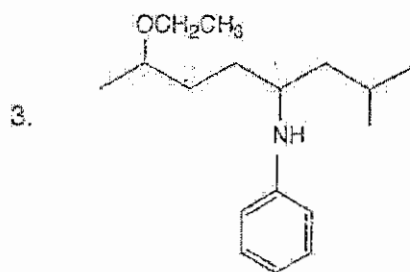
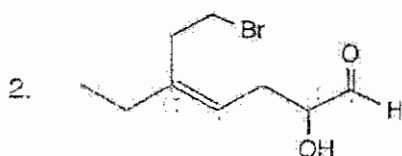
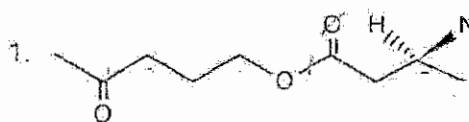


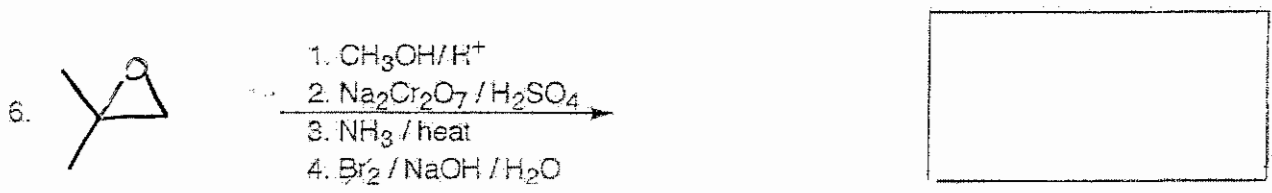
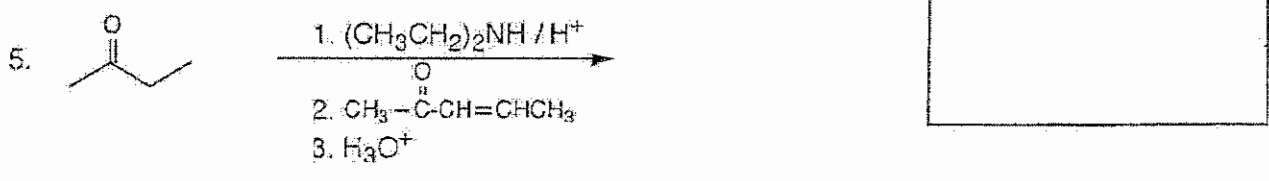
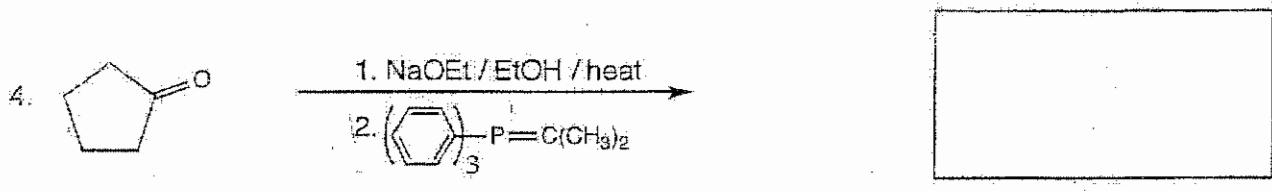
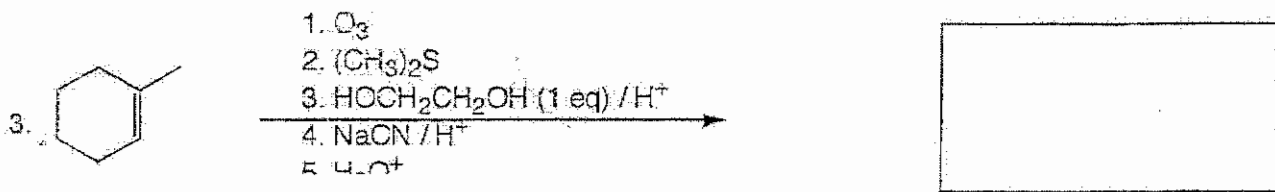
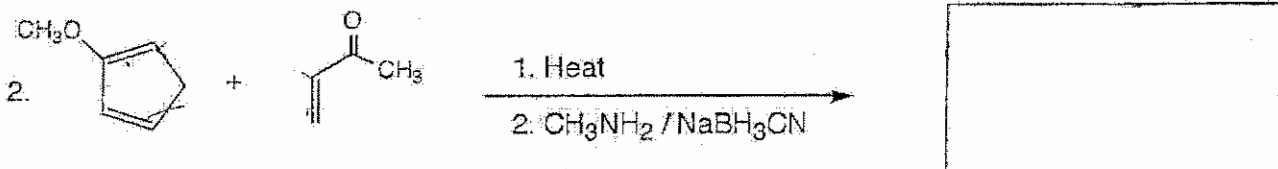
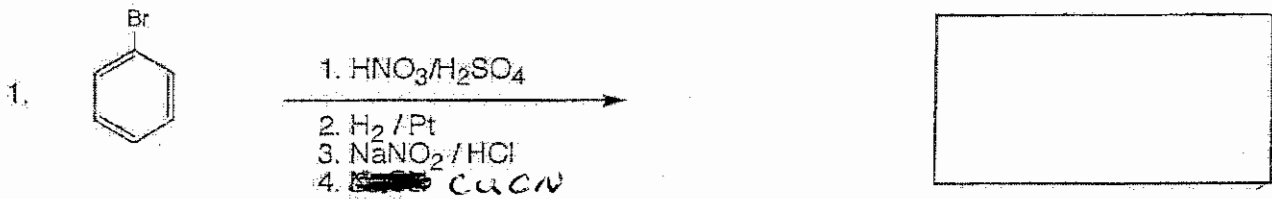
**A. Nomenclature:** (15 points, 5 points each)

