Final Exam

Chemistry 3331

December 11, 2012

Name (PRINT) _____
Last, First

Signature _____

ID # _____

PLEASE CIRCLE CLASS TIME

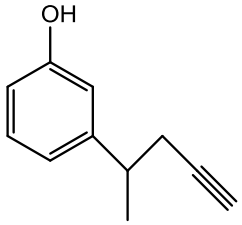
10:00 AM

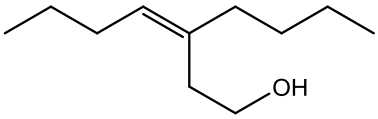
1:00 PM

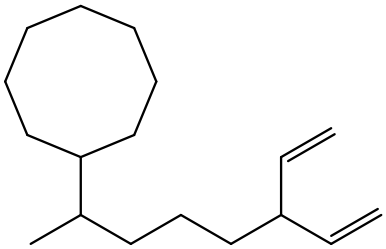
NOTE: Present your ID when you return the exam booklet

Made By: Rana S.

A. Nomenclature: (12 points)
Give an acceptable IUPAC name for each of the compounds in 1,2, and 3. Be sure to indicate the **stereochemistry** where appropriate. Following the required conventions, draw a proper Fischer Projection for the compound in 4.

1. 

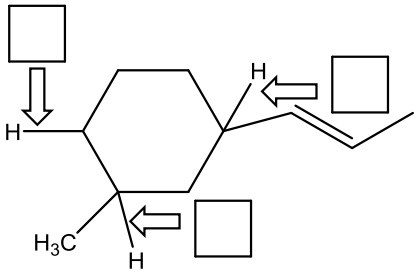
2. 

3. 

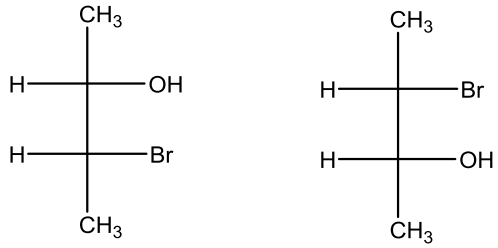
4. (4R, 5R)-4,5,6-tribromohex-1-yne

B. Facts: 22 points

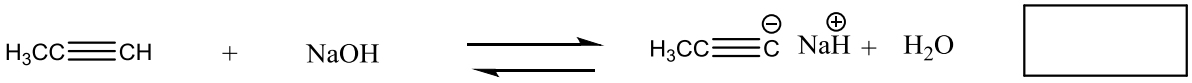
1. Place the indicated bonds in order of increasing bond dissociation energy (BDE). (1=lowest energy, 3=highest energy) (3 pts)



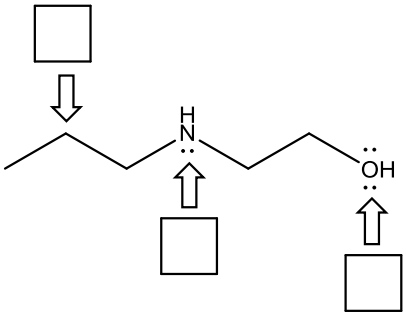
2. Label the following pair as identical, structural isomers, enantiomers, or diastereomers. (3 pts)



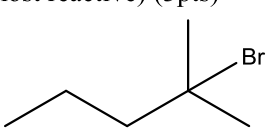
3. Does the following equilibrium lie to the Left or the Right? (2 pts)

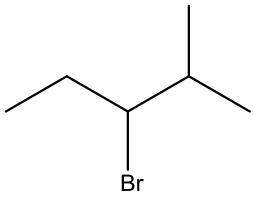


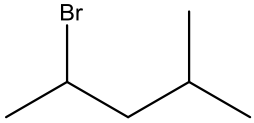
4. Label the hybridization of the indicated atoms. (3pts)



5. Place the following compounds in order of increasing reactivity with NaI in acetone. (1=lowest reactive, 3 = most reactive) (3pts)

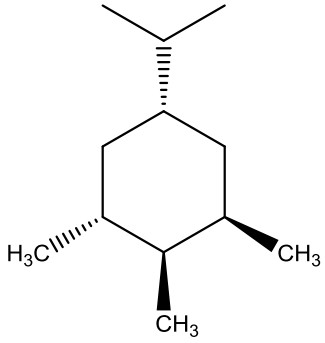






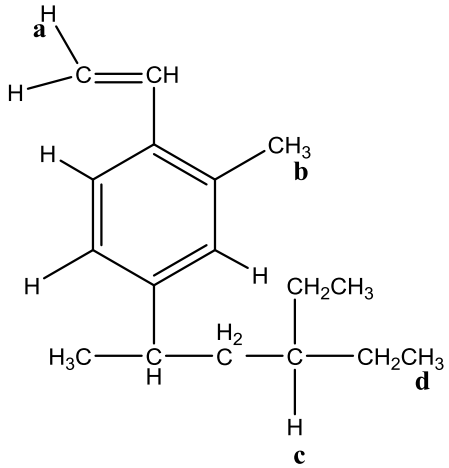
☐ ☐ ☐

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



answer: ☐

7. 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, c,** and **d**? (5pts)



