Final Exam

Chemistry 3331

December 9, 2011

Name:_____

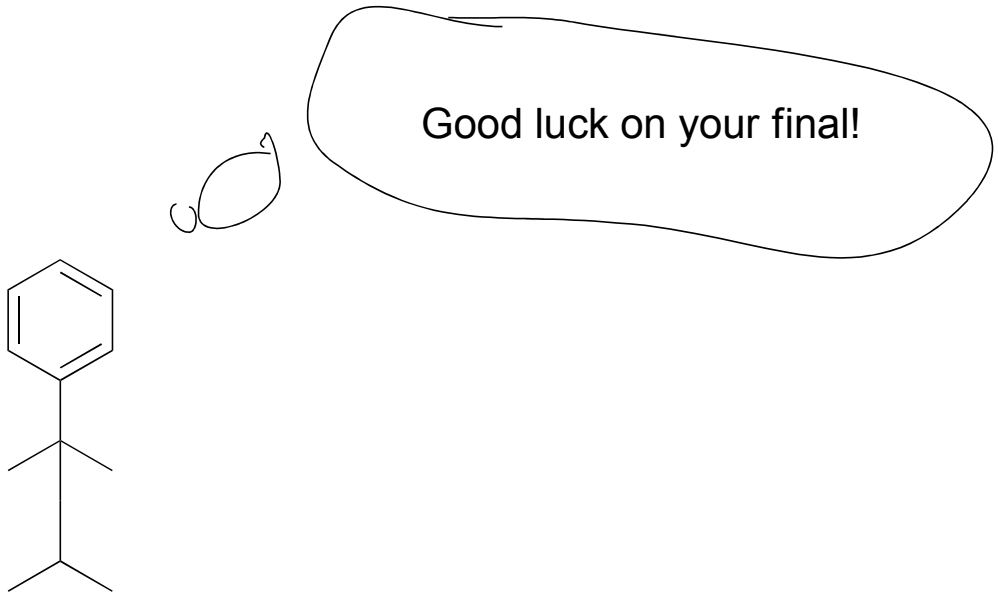
Signature:_____

ID#_____

PLEASE CIRCLE CLASS TIME!

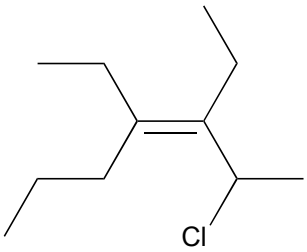
10:00 AM

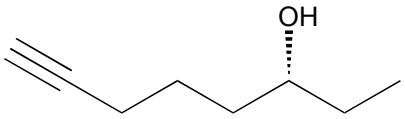
1:00 PM

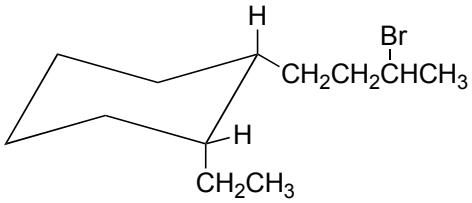


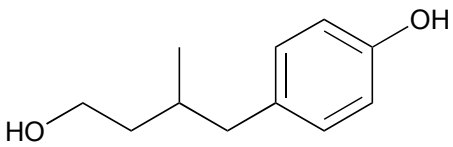
A. Nomenclature: (12 Points)

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









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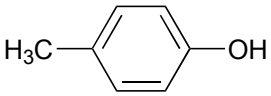
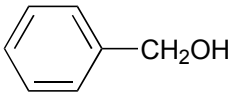
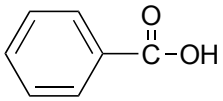
B. Facts: 22 points

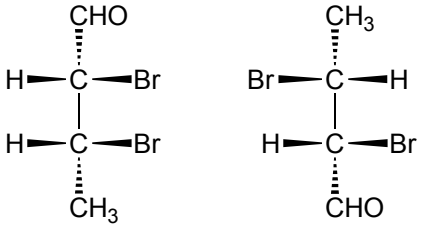
1. Place the following compounds in order of increasing acidity. (1=least acidic, 3 =most acidic) (3 pts.)



