

Final Exam

Name (PRINT) _____

Chemistry 3331

Signature _____

December 6, 2006

ID# _____

Please circle class day/time.

T/Th 10 AM

T/Th 1 PM

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

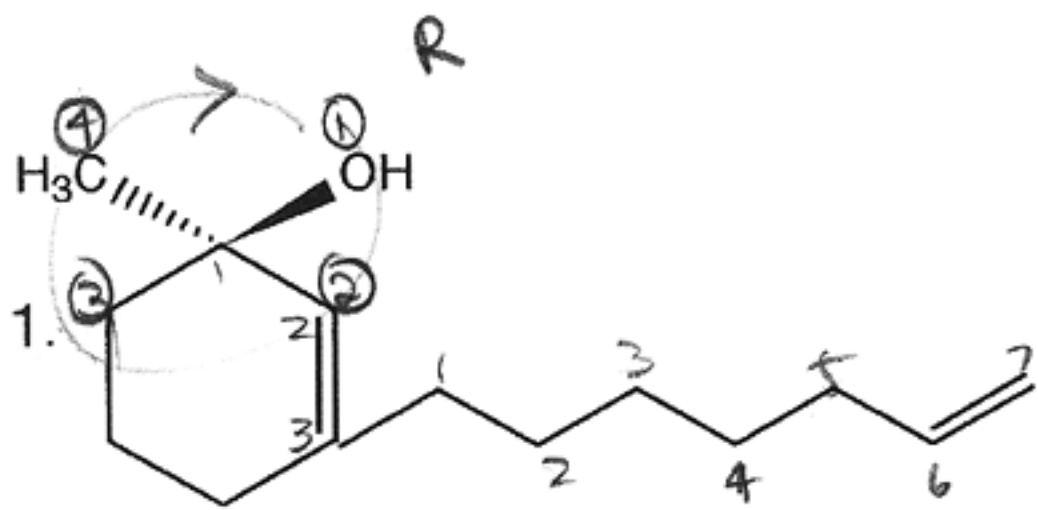
TOTAL

102 ✓

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

A. Nomenclature : Total = 12 points

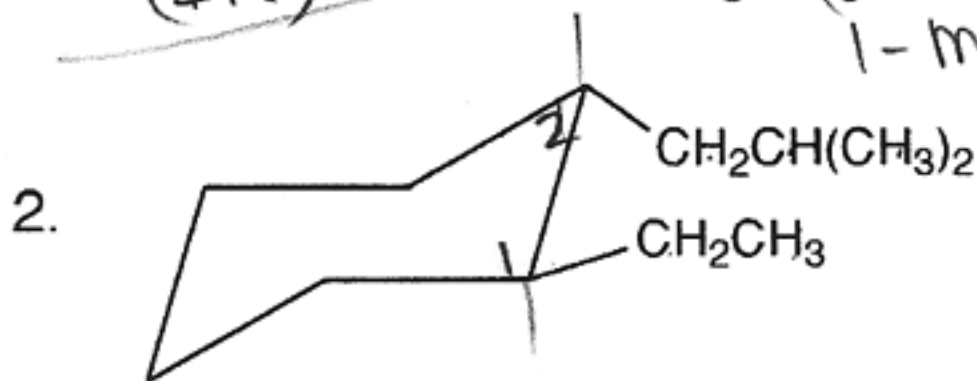
Please provide a proper IUPAC name for each of the following compounds. Include stereochemistry where appropriate.



(1R)-3-(6-heptenyl)-1-methylcyclohex-2-en-1-ol

cyclohexenol
cyclohex-2-en-1-ol

(1R) 3-(6-heptenyl)
1-methyl



trans-1-ethyl-2-(2-methylpropyl)cyclohexane

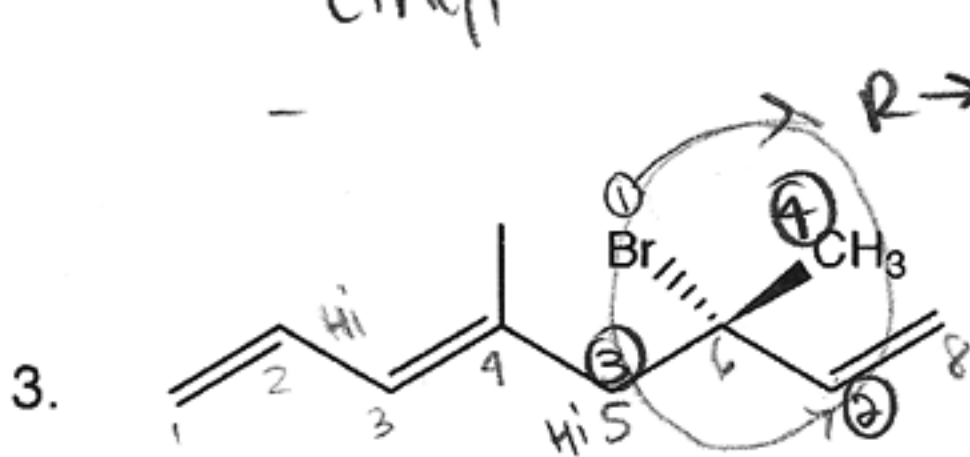
cyclohexane

trans

-ethyl

CH_3
- CH_2 - $\underset{\text{H}}{\text{C}}$ - CH_3 propyl

2-(2-methylpropyl)



(3E, 6S)-6-bromo-4,6-dimethylocta-1,3,7-triene

octatriene

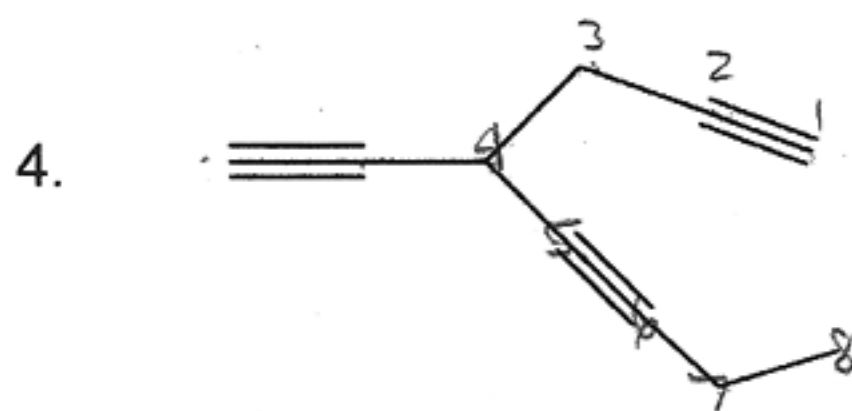
octa-1,3,7-triene

(3E, 6S)

(3E, 6S)

4-methyl
6-methyl
6-bromo

> 4,6 dimethyl
6-bromo



4-ethynyl-1,5-diyne

octadiyne

1-octa-1,5-diyne

ethane
4-ethyn

ethyne
ethynl

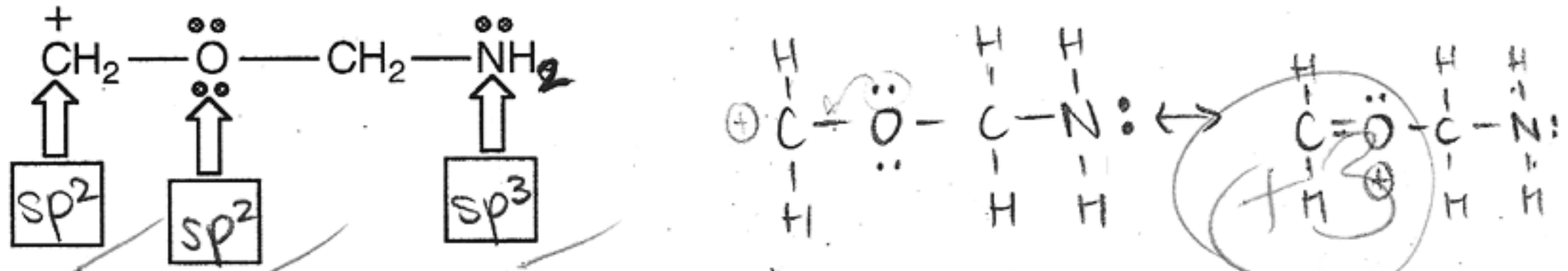
propyl
propenyl

4-ethynyl

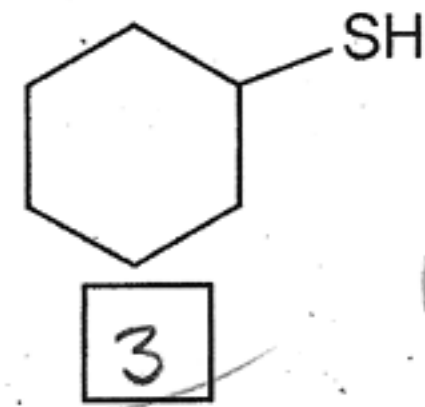
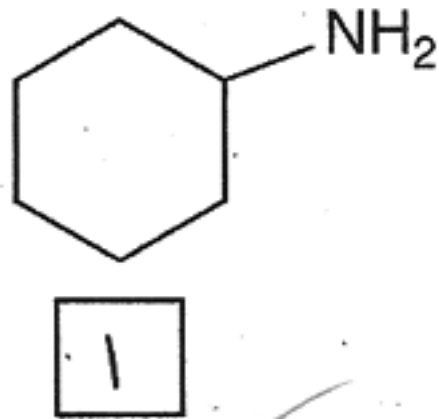
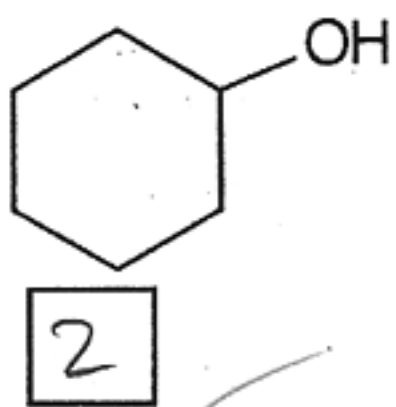
propynyl

B. Facts: Total Points = 22

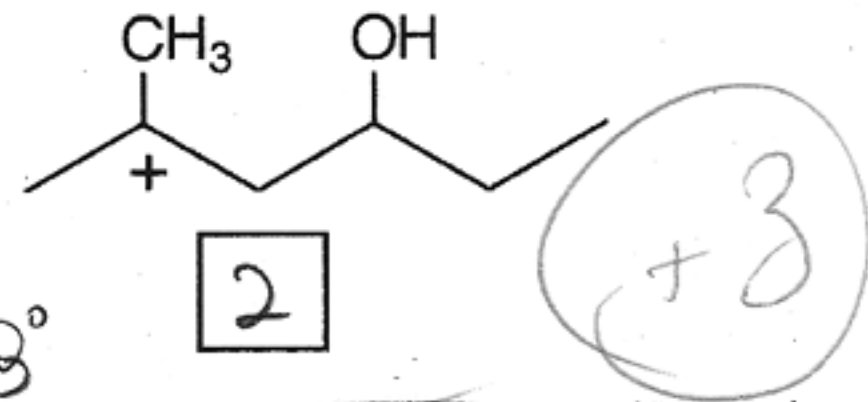
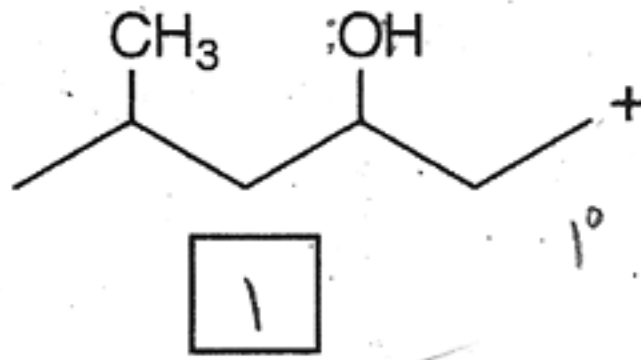
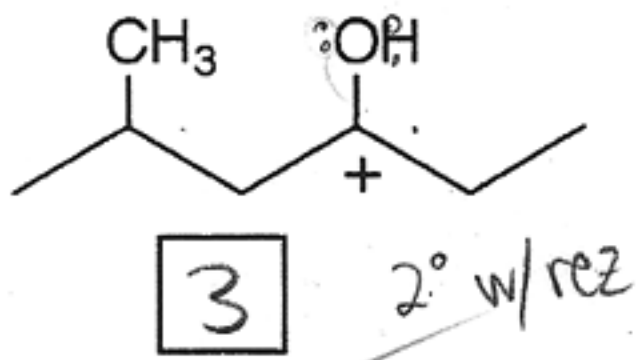
1. Label the hybridization of the indicated atoms in the structure below. (3 pts.)



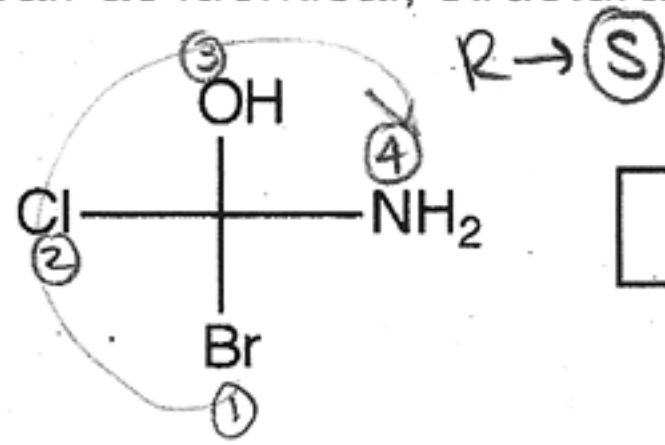
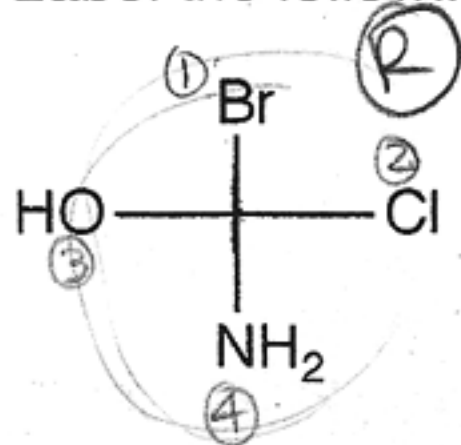
2. Rank the following compounds in order of increasing acidity. (1=least acidic, 3=most) (3 pts.)



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



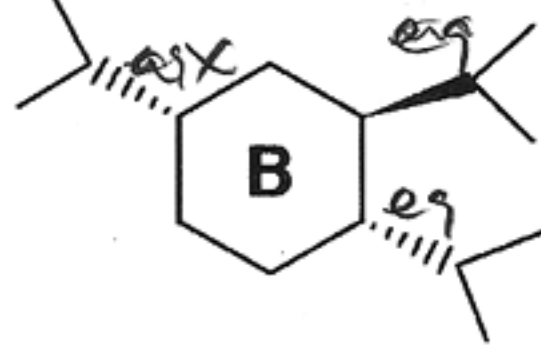
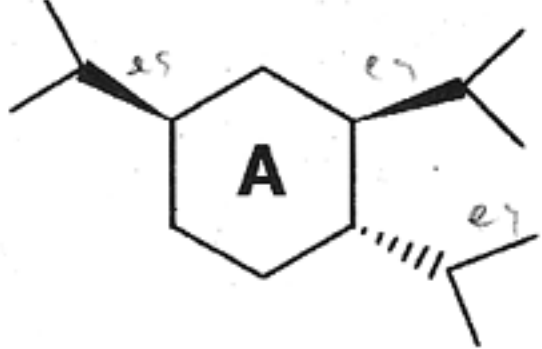
4. Label the following pair as identical, structural isomers, enantiomers or diastereomers. (3 pts.)



enantiomers

+3

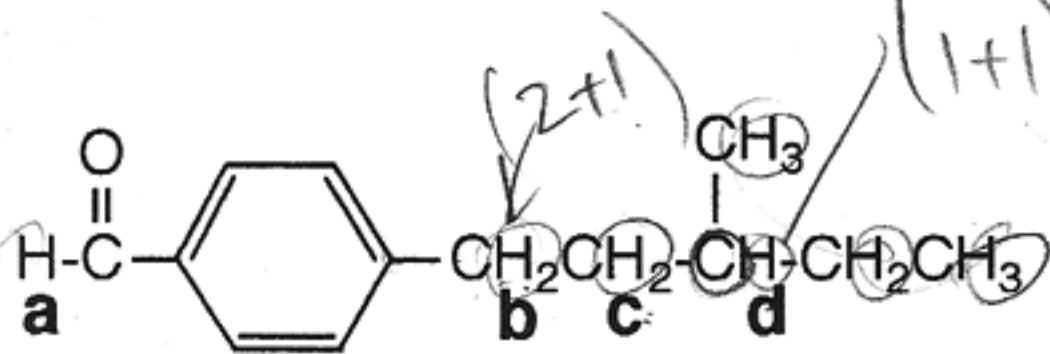
5. Place the letter of the more stable isomer in the box provided. (3 pts.)



A

+3

6. Place the answers to the following questions in the appropriately labeled boxes. a) How many distinct types of protons does the compound below have? b) What are the theoretically predicted multiplicities (splitting patterns) of the signals for the protons labeled a, b and c? (7 points)



a) types of protons

b) multiplicity of H_a

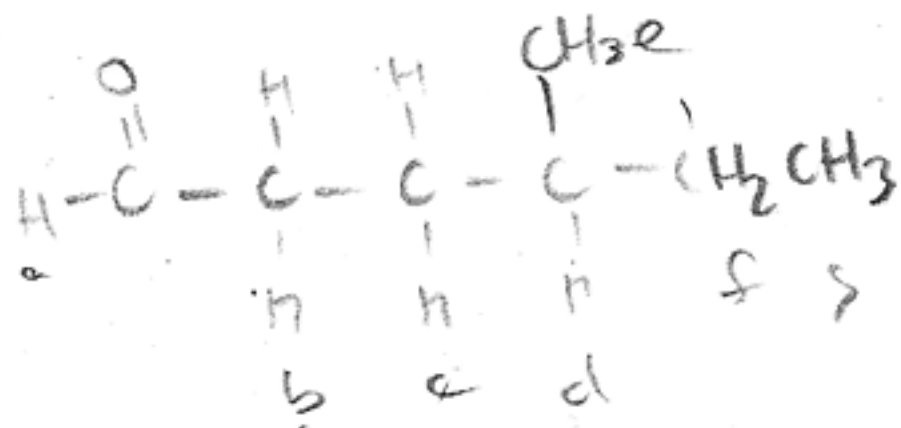
multiplicity of H_b

multiplicity of H_c

2 pt. bonus: multiplicity of H_d

- 7
- 1
- 3
- 6
- 30

n+1 rule



2

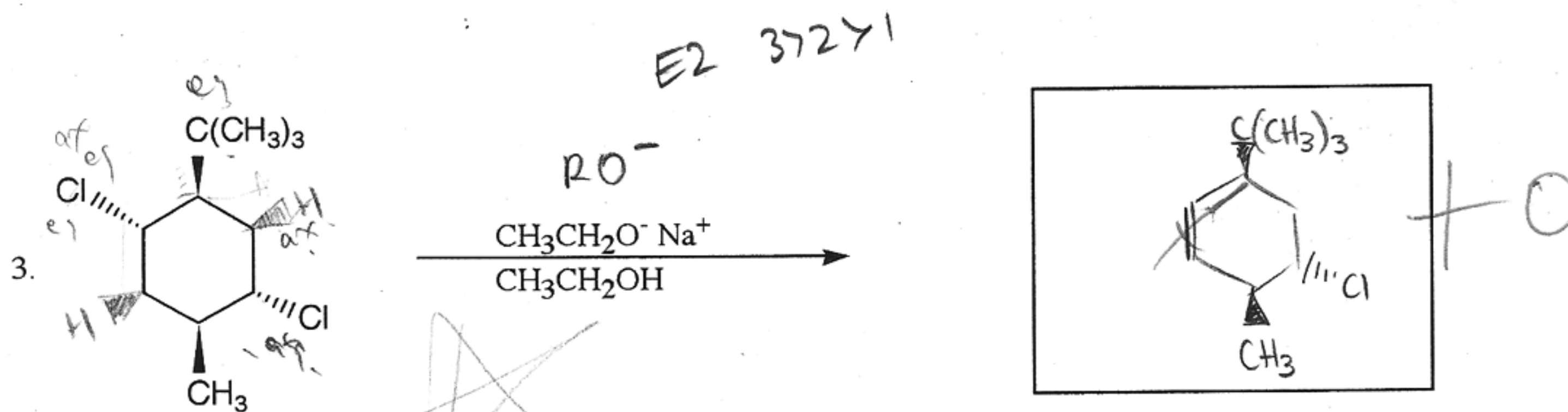
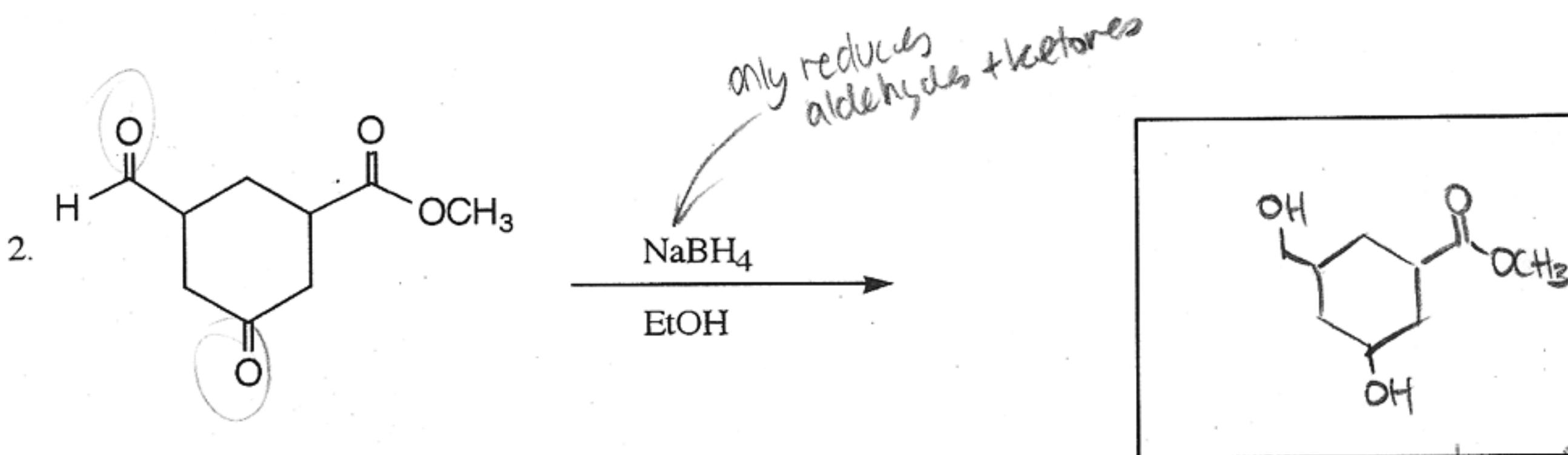
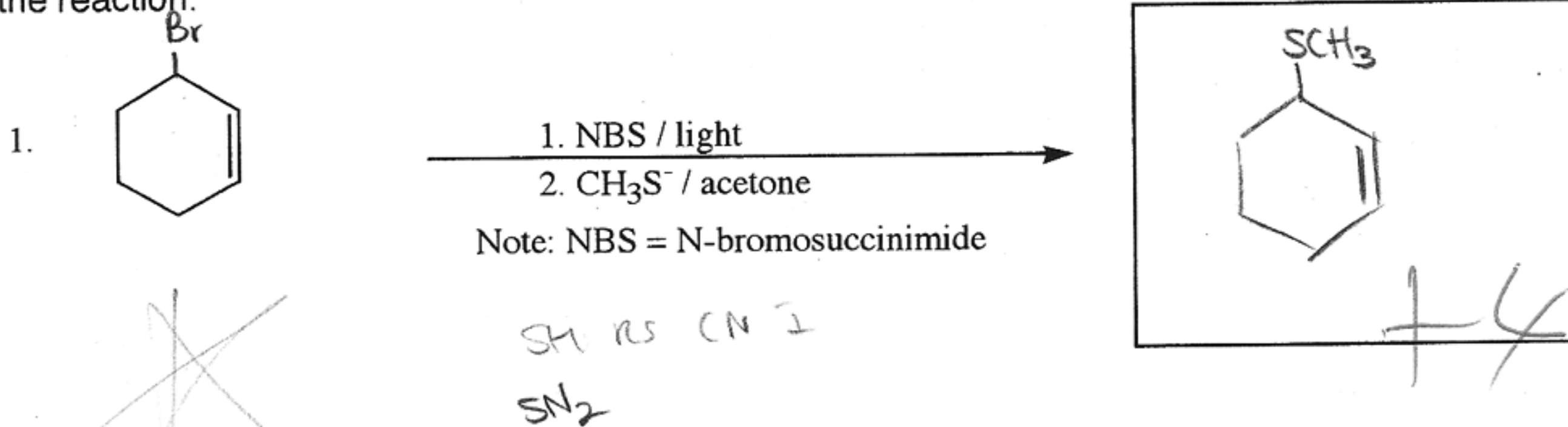
(1)(3)
2 (3)(2)

(3)(4)(3)
(9)(4) = 36

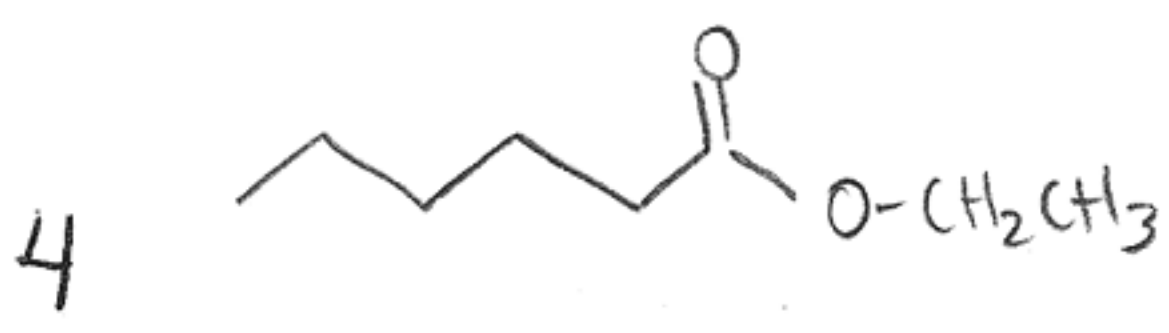
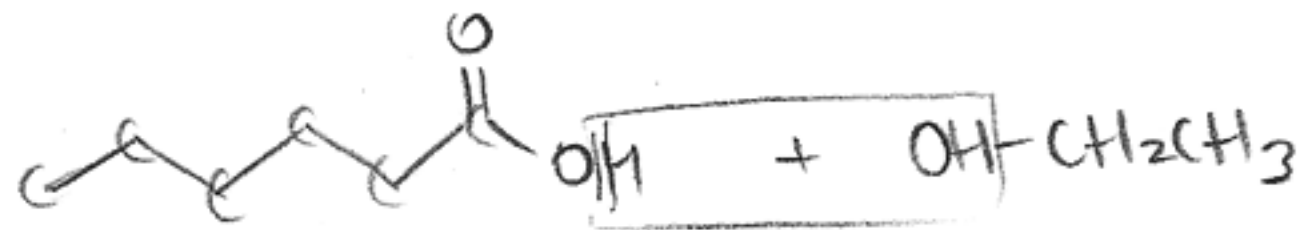
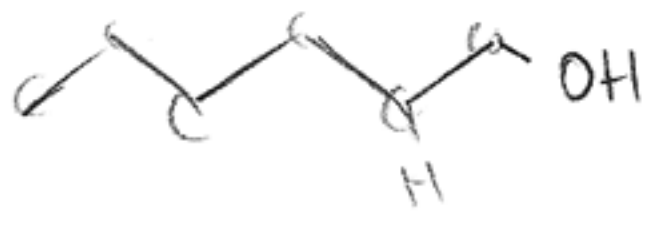
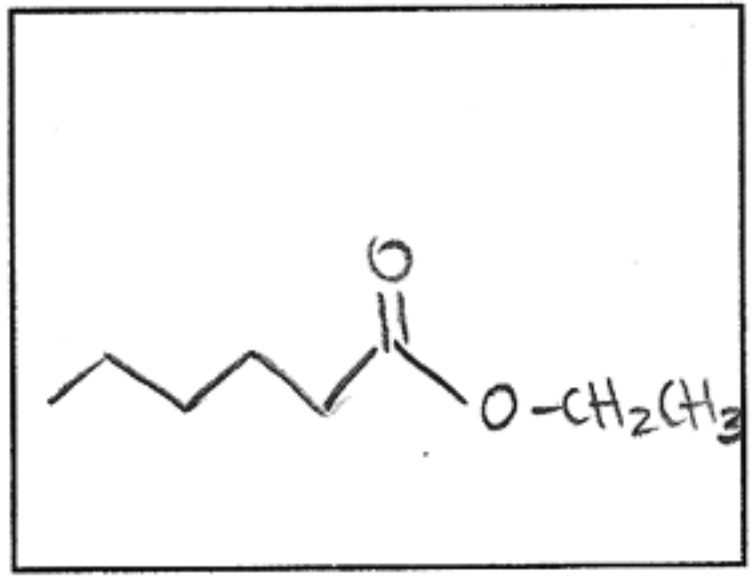
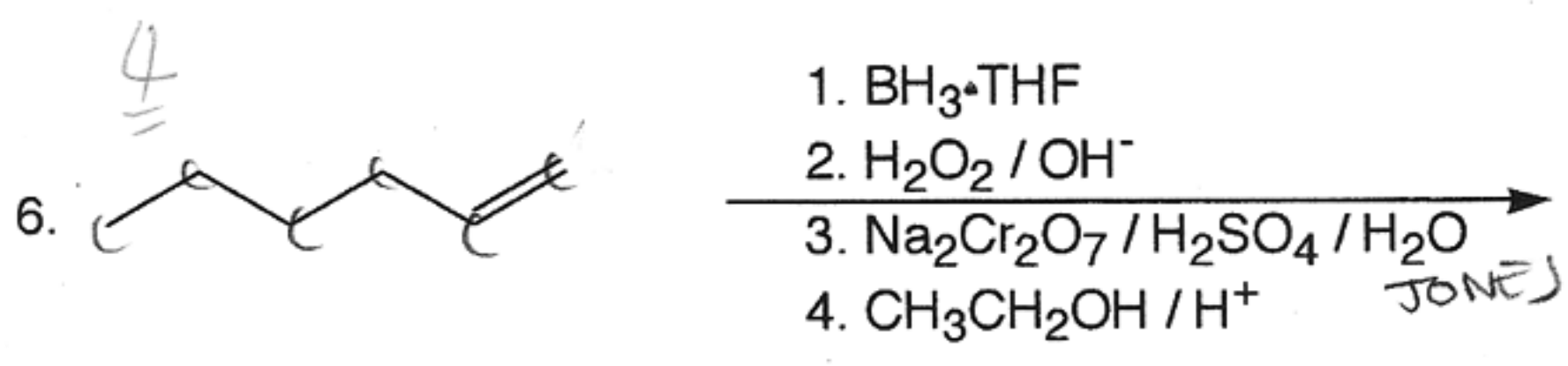
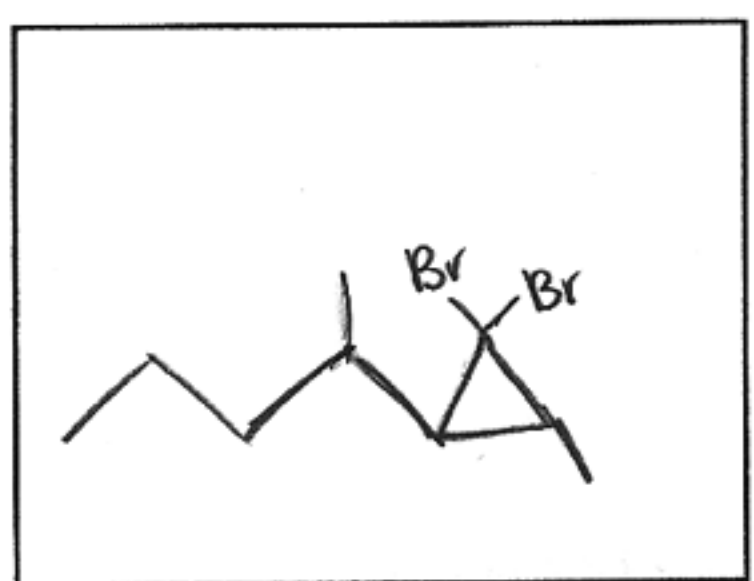
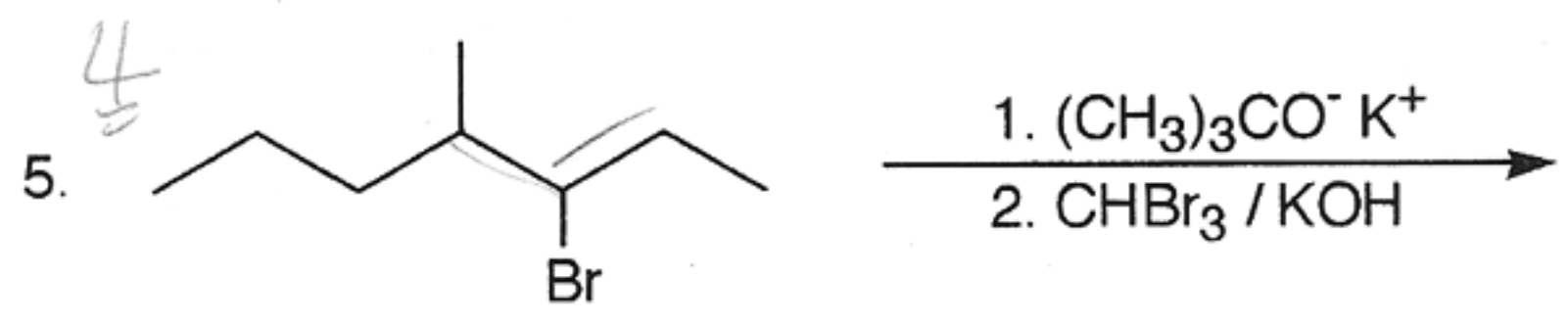
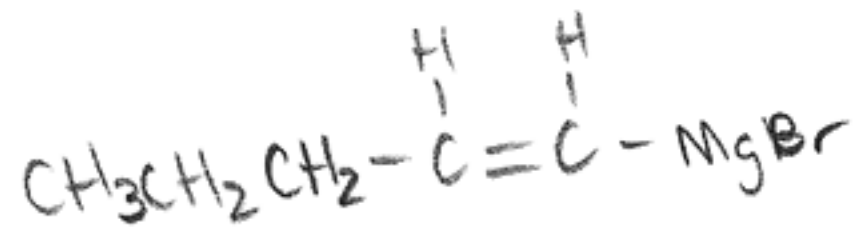
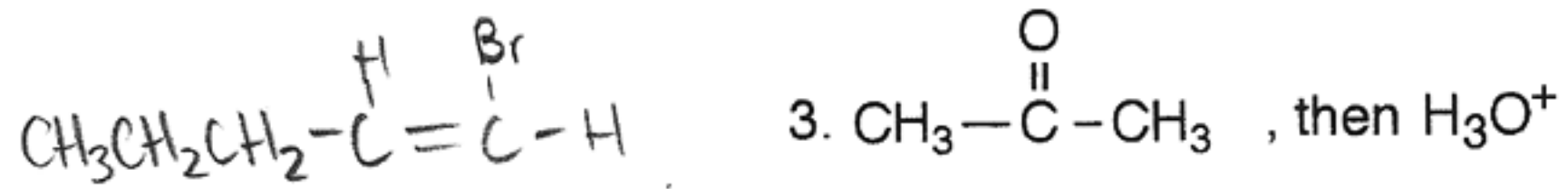
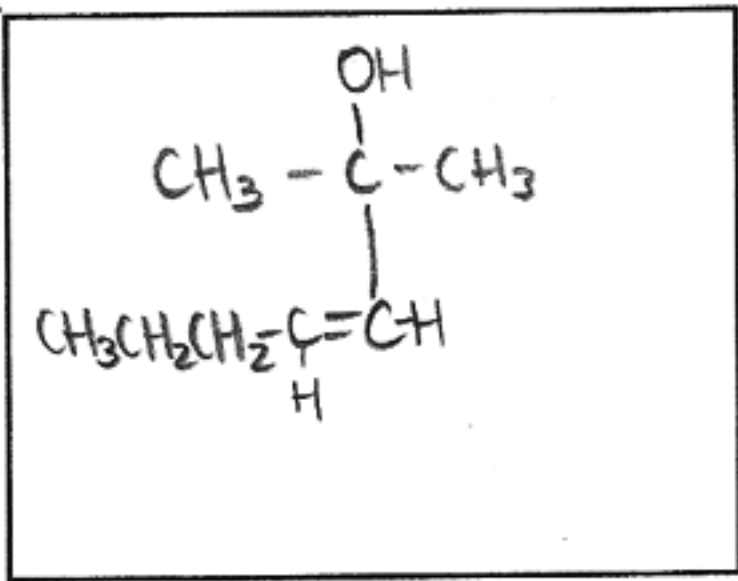
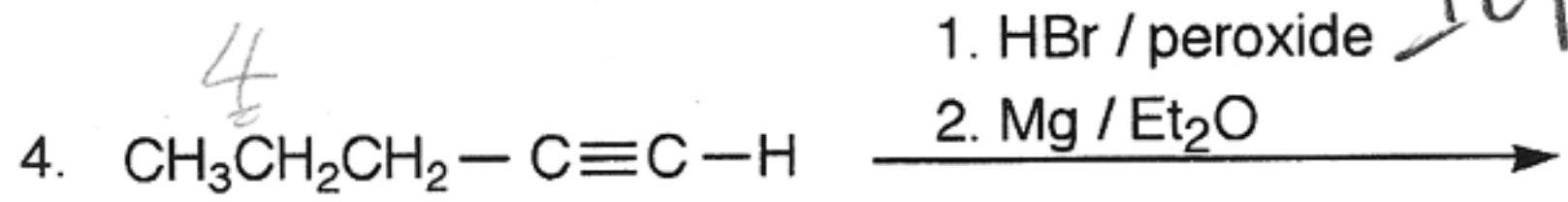
23

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

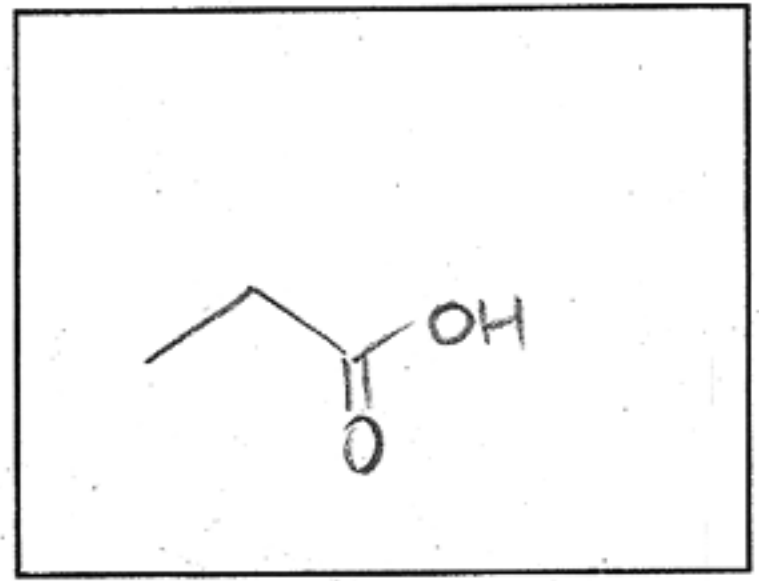
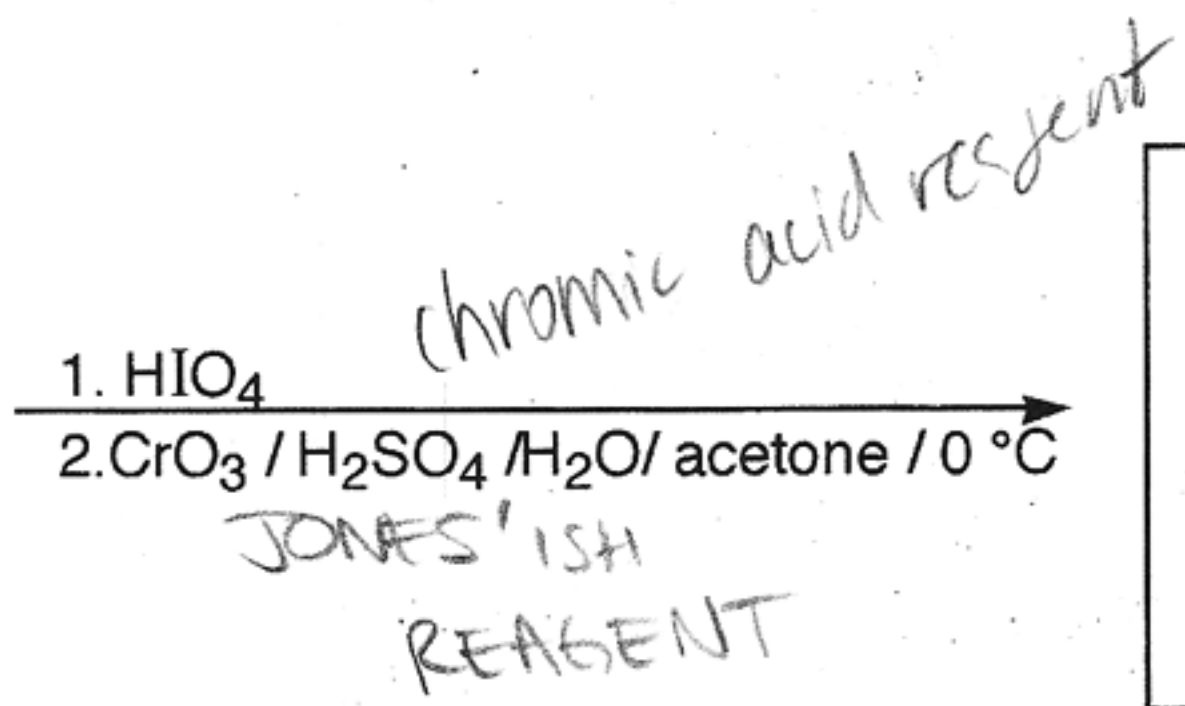
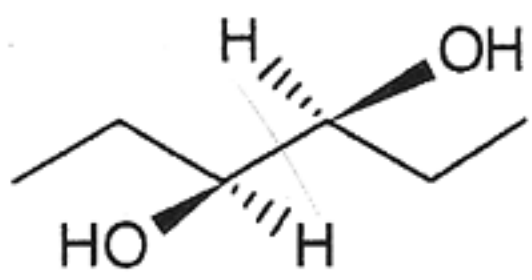
Please provide the major product or required reagents in the answer box. Be sure your drawing indicates stereochemistry if applicable. Partial credit is awarded only when intermediate products are shown below the reaction.



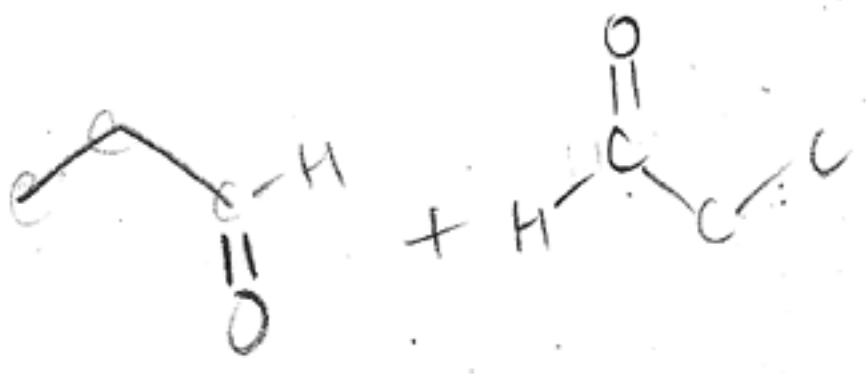
1 eq or 2?



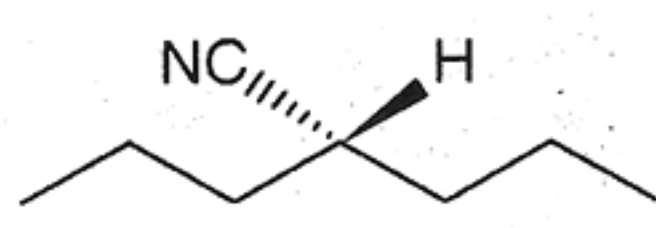
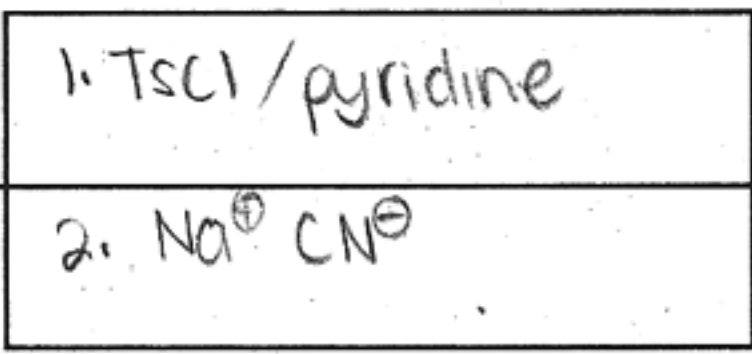
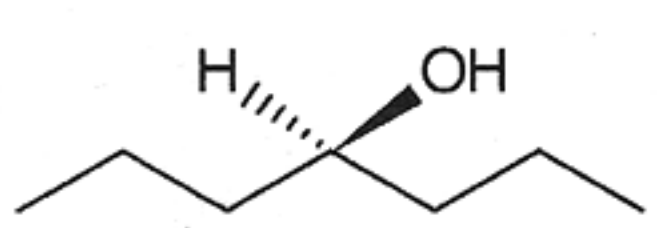
7.



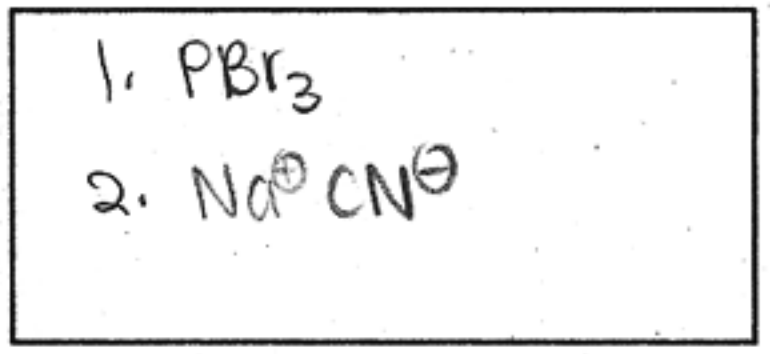
+ 4



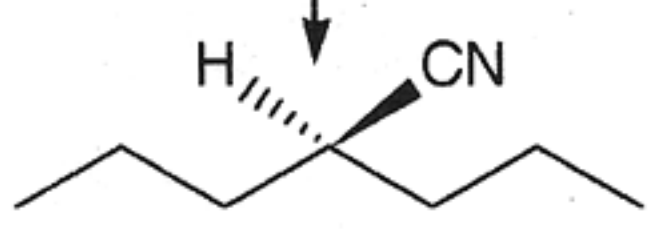
8.



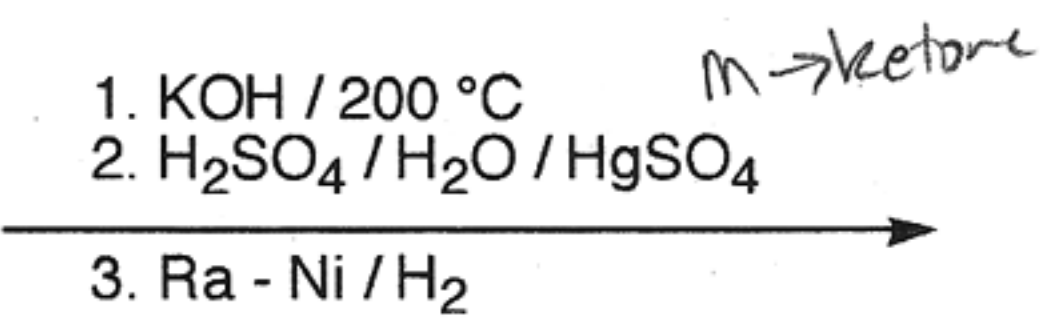
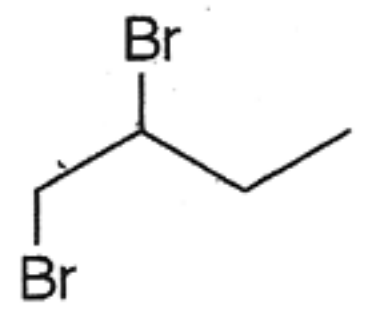
+ 2



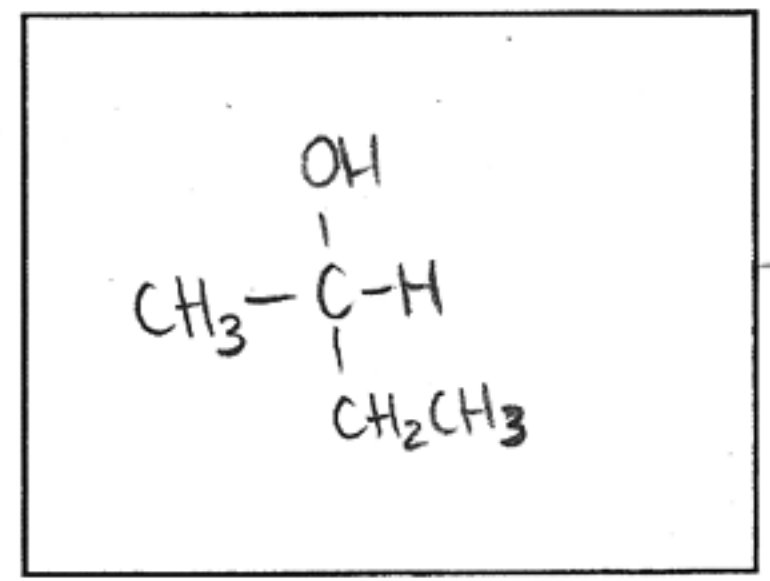
+ 2



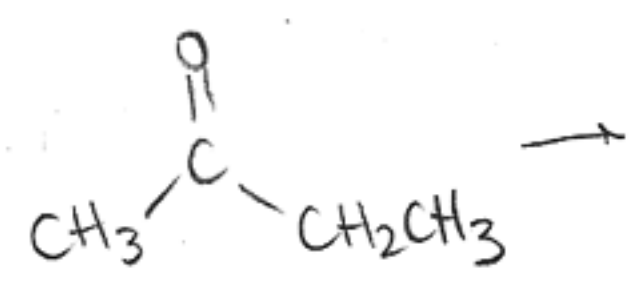
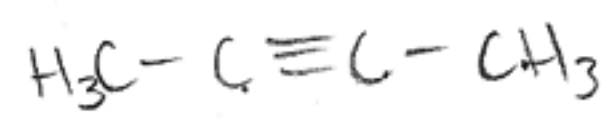
9.



Note: Ra - Ni = Raney nickel



+ 4

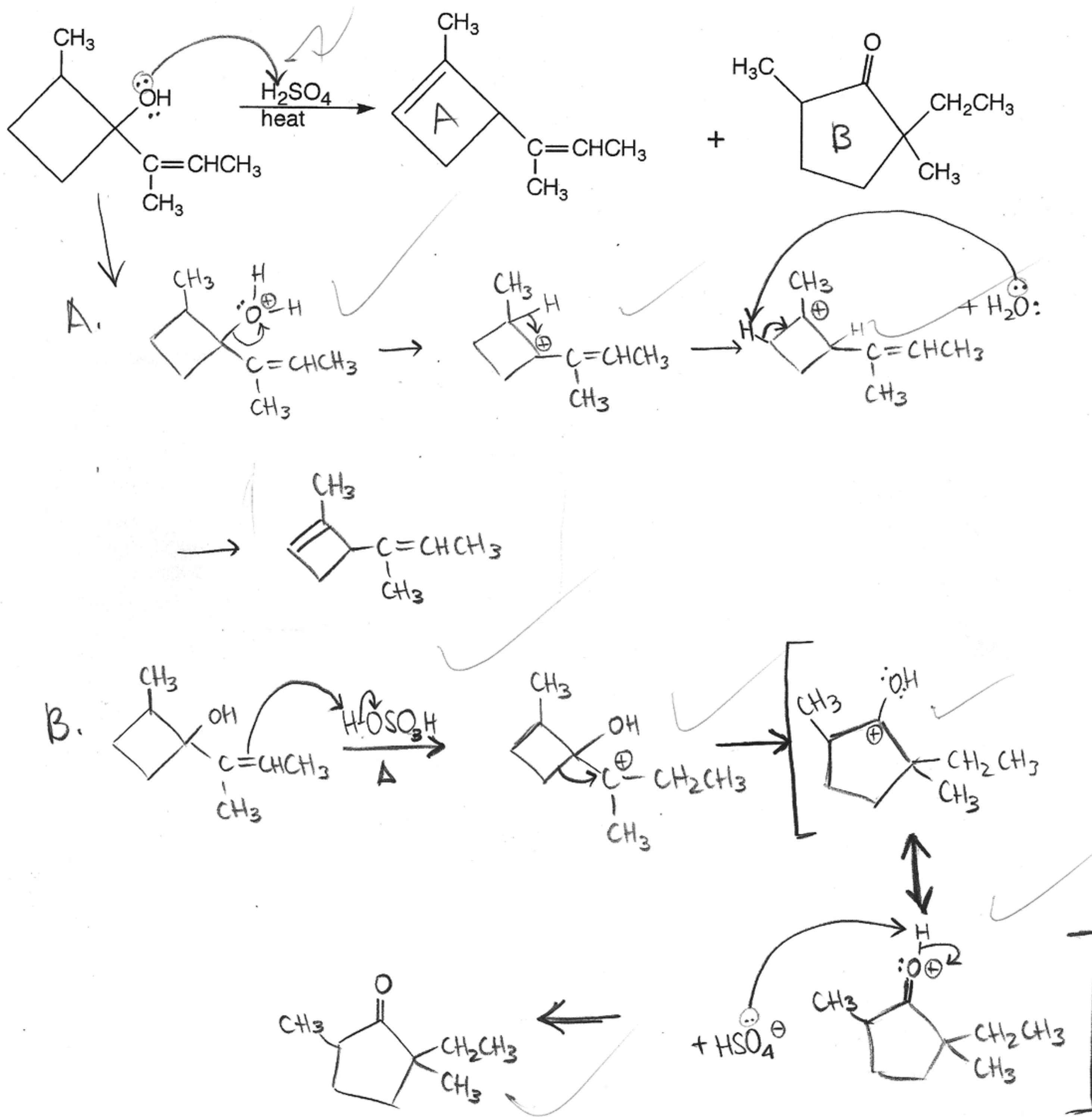


5

12

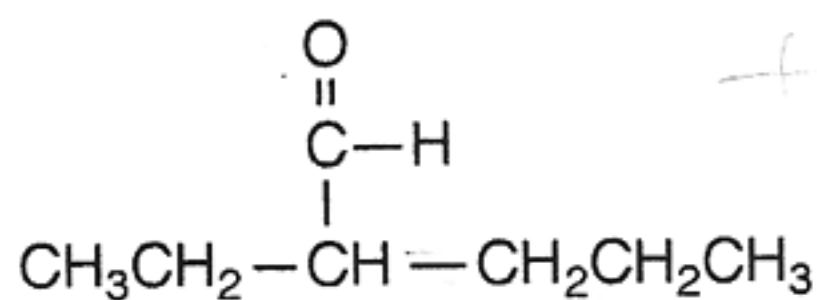
D. Mechanism: (10 points)

The reaction presented below produces several products. Provide clear mechanisms to explain the formation of the two products 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!

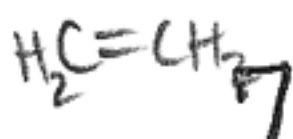
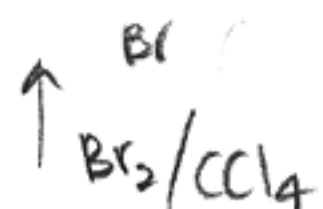
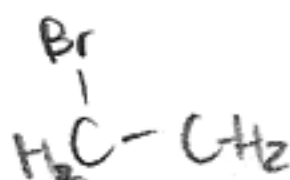
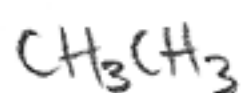
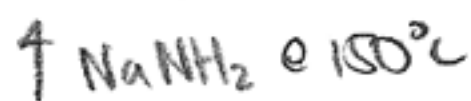
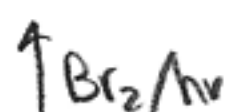
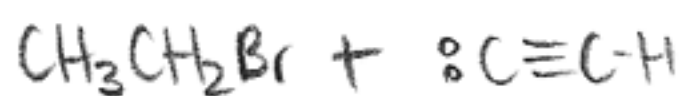
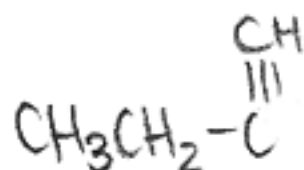
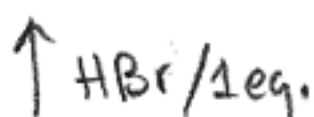
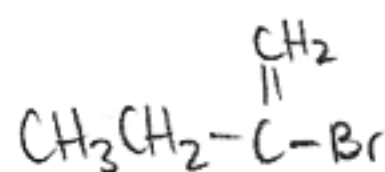
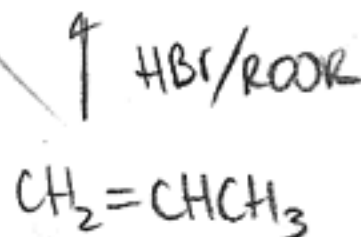
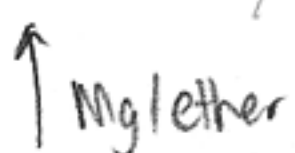
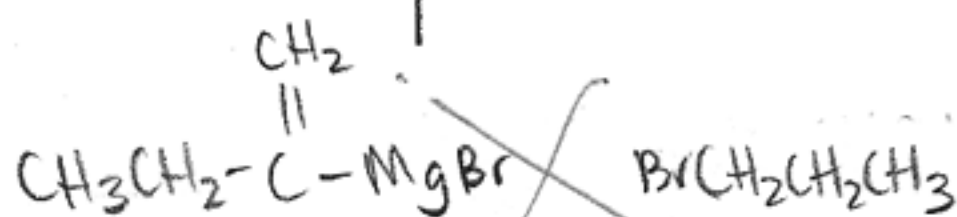
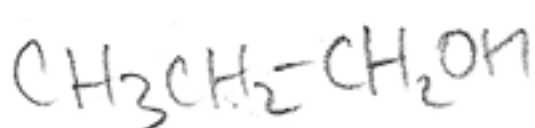
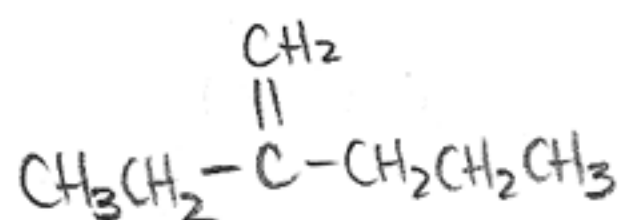
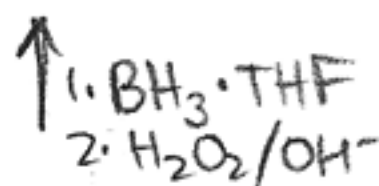
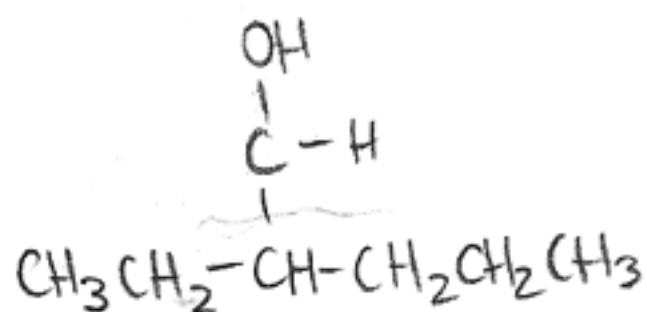
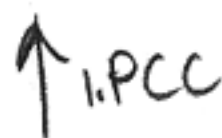


E. Synthesis: 10 Points

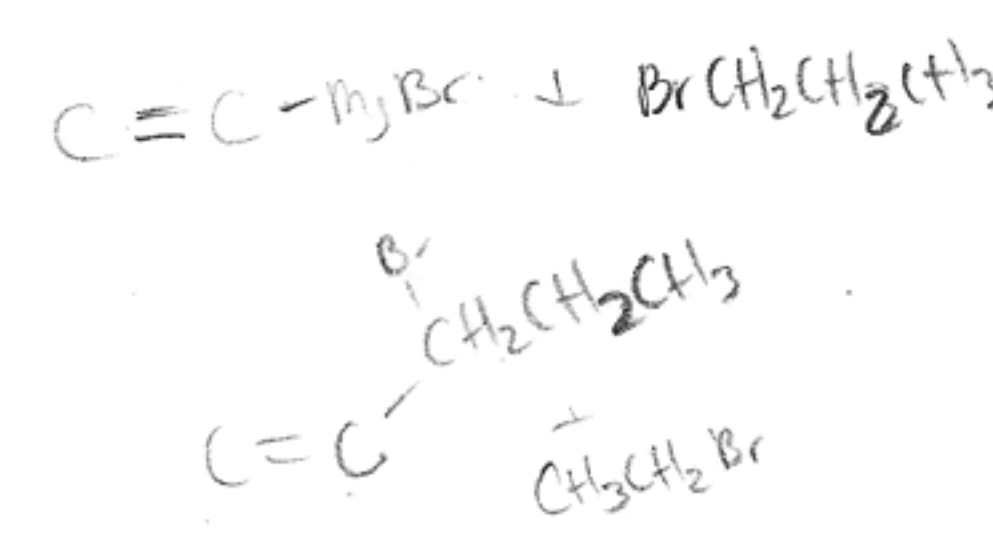
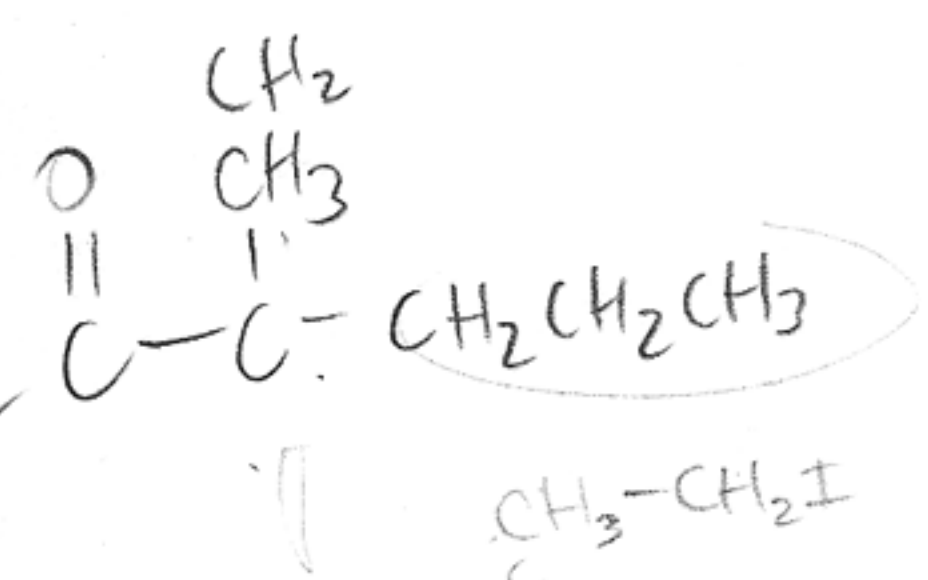
Synthesize the molecule below using any of the following reagents: alkanes, alkenes, or alcohols of no more than **three carbons**, any inorganic reagents, any peroxy acids, and any oxidizing or reducing agents.



aldehyde
PCC

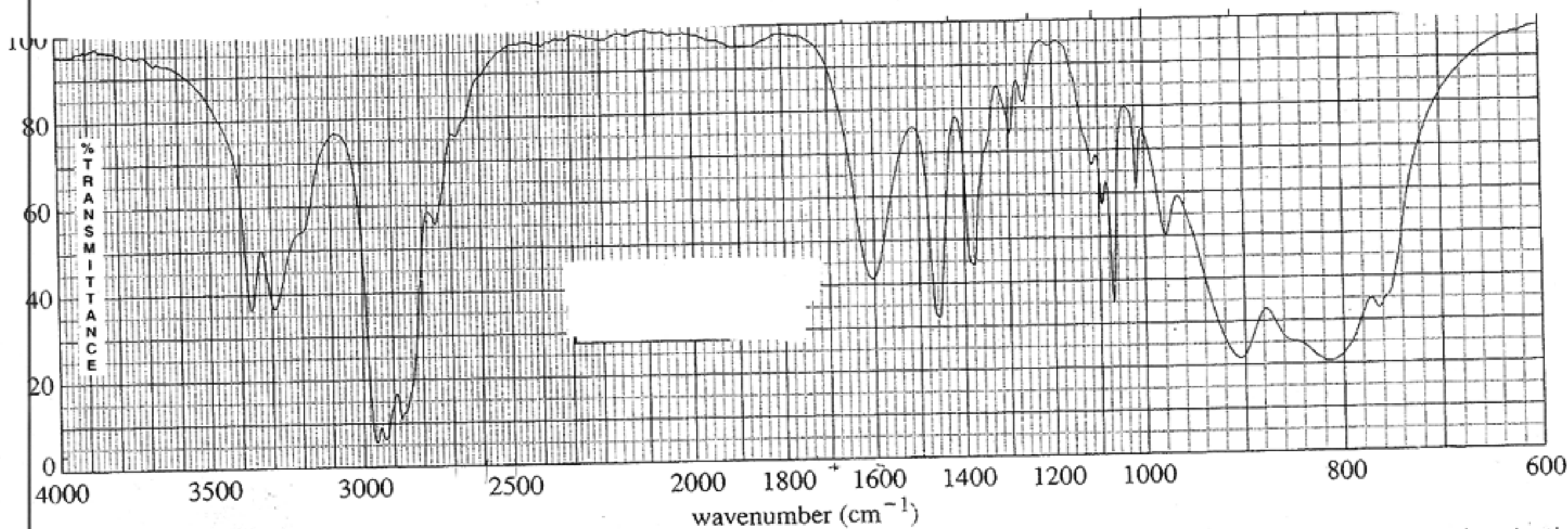
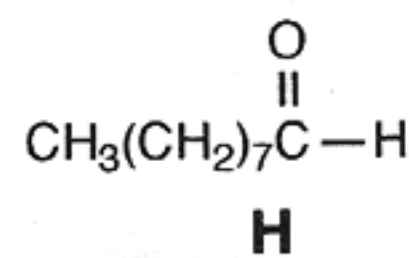
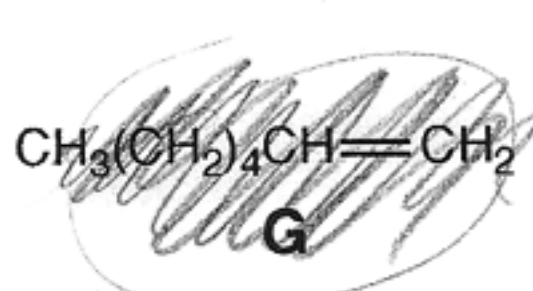
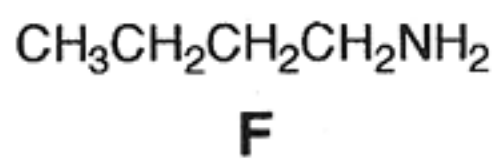
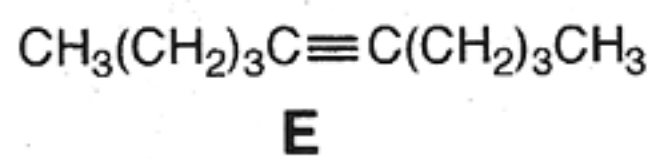
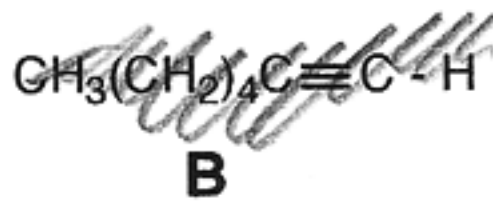
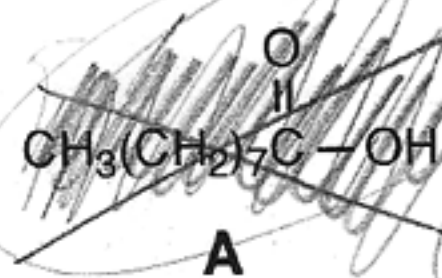


aldehyde
PCC
alcohol → aldehyde w/ PCC
NaBH4
oxidizing an alcohol
from OH → =O
 SiO_2/BH_3
CH3OH

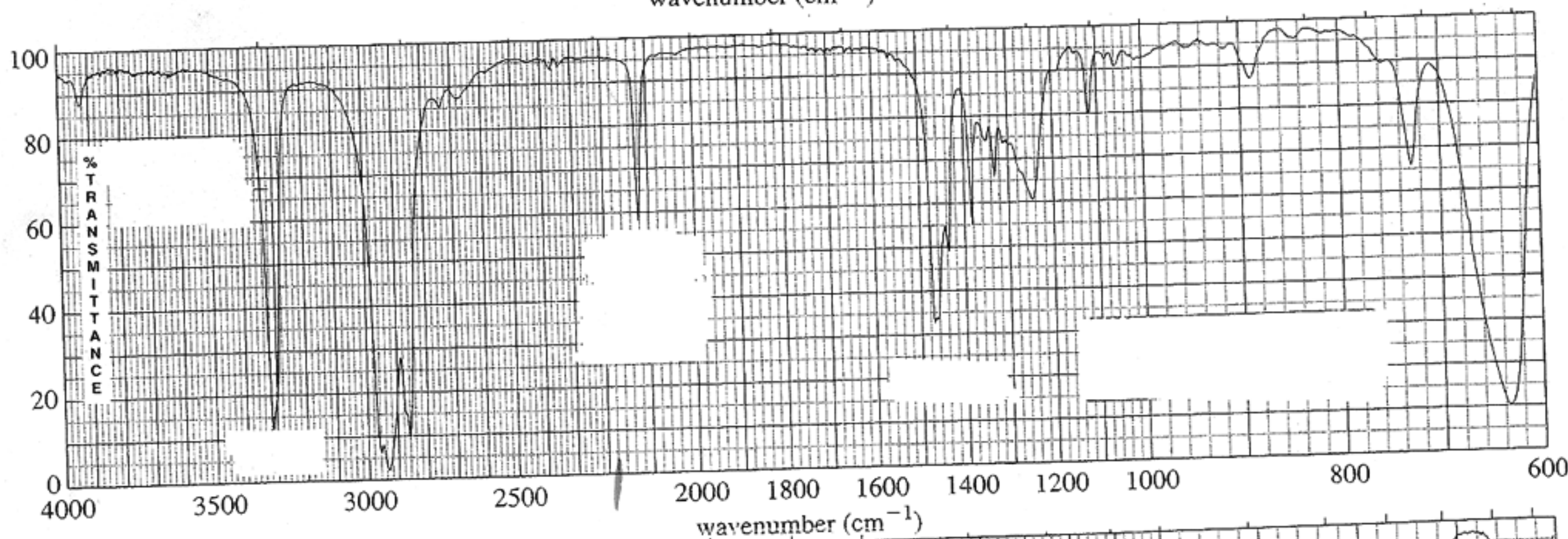


F(a). Spectroscopy (10 points)

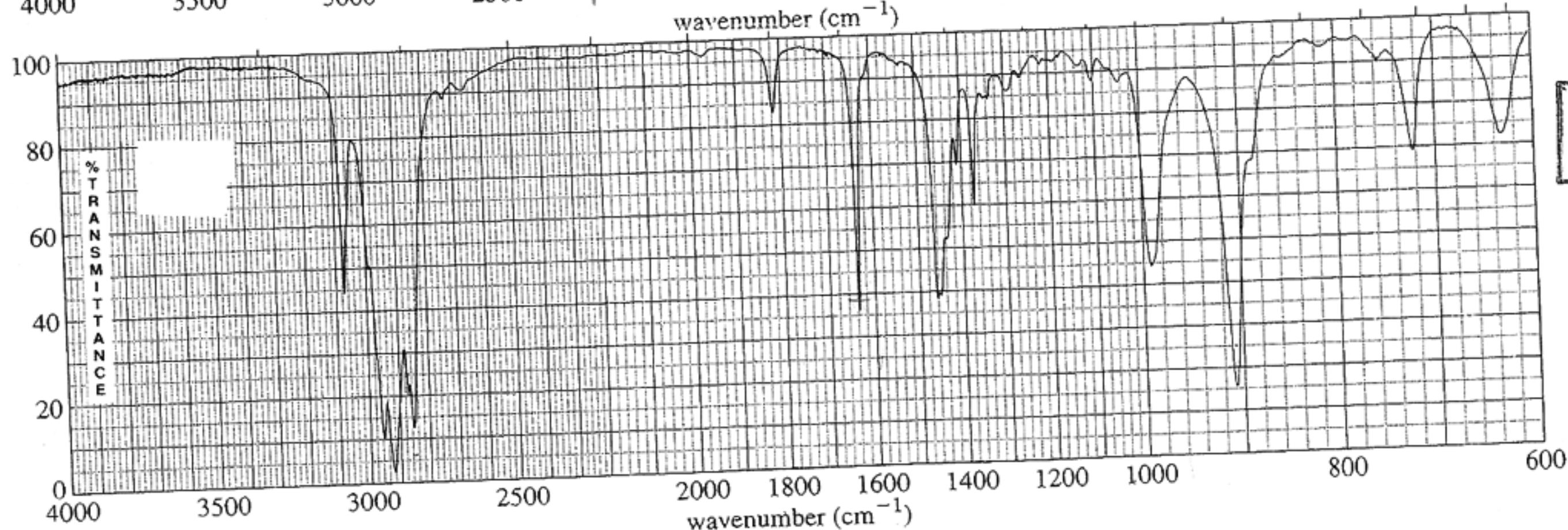
Carefully examine the five infrared spectra and the compounds below. Place the letter of the compound in the box beside its spectrum.



1.
 C F

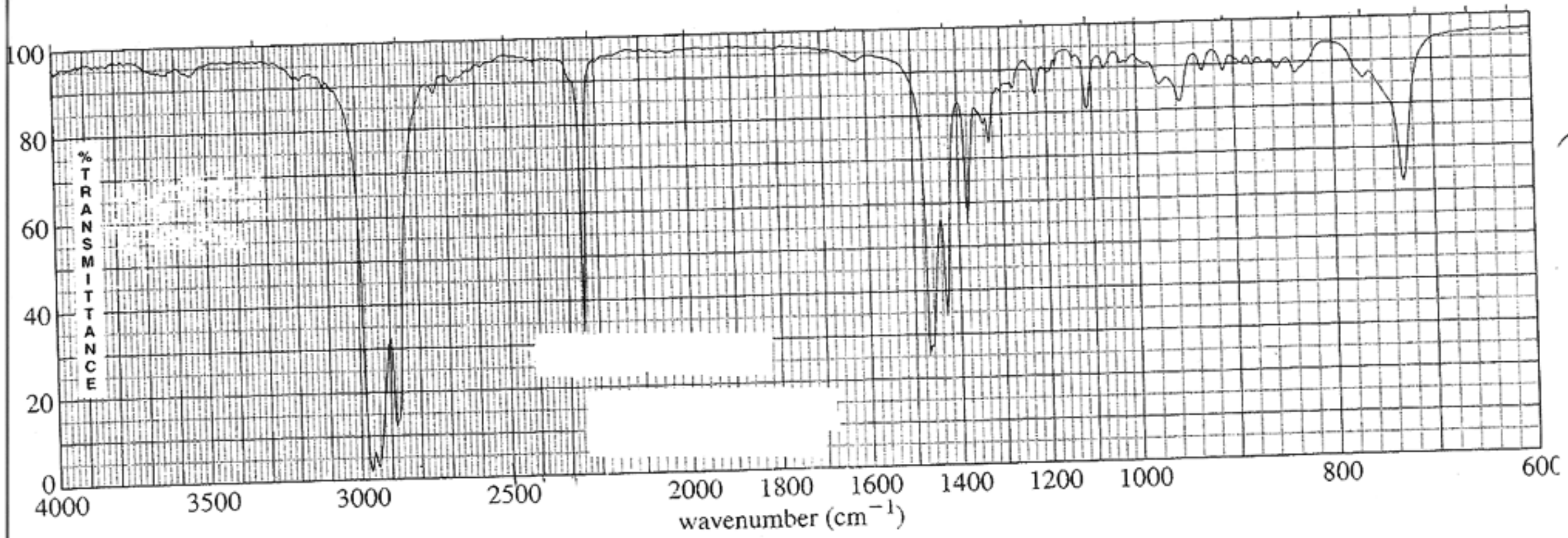


2.
 E B



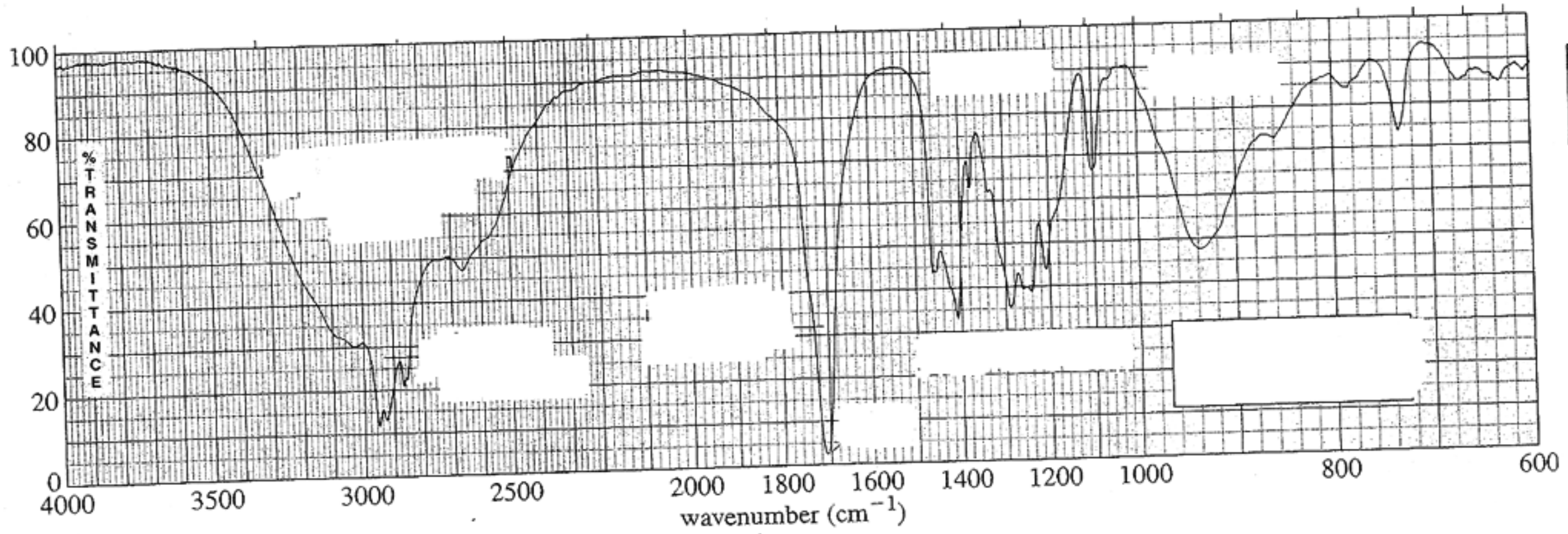
3.
 G

2



4.

D



5.

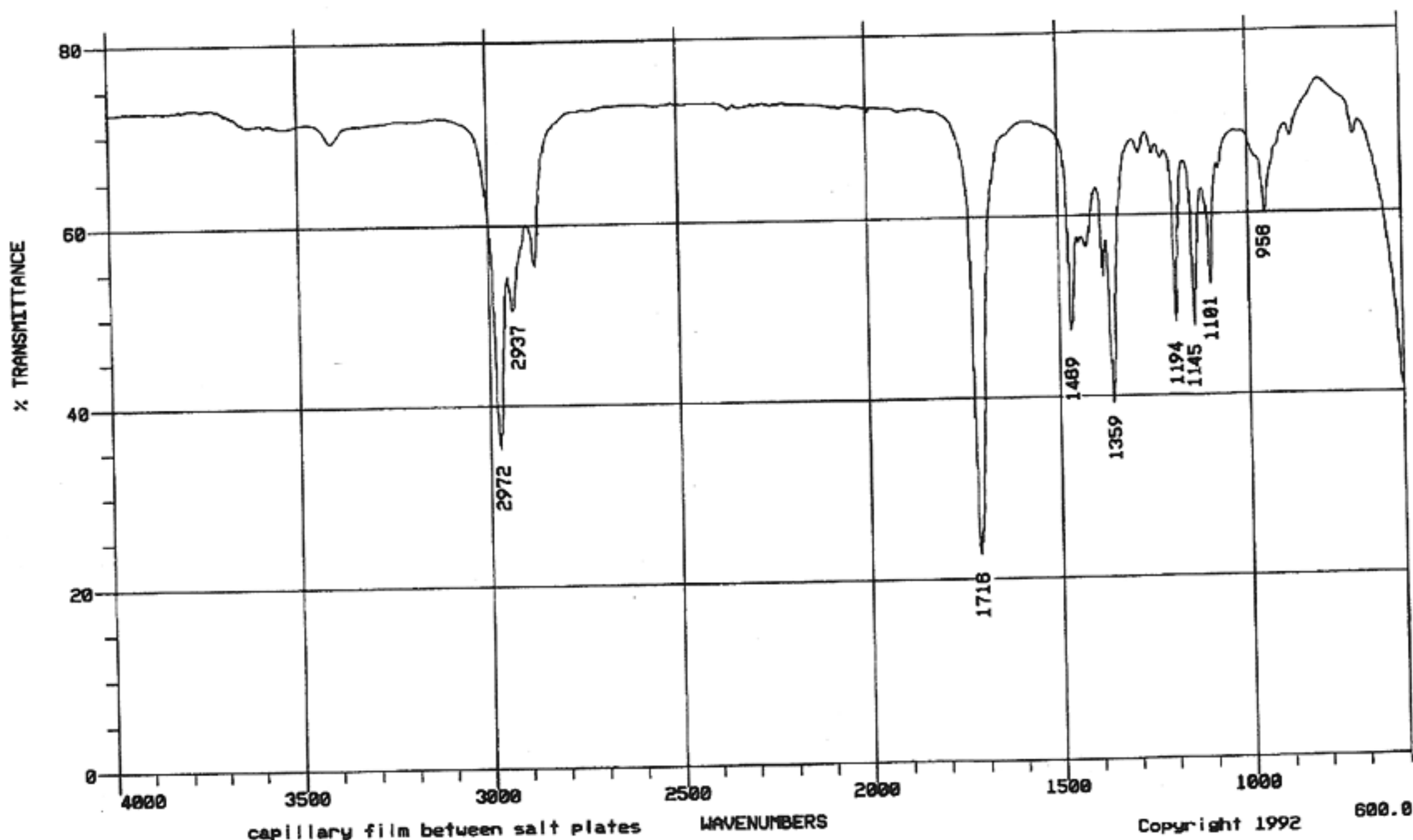
A



4

F(b). Spectroscopy BONUS: 10 Points

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.



$5 - 5 + 1 = UN = 1$

1 ring or 1 DB

