First Exam

Chemistry 3332

February 17, 2006

Name (PRINT) Key, Answer
Last, First

Signature _____

ID# _____

Please circle class time.

Dr. Bean's 10:00 AM

Dr. Bean's 1:00 PM

Page #	Score	
1. 12 pts.		
2. 20 pts.		
3. 18 pts.		
4. 18 pts.		
5. 11 pts.		
6. 11 pts.		
7. 10 pts.		

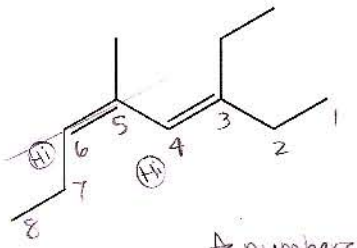
TOTAL _____

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

A. Nomenclature: (12 points, 4 points each)

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

1.



(5Z)-3-ethyl-5-methylocta-3,5-diene

* numbered right to left to give substituents lowest possible #'s cuz you could number the double bonds either way.

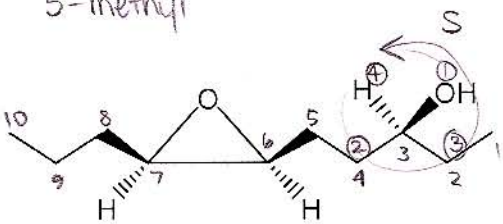
octa-3,5-diene

(5Z)

3-ethyl

5-methyl

2.



cis-(3S)-6,7-epoxydecan-3-ol

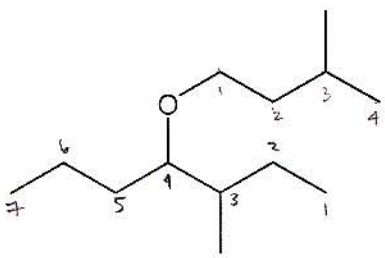
* alcohol has priority in choosing the parent name

decan-3-ol

cis, 3S

6,7-epoxy

3.



4-isopentoxy-3-methylheptane

3-methyl-4-(3-methylbutoxy)

heptane

3-methyl

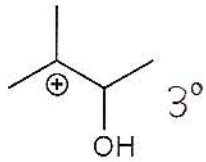
4-isopentoxy or 4-(3-methylbutoxy)

vs. methyl-methylbutoxy

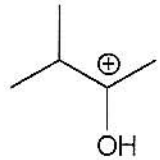
* iso, neo, cyclo count!

B. Facts: Total Points = 20

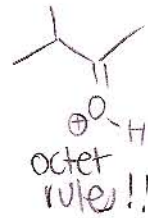
1. Place the following carbocations in order of increasing stability. (1=least stable, 3=most stable) (3 pts.)

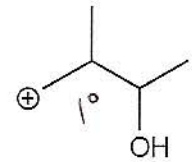


2



3

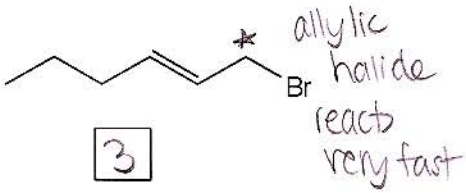




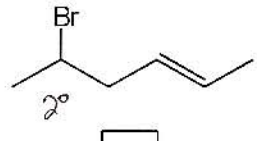
1

2. Place the following compounds in order of increasing reactivity in an S_N2 process. (1=least reactive, 3=most reactive) (3 pts.)

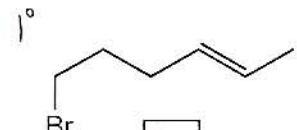
1°>2°>3°



3

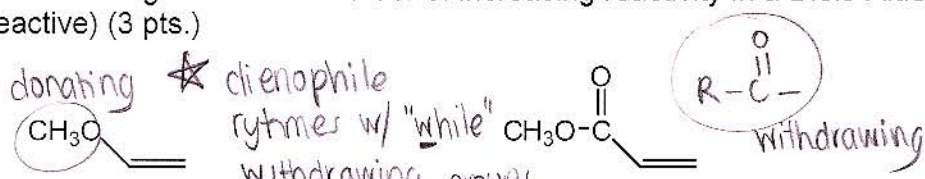


1



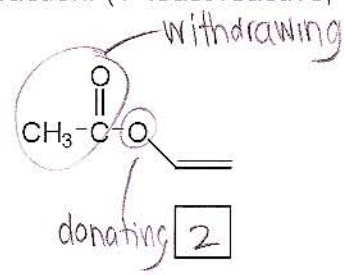
2

3. Place the following molecules in order of increasing reactivity in a Diels-Alder reaction. (1=least reactive, 3=most reactive) (3 pts.)



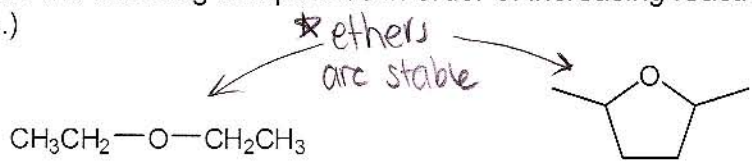
1

3



2

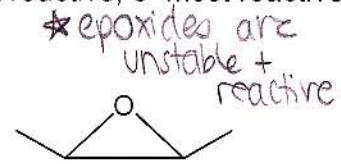
4. Place the following compounds in order of increasing reactivity with HI. (1=least reactive, 3=most reactive) (3 pts.)



2

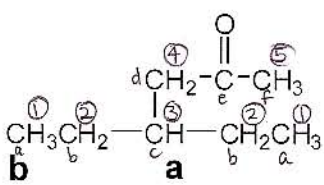
S_N2 style attack...
1°>2°>3°

1



3

5. Answer the following questions about the compound below. Place the answers in the appropriately labeled boxes. a) How many distinct types of protons does the compound have? b) What is the theoretically predicted multiplicity (splitting pattern) of the signal for the proton labeled **a**? c) How many distinct types of carbons does the compound have? d) What is the multiplicity of the signal in the proton coupled ^{13}C NMR spectrum for the carbon labeled **b**? (8 pts.)



a) number of proton types: 5

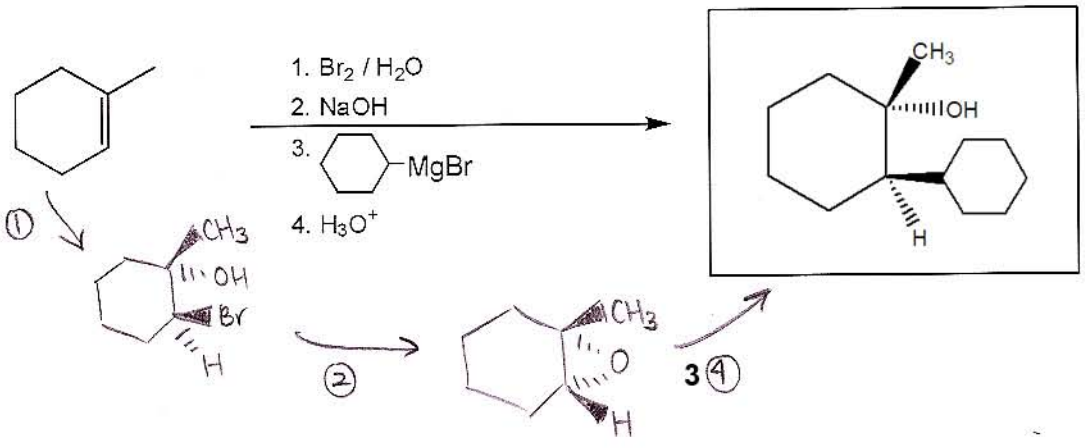
b) H_a multiplicity: $(2+2+1)(2+1) = 15$ 15

