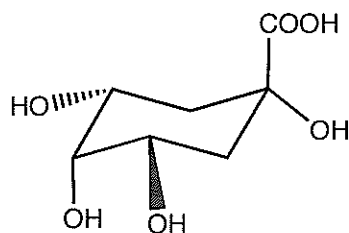


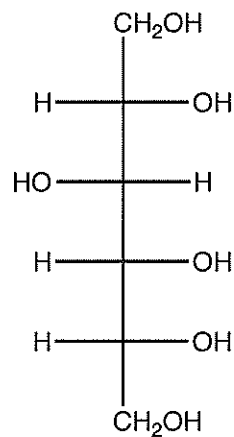
Chemistry 3311-100
Organic Chemistry/Dr. Barney Ellison
Monday: May 5th @ 4:30 pm → 7:00 pm / Final / Chem 140

Name: Key (please print)

1. (10 pts) An optically active substance was isolated and the specific rotation was measured to be $[\alpha]_D = +40.3^\circ$. Two structures have been proposed, A and B. Which is correct.



A



B

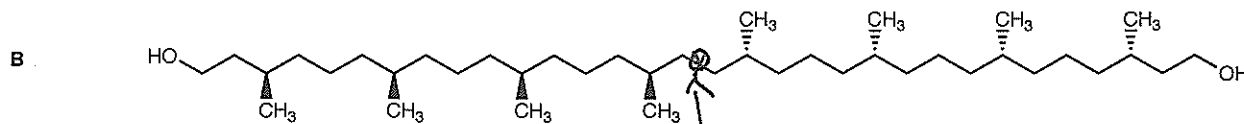
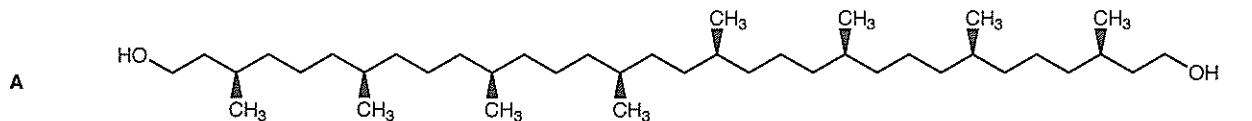
A is a chiral
because it has a
plane of symmetry.

$$[\alpha]_D = 0$$

B is chiral

$$[\alpha]_D = +40.3^\circ$$

2. (10 pts) One of the principal substances obtained from archaea is derived from an optically active, 40-carbon diol. Two structures have been proposed, A and B. Which is correct.



B has a center of symmetry & is achiral.

A is the ~~the~~ product from archaea bacteria.

3. (10 pts) Give the mechanistic symbols [S_N1 , S_N2 , E1, E2] that are most consistent with each of the following statements:

a) Methyl halides react with sodium ethoxide in ethanol only by this mechanism.

S_N2

b) Unhindered primary halides react with sodium ethoxide in ethanol mainly by this mechanism.

~~S_N2~~

S_N2

↑ strong base

some E2

c) When cyclohexyl bromide is treated with sodium ethoxide in ethanol, the major product is formed by this mechanism.

E2

some S_N2

d) The substitution product obtained by solvolysis of *tert*-butyl bromide in ethanol arises by this mechanism.

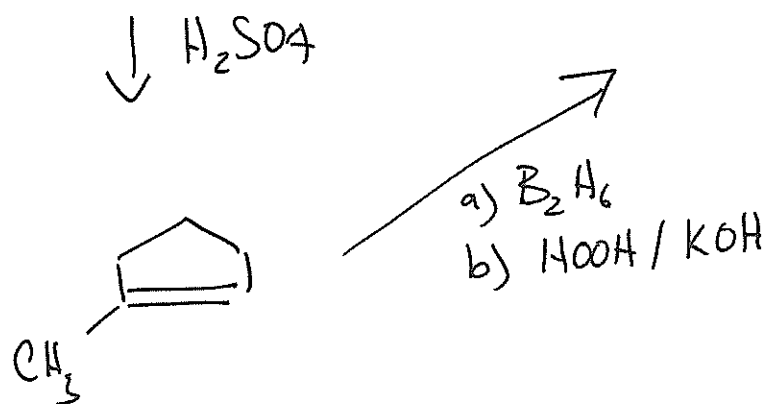
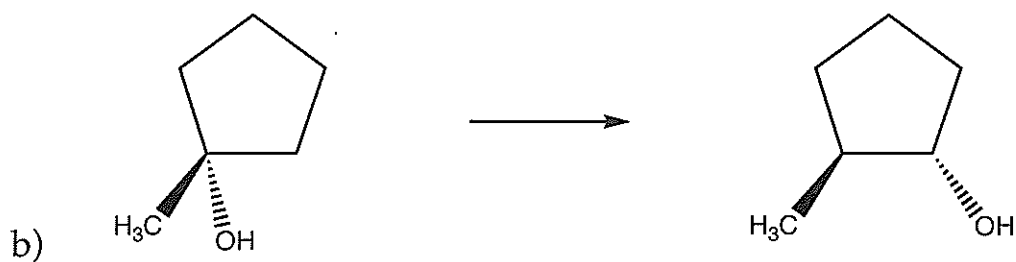
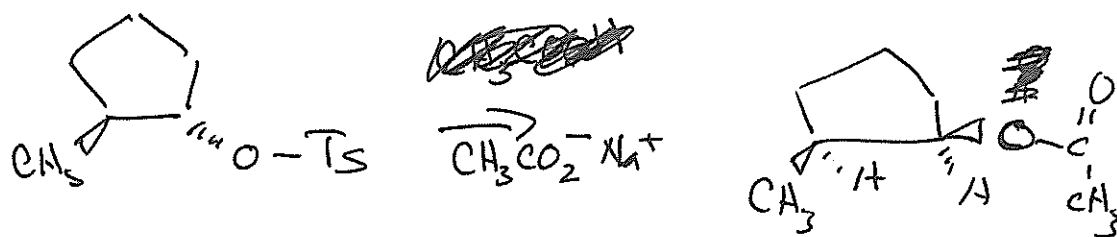
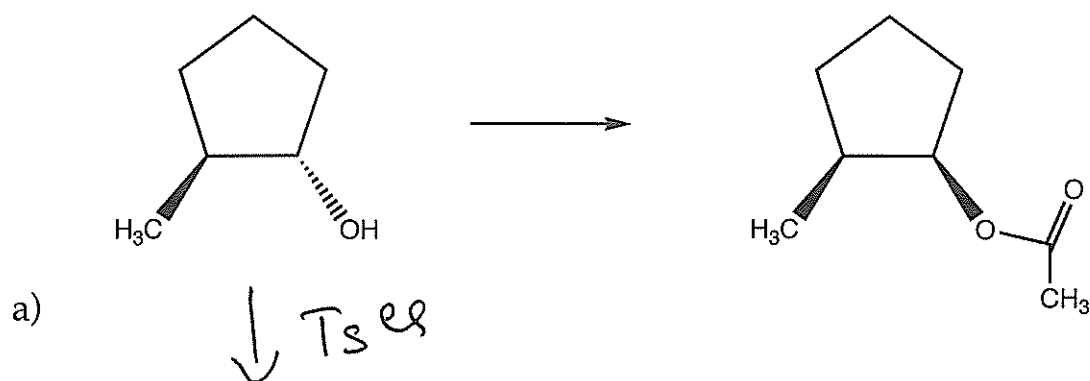
S_N1

