Final Exam

Chemistry 3331

December 9, 2009

Name:_____

Signature:_____

ID#_____

PLEASE CIRCLE CLASS TIME!

10:00 AM

1:00 PM

4:00 PM

| Page # | Score |
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| 1.12 pt | |
| 2. 22 pt | |
| 3. 12 pt | |
| 4. 12 pt | |
| 5. 12 pt | |
| 6. 12 pt | |
| 7. 10 pt | |
| 8. 4 pt | |
| 9. 6 pt | |

Total:_____

NOTE: Present your ID when you return the exam booklet

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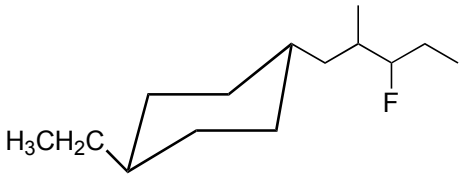
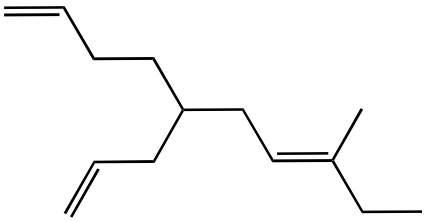
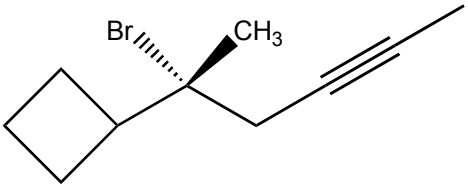
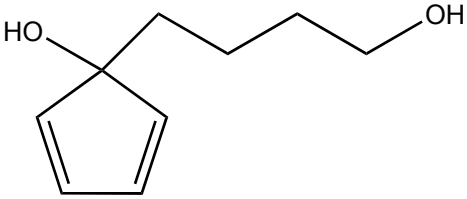
**A. Nomenclature:** (12 Points)

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



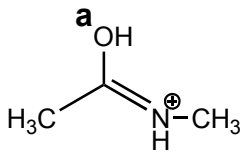



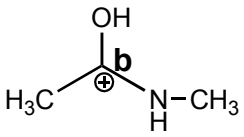


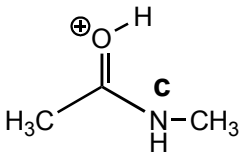



**B. Facts:** 22 points

1. Place the following resonance contributors in order of increasing stability. (1=least stable, 3 =most stable) (3 pts.)



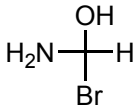



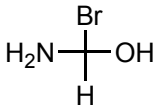




2. For the resonance contributors in the problem above, give the hybridization of the labeled atoms. (3 pts)

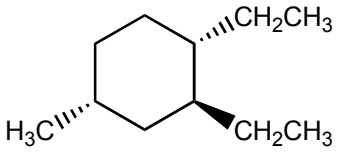
O **a** C **b** N **c**

3.Label the following pair as identical, structural isomers, enantiomers or diastereomers. (3 pts)

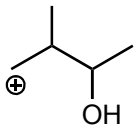


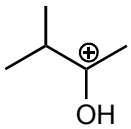



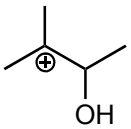

4. Draw the more stable conformation of the molecule below. (4 pts.)



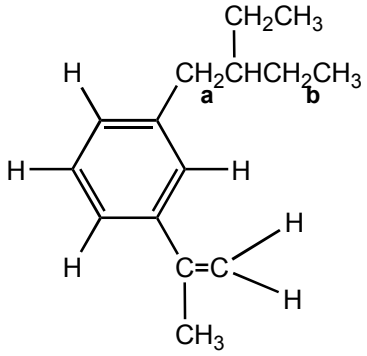

5. Place the following cations in order of increasing stability. (1= least stable, 3=most stable)




6. Answer the following questions for the molecule shown below and place the answers in the appropriate boxes. (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 protans labeled **a** and **b** ? (6 pts)




