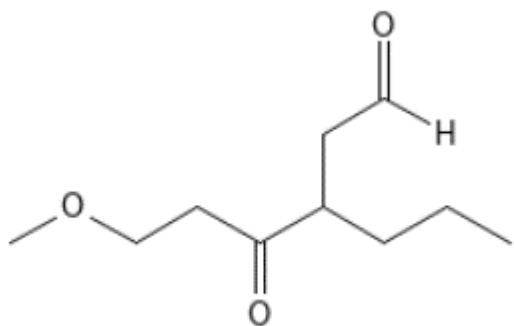


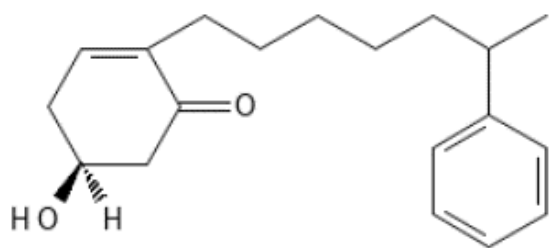
A. Nomenclature: (12 Points)

Give an acceptable IUPAC name for each of the following compounds in **1** and **2**. Draw the structure of the compound in **3**. Be sure to note **stereochemistry** where appropriate.

1.



2.

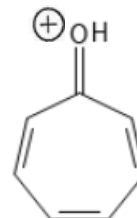
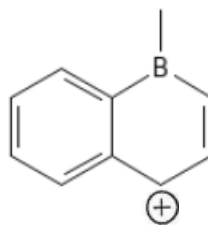
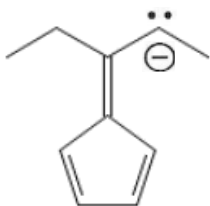
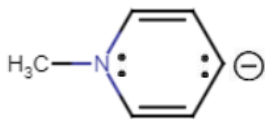


3.

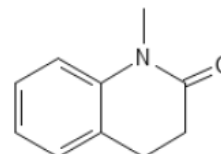
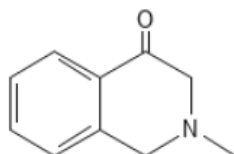
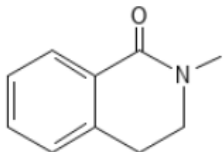
4-benzylacetophenone

B. Facts: (20 Points)

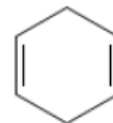
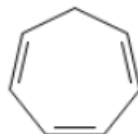
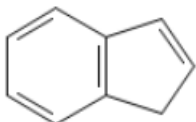
1. Label the molecules below as aromatic(**AR**), antiaromatic(**AA**), or nonaromatic(**NA**). Please assume all are planar. (8 pts.)



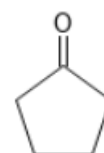
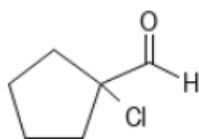
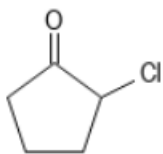
2. Rank the following substituted benzene compounds in order of increasing rate of reaction with a mixture of HNO₃ and H₂SO₄ (1=slowest rate, 3=fastest rate) (3 pts.)



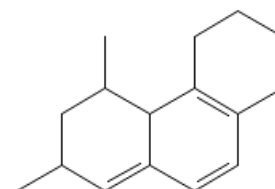
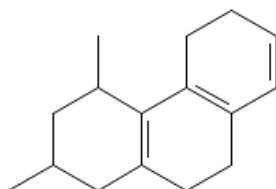
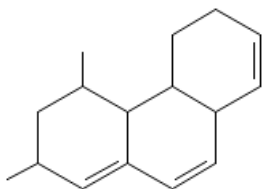
3. Rank the compounds in order of increasing acidity (1= least acidic, 3=most acidic) (3pts.)



4. Place the following compounds in order of increasing amount of hydrate present at equilibrium in their reactions with water (1= least amount, 3=greatest amount) (3pts.)