e) In ethanol that contains sodium ethoxide, *tert*-butyl bromide reacts mainly by this mechanism.

↑ strong base

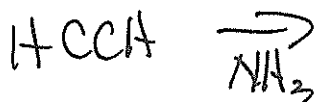
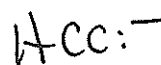
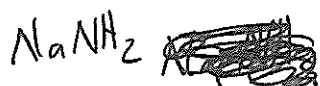
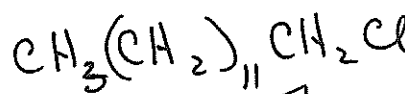
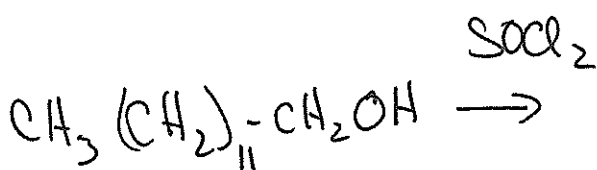
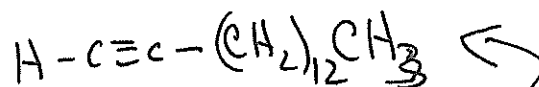
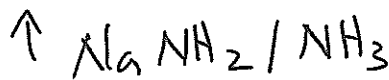
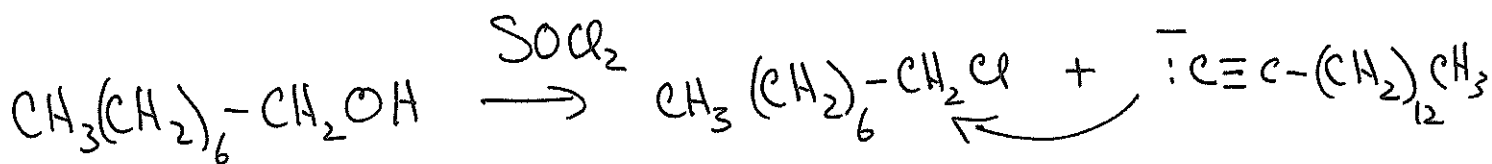
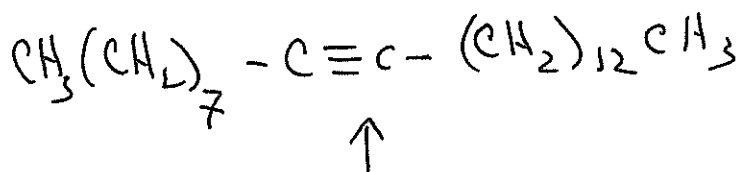
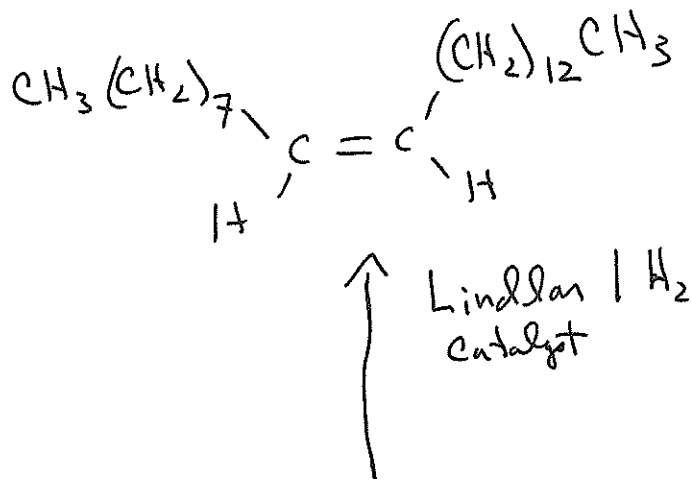
E2

4. (10 pts) Show how to carry out the following transformations.

