

Final Exam

Chemistry 3331

December 12, 2001

Name (PRINT) \_\_\_\_\_  
Last, First

Signature \_\_\_\_\_

ID # \_\_\_\_\_

**PLEASE CIRCLE CLASS TIME**

10:00 AM

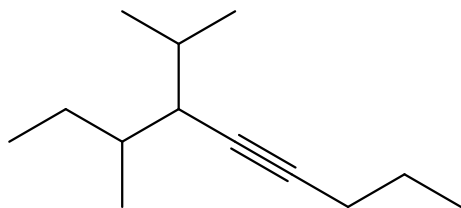
1:00 PM

**NOTE: Present your ID when you return the exam booklet**

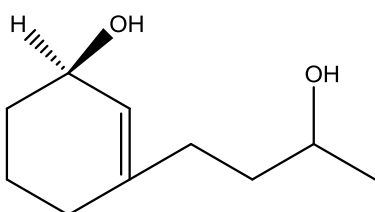
**A. Nomenclature:** Total= 12 points, 3 points each

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

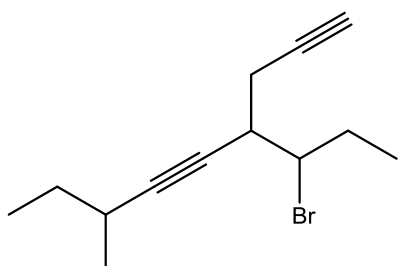
1.



2.

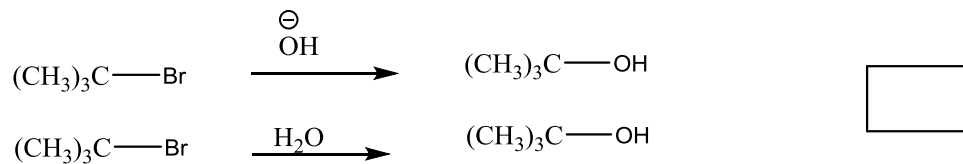


3.

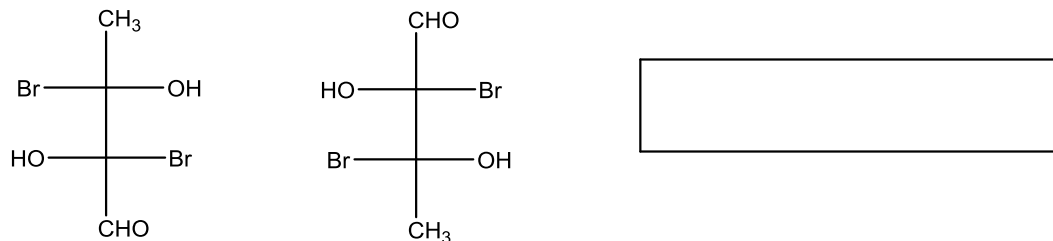


**B. Facts:** 18 points

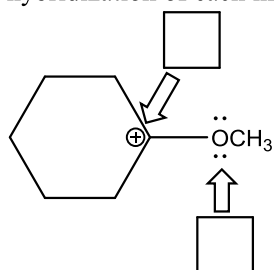
1. State whether reaction a or reaction b has the faster rate. If both reactions have the same rate, write "same". (2 pts)



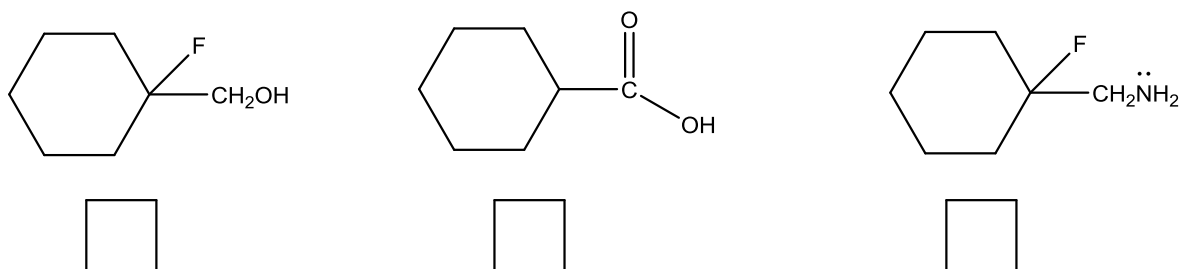
2. Label the following pair as identical, structural isomers, enantiomers, or diastereomers. (2 pts)



