Final Exam

Chemistry 3331

December 5, 2007

Name (PRINT) _____
Last, First

Signature _____

ID# _____

Please circle class time.

Dr. Bean's 10:00 AM

Dr. Bean's 1:00 PM

Dr. Bean's 4:00 PM

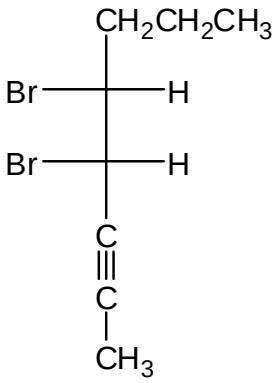
Page #	Score	
1. 12 pts.		
2. 22 pts.		
3. 12 pts.		
4. 12 pts.		
5. 12 pts.		
6. 10 pts.		
7. 10 pts.		
8. 6 pts.		
9. 4 pts.		
10. 10 pts.		

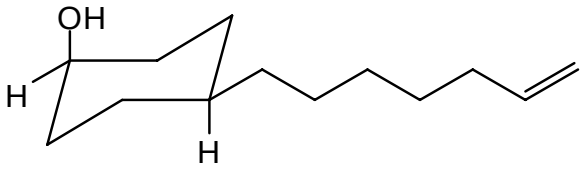
TOTAL _____

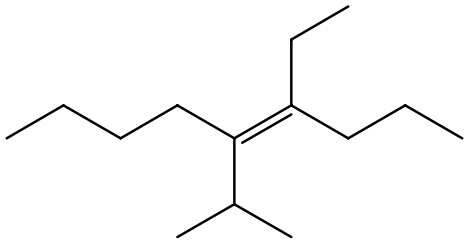
Note: Present your student ID when you return the exam booklet

A. Nomenclature: (12 points)

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

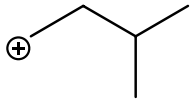
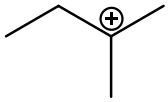
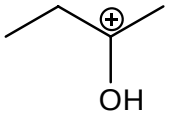
1. 

2. 

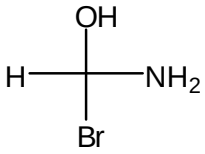
3. 

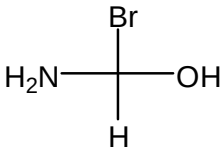
B. Facts: (22 points)

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

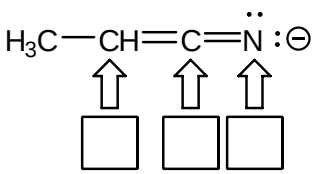




2. Label the following pair as identical, structural isomers, enantiomers, or diastereomers. (4 pts.)

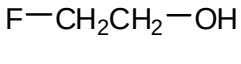


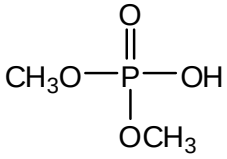


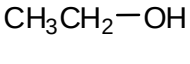
3. Determine the hybridization of each indicated atom. (3 pts)



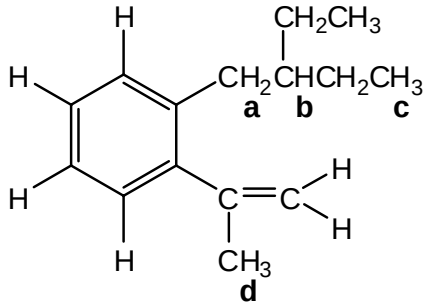
4. Place the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (3 pts.)







6. Answer the following questions for the molecule shown below and place the answers in the appropriate boxes. (i) How many different 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**, **c** and **d**? (6 pts.)



(i) number of distinct protons

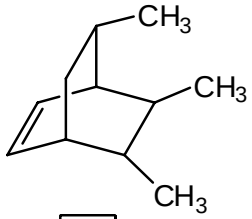
(ii) multiplicity of $H_{\mathbf{a}}$

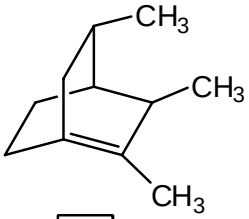
multiplicity of $H_{\mathbf{b}}$

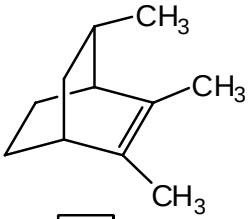
multiplicity of $H_{\mathbf{c}}$

multiplicity of $H_{\mathbf{d}}$

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



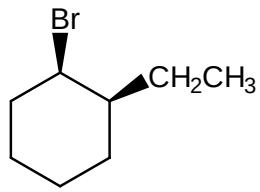




C. Reactions: (36 points, 4 pts. each)

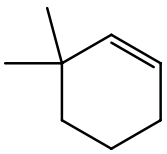
Please provide the starting material, major product or the reagents in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.