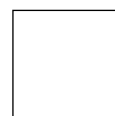
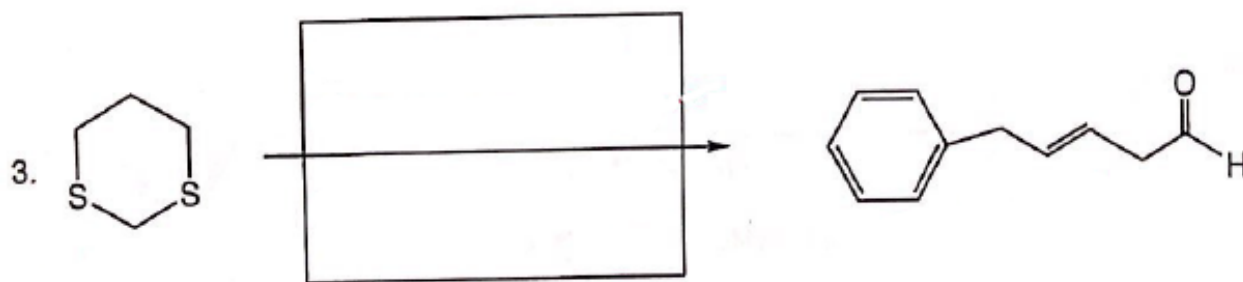
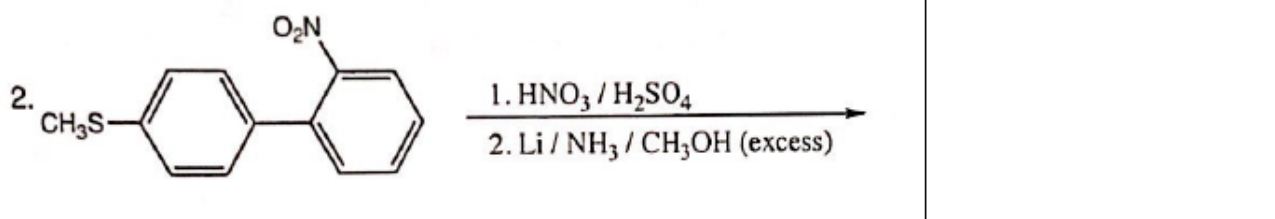
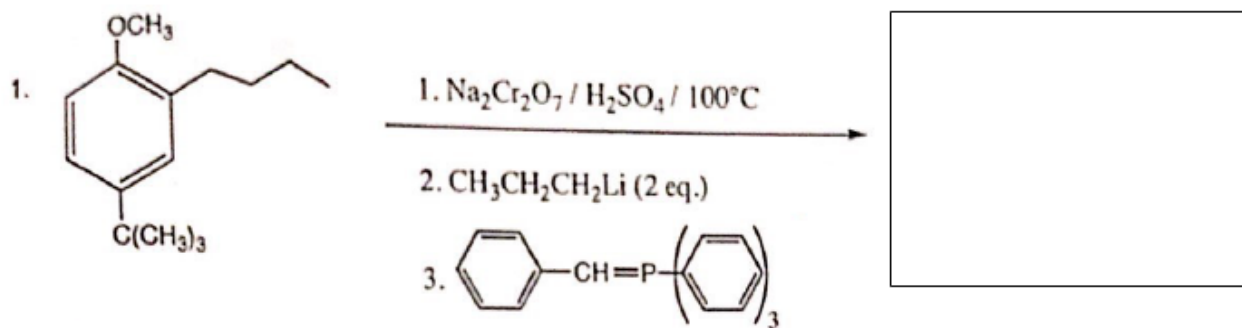