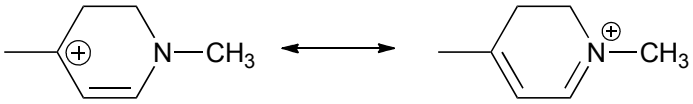




2. Label the following pair as identical, structural isomers, enantiomers or diastereomers. (3 pts)



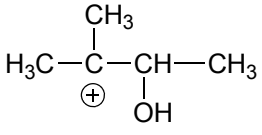
3.a) Which is the more stable resonance contributor, A or B? (2 pts)

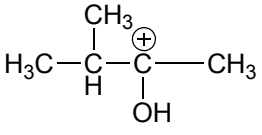


A B

b) Determine the hybridization of the nitrogen atom in contributor A, and place your answer in the box (2 pts)

4. Which is the more stable cation, A or B? (2pts)





A B

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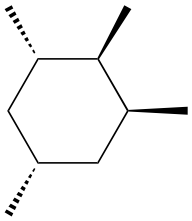
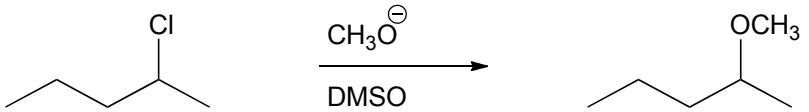
5. Consider the substituted cyclohexane below. In the more stable chair conformation, how many methyl groups are in equatorial positions? (3 pts)



answer: ☐

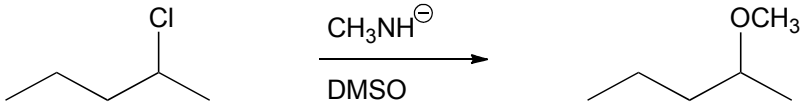
6. Compare the reaction rates of reaction a and reaction b and place the letter of the faster reaction in the box (2pts)

a.

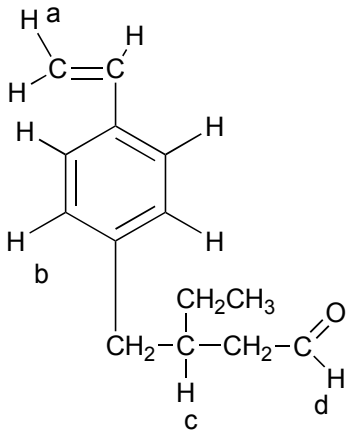


☐

b.



7. Answer the following questions for the molecules 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 predictied multiplicities (splitting pattern of the signals for the protons labeled a, b, c, and d?) (5pts)



(i) number of distinct protons ☐

(ii) multiplicity of Ha ☐

multiplicity of Hb ☐

multiplicity of Hc ☐

multiplicity of Hd ☐

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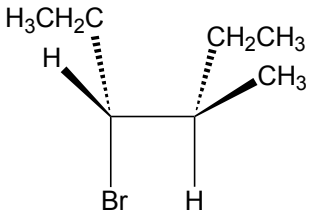
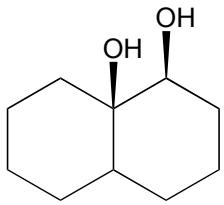
C. Reactions: Total = 36 points, 4 points each

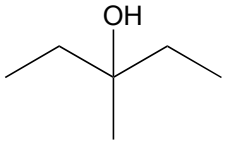
Please provide the major product or the reagents in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.

1. 

$\xrightarrow[2.\ CH_2I_2 / Zn(Cu)]{1.\ CH_3ONa / CH_3OH}$

2. 

$\xrightarrow[2.\ Na_2Cr_2O_7 / H_2SO_4 / H_2O]{1.\ HIO_4}$

3. 