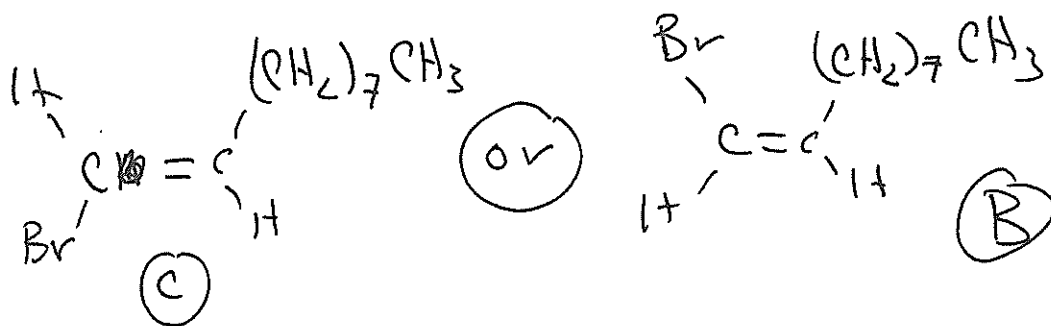
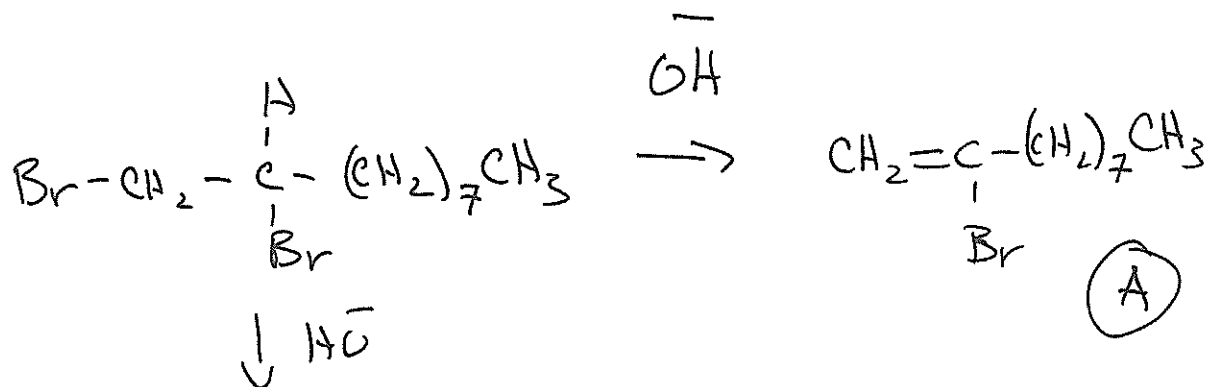


5. (10 pts) (Z)-9-tricosene [(Z)-CH₃(CH₂)₇CH=CH(CH₂)₁₂CH₃] is the sex pheromone of the female house fly. Synthetic (Z)-9-tricosene to traps that contain a ⁶⁰Co radioactive source. Using acetylene and alcohols of your choice as starting materials, show how you would prepare (Z)-9-tricosene.

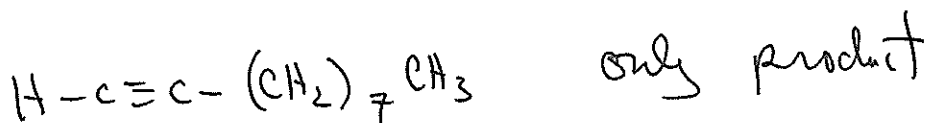
Target is:



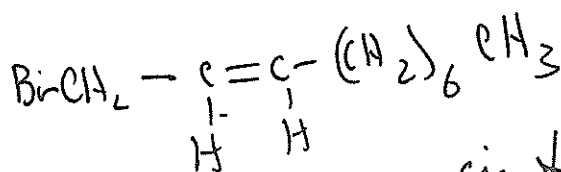
6. (10 pts) When 1,2-dibromodecane was treated with KOH in aqueous ethanol, it yielded a mixture of 3 isomeric compounds with molecular formula, $C_{10}H_{19}Br$. Each of these compounds was converted to 1-decyne on reaction with sodium amide in DMSO. Identify these 3 compounds.



All isomers are $C_{10}H_{19}Br$.



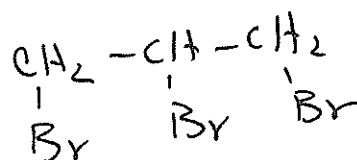
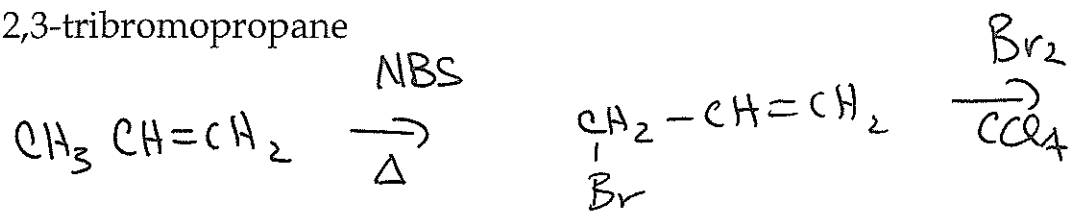
This excludes isomers like



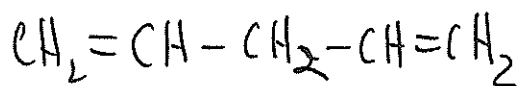
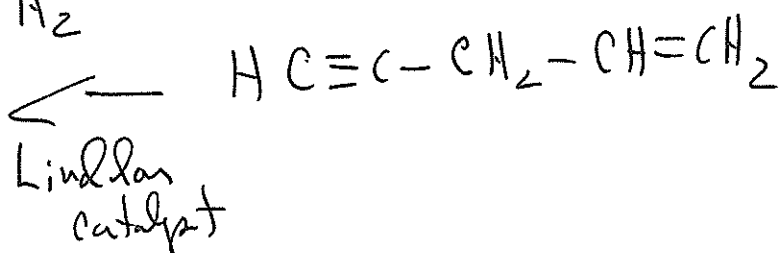
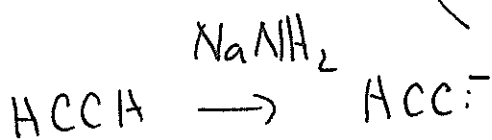
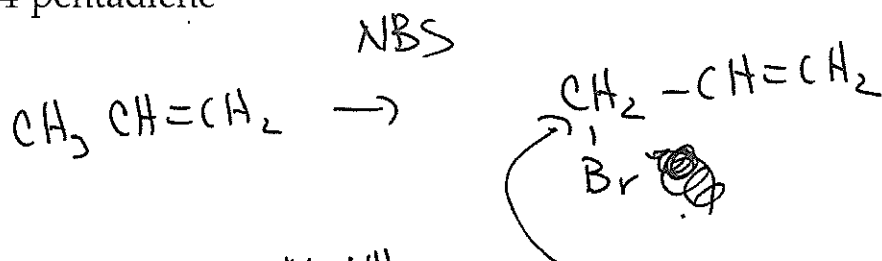
can't go to
→ 1-decyne

7. (10 pts) Show how to prepare the following compounds starting with propene and any necessary organic or inorganic reagents.

a) 1,2,3-tribromopropane

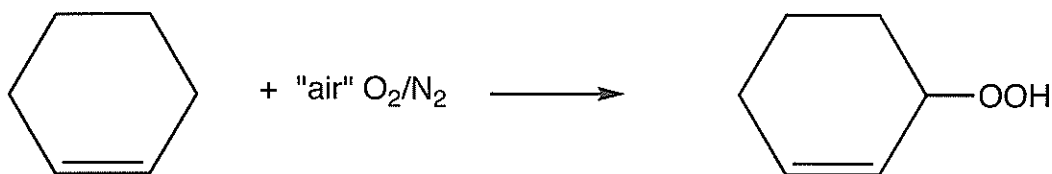


b) 1,4-pentadiene

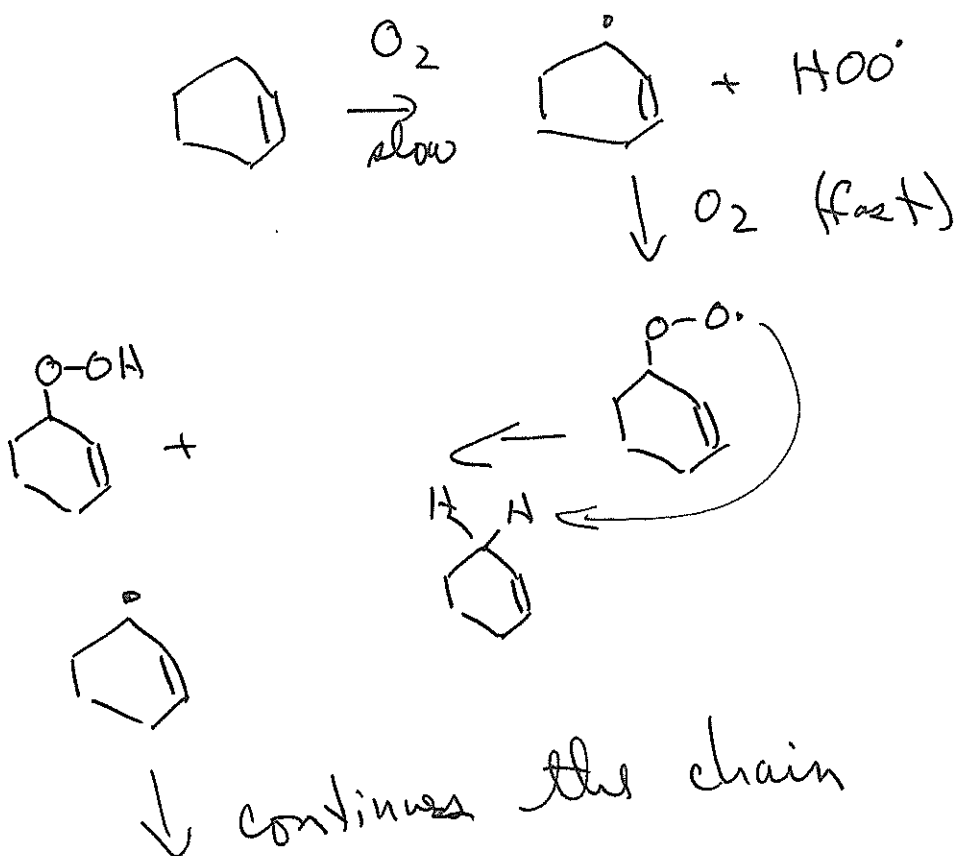


1,4 pentadiene

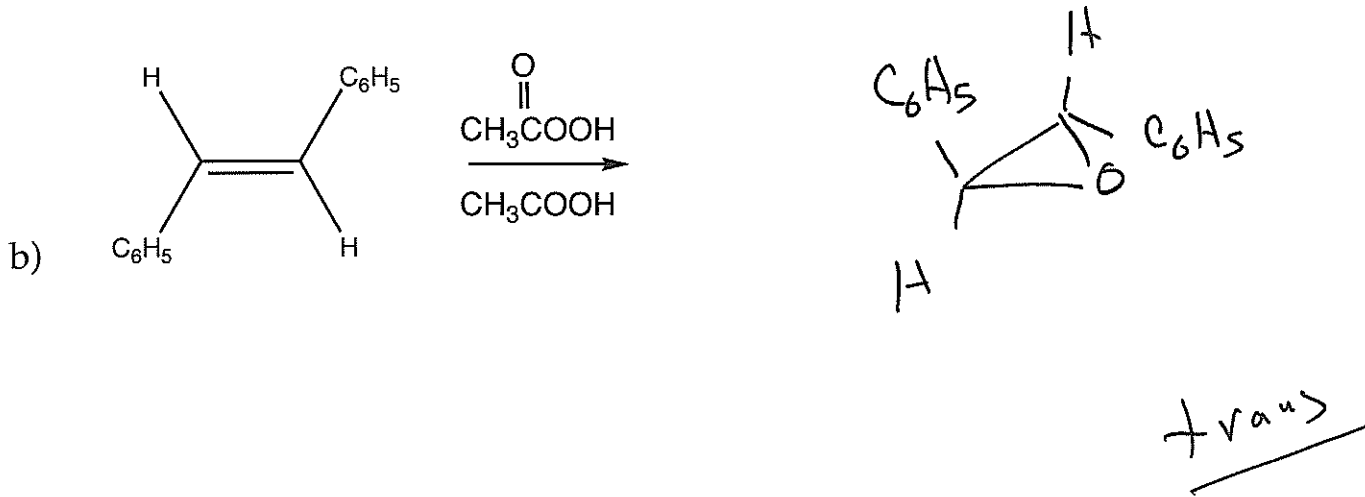
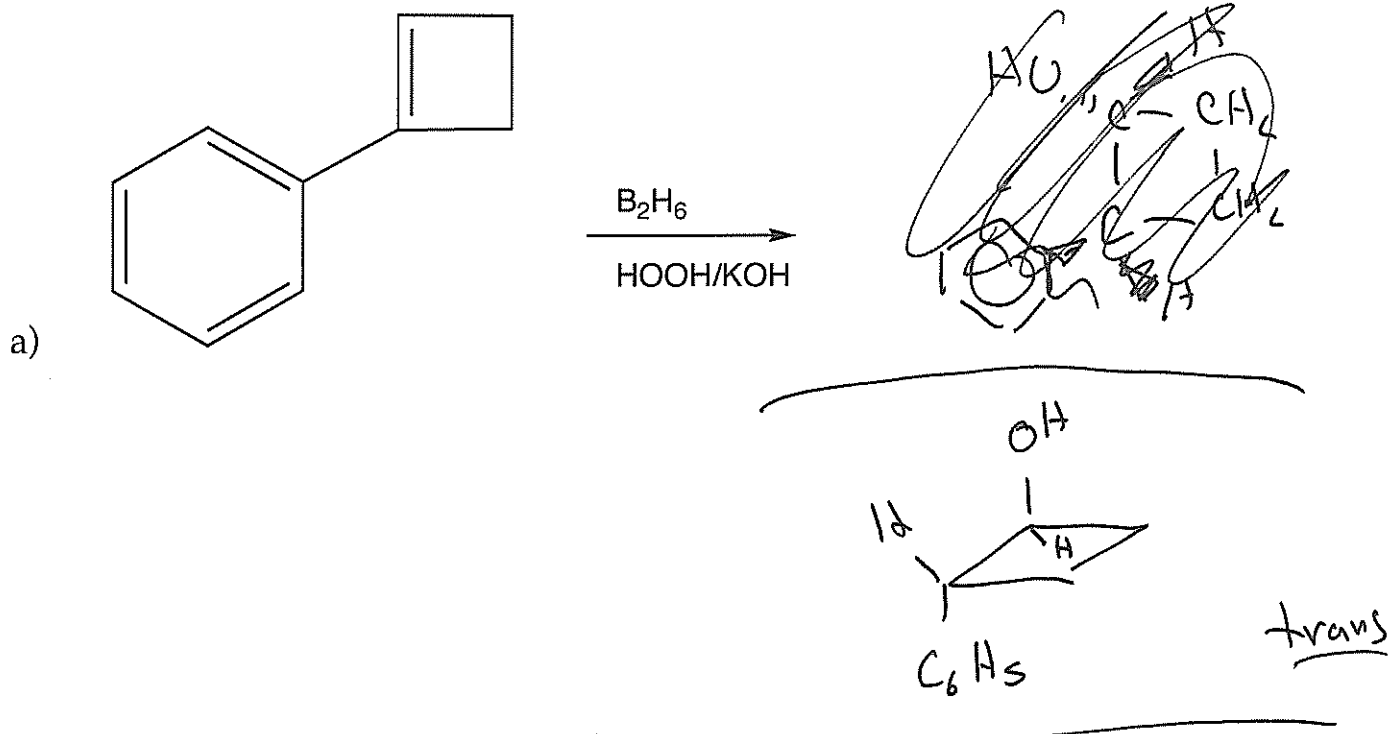
8. (10 pts) Alkenes slowly undergo a reaction in air called autooxidation in which allylic hydroperoxides are formed. Recall that oxygen is a diradical ($\bullet\text{OO}\bullet$), suggest a reasonable mechanism for this chain reaction.