(i) number of distinct protons

(ii) multiplicity of $H_a$

multiplicity of $H_b$

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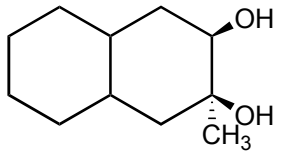
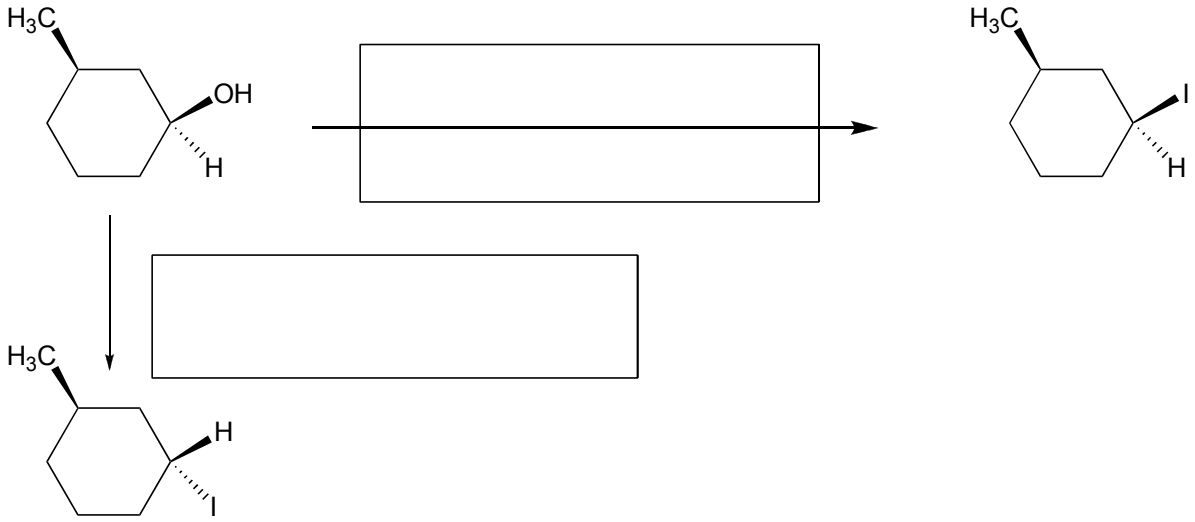
**C. Reactions:** Total = 36 points, 4 points each
Please provide the major product or the reagents in the answer box. Be sure your drawing indicates **stereochemistry** if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.

1.

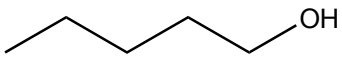


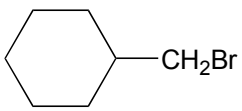

1. $HIO_4$
2. $CH_3CH_2MgBr$ (2 eq), then $H_3O^+$

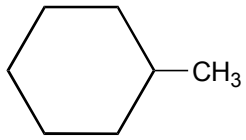
2.



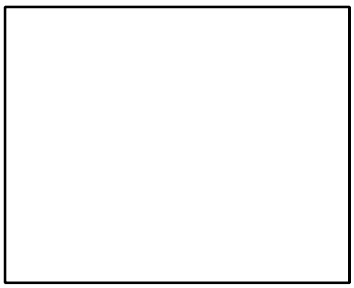

3.

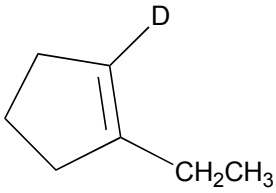



1. Na
2. 

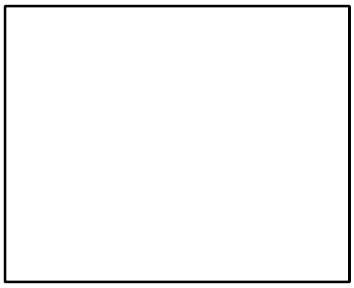
4. 