$\xrightarrow[2.(CH_3)_3CO^- / (CH_3)_3COH]{1.\ HBr / ether, 0C}$

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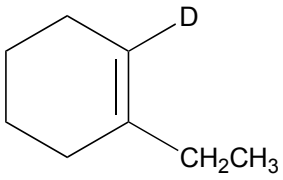
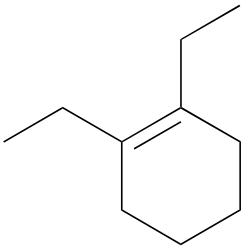
4. 

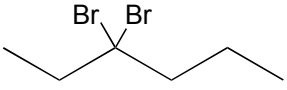
1. $Hg(OAc)_2$ / H_2O

2. $NaBH_4$
3. PBr_3

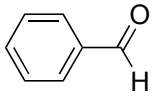
5. 

1. MCBPA

2, H_3O^+

6. 

1. $NaNH_2$ / 150C

2. 

3. H_3O^+

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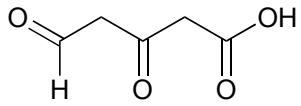
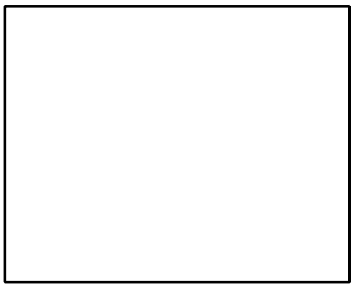
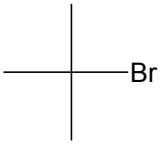
7. 

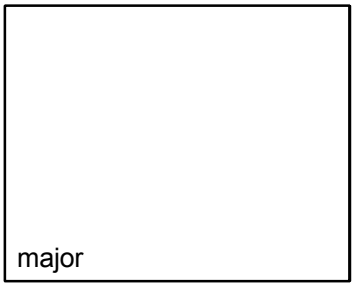
1. $NaBH_4$ / EtOH

2. CH_3CH_2OH / H^+

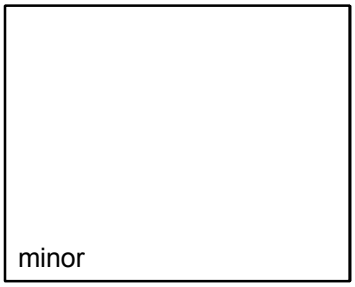


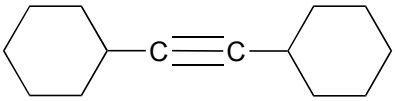
8. 

1. CH_3CH_2OH / heat



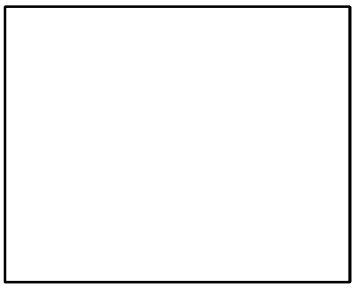
+



9. 

1. $HgSO_4$ / H_2SO_4/ H_2O

2. CH_3MgBr then H_3O^+



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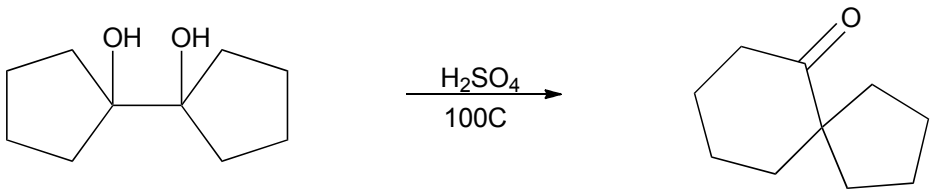
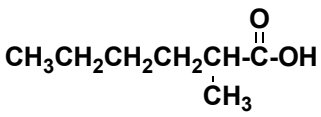
D. Mechanism (10 points)

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.**

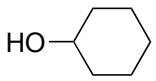


E. Synthesis (10 points)
Synthesize the molecule below using any of the following reagents: alcohols or alkenes of **three carbons or less**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.