(i) number of distinct protons ☐

(ii) multiplicity of H_a ☐

multiplicity of Hb ☐

multiplicity of H_c ☐

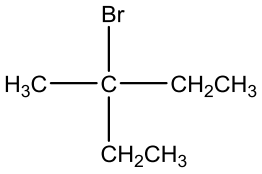
multiplicity of H_d ☐

☐

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 the reactions.

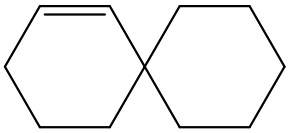
1.



1. $(CH_3)_3CO^{\ominus}\ K^{\oplus}$ / $(CH_3)_3COH$

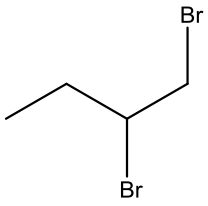
2. Br_2 / H_2O

2.



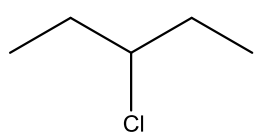
1. NBS / light

3.



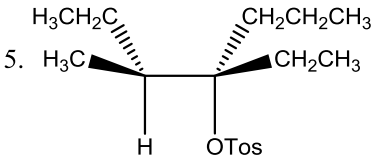
1. KOH / 200 C

2. H_2 / $Pd(BaSO_4)$ / quinoline

4. 

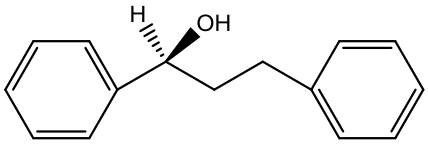
CH_3OH / Heat

Major Minor

5. 

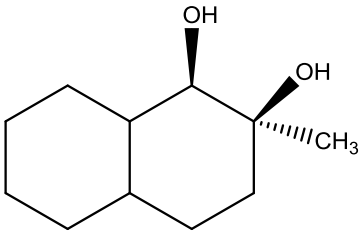
1. $CH_3CH_2O^{\ominus}\ Na^{\oplus}$ / CH_3CH_2OH

2. $CHBr_3$ / KOH

6. 

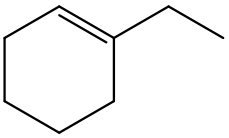
1. PCl_3

2. NaCN /DMSO

7. 

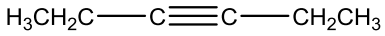
1. HIO_4

2. CrO_3 / H_2SO_4 / H_2O/ acetone, 0 C

8. 

1. $Hg(OAc)_2$ / H_2)
2. $NaBH_4$

3. HCl / ether / 0 C

9. 

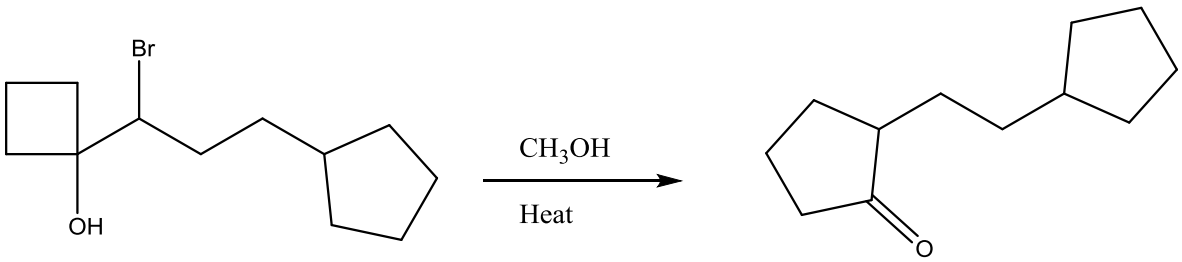
1. $KMnO_4$ / OH / heat, then $H^{\oplus}$