Please provide an acceptable name for each of the following compounds. Be sure to note stereochemistry where appropriate.



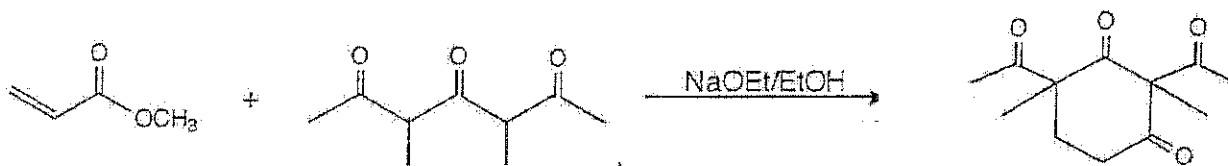
**B. Reactions:** Total = 40 points, 8 points each

Please provide the major product in the answer box for **FIVE** of the reactions. Write "omit" in the box of the reaction you choose to omit. Be sure your drawings indicate stereochemistry if applicable. Partial credit is awarded only when intermediate products are shown below the reaction.



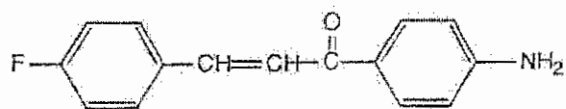
**C. Mechanism:** 15 points

Please provide a clear mechanism for the reaction below. Use curved arrow notation to indicate "electron flow." Show all intermediates and all formal charges. If there is more than one resonance structure, you must show the "best" (i.e., lowest energy) structure.