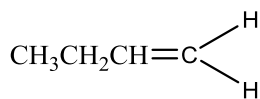
3. Determine the hybridization of each indicated atoms. (2 pts)

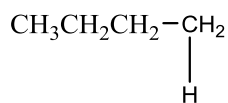


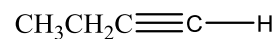
4. Place the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (3 pts)



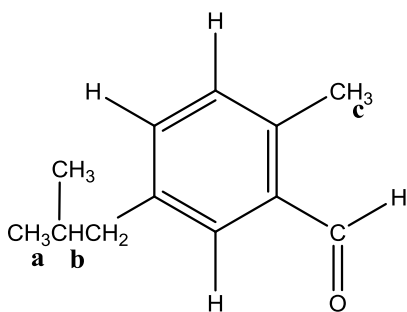
5. Place the following compounds in order of increasing frequency of the indicated bond stretching vibration. (1=lowest frequency, 3=highest frequency) (3 pts)








6.. Answer the following questions for the molecule shown below and place the answers in the appropriate box. (i) How many distinct proton types are present in the molecule? (ii) What are the theoretically predicted multiplicities (splitting patterns) of the signals for the protons labeled **a**, **b**, and **c**? (4 pts)



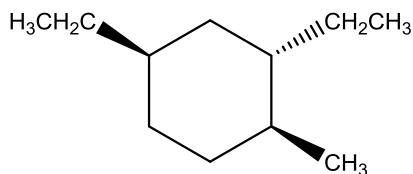
(i) number of distinct protons

(ii) multiplicity of H<sub>a</sub>

multiplicity of H<sub>b</sub>

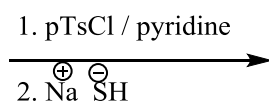
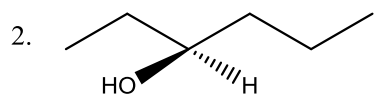
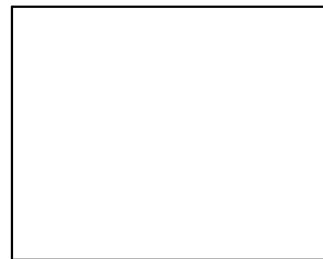
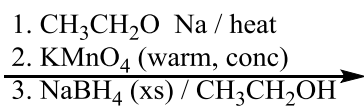
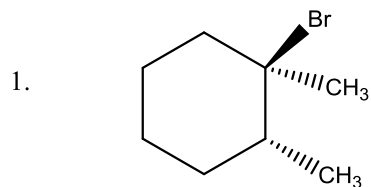
multiplicity of H<sub>c</sub>

7. Draw the more stable conformation of the molecule shown below in the box. (2 pts)

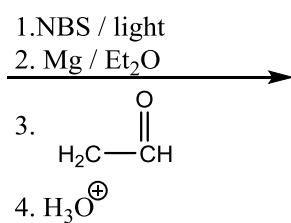
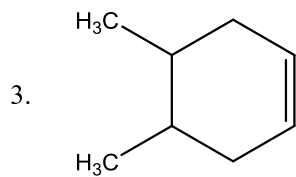


**C. Reactions:** Total= 40 points, 5 points each

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

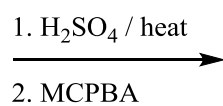
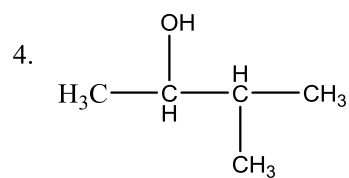


Note: pTsCl = p-toluenesulfonyl chloride

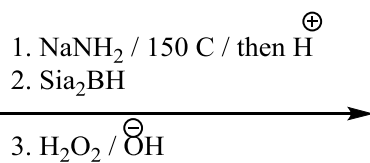
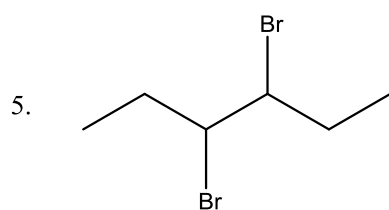
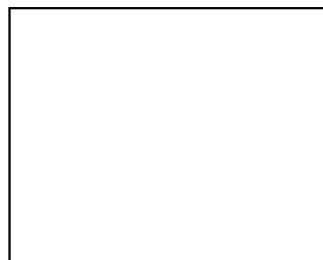


