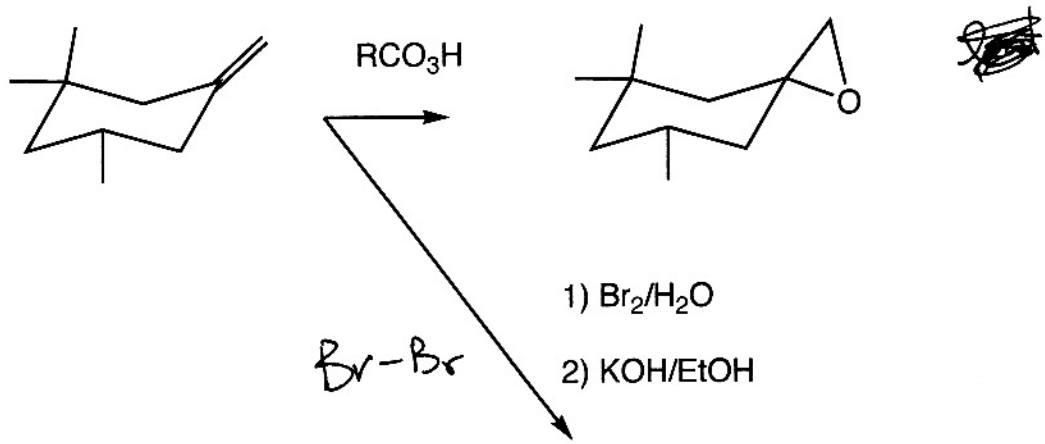
Chemistry 3351-100
Organic Chemistry / Dr. Barney Ellison
Thursday: **Saturday, 15 Dec., 1:30—4:00 PM** / Final Exam / Chemistry 142

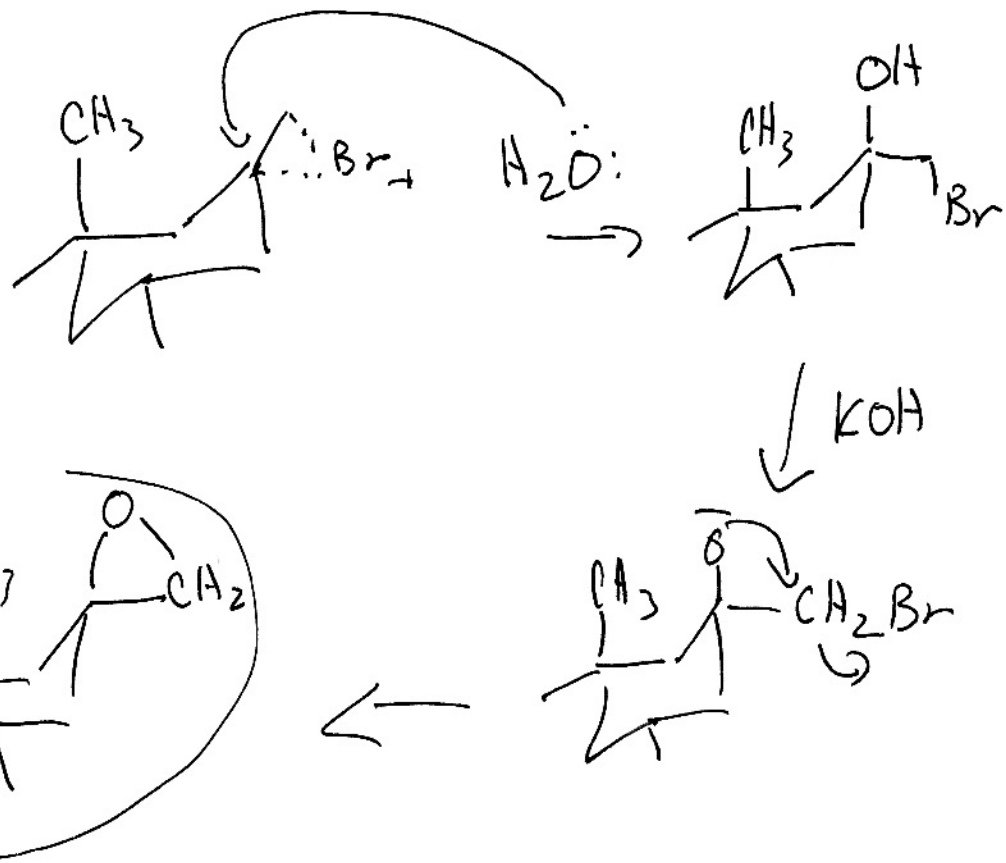
Name: Key (please print)

1. (10 pts) 3,3, 5-Trimethyl-1-methylenecyclohexane reacts with 3-chloroperoxybenzoic acid mostly the diastereomeric epoxide shown. However, when the same alkene is treated with Br_2 in water and then with alcoholic base, the other diastereomer is the major product. Draw the structure of the second diastereomer and explain the results.



?

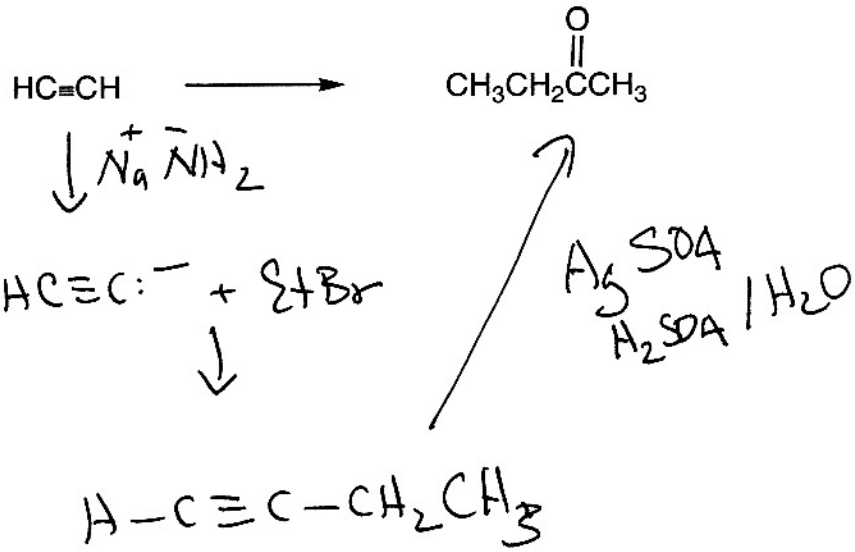
least hindered face



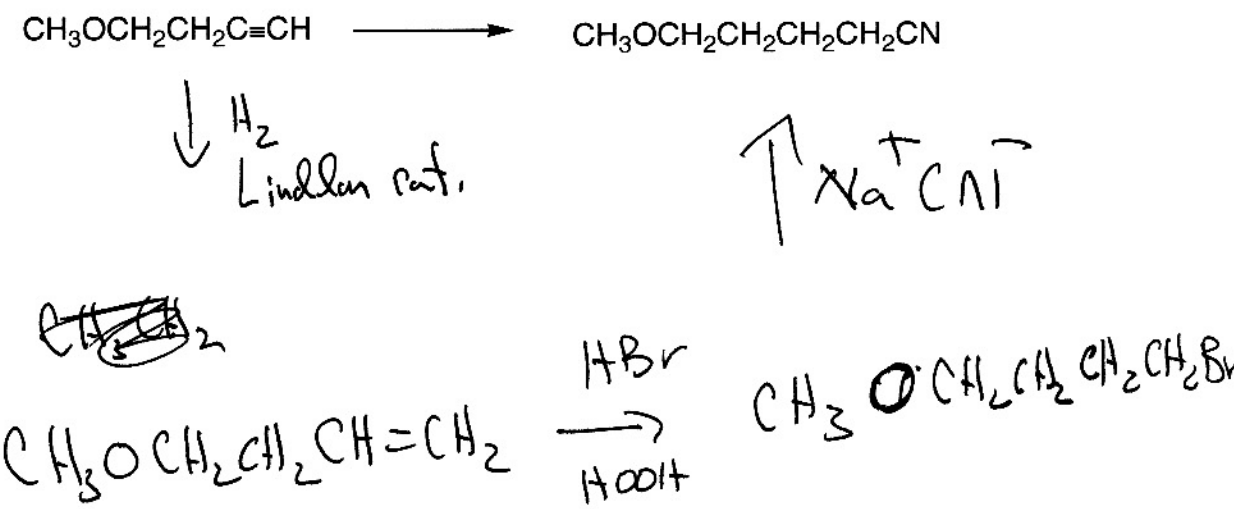
Product

2. (20 pts) Show how each of the following conversions can be accomplished. In addition to the starting materials, other organic compounds can be used as necessary.

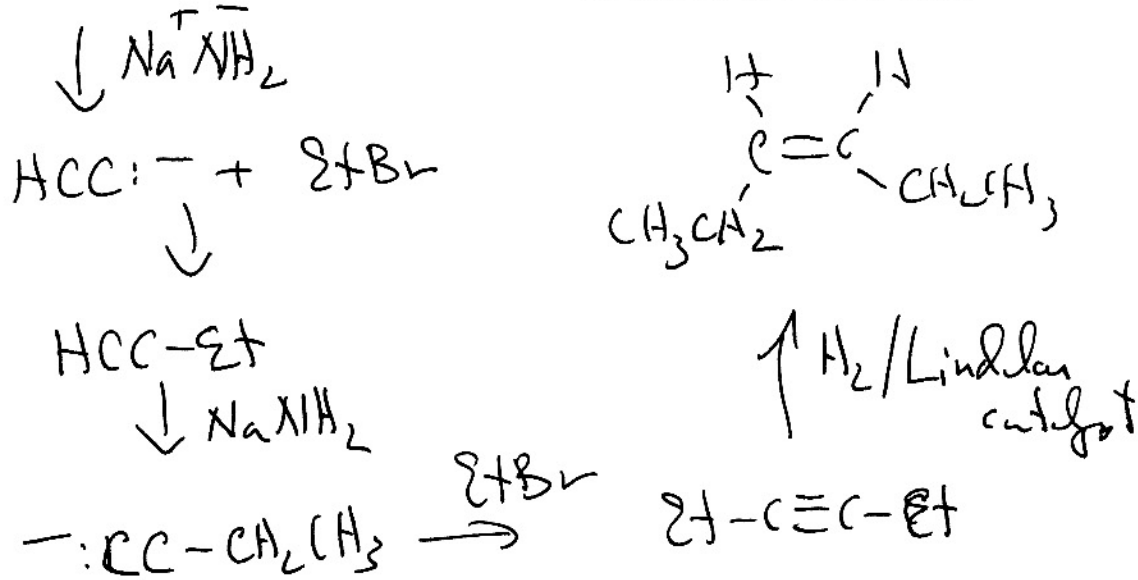
a.



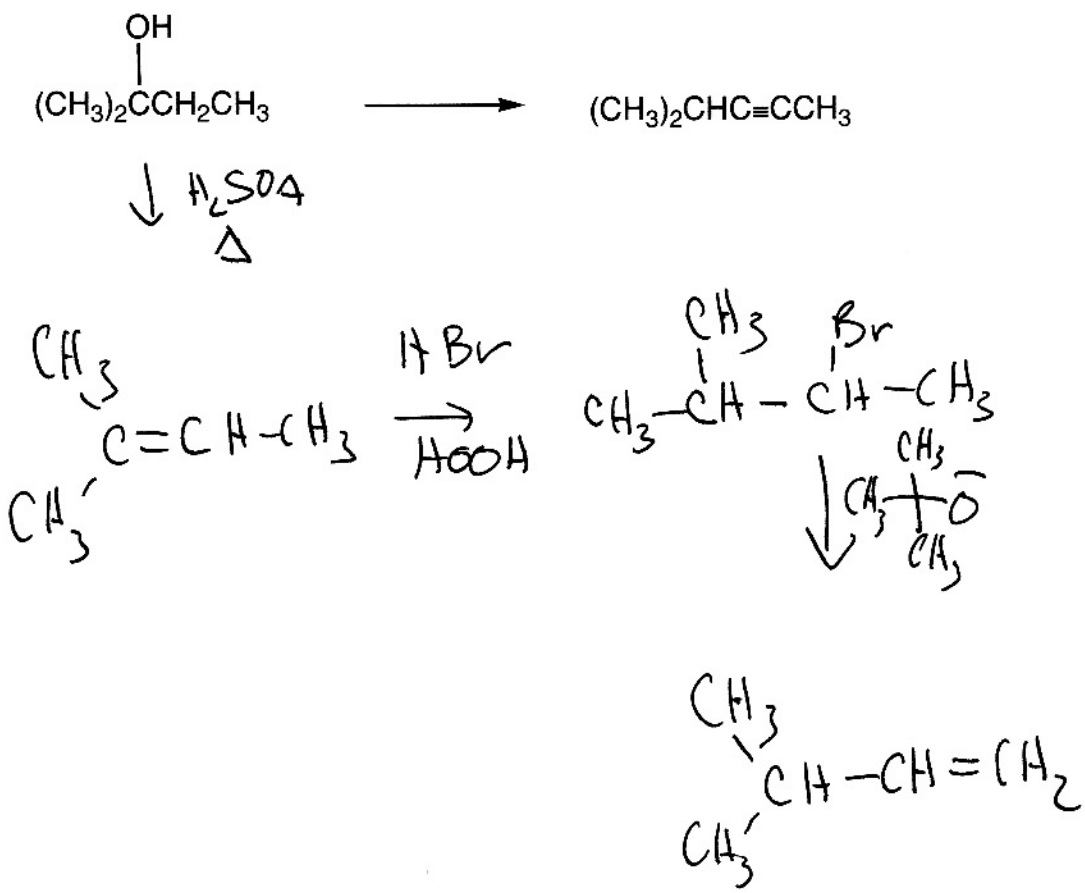
b.



c. $HC{\equiv}CH \longrightarrow$ *cis*-$CH_3CH_2CH{=}CHCH_2CH_3$

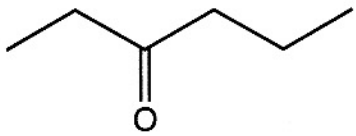


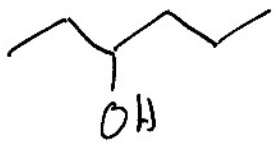
d. $(CH_3)_2CCH_2CH_3$ (OH) $\longrightarrow$ $(CH_3)_2CHC{\equiv}CCH_3$



3. (20 pts) Show how the following compounds can be prepared from alkyl halides and alcohols containing 4 or fewer carbons.

a.





H_2O

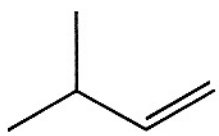
THF

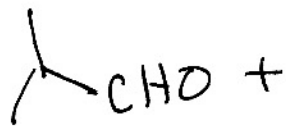
$CH_2CH_2CH_2CH_3$
OH

PCC

$EtBr \xrightarrow[Et_2O]{Mg} CH_3CH_2MgBr + CHO-CH_2CH_2CH_3$

b.

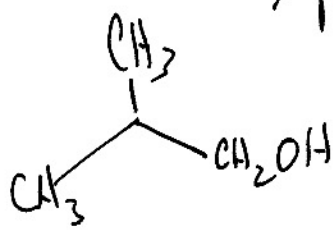




$CHO + CH_2=PPh_3$

PCC

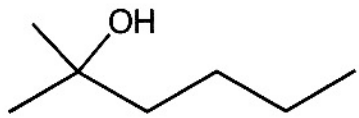
$BuLi^+$

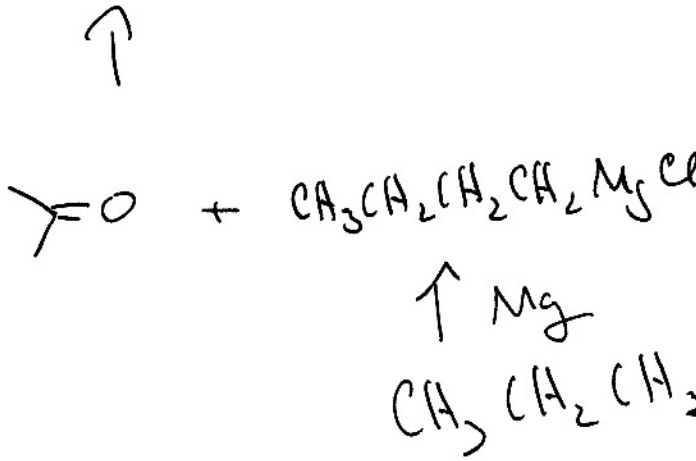


$CH_3-\overset{+}{P}Ph_3$

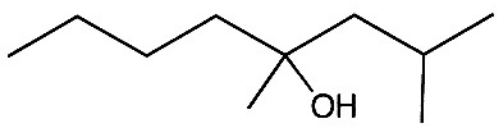
$CH_3I + PPh_3$

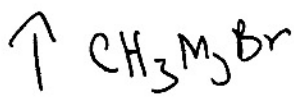
c.

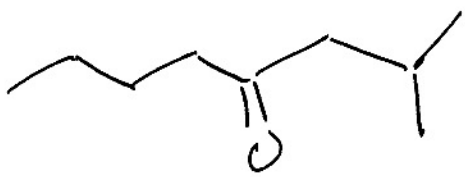

OH

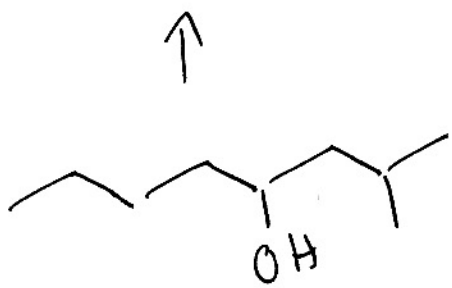

=O
+ CH3CH2CH2CH2MgCl
Mg
CH3CH2CH2CH2Br

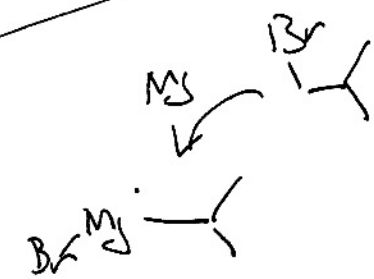
d.


OH

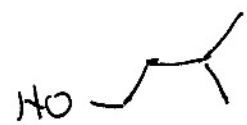

CH3MgBr

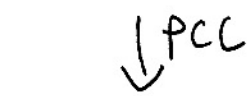


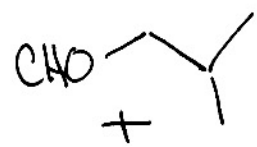

OH

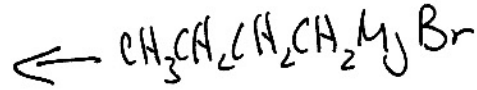

Mg
Br
Br
Mg

CH2=O