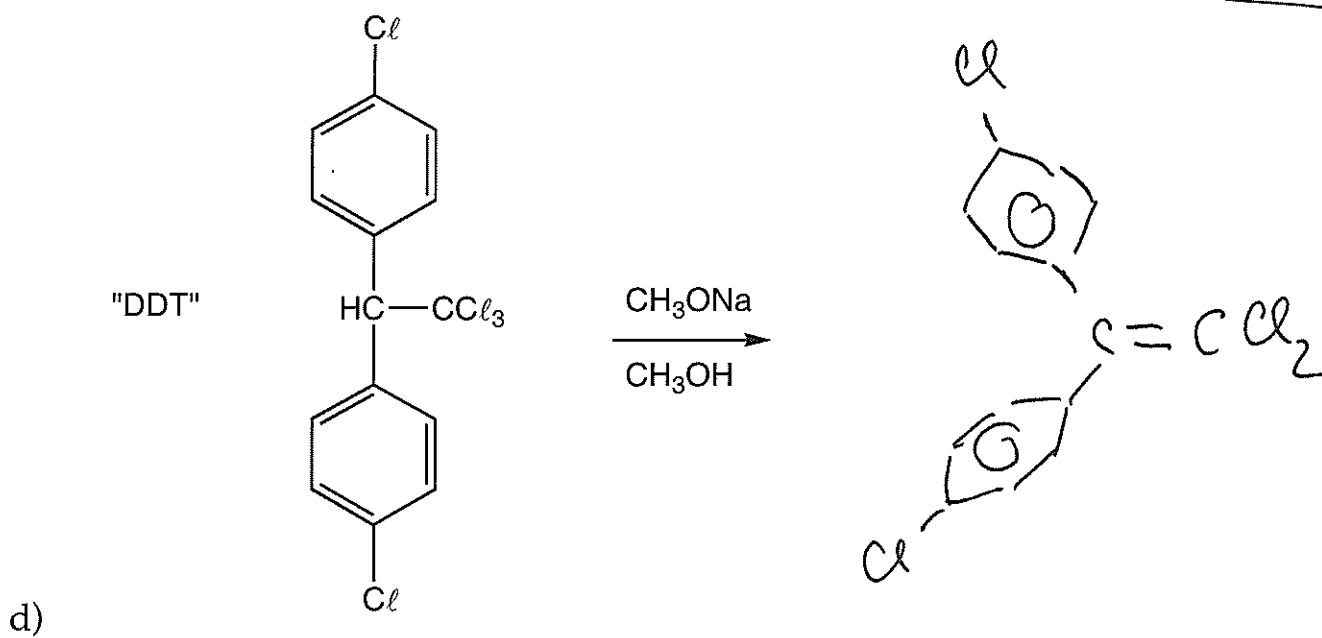
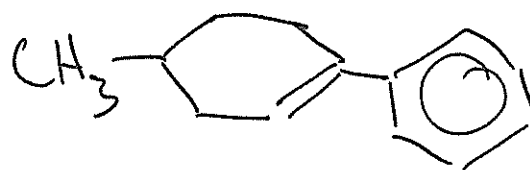
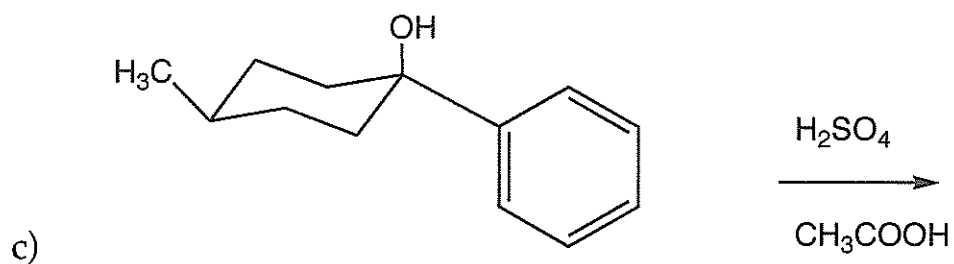


The diradical O_2 abstracts a H atom from allylic site.

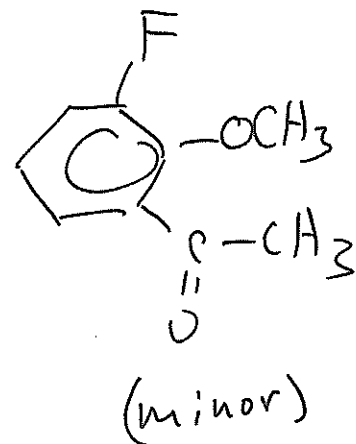
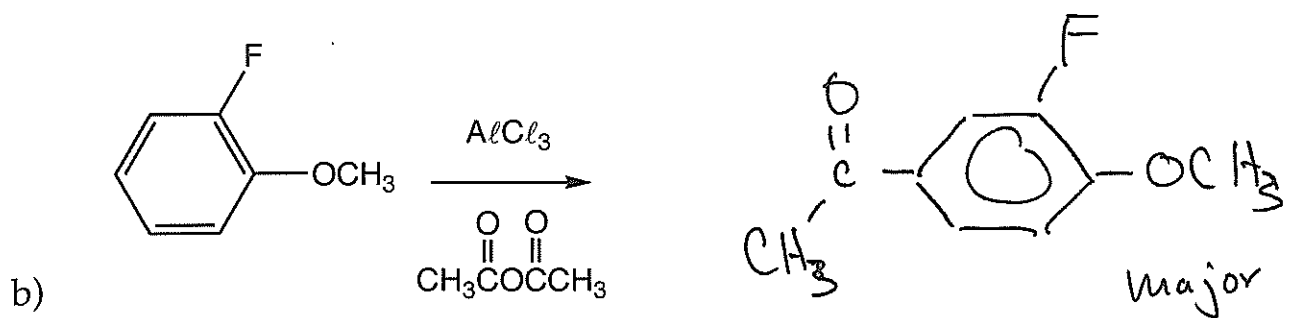
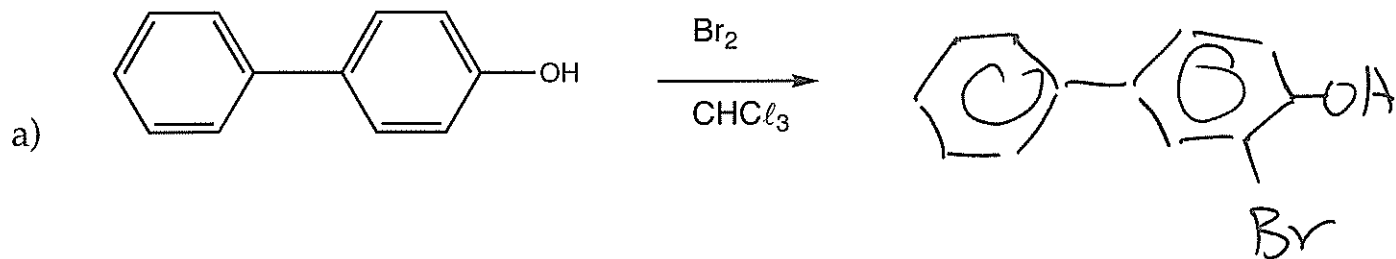