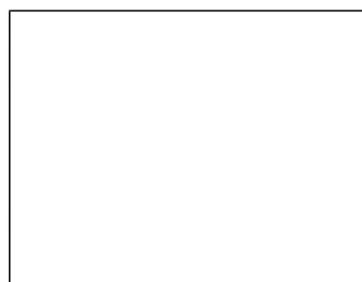
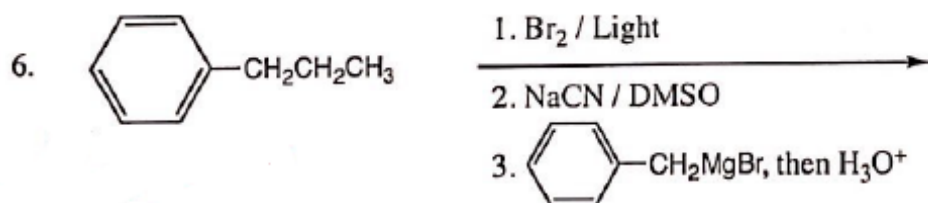
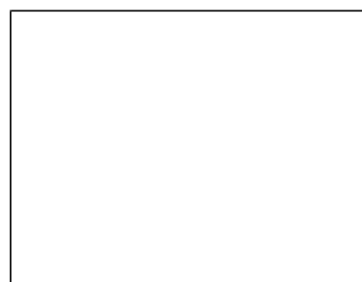
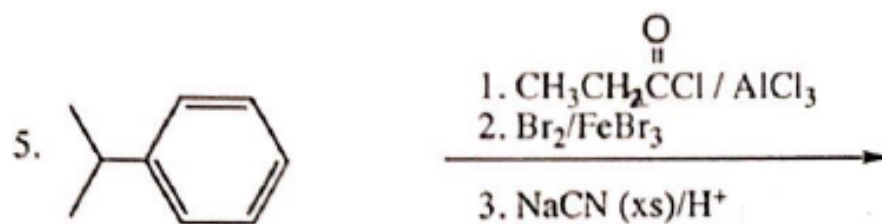
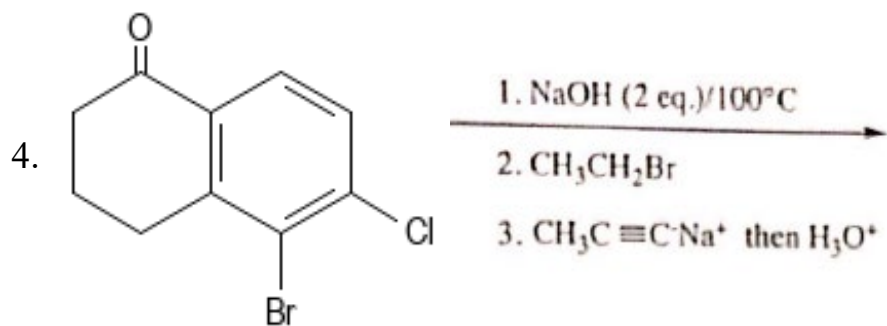
5. Place the following compounds in order of increasing λ_{\max} (wavelength) of the π to π^* transitions in their UV spectra (1=shortest wavelength, 3=longest wavelength) (3 pts.)



C. Reactions: Total = 36 points, 6 points each

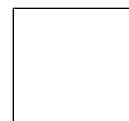
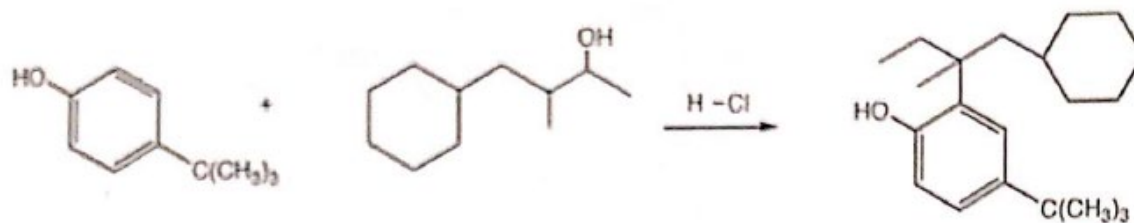
Please provide the reagents or the major products in the answer box. Indicate **stereochemistry** if applicable. **Full credit is awarded only when the product of each step in a multi-step reaction is shown below the reaction**





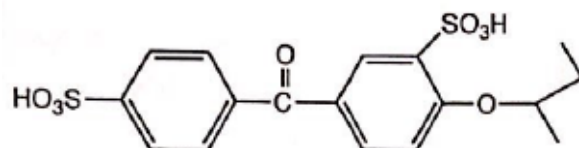
D. Mechanism: (11 points)

Provide a clear mechanism to explain the formation of the product. Use curved arrows to indicate "electron flow." **Show all intermediates and all formal charges.** When more than one resonance contributor may be drawn, be sure to draw the most stable contributor.



E. Synthesis: 11 Points

Synthesize the molecule below using **benzene, alcohols of four carbons or less**, any inorganic reagents, and any oxidizing or reducing agents.



F. Spectroscopy: 10 Points

A compound with the formula $C_{10}H_{10}O$ exhibits the IR, 1H NMR, and proton decoupled ^{13}C NMR spectra shown below. Please identify this compound and draw the structure in the box provided below