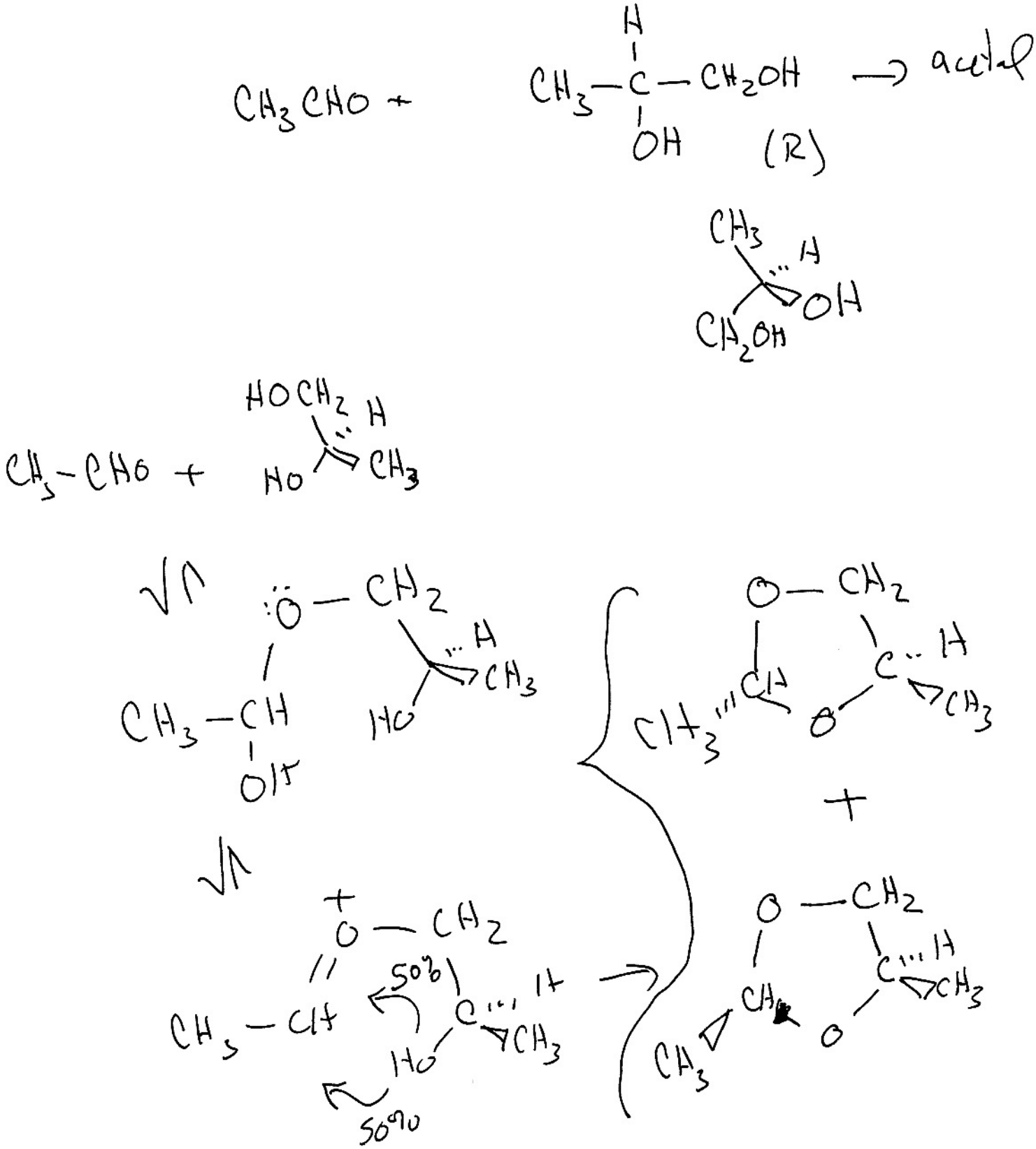

HO


PCC


CHO
+

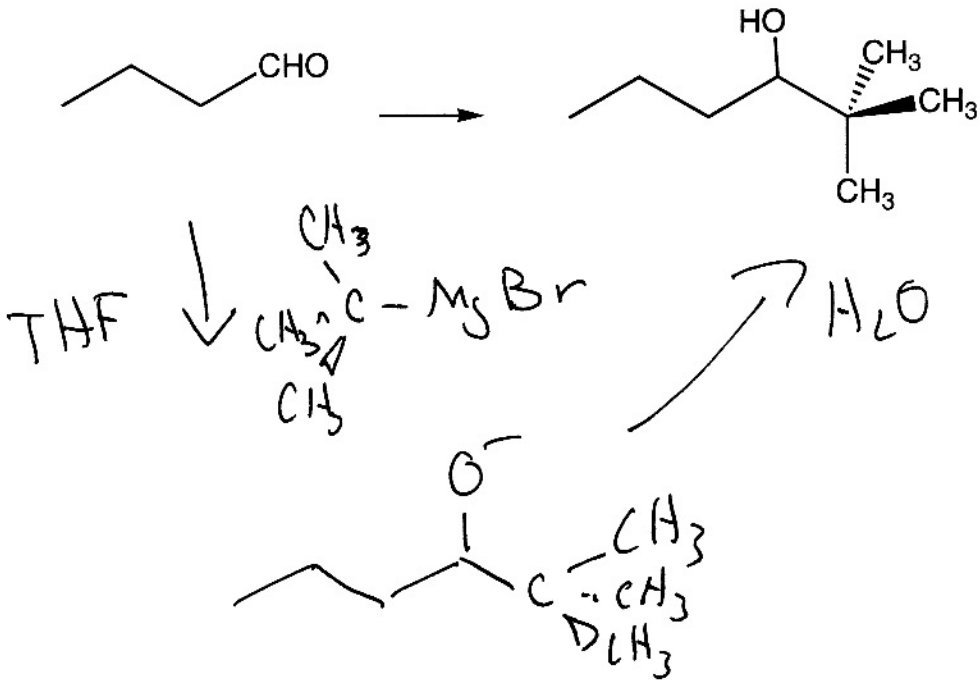

CH3CH2CH2CH2MgBr

4. (10 pts) Acetaldehyde reacts with (R)-1,2 propanediol to give two isomeric acetals. What are the structures?

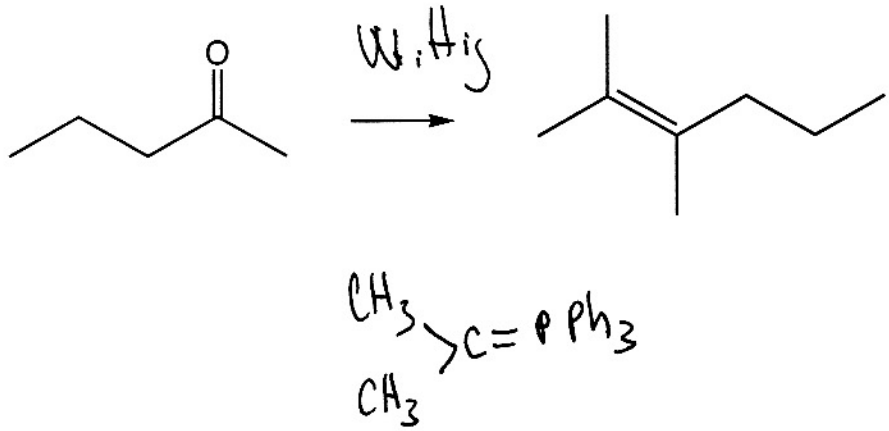


5. (20 pts) Show one can accomplish the following conversions in a practical manner using any necessary organic or inorganic reagents.