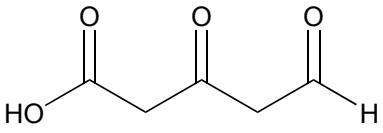

1. $Br_2$ / Light
2. $(CH_3)_3CO^-$
3. HBr / Peroxide



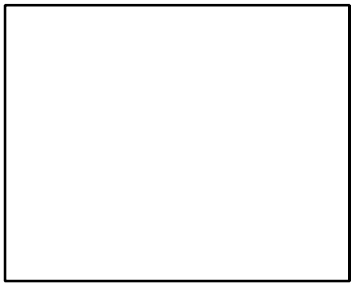
5. 


1. $BH_3 \cdot THF$
2. $H_2O_2$ / $OH^-$
3. $CH_3CH_2CO_2H$ / $H^+$



6. 


1. $NaBH_4$ (XS) / EtOH



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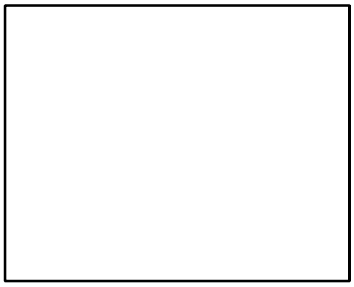
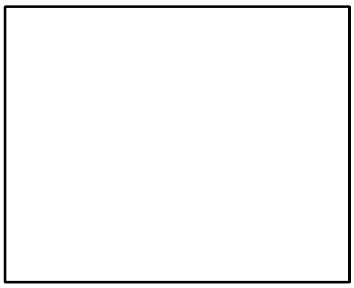
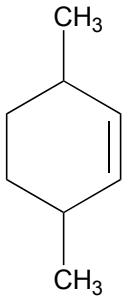
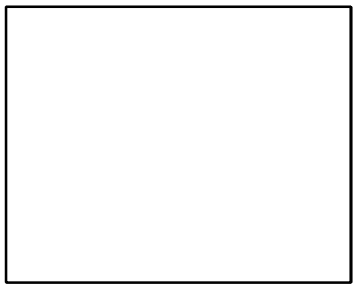
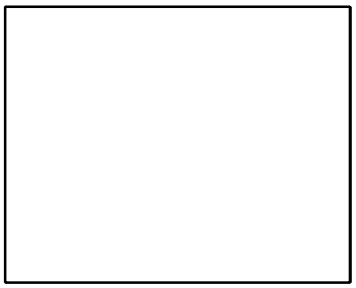
7. $CH_3CH_2CH_2C{\equiv}CH$ → (1. $HgSO_4$ / $H_2SO_4$ / $H_2O$; 2. $CH_3C{\equiv}C^{\ominus}$; 3. $H_3O^+$) → 

5. $CH_3CH_2C{\equiv}CCH_2CH_3$ → (1. Li / $NH_3$; 2. $CHCl_3$ / KOH) → 

6.  → (1. NBS / Light) →  + 

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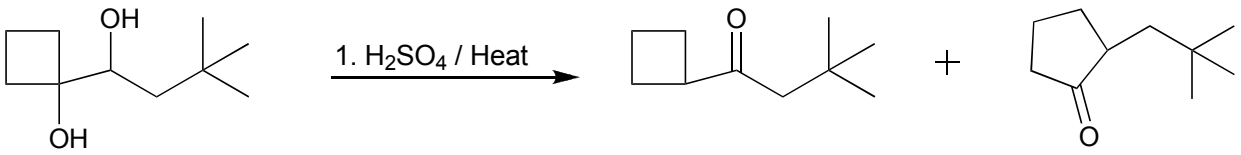
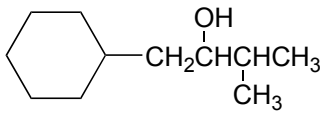
**D. Mechanism** (10 points)
Provide a clear mechanism to explain the formation of the product shown in the reaction below. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges.**

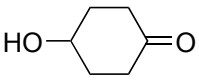


**E. Synthesis** (10 points)
Synthesize the molecule below using any of the following reagents: alcohols and/or alkanes of **two carbons or less**, cyclohexane, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.

