

Final Exam

Chemistry 3331

December 9, 2014

Name: _____

Signature: _____

ID# _____

PLEASE CIRCLE CLASS TIME!

10:00 AM

1:00 PM

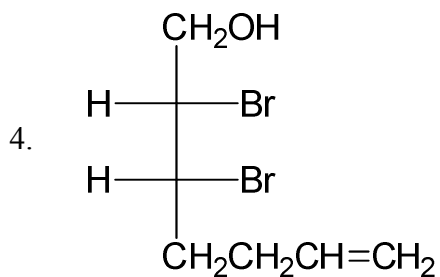
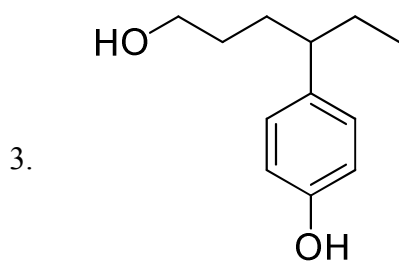
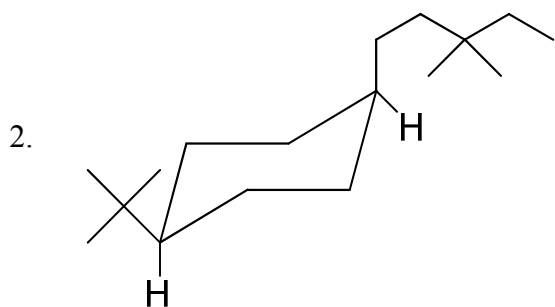
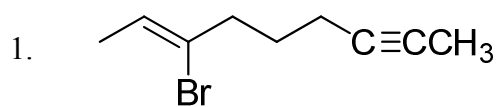
| Page # | Score | |
|----------|-------|--|
| 1. 12 pt | | |
| 2. 10 pt | | |
| 3. 12 pt | | |
| 4. 12 pt | | |
| 5. 12 pt | | |
| 6. 12 pt | | |
| 7. 10 pt | | |
| 8. 10 pt | | |
| 9. 4 pt | | |
| 10. 6 pt | | |

Total: _____

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

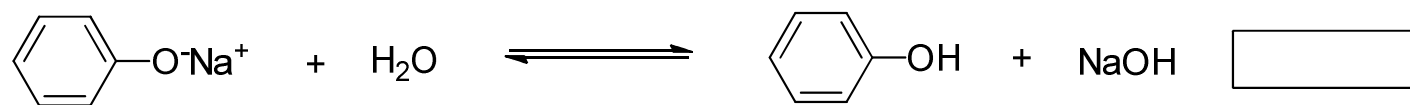
A. Nomenclature: (12 points)

Given an acceptable IUPAC name for each compounds. Be sure to indicate the **stereochemistry** where appropriate.

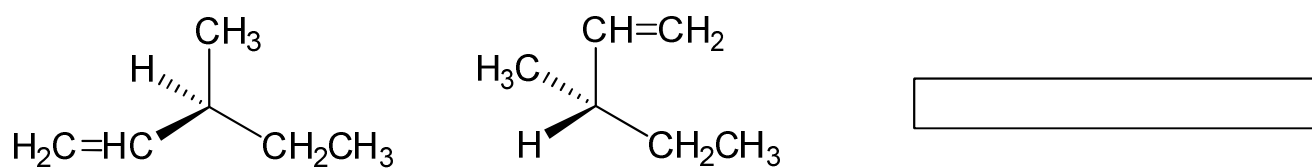


B. Facts: 22 points

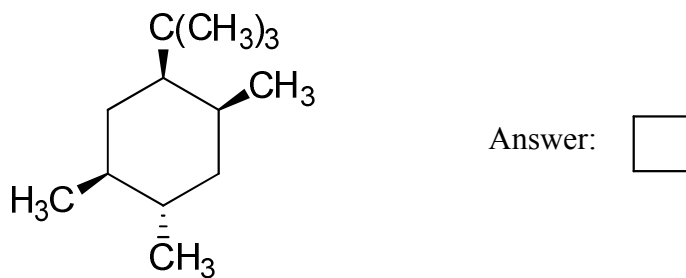
1. Does the following equilibrium lie to the Left or the Right? (2 pts.)



