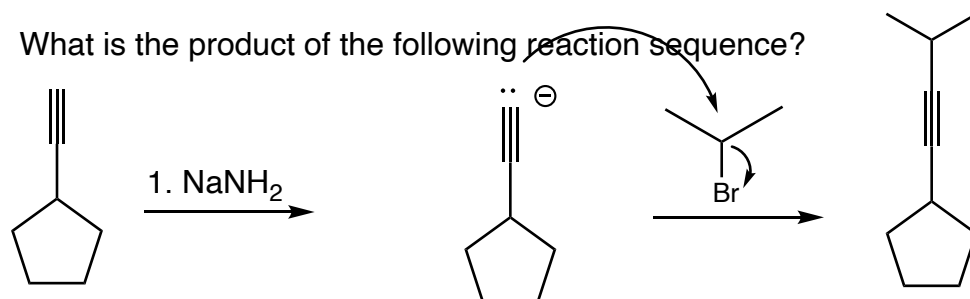
10. Answer the following 3 questions:

- A. the solvent commonly referred to as "ether" has what structure?
- B. ether was first developed as an anesthetic for what type of medical practice? dentistry
- C. peroxides are formed when ethers react with what compound? O_2

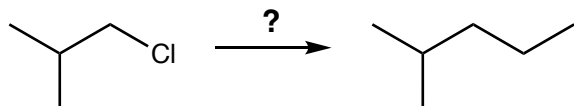
11. In the box, provide the reagent that is best suited for the following reaction:



12. What is the product of the following reaction sequence?

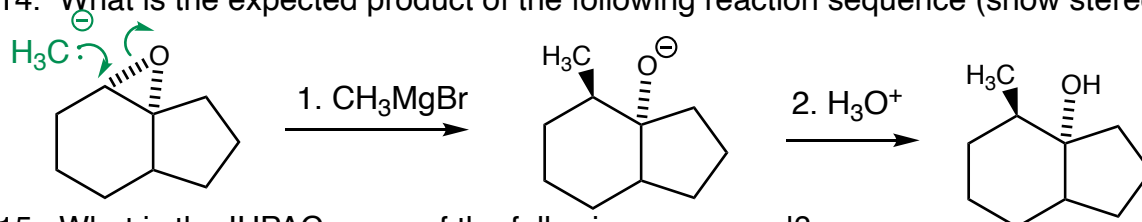


13. What organometallic reagent would be best suited to complete the following reaction (may be more than one)?

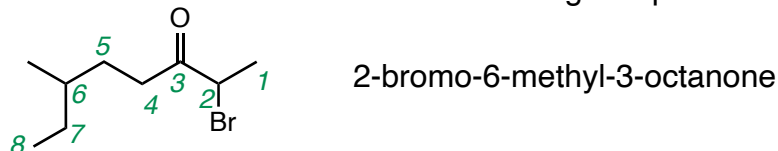


- A. $\text{CH}_3\text{CH}_2\text{MgBr}$
- B. CH_3MgBr
- C. $(\text{CH}_3)_2\text{CuLi}$
- D. $(\text{CH}_3\text{CH}_2)_2\text{CuLi}$

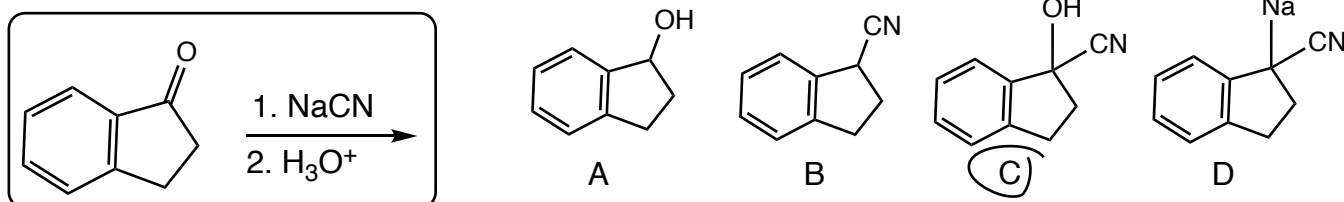
14. What is the expected product of the following reaction sequence (show stereochemistry):



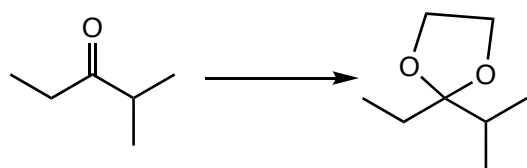
15. What is the IUPAC name of the following compound?



16. What one of the following is the expected major product of the following reaction:



17. What set of reagents must be added to complete the following reaction:

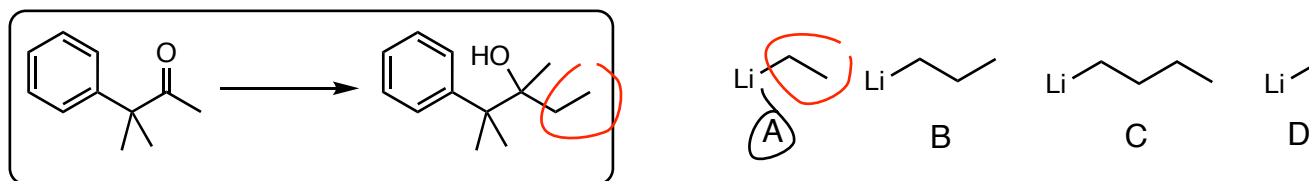


- A. HOCH₂OH, TsOH
- B. HOCH₂OH, KOH
- C. HOCH₂CH₂OH, KOH
- D. HOCH₂CH₂OH, TsOH
- E. HOCH₂CH₂CH₂OH, KOH
- F. HOCH₂CH₂CH₂OH, TsOH

18. Which one of the following statements properly describes why ketones are generally less reactive than aldehydes towards nucleophiles?

- A. because ketones are more electrophilic and less sterically hindered
- B. because ketones are less electrophilic and less sterically hindered
- C. because ketones are more electrophilic and more sterically hindered
- D. because ketones are less electrophilic and more sterically hindered

19. Addition of which alkyllithium compound, followed by H₃O⁺, is required to complete the following reaction?



20. Draw the product expected from the following reaction:

