

Final Exam

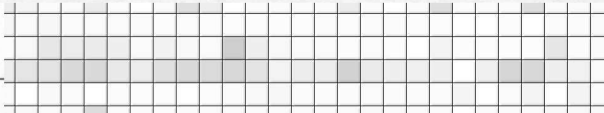
Name(PRINT) itutor.chemistry@gmail.com  
LAST, First

Chemistry 3331

Signature itutor.chemistry@gmail.com

December 9, 2009

ID#



PLEASE CIRCLE CLASS TIME!

10:00 AM

1:00 PM

4:00 PM

Page #	Score	
1. 12 pt	1	2
2. 22 pt	2	2
3. 12 pt	1	2
4. 12 pt	1	2
5. 12 pt	1	2
6. 10 pt	1	0
7. 10 pt	1	0
8. 4 pt	0	4
9. 6 pt	0	6

Total: 100

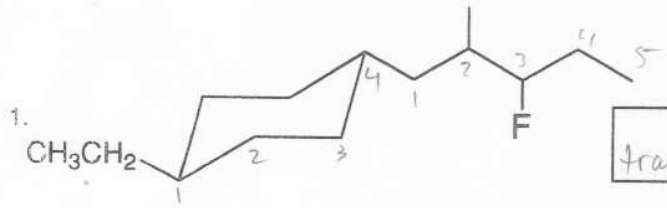
NOTE: Present your ID when you return the exam booklet.

73

?

A. Nomenclature: (12 points)

Give an acceptable IUPAC name for each compound. Be sure to indicate the stereochemistry where appropriate.



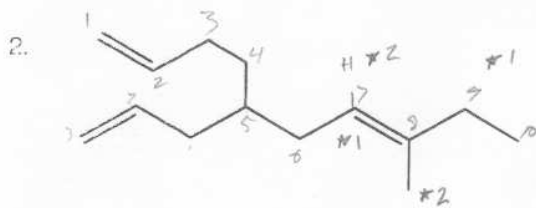
trans-1-ethyl-4-(3-fluoro-2-methylpentyl)cyclohexane

cyclohexane

1-ethyl

4-(3-fluoro-2-methylpentyl)

4



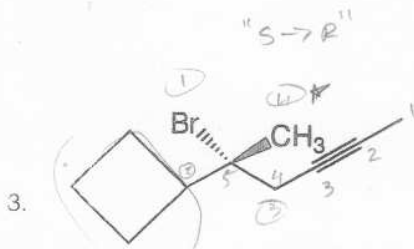
(7E)-8-methyl-5-(2-propenyl)dec-1,7-diene

dec-1,7-diene

8-methyl

5-(prop-2-enyl)

4



OMIT!!!

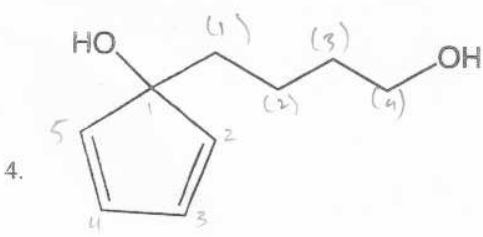
R/S

(1S)-pent-2-yne

5-bromo

5-methyl

5-cyclobutyl



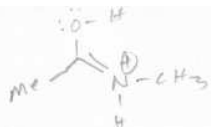
1-(4-hydroxybutyl)cyclopenta-2,4-dien-1-ol

Cyclopent-2,4-dien-1-ol

1-(4-hydroxybutyl)  
butanyl

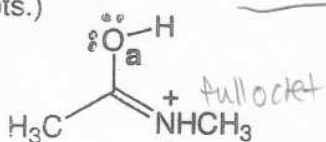
4

B. Facts: 22 points

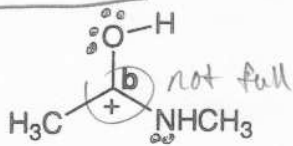


inductive only through sigma bonds!

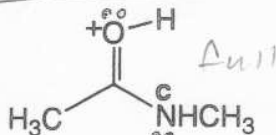
1. Place the following resonance contributors in order of increasing stability. (1=least stable, 3=most stable) (3 pts.)



3



1



2

N can handle + charge better than Oxygen.