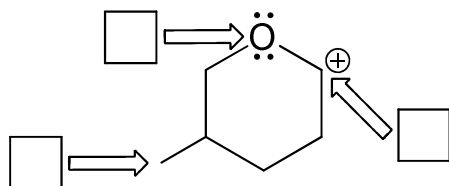
2. Label the following pair as identical, structural isomers, enantiomers or diastereomers. (2 pts.)



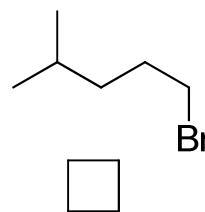
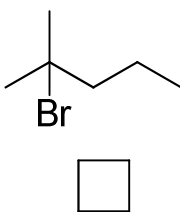
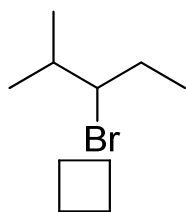
3. Consider the substituted cyclohexane below. In the more stable chair conformation, how many methyl groups are in equatorial positions? (3 pts.)



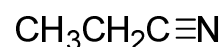
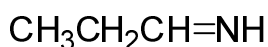
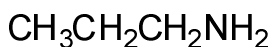
4. Label the hybridization of the indicated atoms. (3 pts.)



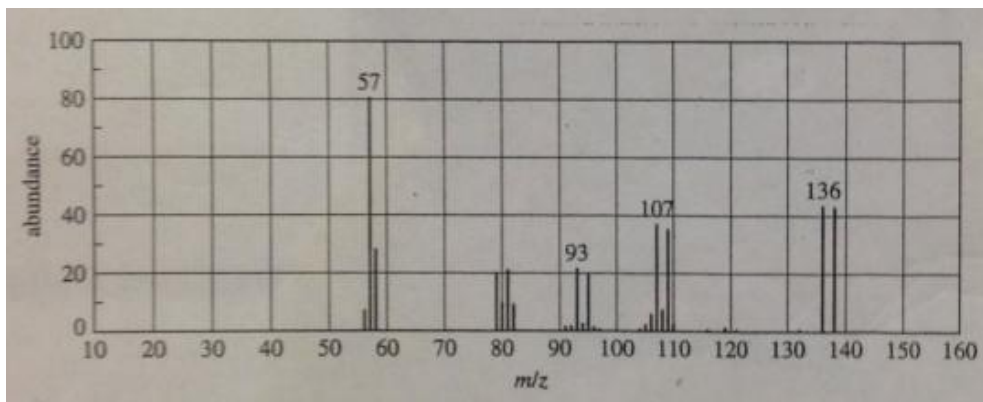
5. Place the following compounds in order of increasing reaction rate in 95% ethanol/water. (1=slowest rate, 3=fastest rate) (3 pts.)



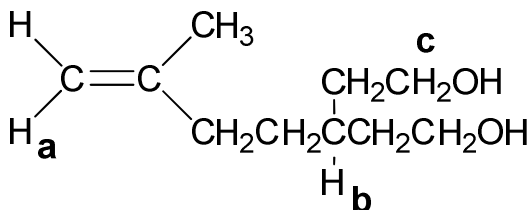
6. Place the compounds in order of increasing stretching frequency for the carbon-nitrogen bond. (1=lowest frequency, 3=highest frequency) (3 pts.)



7. An unknown compound contains carbon, hydrogen, and one other element. Identify the element from the mass spectrum and place its symbol in the box. (2 pts.)



8. Answer the following questions for the molecule shown below and place the answers in the appropriate boxes. (i) Under normal conditions of purity, what are the theoretically predicted multiplicities (splitting patterns) of the signals for the protons labeled **a**, **b**, and **c**? (ii) Under ultrapure conditions, what is the theoretically predicted multiplicity of the signal for the protons labeled **c**? (4 pts.)



(i) multiplicity of H_a

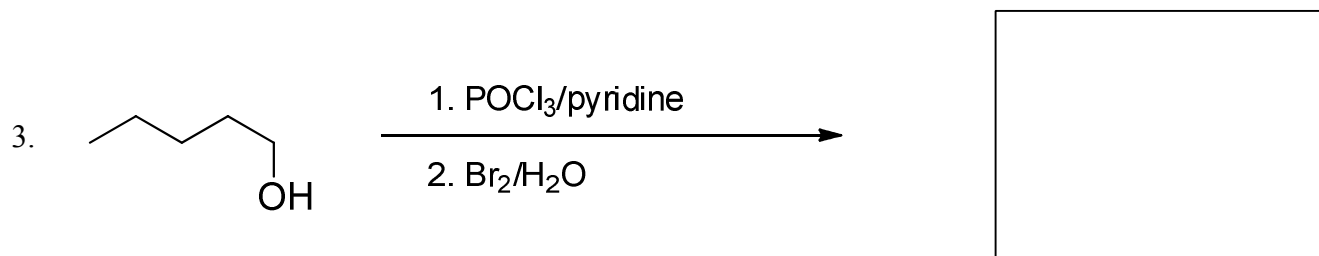
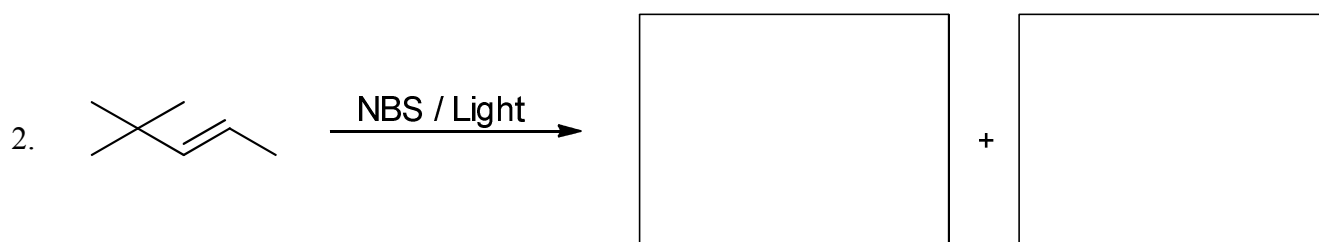
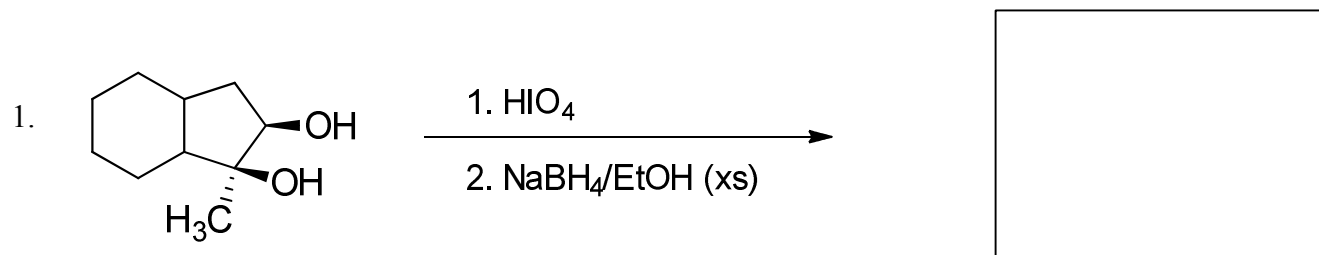
multiplicity of H_b

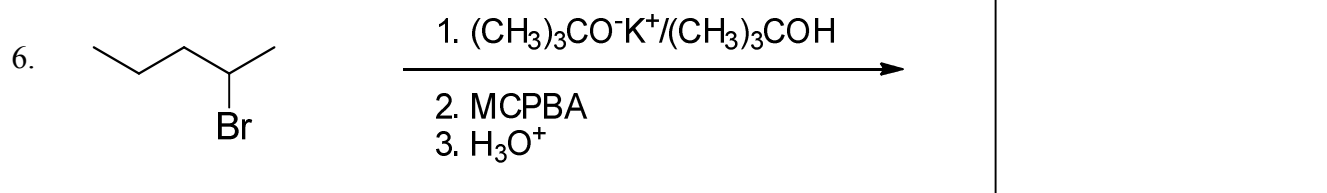
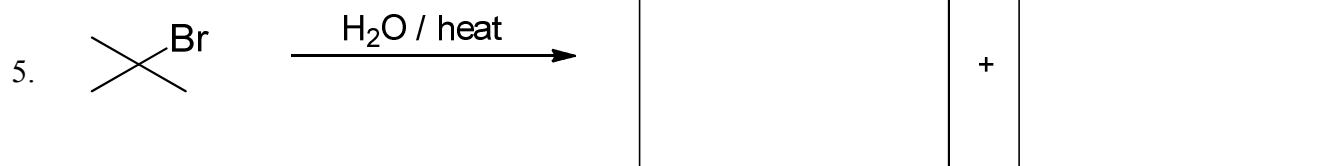
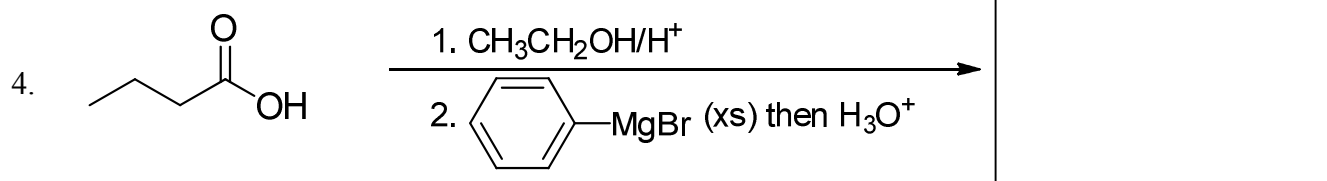
multiplicity of H_c

(ii) multiplicity of H_c

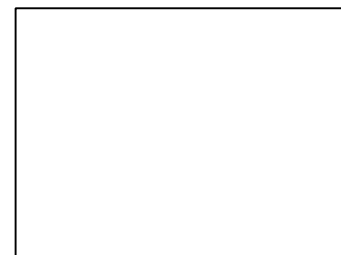
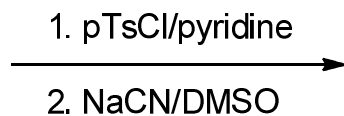
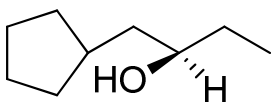
C. Reactions: Total = 36 points, 4 points each

Please provide the major product unless otherwise indicated 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 in the reaction.

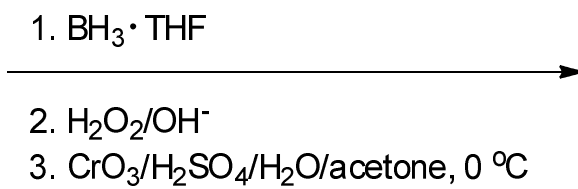
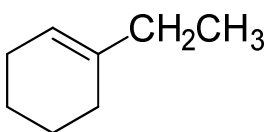




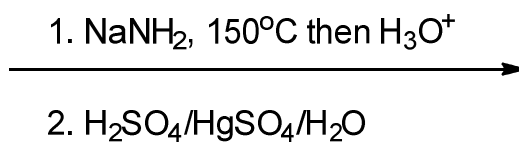
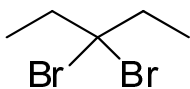
7.



8.

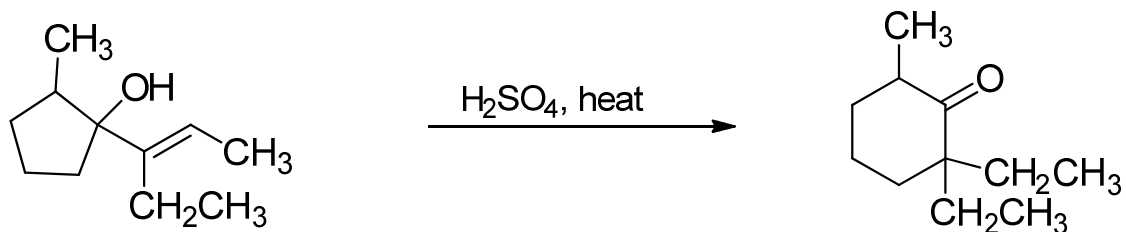


9.



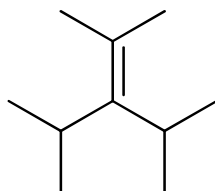
D. Mechanism: (10 points)

The reaction below produces a conjugated diene along with a small amount of the product shown. Provide a clear mechanism to explain the formation of this product. Use curved arrows to indicate “electron flow”. Remember to show only one step at a time. Show all intermediates and all formal charges. **If more than one resonance contributor is possible, be sure to show the more stable contributor.**



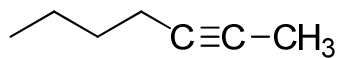
E. Synthesis: (10 points)

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

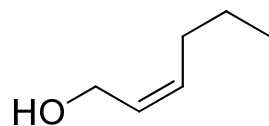


F. Spectroscopy: 10 Points

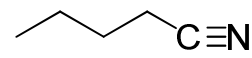
1. Carefully examine the two infrared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum. (4 pts.)



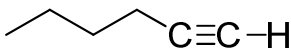
A



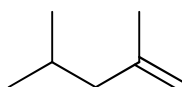
B



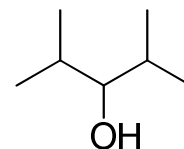
C



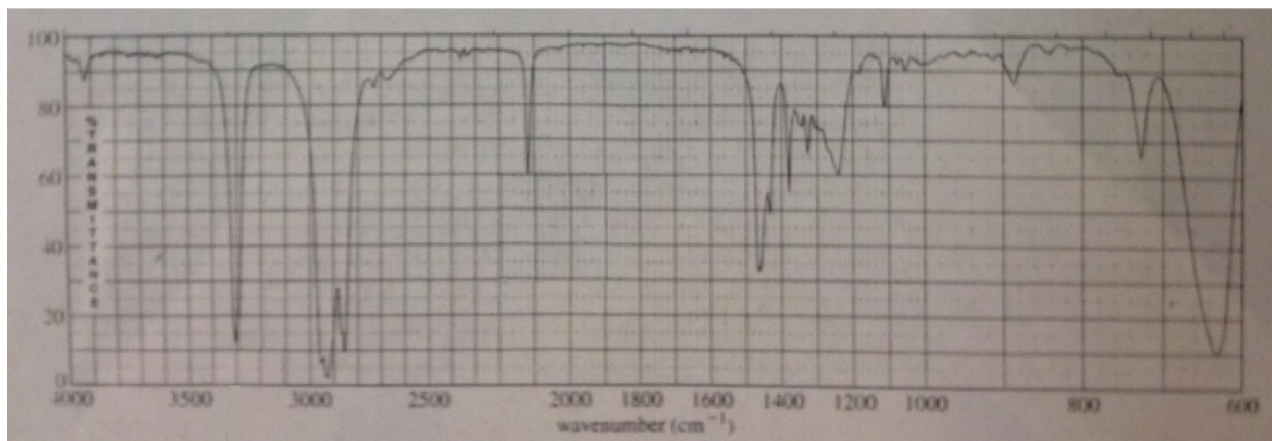
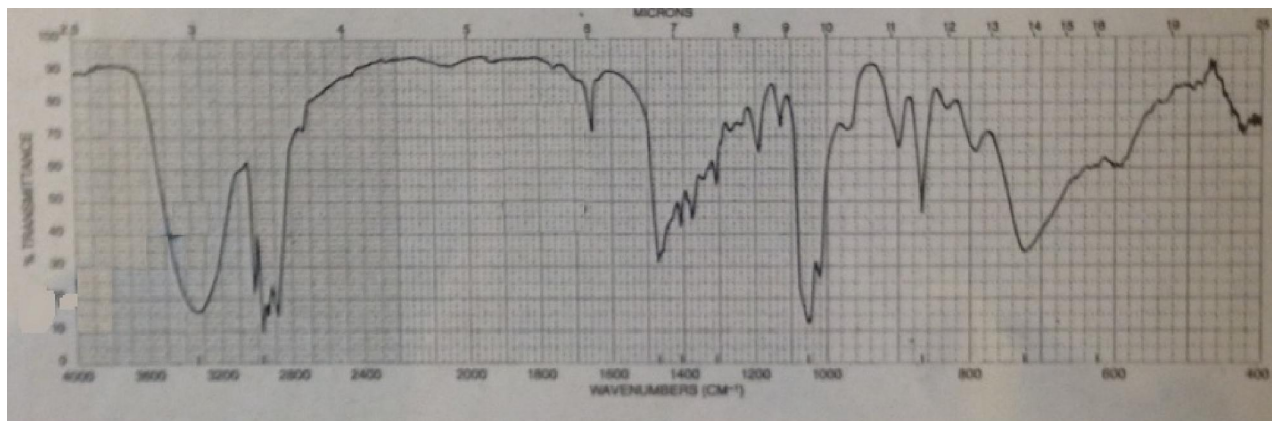
D



E



F



2. A compound with the formula $C_9H_{12}O$ exhibits the IR and 1H NMR shown below. please identify this compound and draw the structure in the box provided below. (6 pts.)