Note: NBS = N-bromosuccinimide

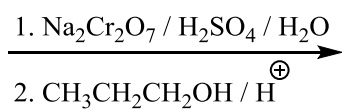
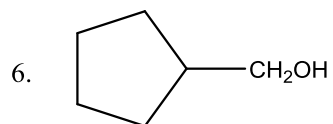
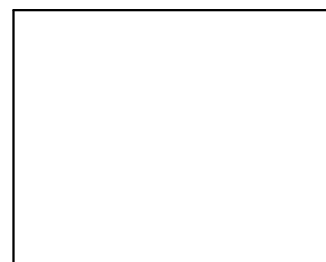




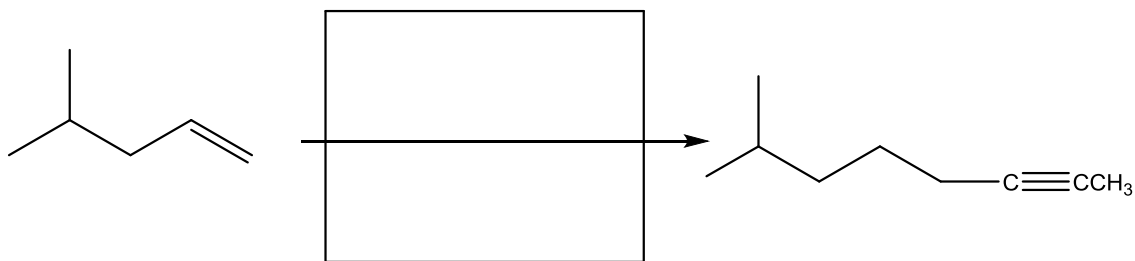
Note: MCPBA = m-chloroperbenzoic acid



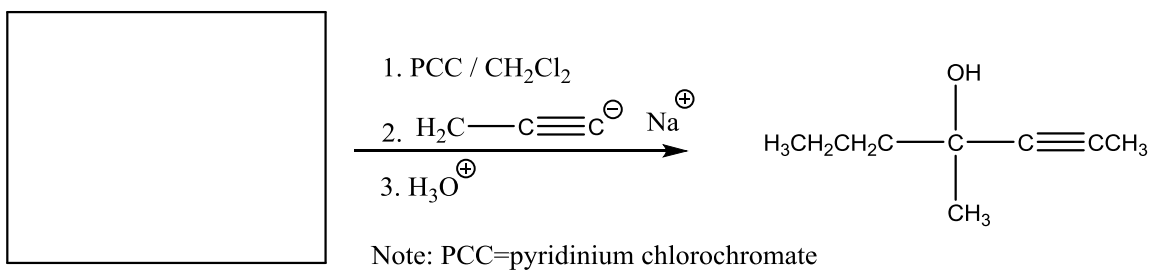
Note:  $\text{Sia}_2\text{BH}$  = disiamylborane



7.

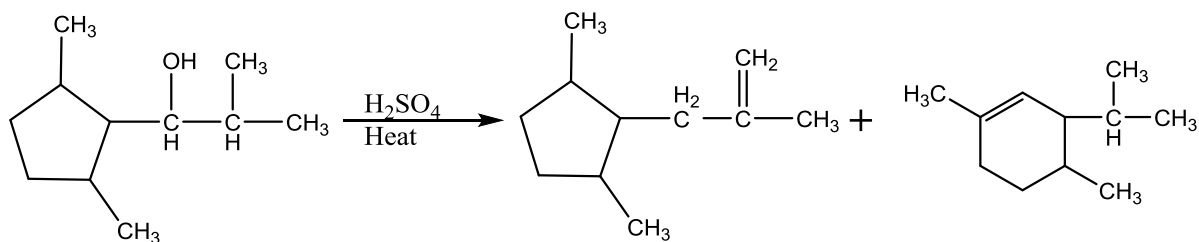


8.



**D. Mechanisms:** 10 points

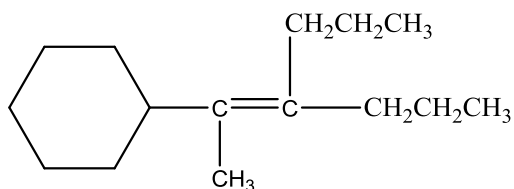
Provide a clear mechanism to explain the formation of the product shown. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges.** **Do not show transition states.**





**E. Synthesis:** 10 points

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



F. Spectroscopy: 10 points

A compound with the formula  $C_5H_{12}O$  exhibits the IR and the HNMR shown below. Please identify this compound and draw the structure in the box provided below.