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

Oa

sp<sup>2</sup>

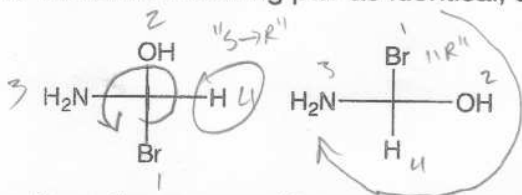
Cb

sp<sup>2</sup>

Nc

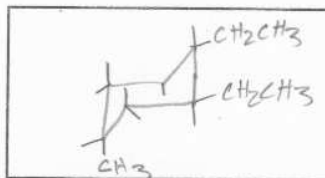
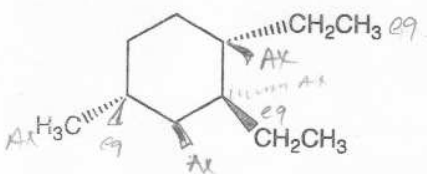
sp<sup>2</sup>

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



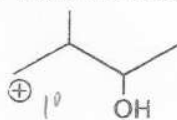
identical

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

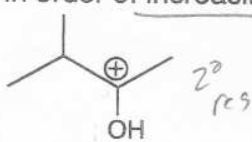


2 eq CH<sub>2</sub>CH<sub>3</sub>  
1 AX CH<sub>3</sub>

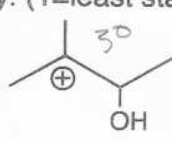
5. Place the following cations in order of increasing stability. (1=least stable, 3=most stable) (3 pts.)



1



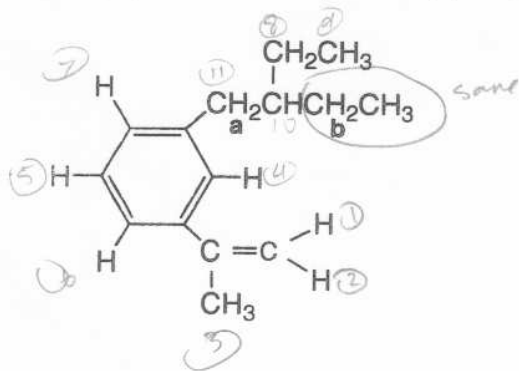
3



2

res: 3° > 2° > 1°

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 protons labeled a and b? (6 pts.)

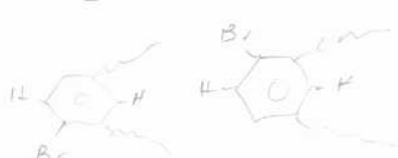


(i) number of distinct protons

(ii) multiplicity of H<sub>a</sub>

multiplicity of H<sub>b</sub>

(3+1)(1+1) = 8  
4 x 2

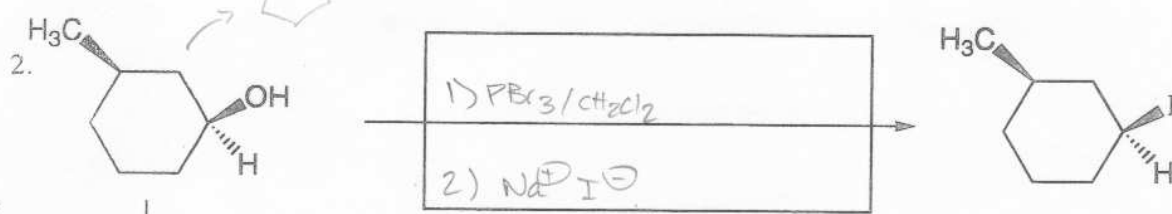
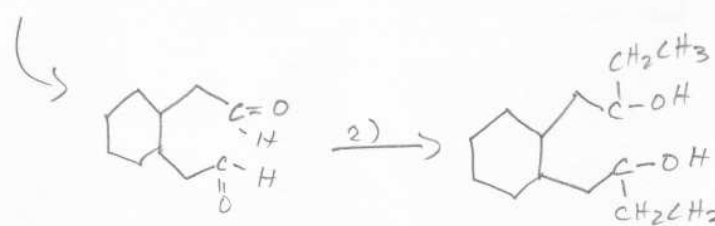
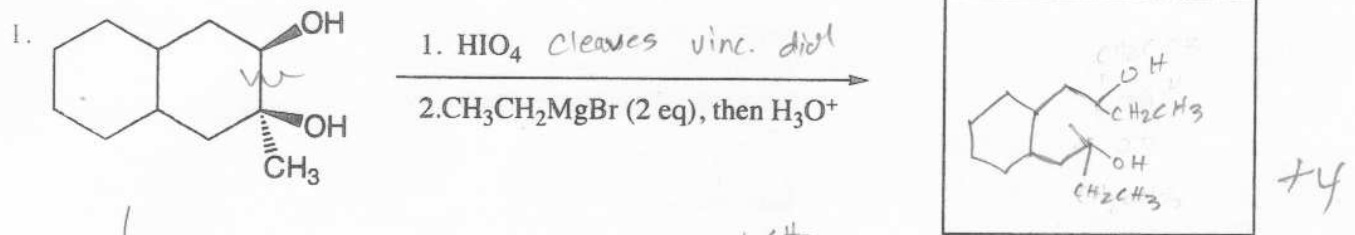