c) number of carbon types: 6

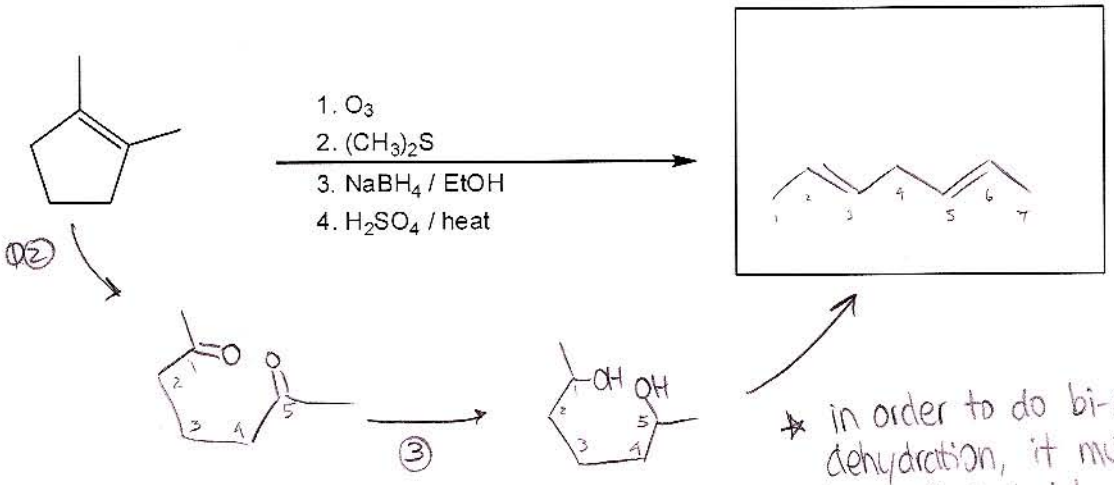
d) C_b multiplicity: $(3+1)$ 4

C. Reactions: Total = 36 points, 6 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 are shown below the reaction.

1.

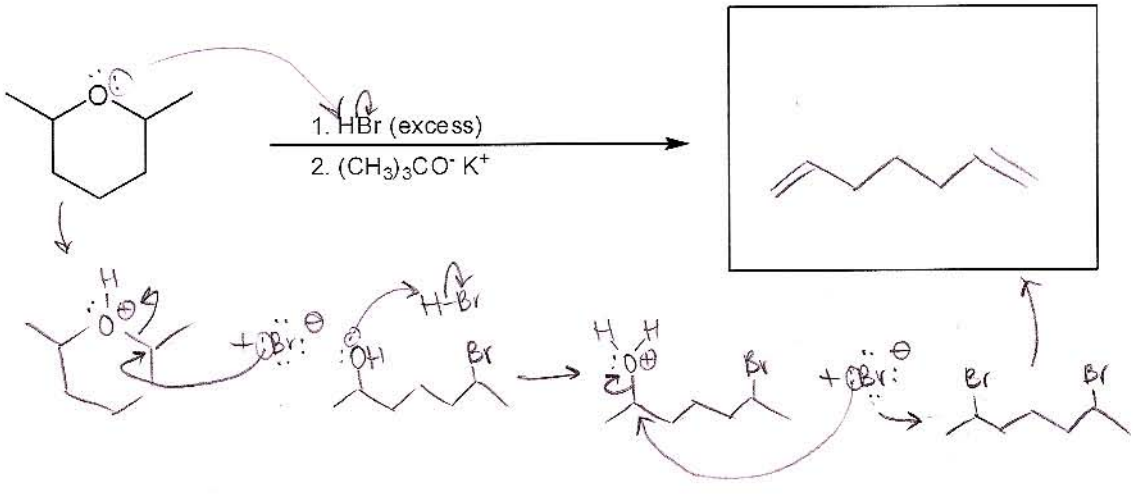


2.