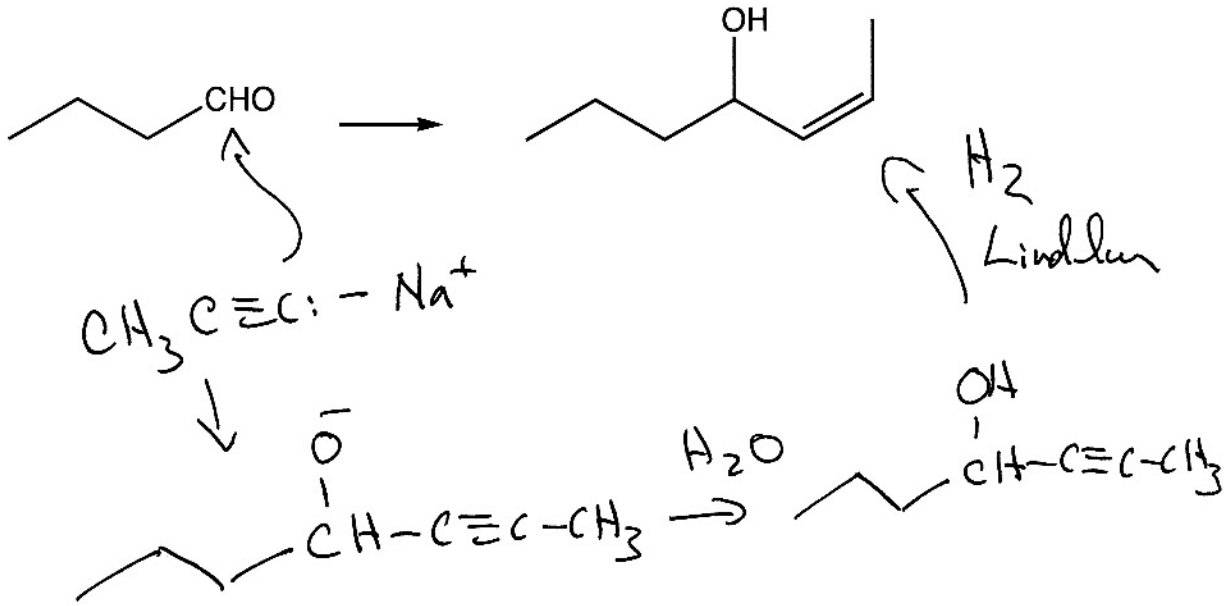
a.



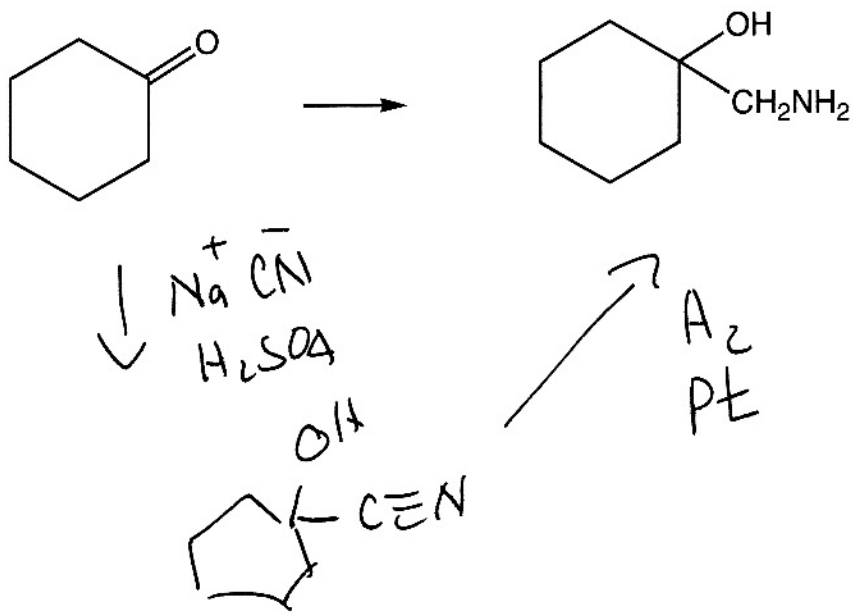
b.



c.

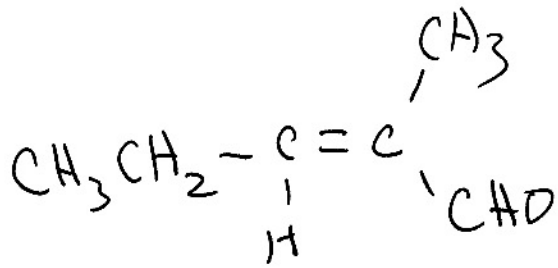

CHO
OH
H_2
Lindlar
$CH_3C{\equiv}C{:}^- Na^+$
$\bar{O}$
$CH{-}C{\equiv}C{-}CH_3$
H_2O
OH
$CH{-}C{\equiv}C{-}CH_3$

d.

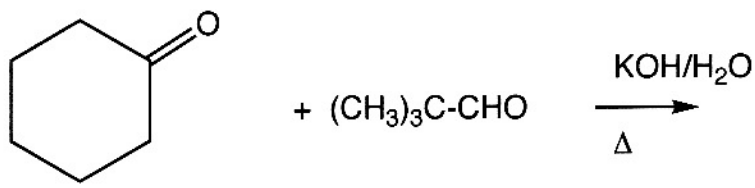

O
OH
CH_2NH_2
$Na^+ \bar{C}N$
H_2SO_4
OH
$C{\equiv}N$
H_2
Pt

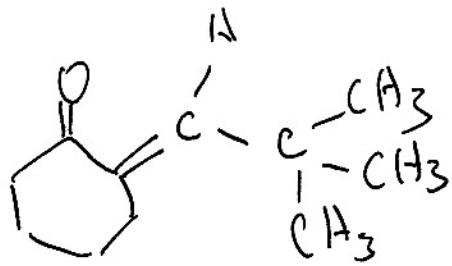
6. (20 pts) What is the product of the following reactions?

a. $CH_3CH_2CHO + KOH/H_2O + \Delta \rightarrow$?