2

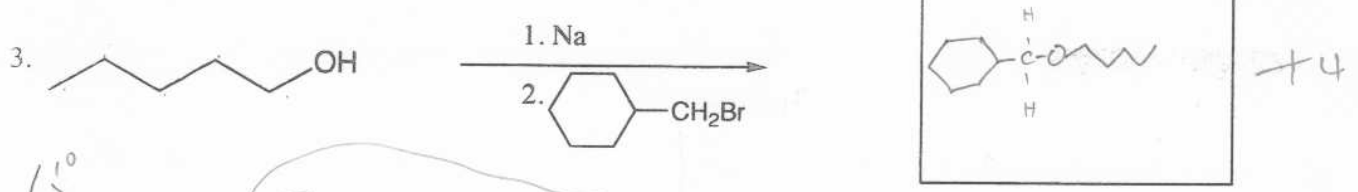
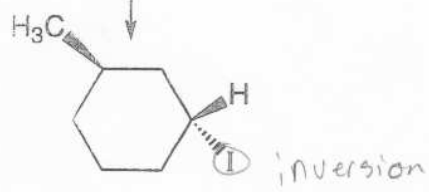
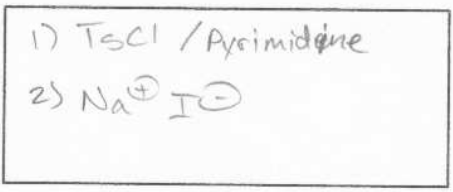
22

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

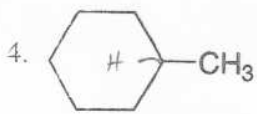
Please provide the major product unless otherwise indicated or the reagents in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.



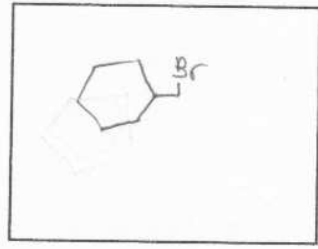
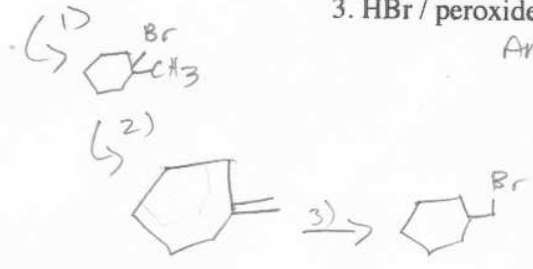
check R/S



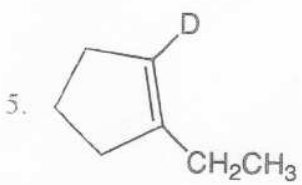
add 



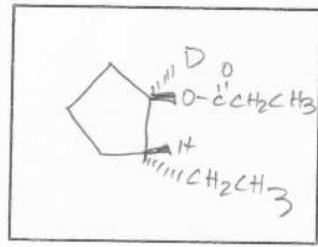
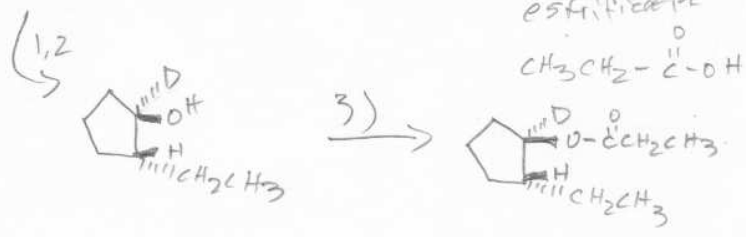
1. Br<sub>2</sub> / Light  
 2. (CH<sub>3</sub>)<sub>3</sub>CO<sup>-</sup>K<sup>+</sup> / least sub  
 3. HBr / peroxide  
 Antimerk