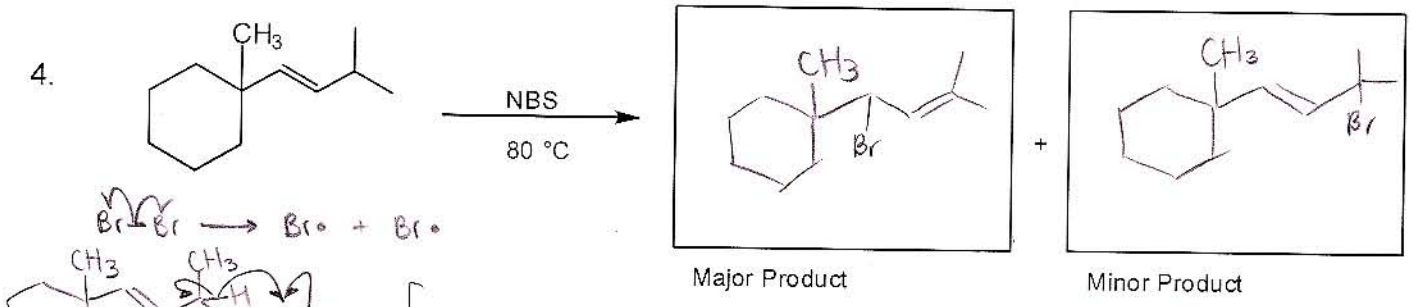


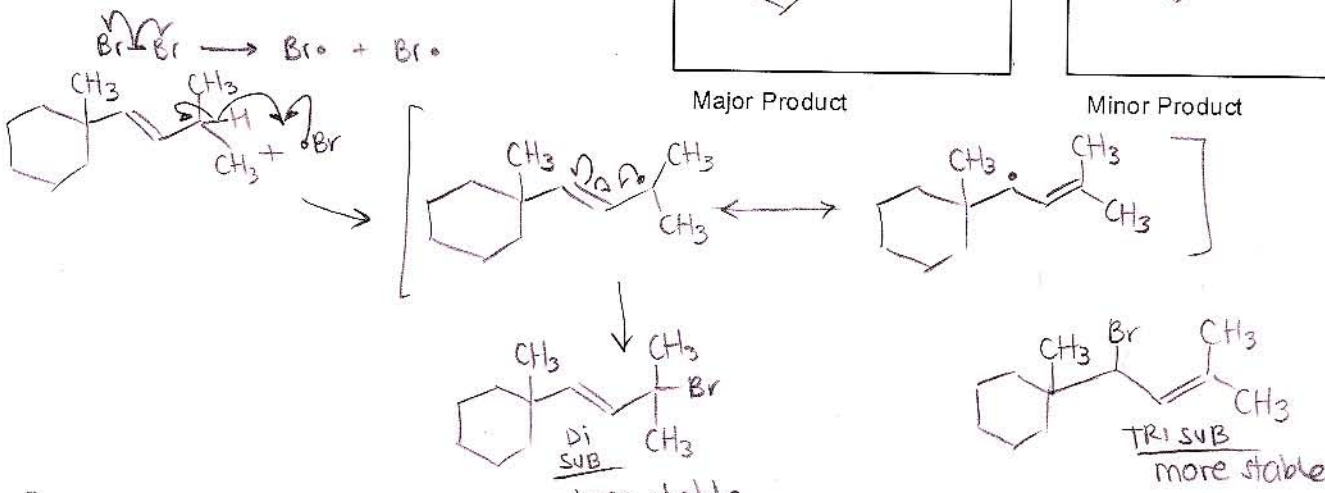
* in order to do bi-molecular dehydration, it must be a 1° alcohol!

3.