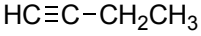


F. Spectroscopy: Total = 10 points

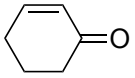
Carefully examine the two infared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum. (4 points)



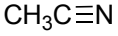
A



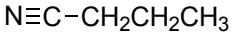
B



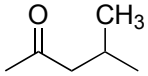
C



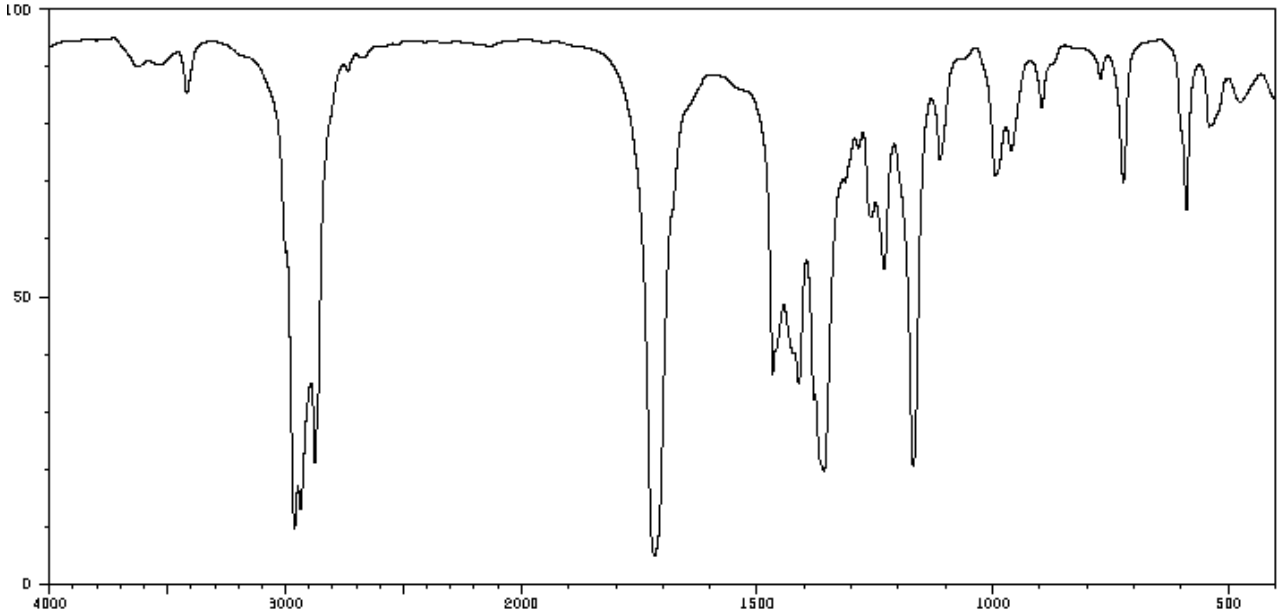
D

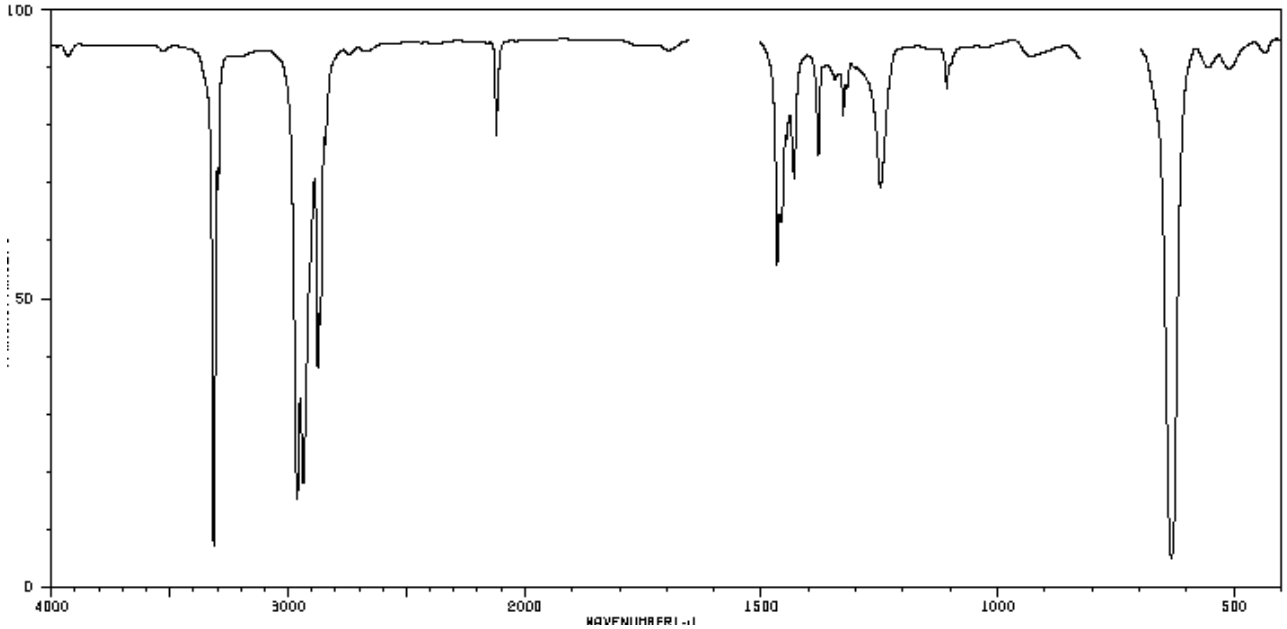


E