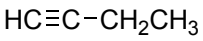


**F. Spectroscopy:** Total = 10 points

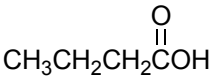
Carefully examine the two infared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum. (4 points)



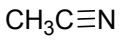
A



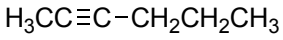
B



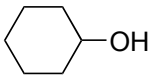
C



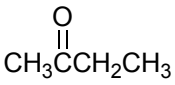
D



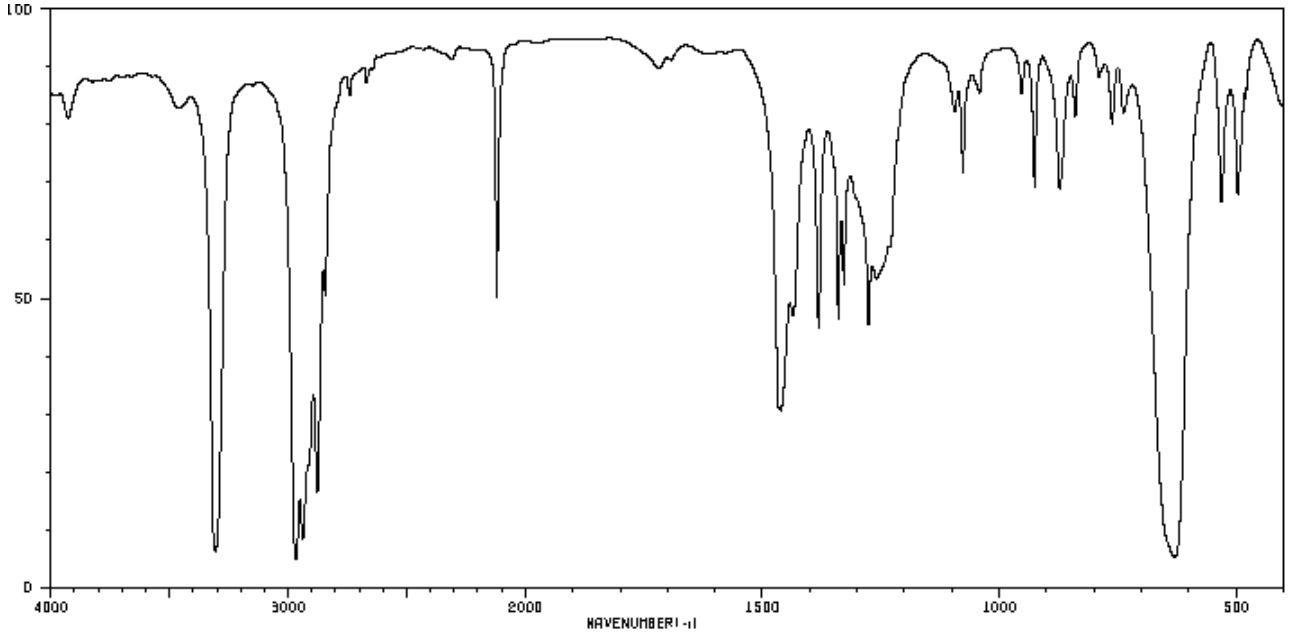
E

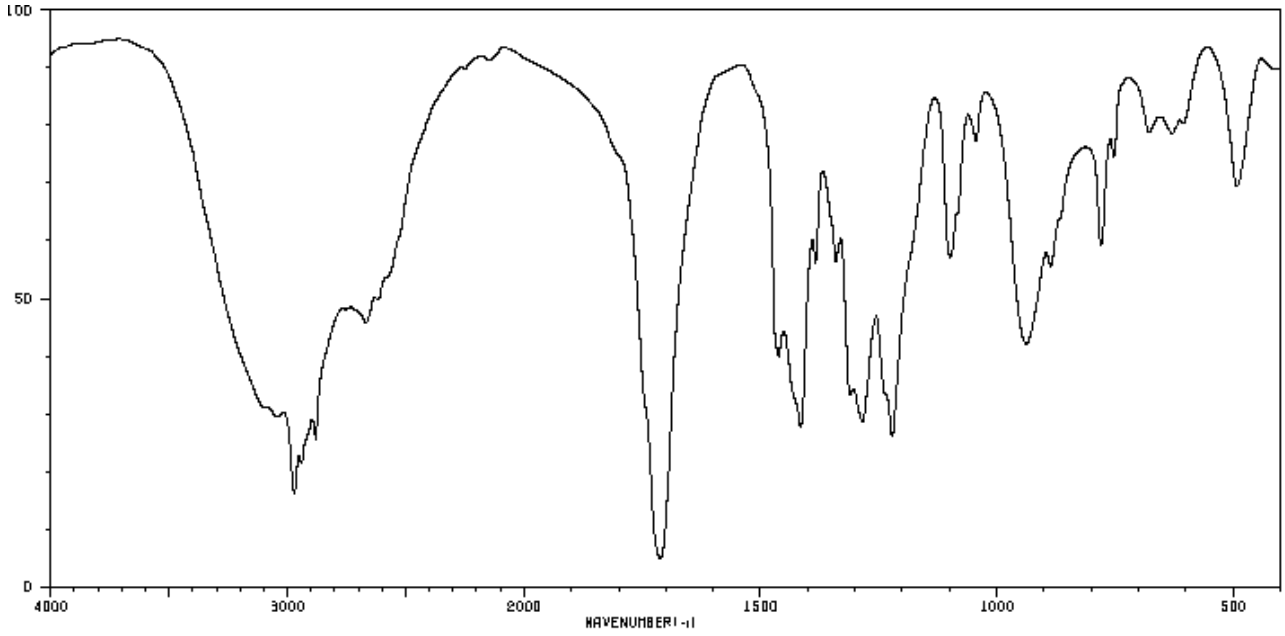


F

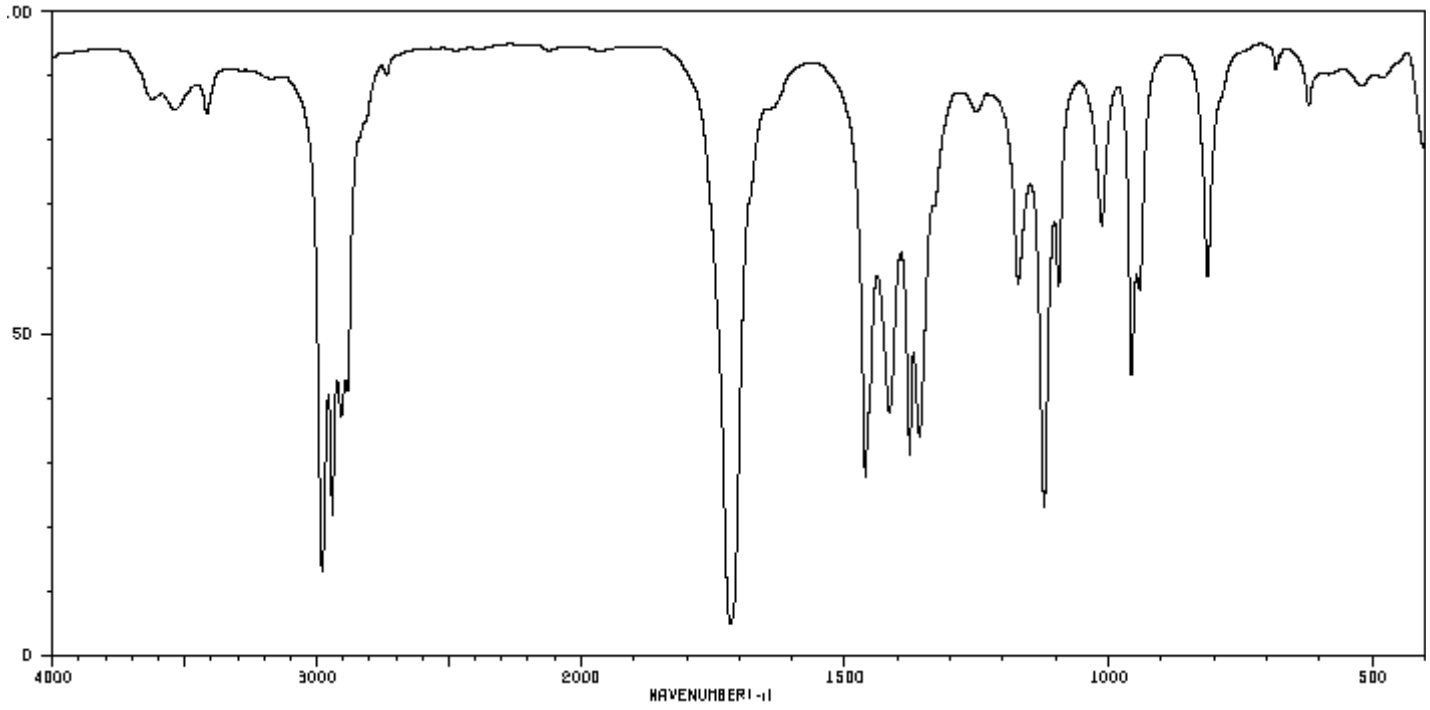