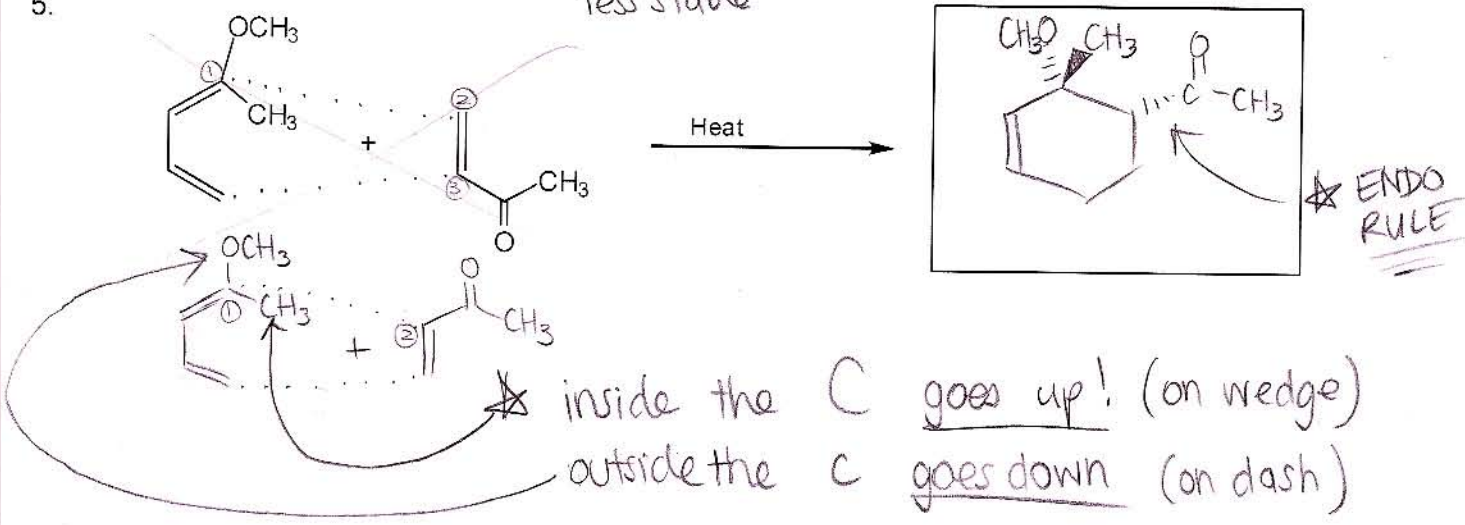


4.