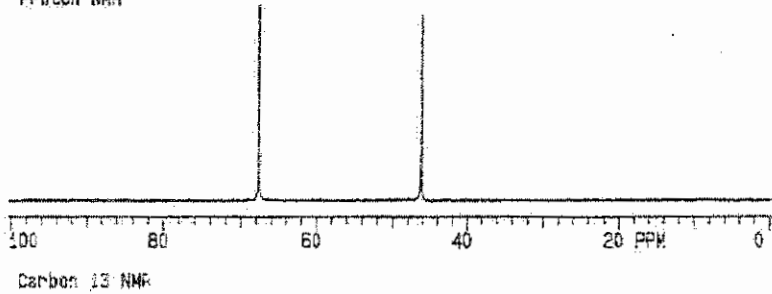
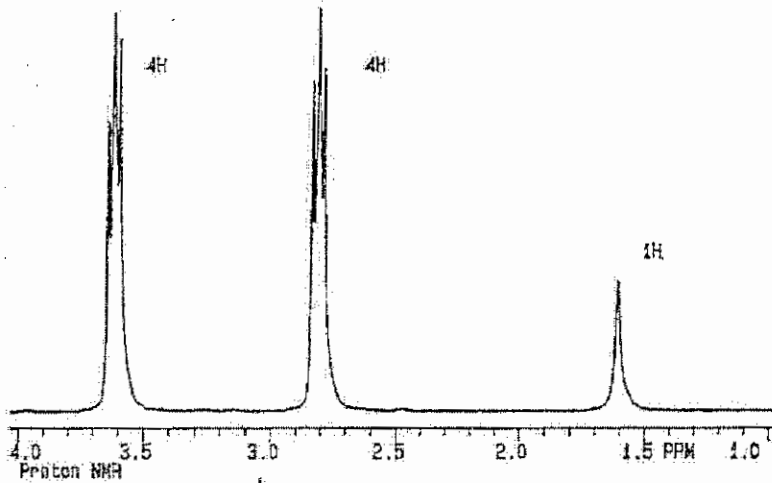
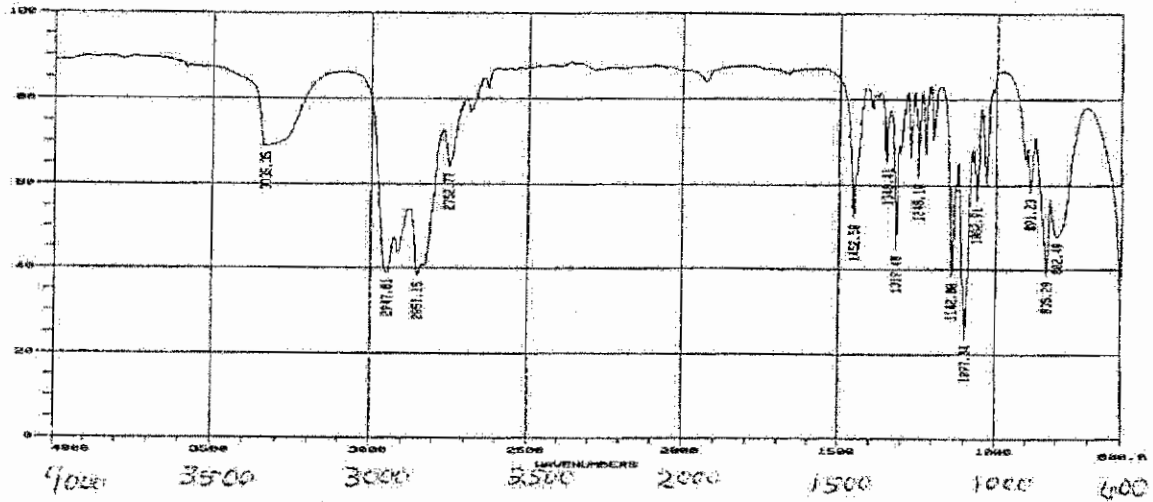
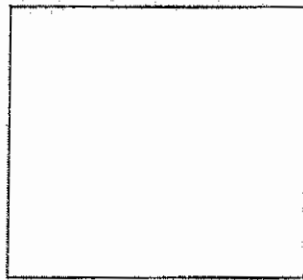
D. Synthesis: (15 points)

Synthesize the compound below using any of the following reagents: benzene and alkanes, alkenes, alkynes or alcohols of **three carbons or less**, any oxidizing or reducing agents, any peroxyacids, and any inorganic reagents. **Please note: A starting material may not contain more than one functional group!**



**E Spectroscopy: 15 Points**

A compound with the formula  $C_4H_9NO$  exhibits the IR,  $^1H$  NMR, and proton-decoupled  $^{13}C$  NMR shown on the following page. Please identify this compound and draw the structure in the box provided below.



**Bonus Question: 10 points**

Below are the IR,  $^1\text{H}$  NMR, and proton-decoupled  $^{13}\text{C}$  NMR spectra of a compound of unknown formula. The singlet at 1.3 ppm in the  $^1\text{H}$  NMR spectrum is  $\text{D}_2\text{O}$  exchangeable. Propose a structure for this compound. Only answers in the box will be graded.

