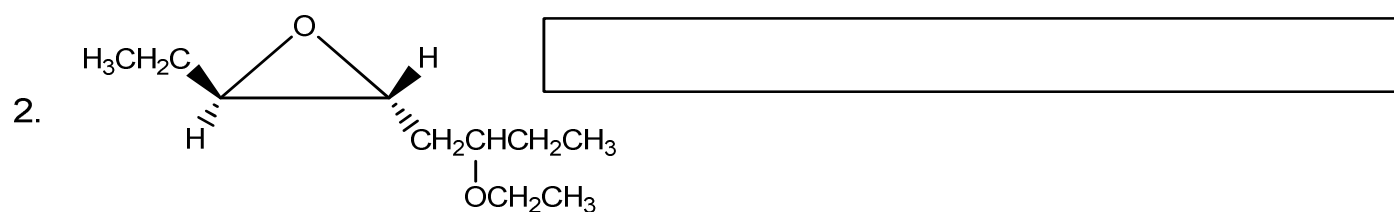
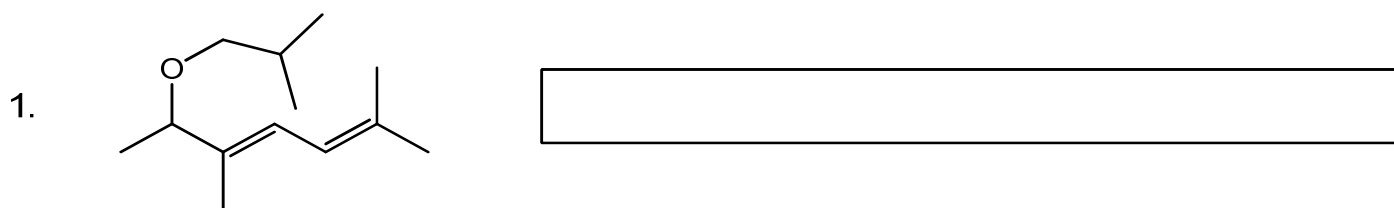




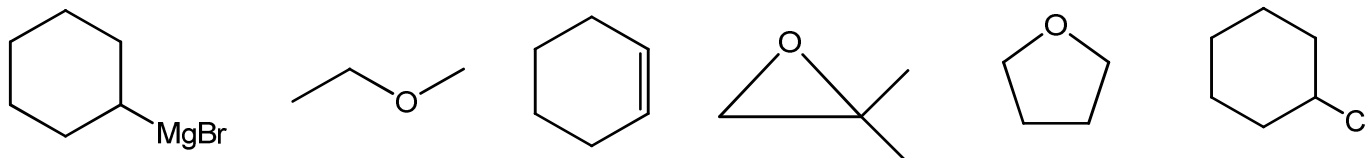
**A. Nomenclature:** (12 points, 4 each)

Give an acceptable name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

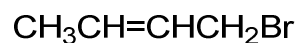
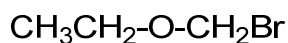


**B. Facts:** Total = 20 points

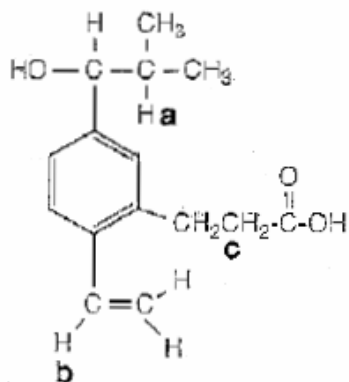
1. Circle the compounds that would be stable (i.e., unreactive) in aqueous NaOH. (6 points) Note: Points will be deducted for any incorrect circles.



2. Place the following compounds in order of increasing reactivity in an SN1 process. (1=least reactive, 3=most reactive) (6 points)



3. Answer the following questions about the compound below. Place the answers in the appropriately labeled boxes. a) How many distinct types of protons does the compound have? b) What are the theoretically predicted multiplicities (splitting patterns) of the signals for the protons labeled **a** and **b**? c) What is the multiplicity of the signal in the proton coupled  $^{13}\text{C}$  NMR spectrum for the carbon labeled **c**? (8 points)



a) number of proton types:

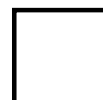
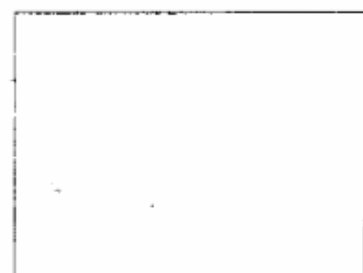
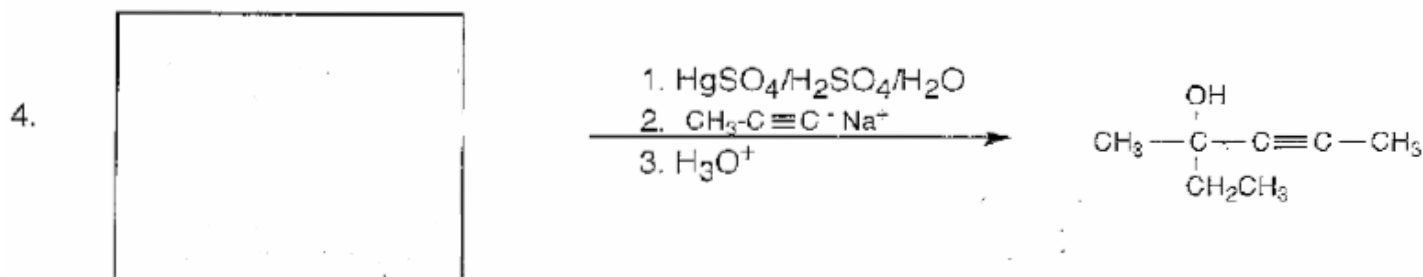
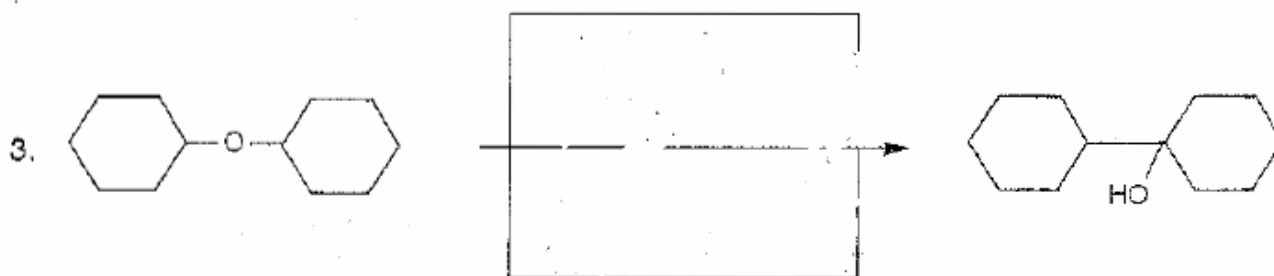
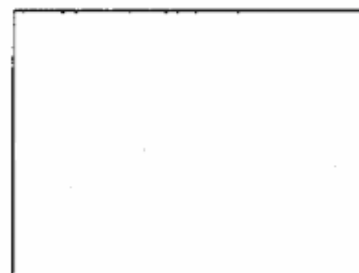
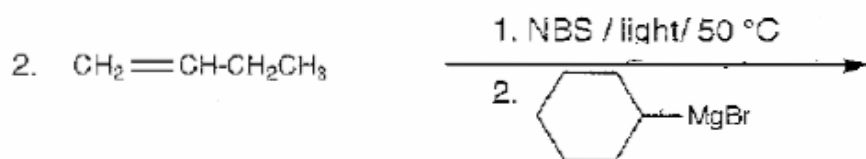
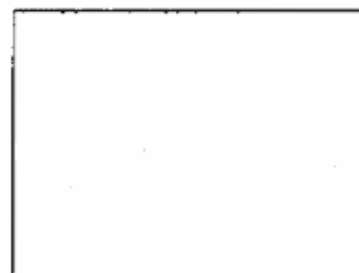
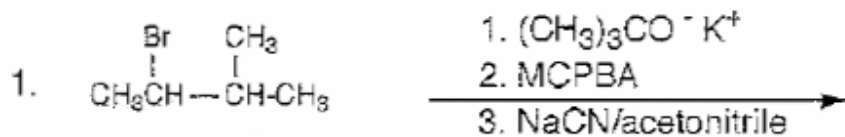
b)  $\text{H}_a$  multiplicity:

$\text{H}_b$  multiplicity:

c)  $\text{C}_c$  multiplicity:

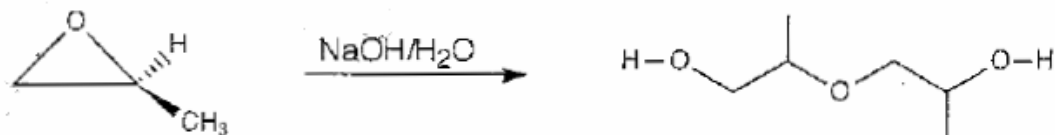
**C. Reactions:** Total = 25 points, 5 points each

Please provide the starting material, reagents, or major product in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products are shown below the reaction.



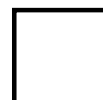
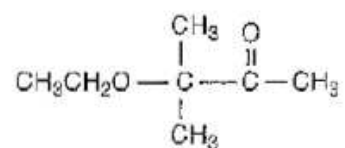
**D. Mechanism:** 14 points

Please provide a clear mechanism for the reaction below. Used curved arrow notation to indicate "electron flow." Show all intermediates and all formal charges.



**E. Synthesis:** (14 points)

Synthesize the compound below using any of the following reagents: alkanes, alkenes, alkynes or alcohols of **three carbons or less**; any oxidizing or reducing agents; and any peroxyacids.



### F. Spectroscopy: 15 Points

A compound with the formula  $C_9H_{10}O$  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.