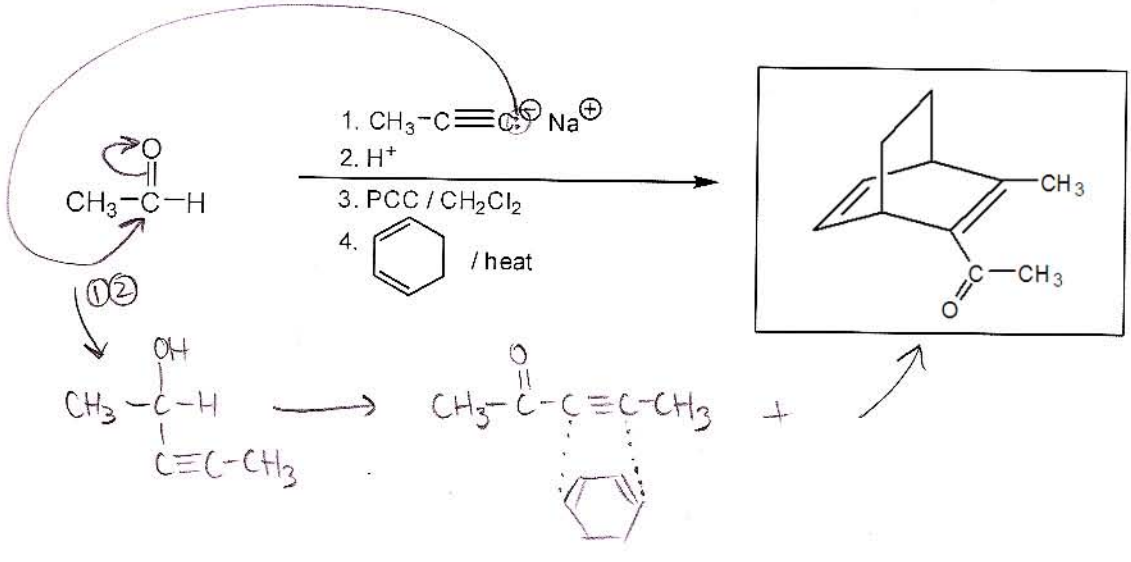

NBS
80 °C
Major Product
Minor Product


Br Br → Br• + Br•
Di SUB
less stable
TRI SUB
more stable

5.

