

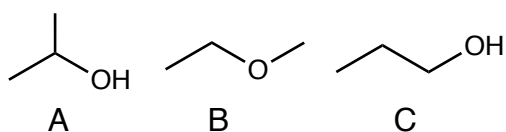
CHM 224
Test 2
Chapters 13, 14, organometallics, 20

NAME:

1. Answer the following 3 questions:

- A. Brandy is 50% alcohol. What is its proof? 100 proof (2 x 50)
 B. This alcohol can be created by heating wood chips: methanol (also called wood alcohol)
 C. This alcohol is referred to as "rubbing alcohol": n-propanol or isopropanol

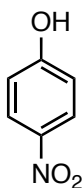
2. The three compounds below have nearly identical molecular weights. Arrange them according to their expected boiling points from highest >>> lowest.



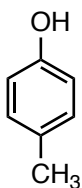
C > A > B

C is polar, hydrogen bonding and unbranched
 A is polar, hydrogen bonding and branched (lower bp relative to C)
 B is polar but not hydrogen bonding, so it has weaker intermolecular forces than A or C

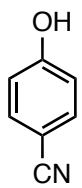
3. Match the pKa values with the compounds provided: pKa's = 7.2, 8.0, 10.3



7.2



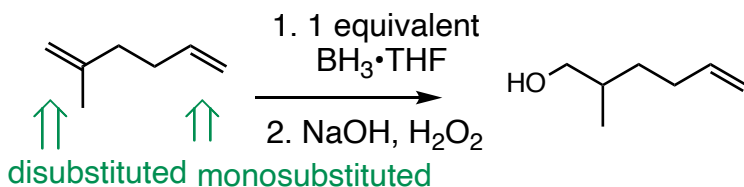
10.3



8.0

• 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)
 • NO₂ is a stronger electron withdrawing group than CN, while CH₃ is an electron donor group

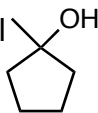
4. What is the expected major product of the following reaction?



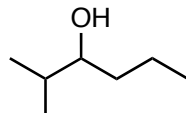
• disubstituted C=C bonds are more reactive towards electrophiles than monosubstituted bonds. Hence, reaction occurs at the left most bond
 • The reaction conditions reflect anti-Markovnikov hydration, i.e., addition of H-OH across the C=C bond such that the OH group ends up at the less substituted carbon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

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

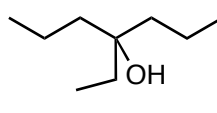
- A. 1-methylcyclopentanol
 B. 2-methyl-3-hexanol
 C. 4-ethyl-4-heptanol
 D. 3-bromo-1-butanol



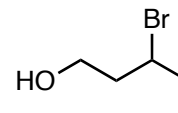
3° alcohol



2°



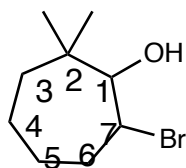
3°



1°

3° alcohols will not be oxidized by KMnO₄

6. Provide the IUPAC name for the following compound:

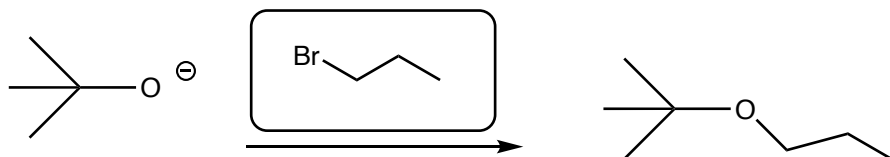


7-bromo-2,2-dimethylcycloheptanol

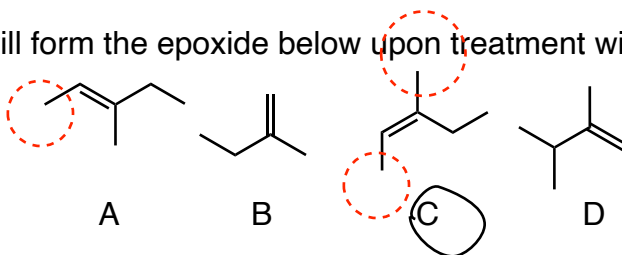
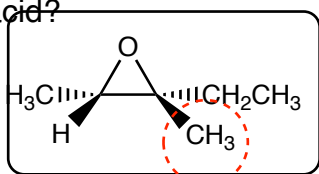
7. Which ONE of the following statements is true?

- 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:



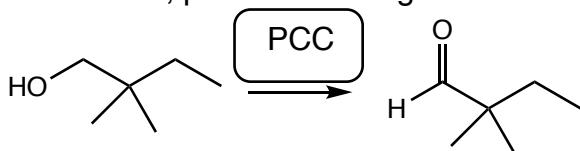
9. Which one of the following alkenes will form the epoxide below upon treatment with a peroxyacid?