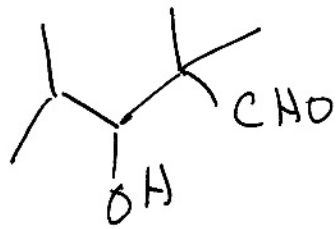


b.





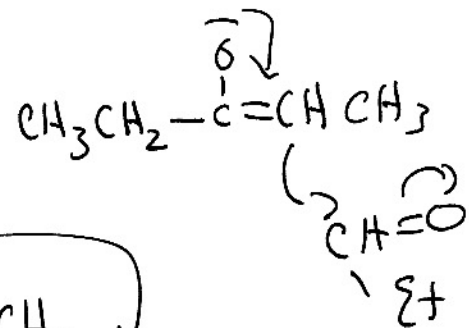
c. $(CH_3)_2CH\text{-}CHO + NaOH/H_2O$ (5° for 5 hours) → ?

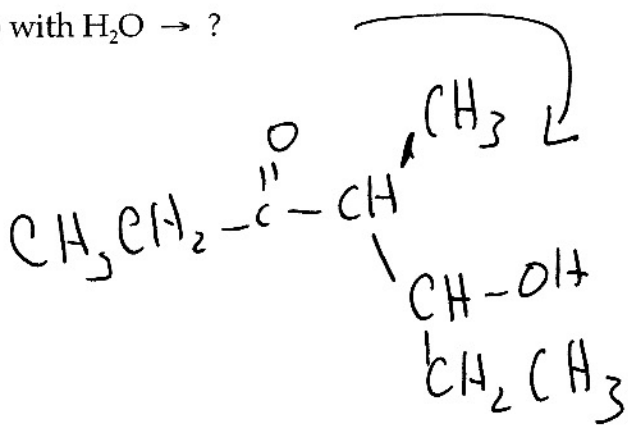


d. 1) $CH_3CH_2COCH_2CH_3$ + 1 eq. LDA →

2) addition of 1 eq. CH_3CH_2CHO →

3) work up with H_2O → ?

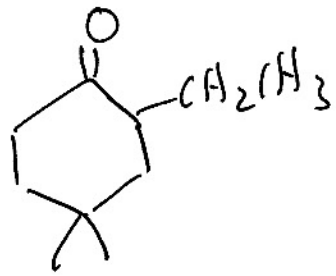




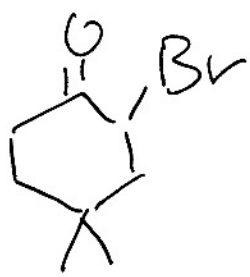
7. (20 pts) What is the product of the reaction of 4,4-dimethylcyclohexanone with each of the following?

a. 1) LDA in THF →

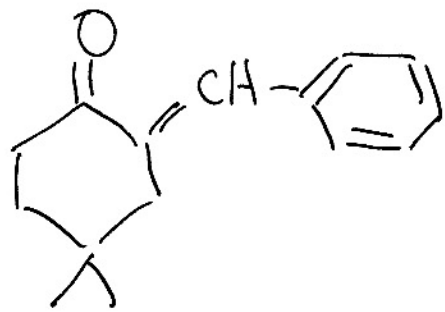
2) CH_3CH_2Br → ?



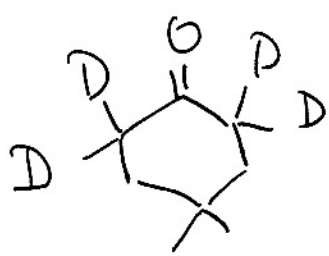
b. Br_2 in CH_3COOH → ?



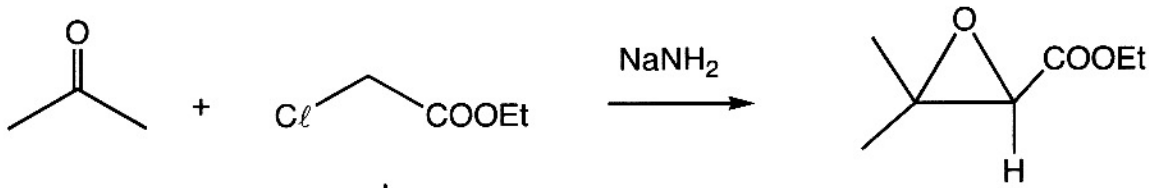
c. C_6H_5-CHO + NaOH/H_2O → ?