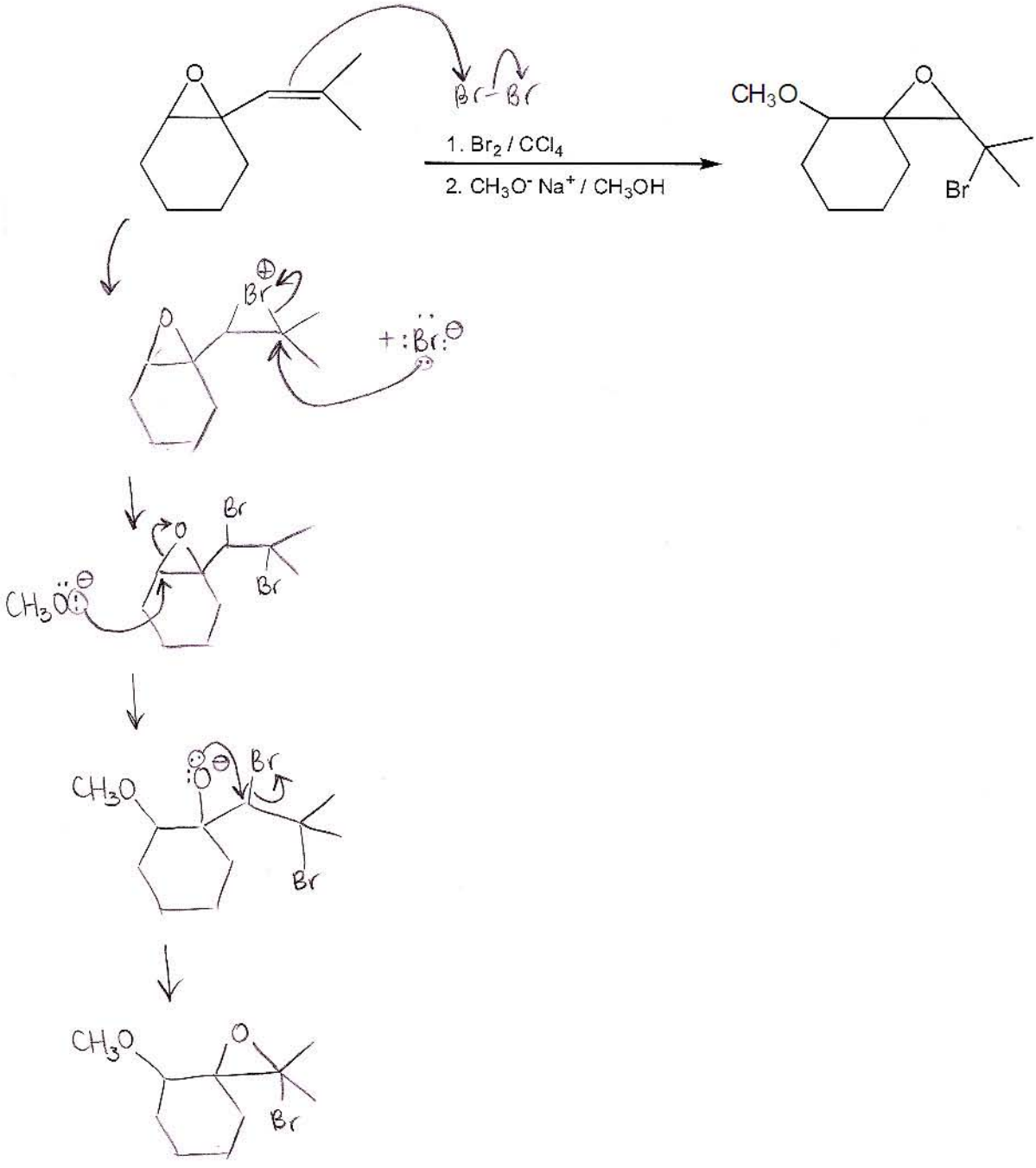

Heat
ENDO RULE
inside the C goes up! (on wedge)
outside the C goes down (on dash)

6.


1. CH3–C≡C⊖ Na⊕
2. H+
3. PCC / CH2Cl2
4. / heat

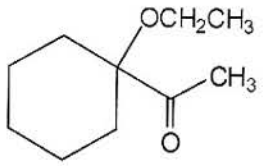
D. Mechanisms: (11 points)

Please provide a clear mechanism for the reaction below. Use curved arrow notation to indicate "electron flow". Show all intermediates and all formal charges.