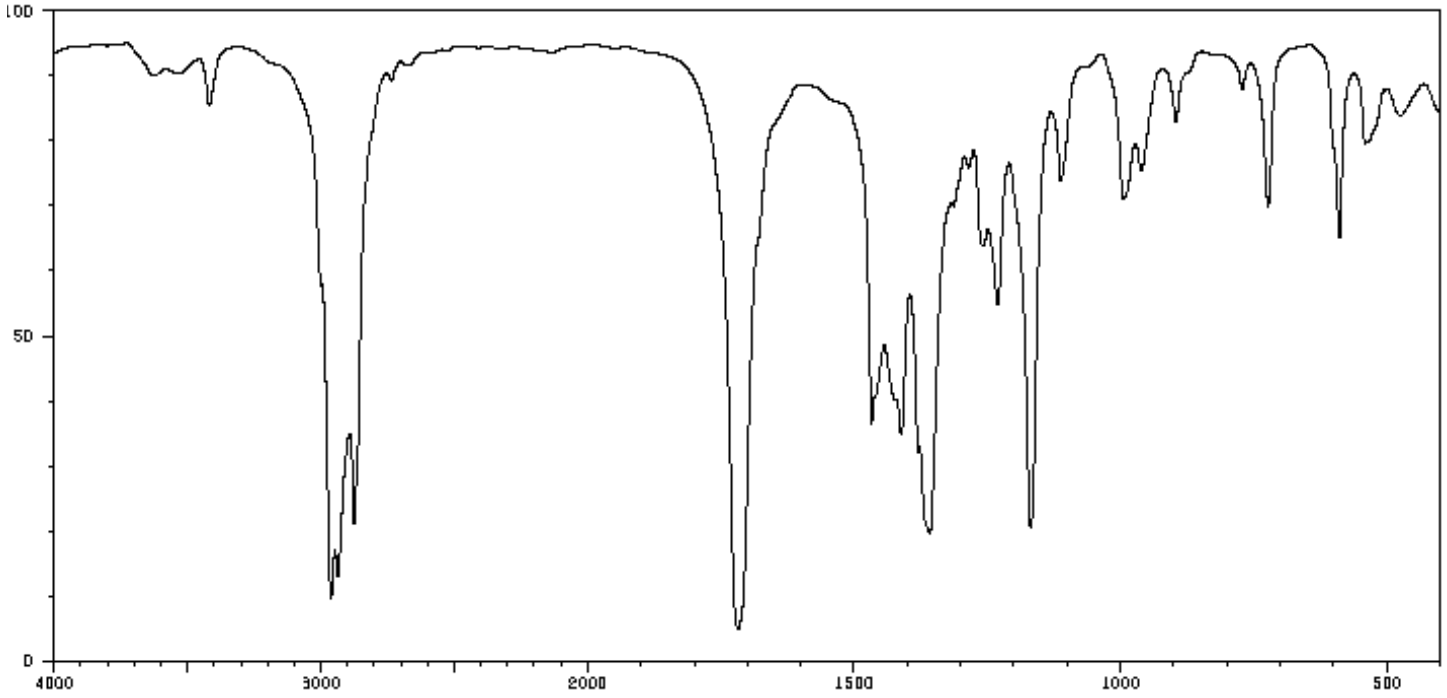
F

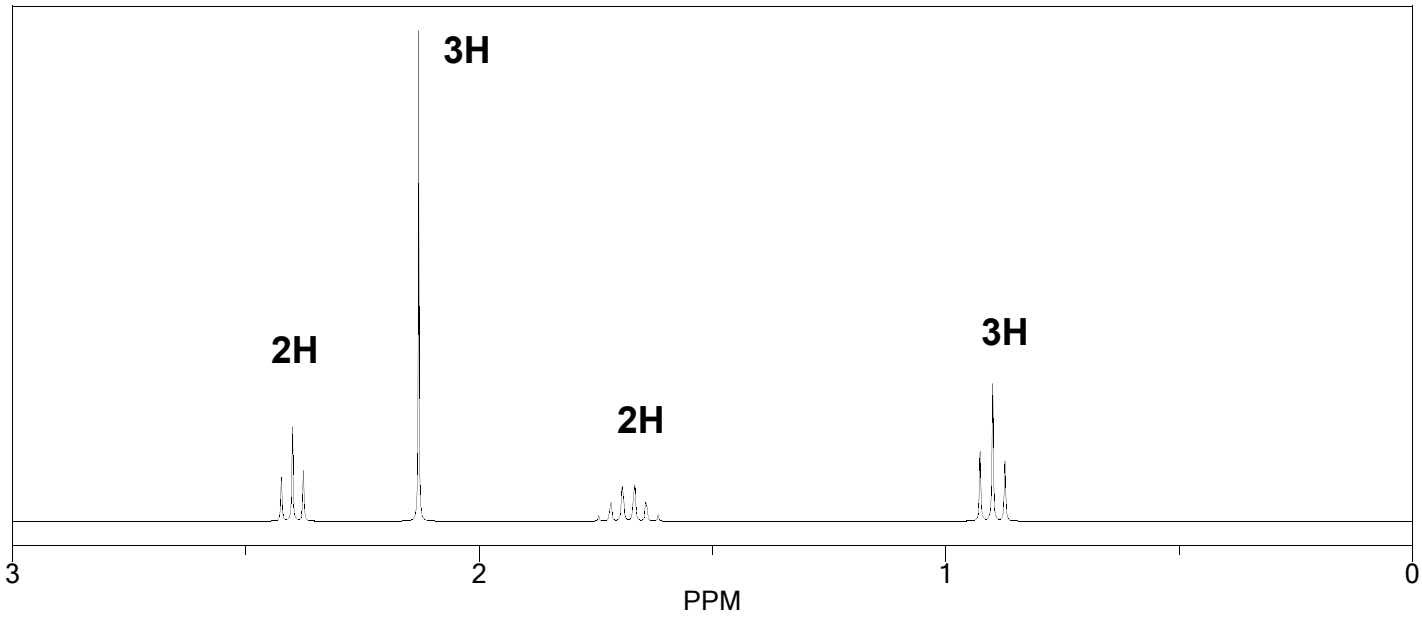




***IR data retrieved from SDBSWeb : http://riodb01.ibase.aist.go.jp/sdbs/

Formula: $C_5H_{10}O$





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