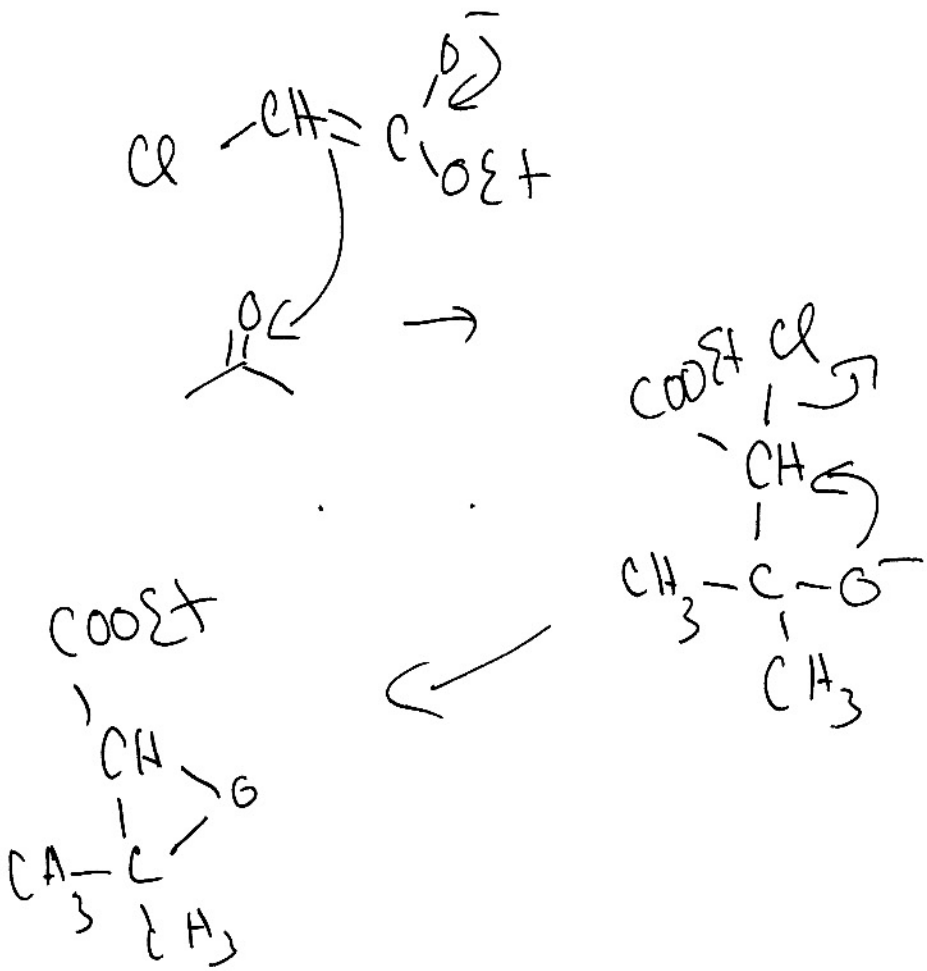


d. NaOD in D_2O @ 25° → ?



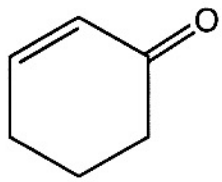
8. (10 pts) When a mixture of an aldehyde or ketone and an α-halo ester is treated with a strong base, and α, β-epoxy ester is obtained. Propose a mechanism.

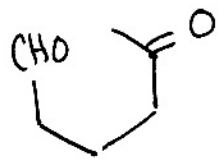




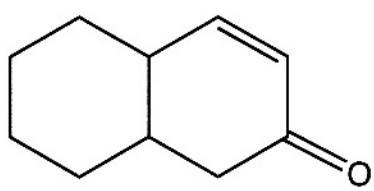
9. (20 pts) Each of the following can be prepared by an intramolecular aldol condensation. Show the precursor in each case.

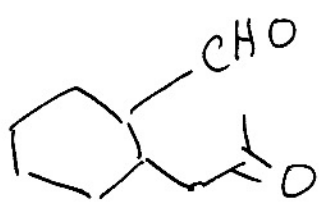
a.





b.





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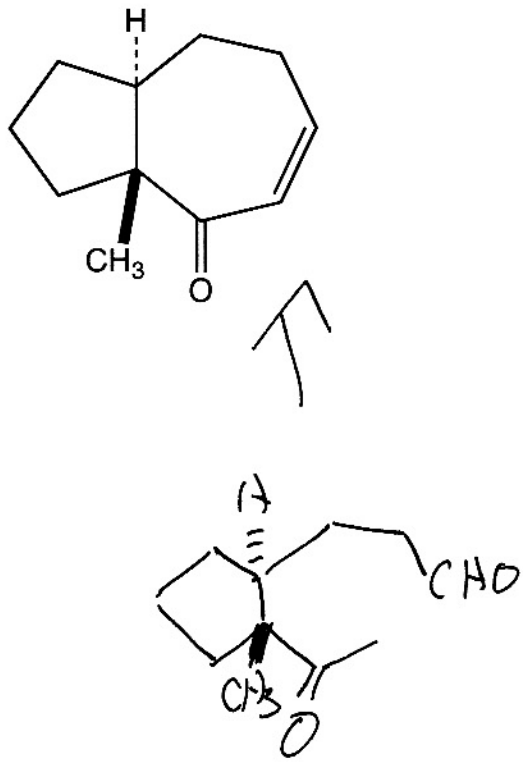
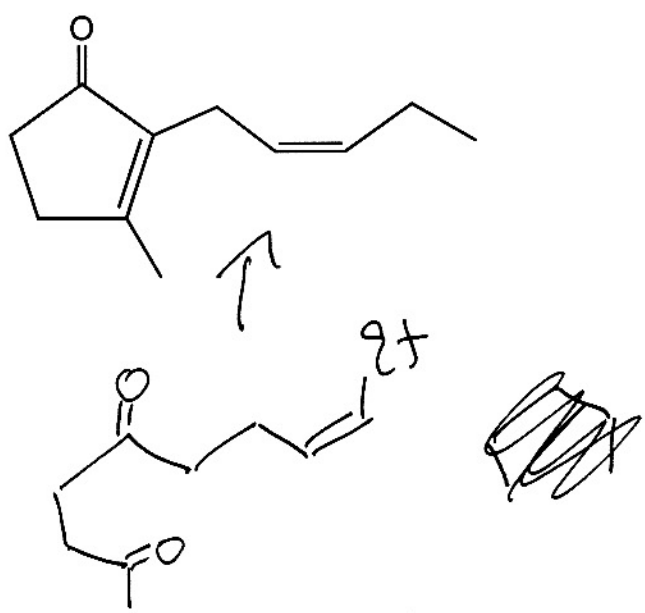
d.