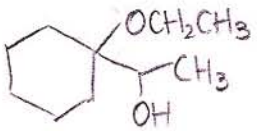


E. Synthesis: (11 points)

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

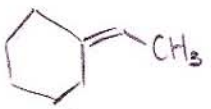


↑ PCC

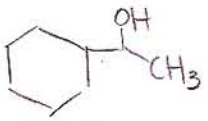


↑ $CH_3CH_2OH/H^{\oplus}$

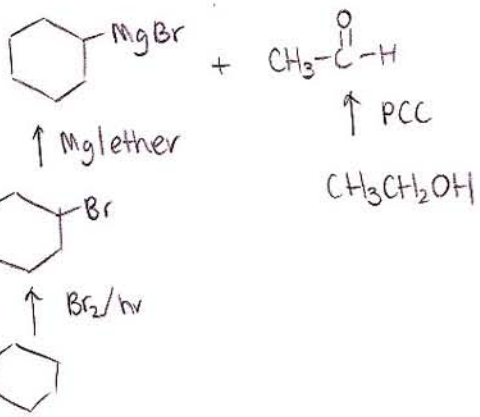
↑ MCPBA



↑ H_2SO_4/Δ * most substituted double bond

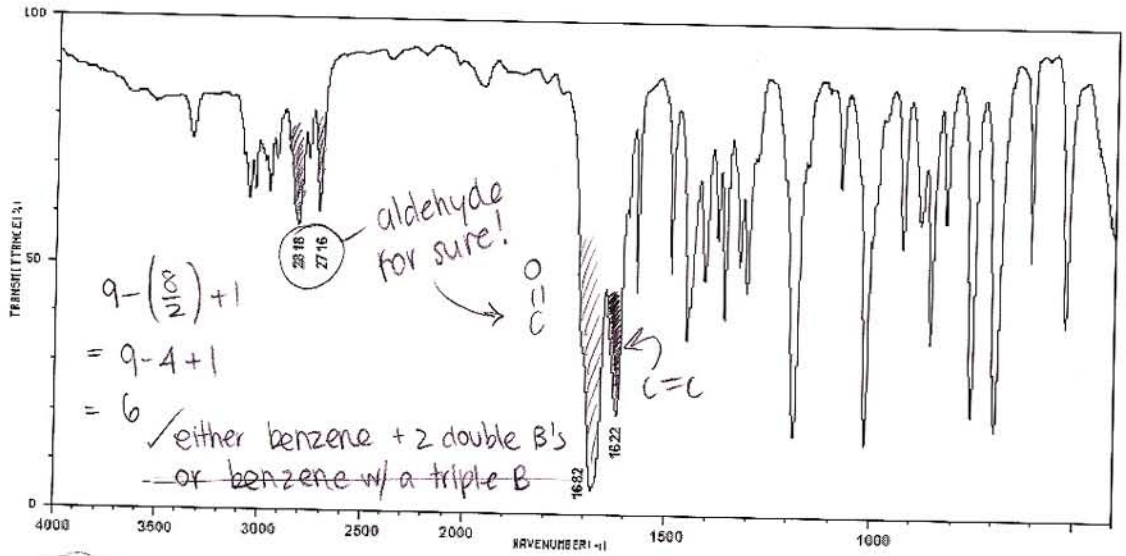


↑ then $H_3O^{\oplus}$



F. Spectroscopy (10 points)

A compound with the formula C_9H_8O exhibits the IR, ^1H NMR and proton decoupled ^{13}C NMR spectra shown below. Please identify this compound and draw the structure in the box provided below.



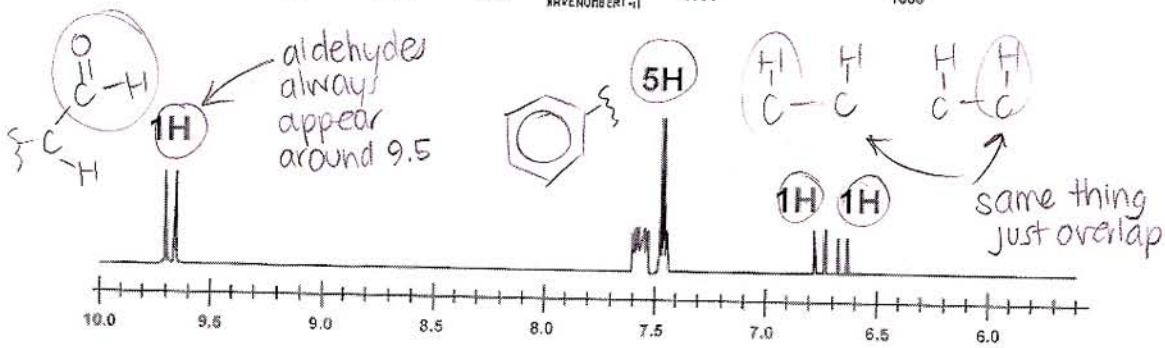
$9-\left(\frac{10}{2}\right)+1$

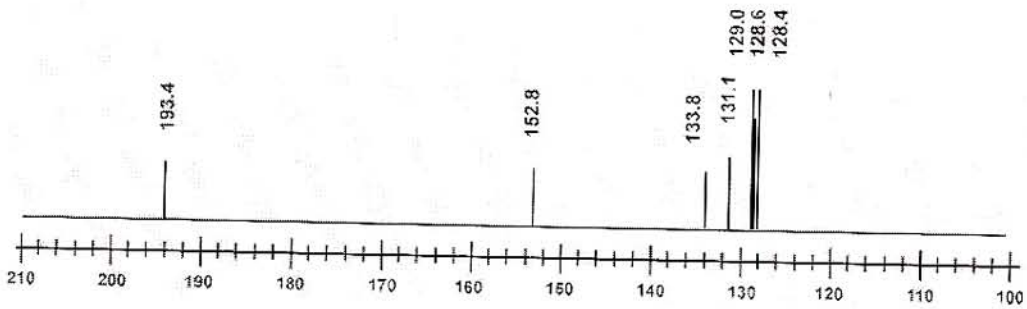
$= 9-4+1$

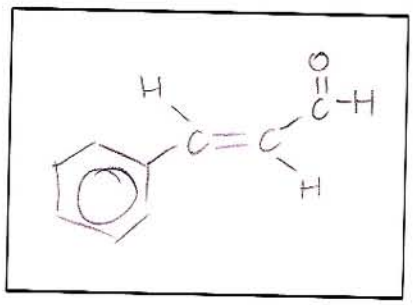
$= 6$

either benzene + 2 double B's

~~or benzene w/ a triple B~~







★not sure why it's trans... can someone tell?