1.



1. $(CH_3)_3CO^- K^+$
2. OsO_4 / H_2O_2 / OH^-
3. HIO_4

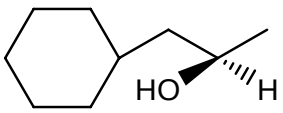
2.



NBS / Light

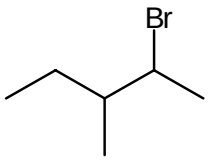
\+

3.

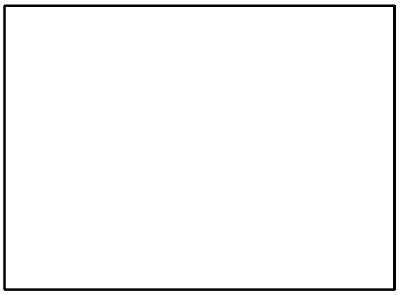


1. PBr_3
2. $CH_3CH_2S^- K^+$

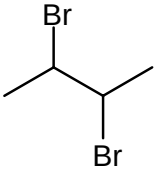
4,

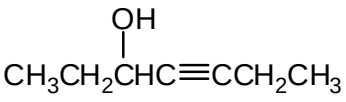


1. NaOH / heat
2. Br_2 / H_2O

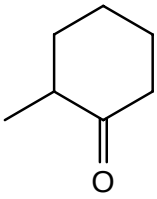


5.

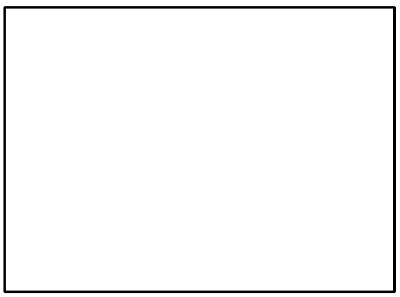


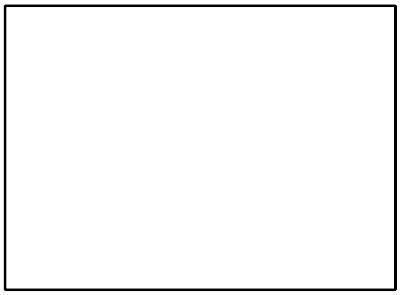


6.

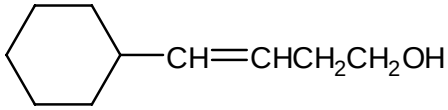


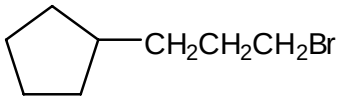
1. $NaBH_4$ / EtOH
2. H_2SO_4 / Heat



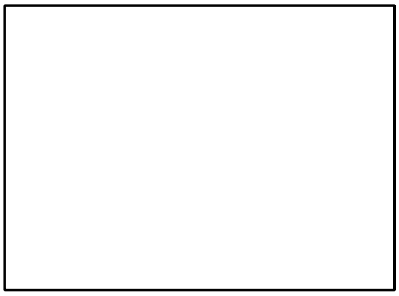
7. 

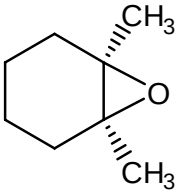
1. HBr / peroxide
2. Mg / ether
3.  , then H_3O^+

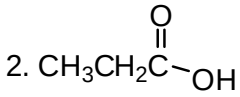


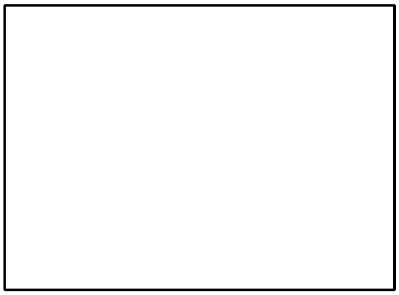
8. 