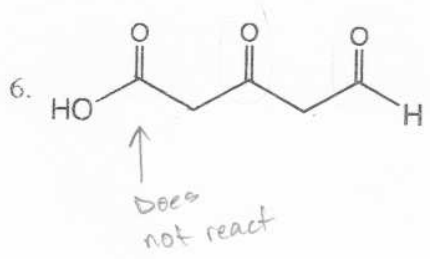
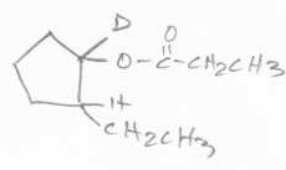
4



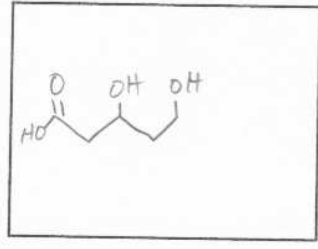
1. BH<sub>3</sub> / THF } non mark  
 2. H<sub>2</sub>O<sub>2</sub> / OH<sup>-</sup> } syn  
 3. CH<sub>3</sub>CH<sub>2</sub>CO<sub>2</sub>H / H<sup>+</sup>  
 esterification  
CC(=O)O



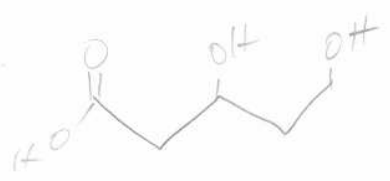
4



Ald, Ket  
 NaBH<sub>4</sub> (XS) / EtOH

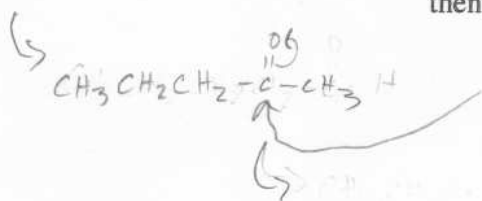
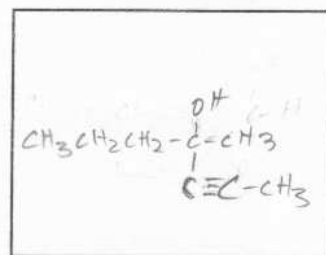
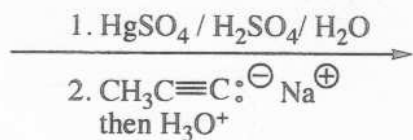


4

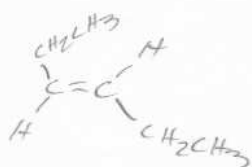
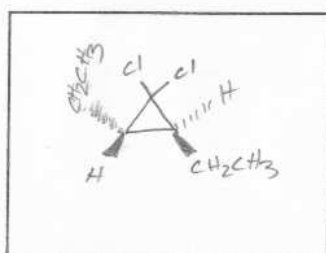
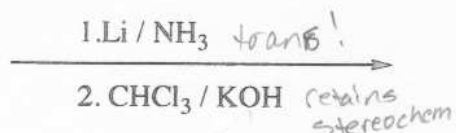
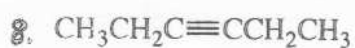


4

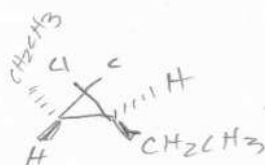
12



4

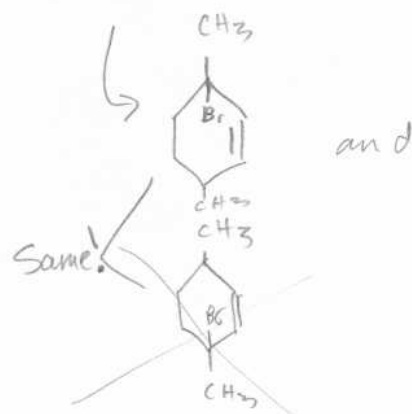
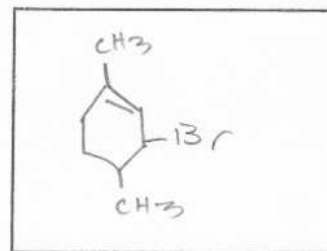
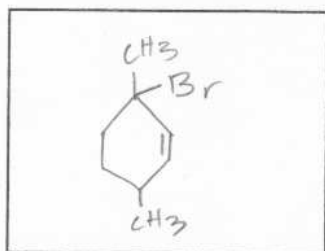


2)



4

9.