10. Answer the following 3 questions:

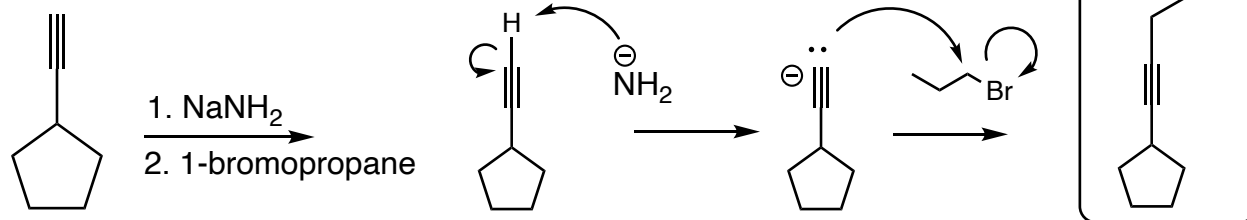
- A. the solvent commonly referred to as "ether" has what structure?
- B. ether was first developed as an anesthetic for what type of medical practice? dentistry
- C. peroxides are formed when ethers react with what compound? O₂

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

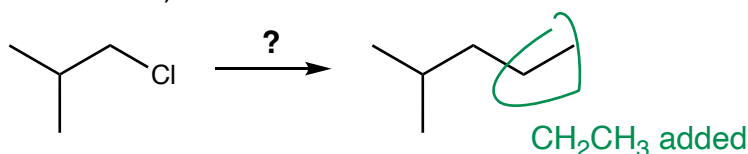


Σ PCC is a mild oxidant suited for oxidation of 1° alcohols to aldehydes
 Σ stronger oxidizing agents such as KMnO₄ or Jones reagent will over-oxidize to the carboxylic acid

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

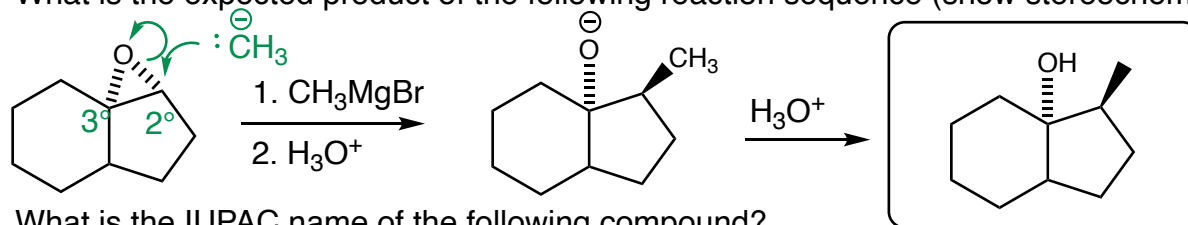


13. What organometallic reagent would be best suited to complete the following reaction (may be more than one)?

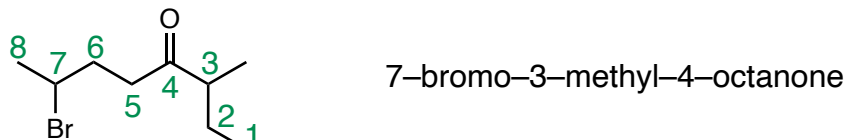


- A. CH₃CH₂MgBr
- B. CH₃MgBr
- C. (CH₃)₂CuLi
- D. (CH₃CH₂)₂CuLi**

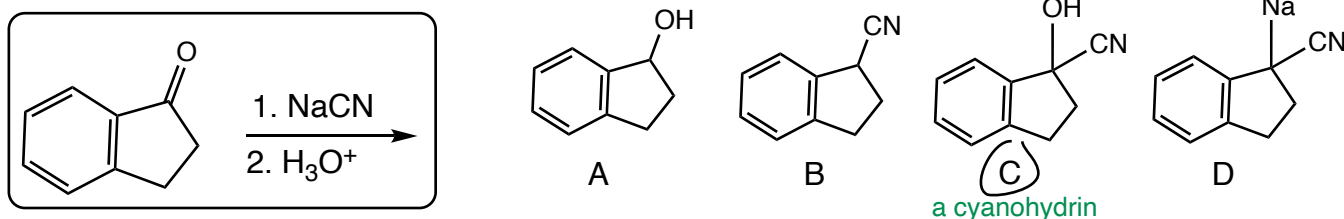
14. What is the expected product of the following reaction sequence (show stereochemistry):



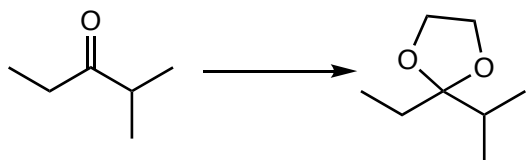
15. What is the IUPAC name of the following compound?



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:

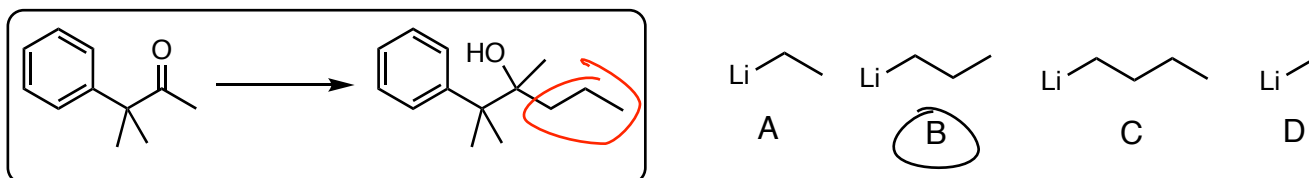


- A. HOCH₂OH, TsOH
- B. HOCH₂OH, KOH
- C. HOCH₂CH₂OH, KOH
- D. HOCH₂CH₂OH, TsOH
- E. HOCH₂CH₂CH₂OH, KOH
- F. HOCH₂CH₂CH₂OH, TsOH

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

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