1. NaOH
2. $Na_2Cr_2O_7$ / H_2SO_4 / H_2O



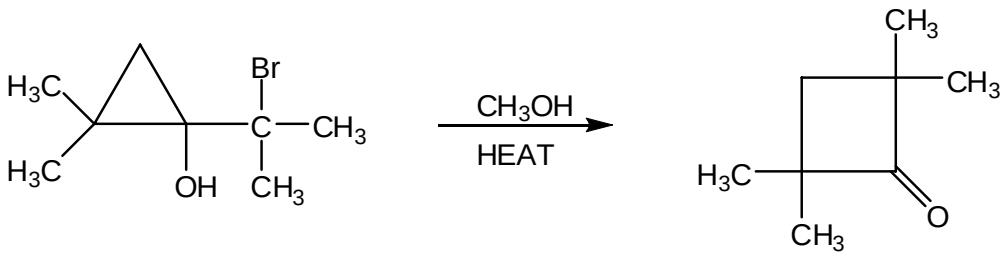
9. 

1. H_3O^+
2.  (XS), H^+



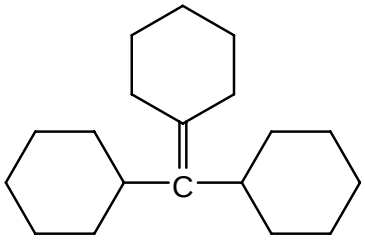
D. Mechanisms: (10 points)

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.**



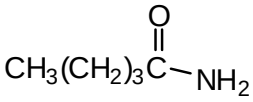
E. Synthesis: (10 Points)

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

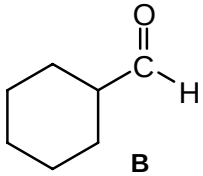


F. Spectroscopy: 10 Points

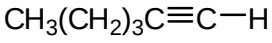
Carefully examine the five infrared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum.



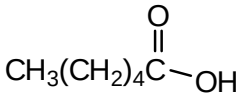
A



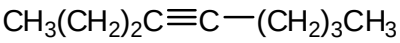
B



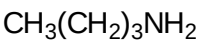
C



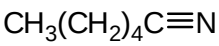
D



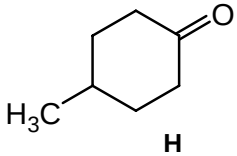
E



F

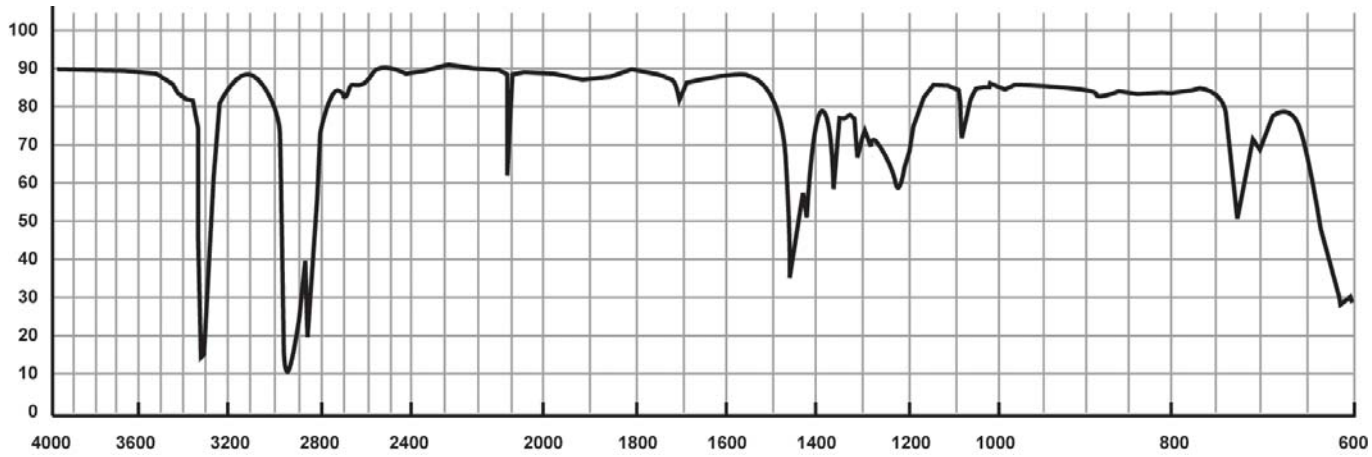


G

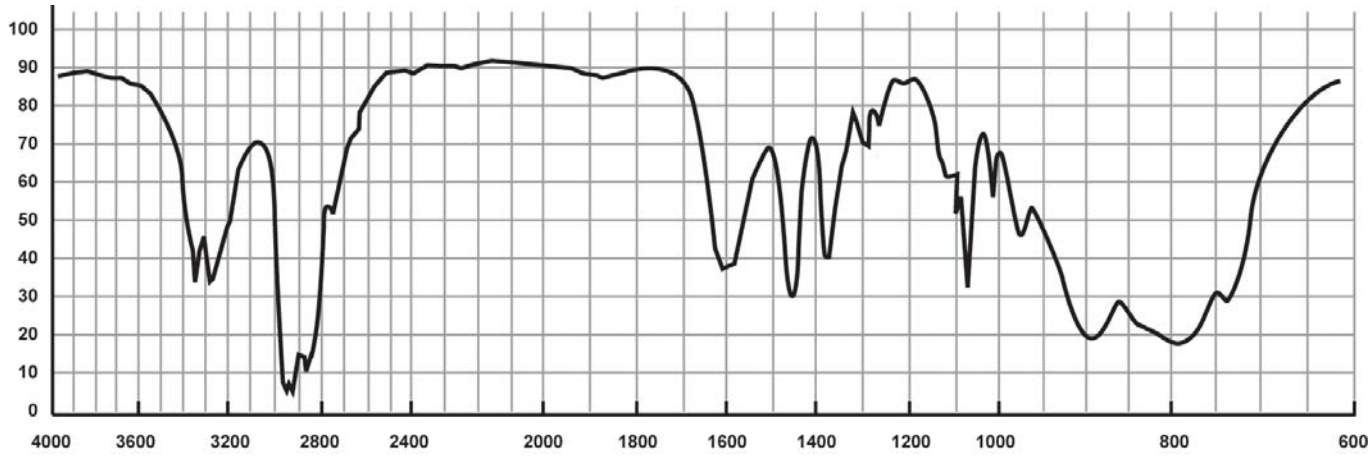


H

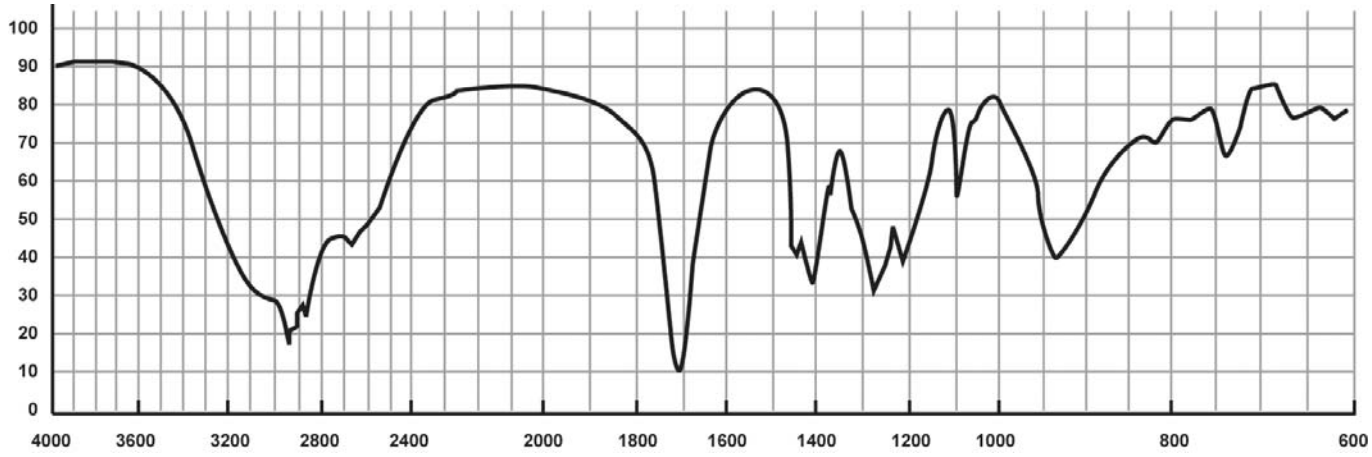
1.



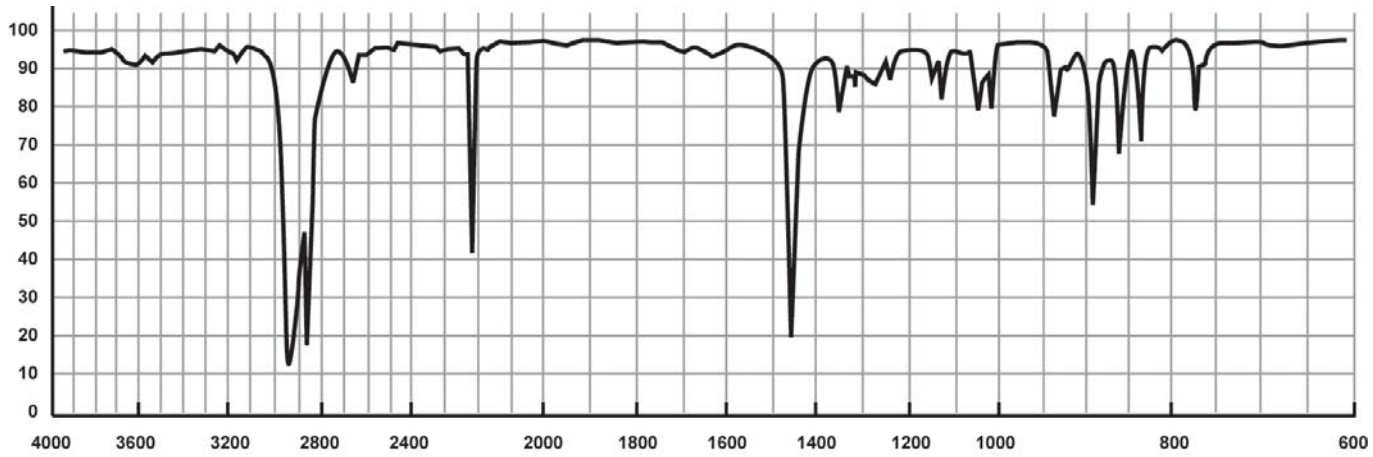
2.



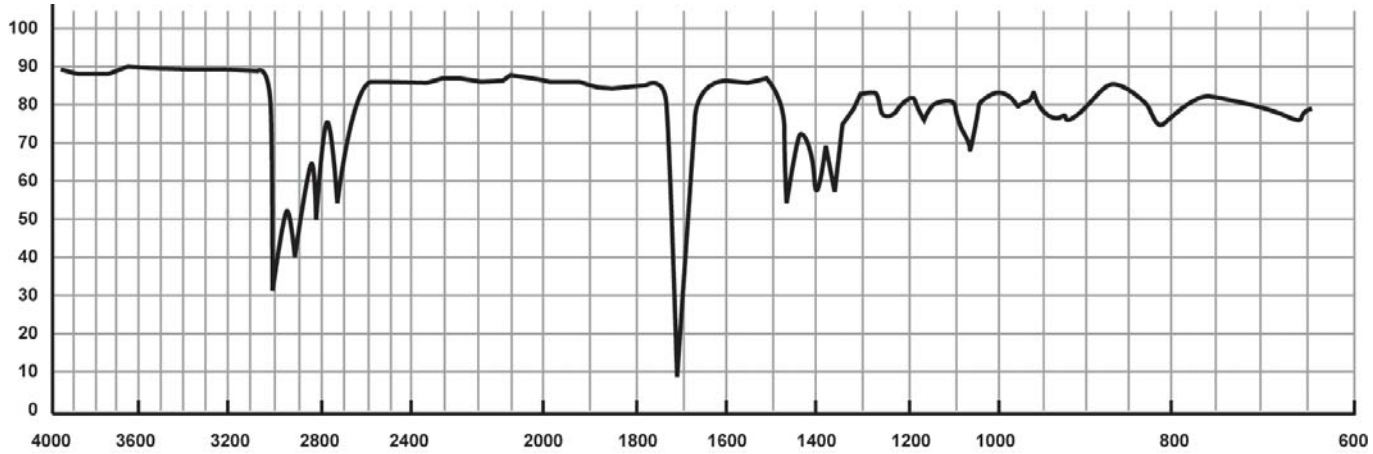
3.



4.


100
90
80
70
60
50
40
30
20
10
0
4000
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
600

5.


100
90
80
70
60
50
40
30
20
10
0
4000
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
600

G. BONUS Spectroscopy: 10 Points

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.