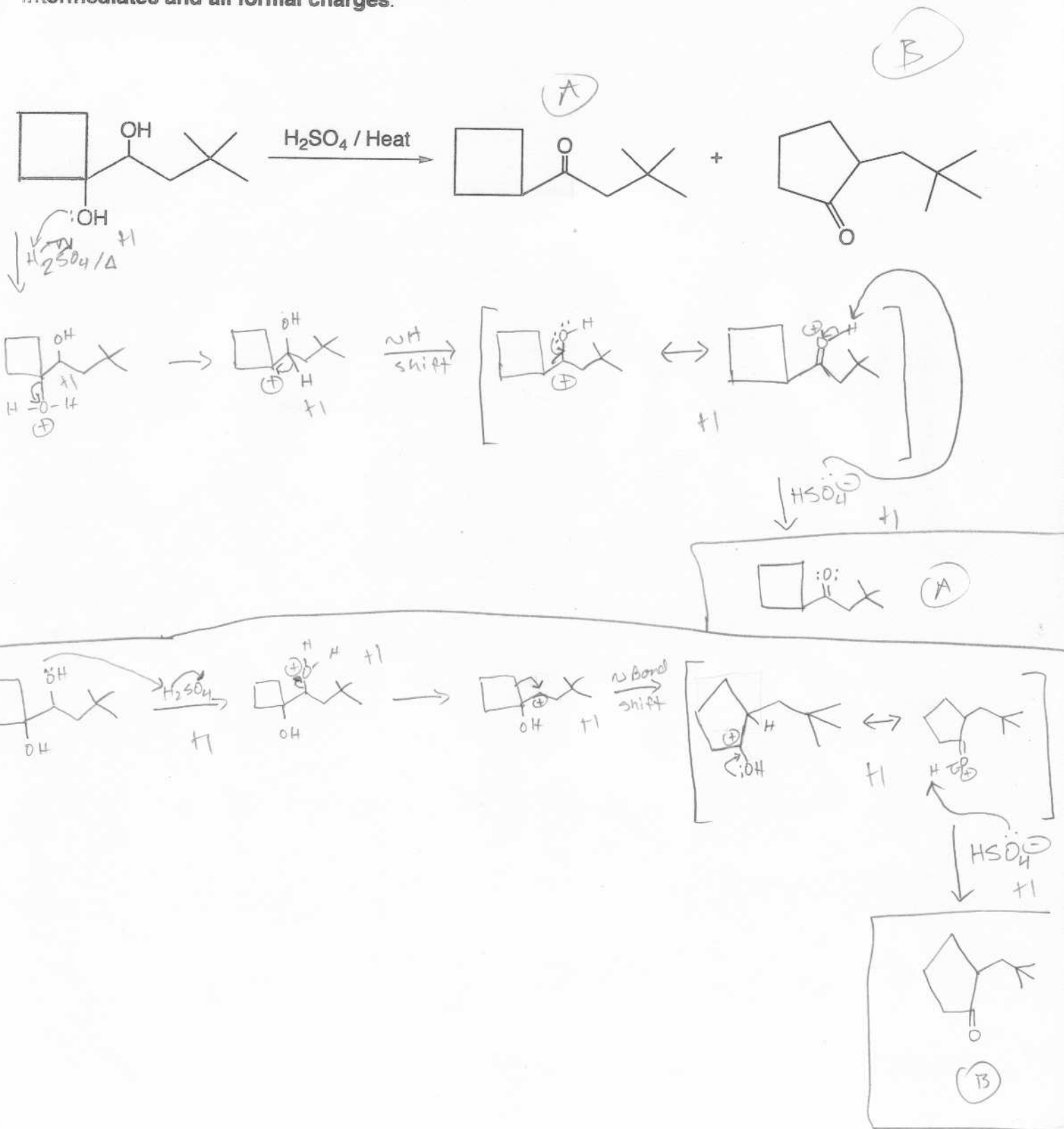


5

12

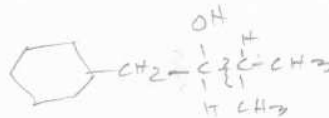
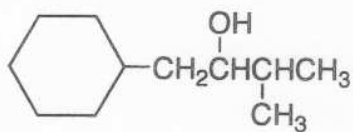
D. Mechanisms: (10 points)

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.