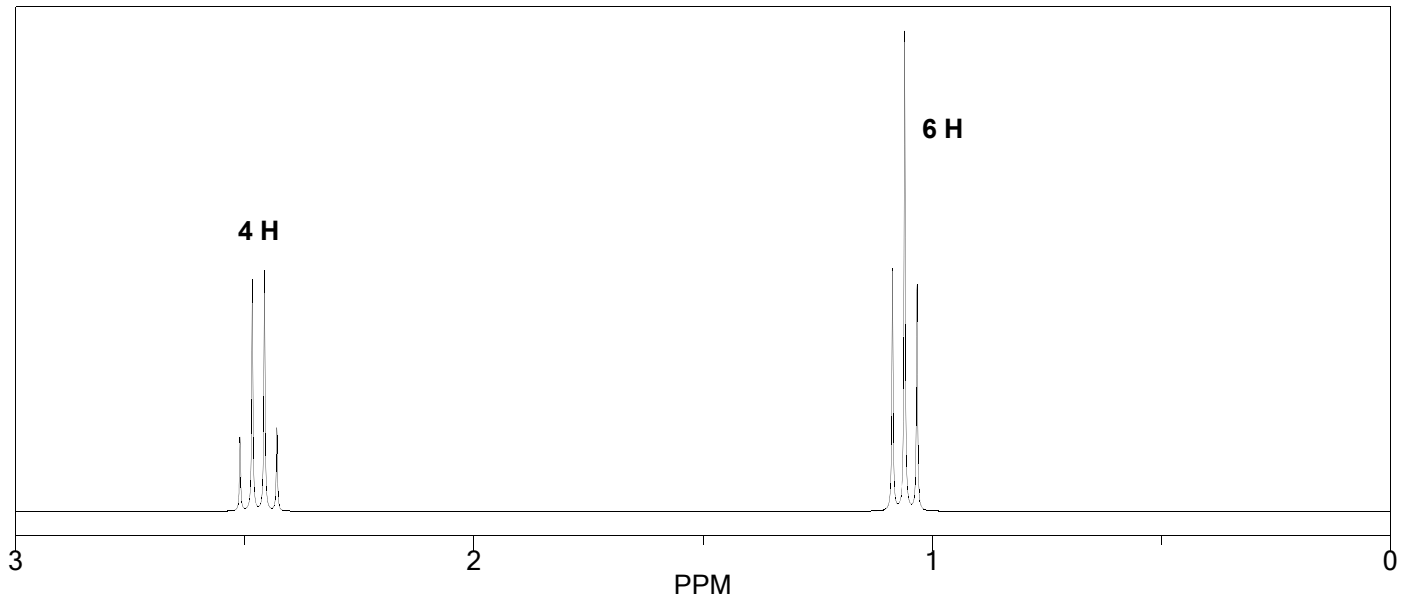
G



A compound with the formula **$C_5H_{10}O$** exhibits the IR and $^1$HMNR shown below. Please identify this compound and draw the structure in the box provided below. (6 pts)

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