2. CH_3OH / $H^{\oplus}$

3. CH_3CH_3MgBr (2eq), then $H_3O^{\oplus}$

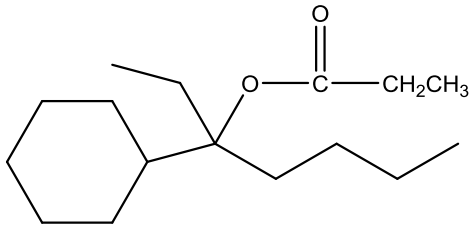
D. Mechanisms: 10 points

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.**



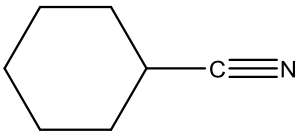
E. Synthesis: 10 points

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

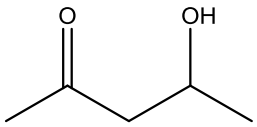


F. Spectroscopy: 10 points

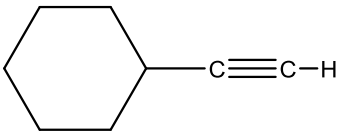
1. Carefully examine the two infrared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum.



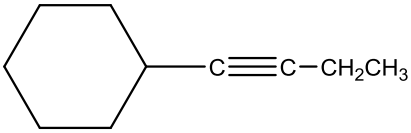
A



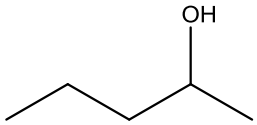
B



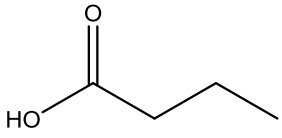
C



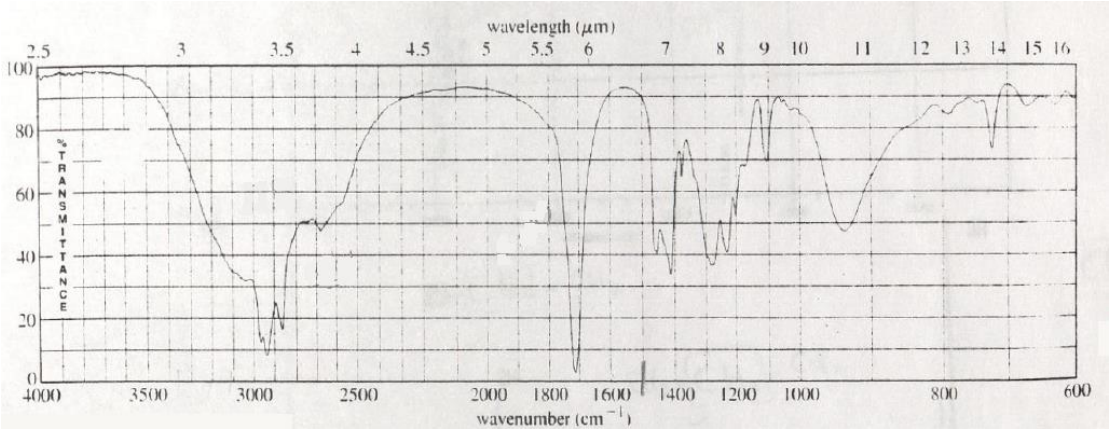
D

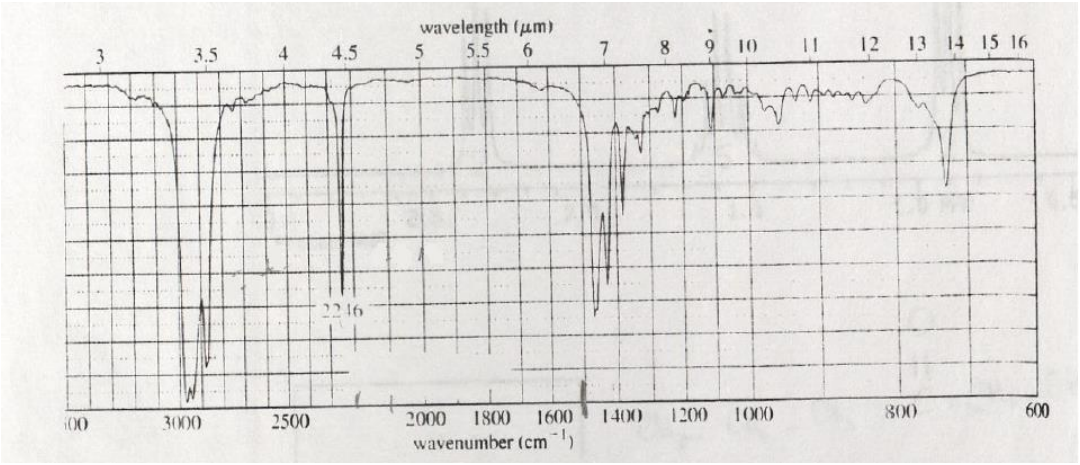


E



F





2. A compound with the formula $C_7H_{14}O$ exhibits IR and ^1H NMR shown below. Please identify this compound and draw the strcuture in the box provided below. (6pts)