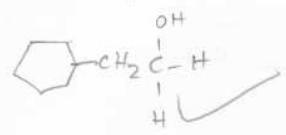
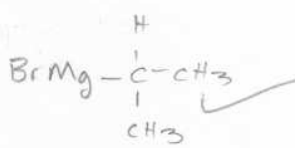
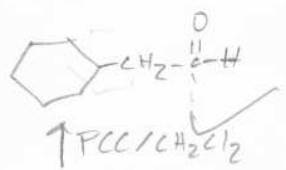
E. Synthesis: 10 Points

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



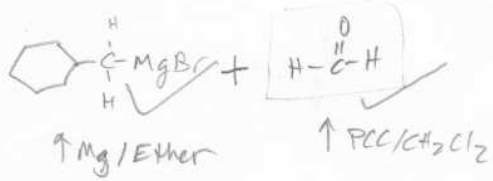
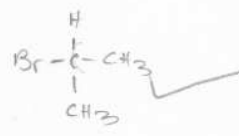
10

then  $H_3O^+$

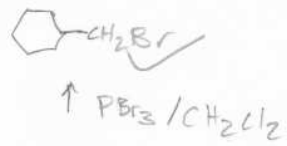
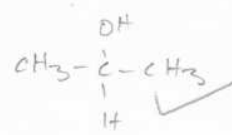


$Mg^0$  / Ether

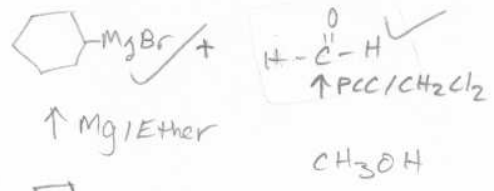
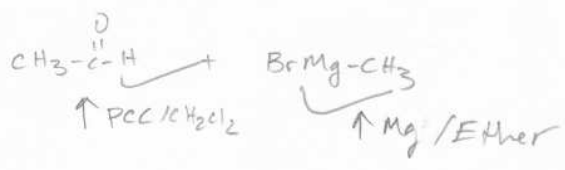
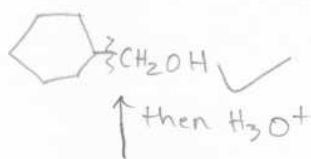
then  $H_3O^+$



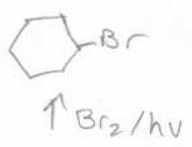
$PBr_3$  /  $CH_2Cl_2$



then  $H_3O^+$



$Br-CH_3$



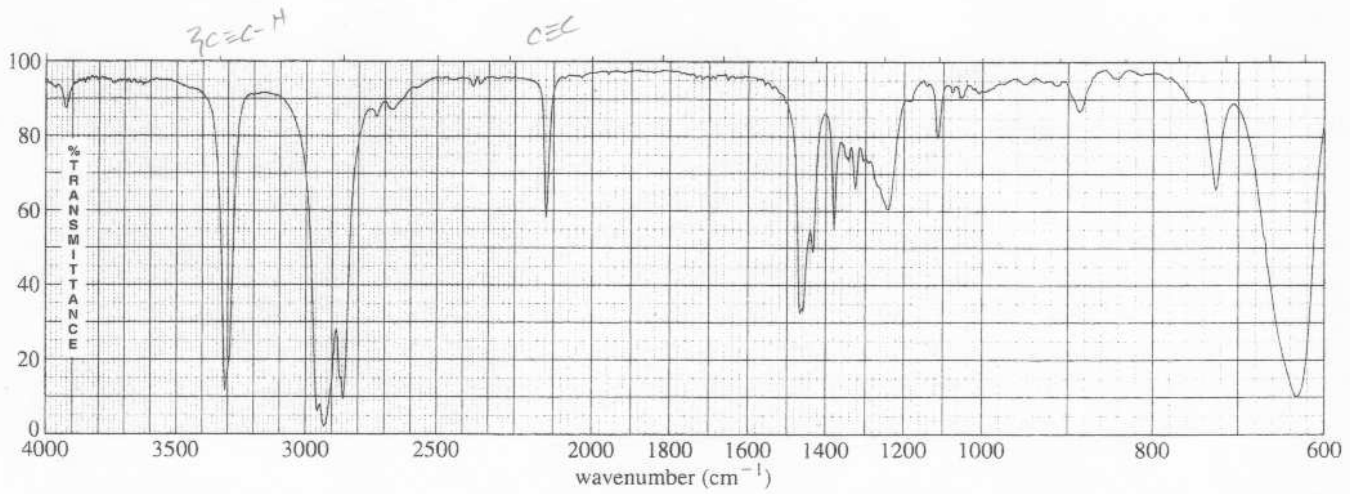
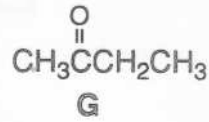
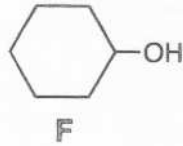
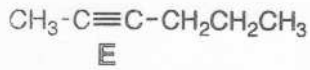
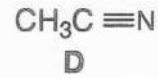
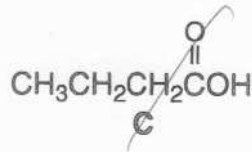
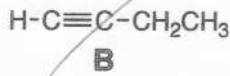
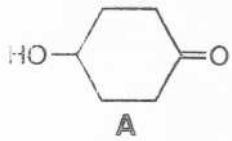
$CH_4$



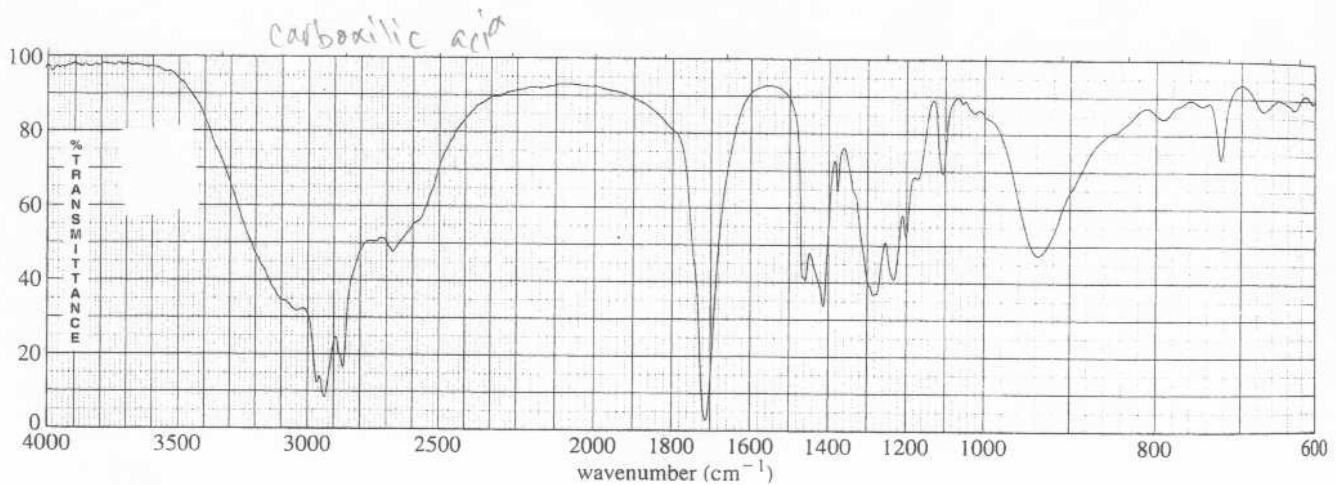


F. Spectroscopy: 10 Points

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.)

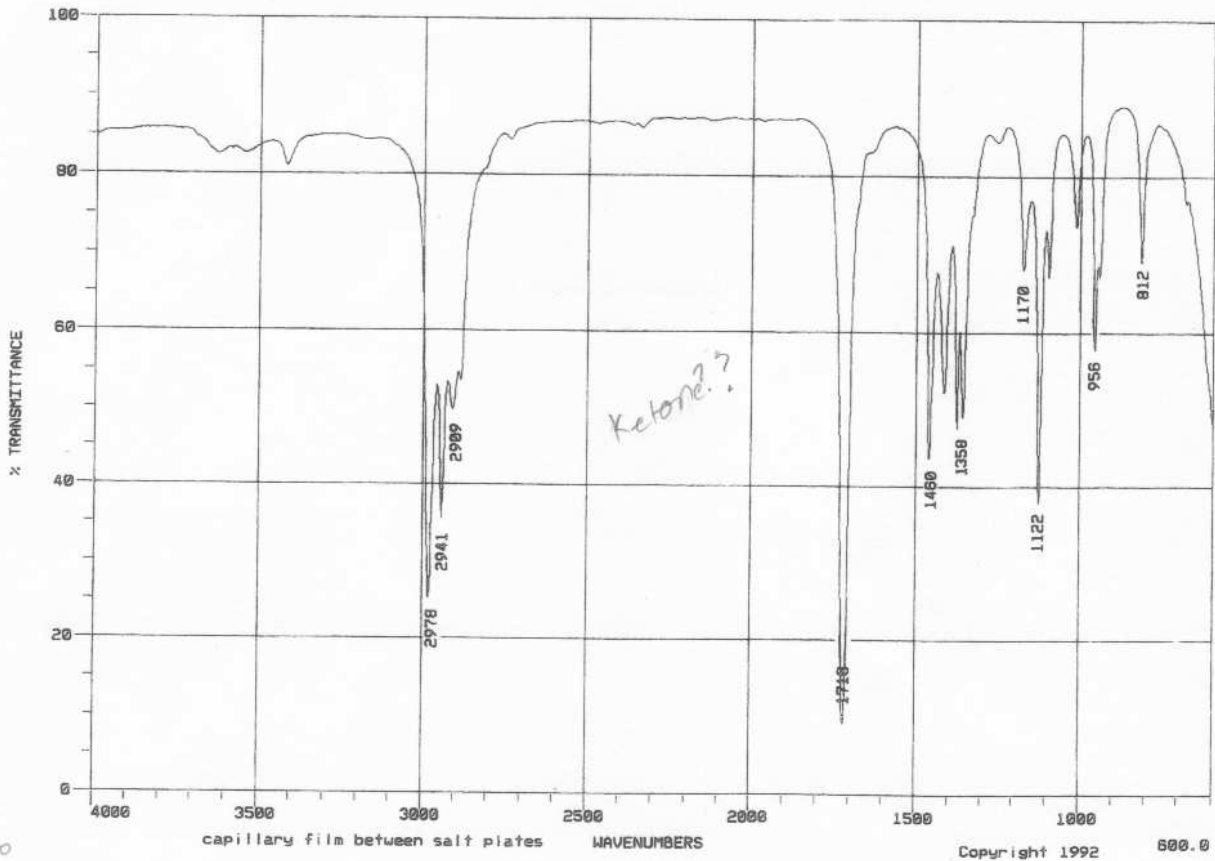


B



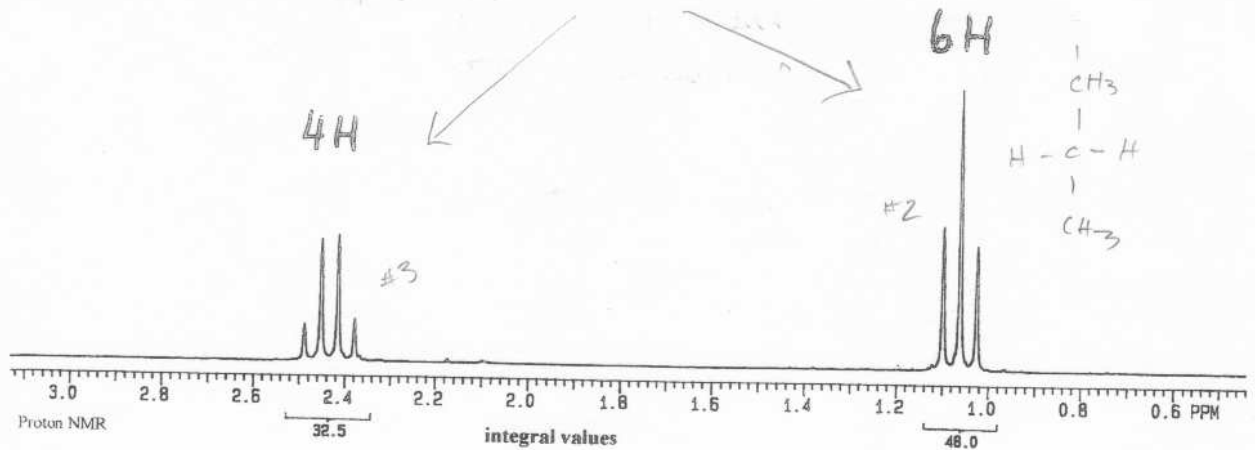
C

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

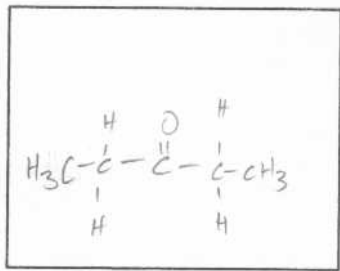


$$\frac{12 - 10}{2} = 1$$

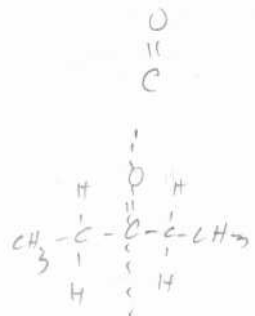
Only 2 diff. protons



1 double bond or a ring?



9



6 plane of symmetry

6