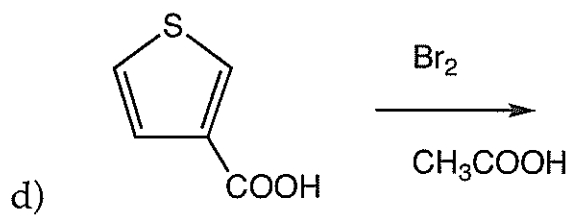
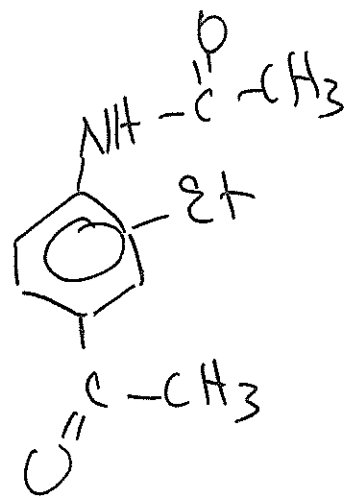
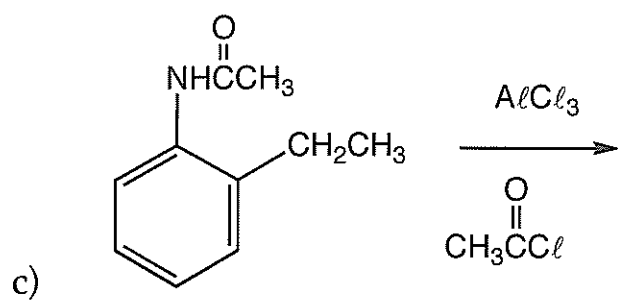
9. (20 pts) Identify the product of each reaction:



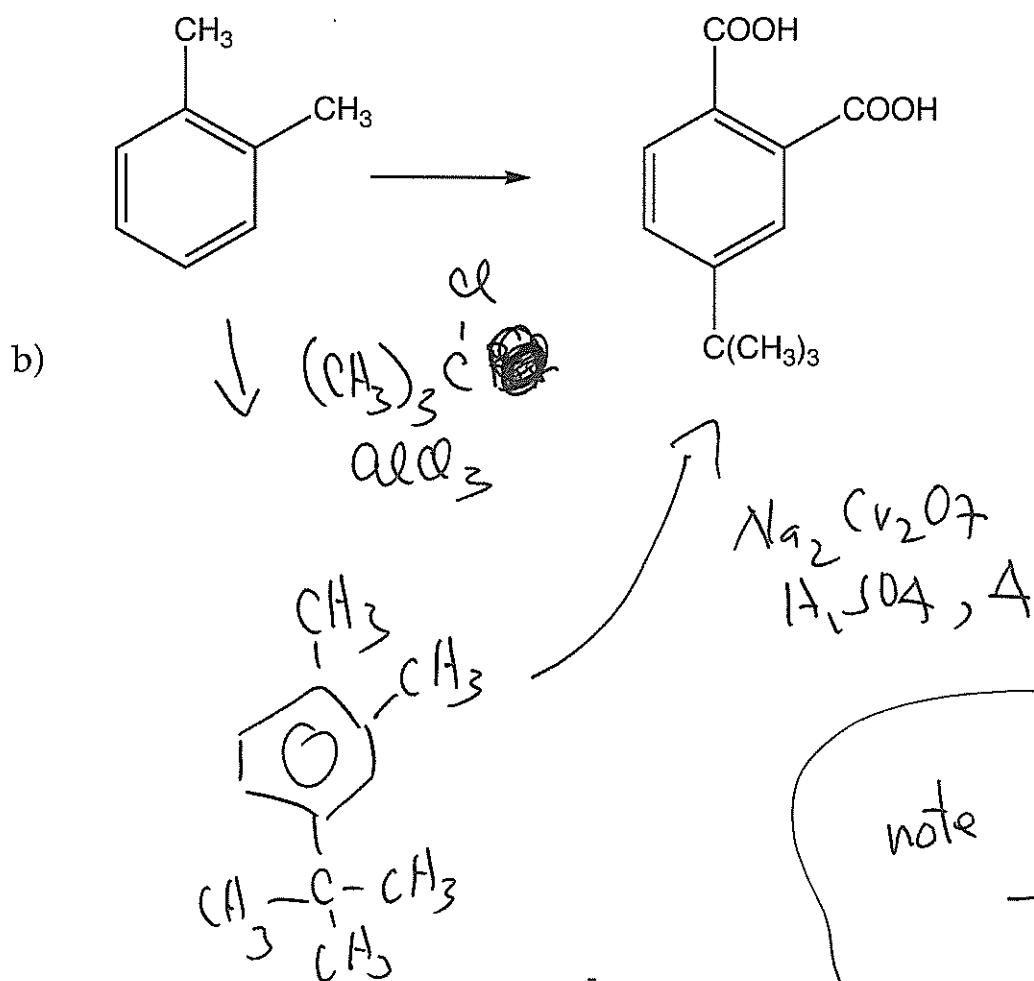
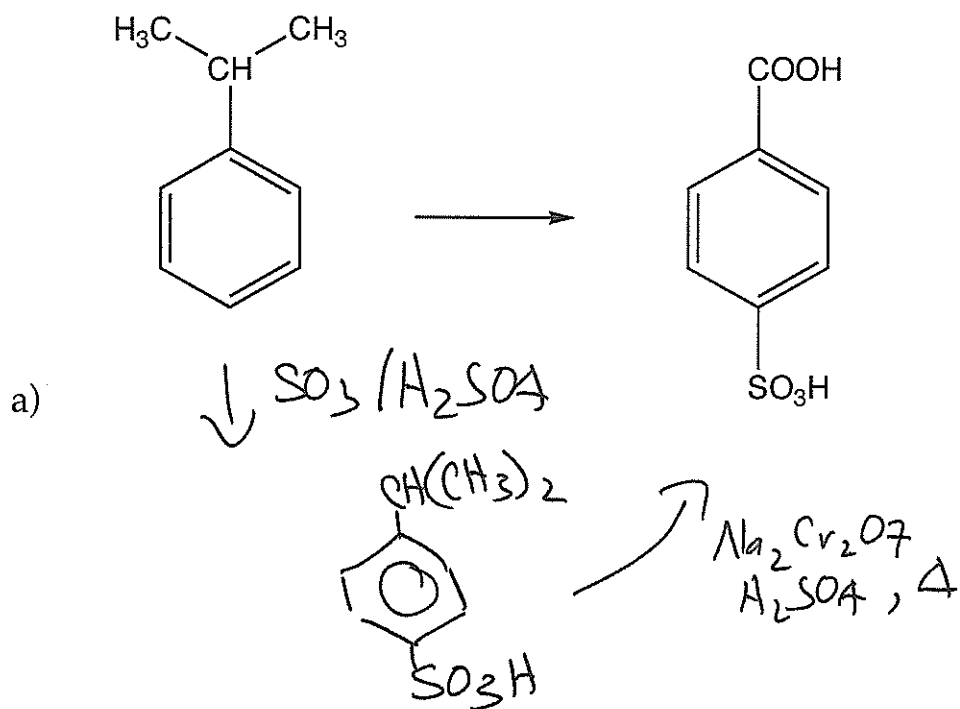


10. (20 pts) Identify the product of each reaction. Only monosubstitution is involved unless otherwise specified.

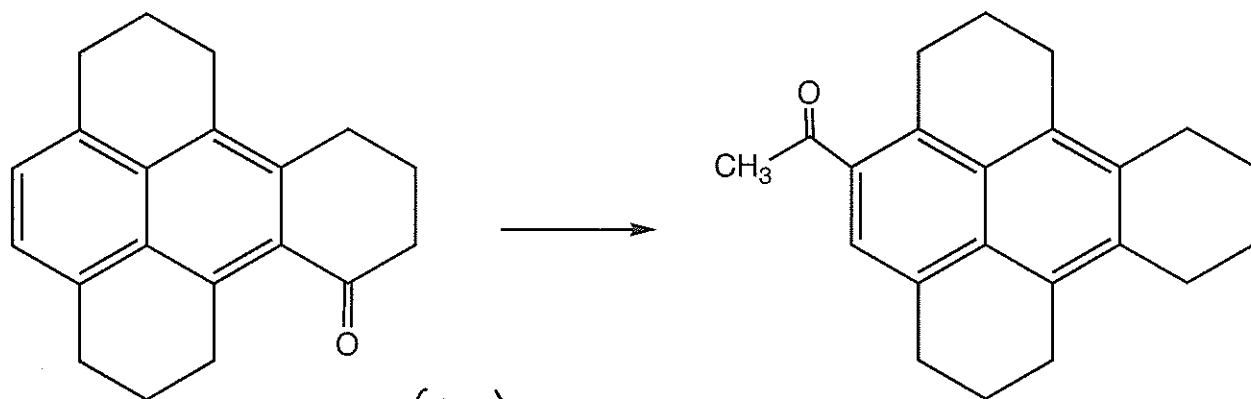




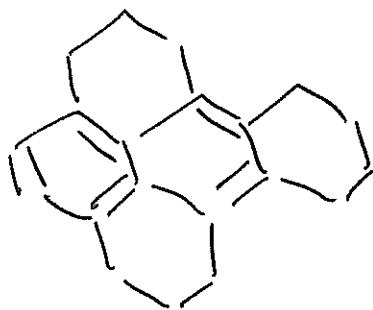
11. (20 pts) Suggest a suitable series of reactions to carry out the following.



c)

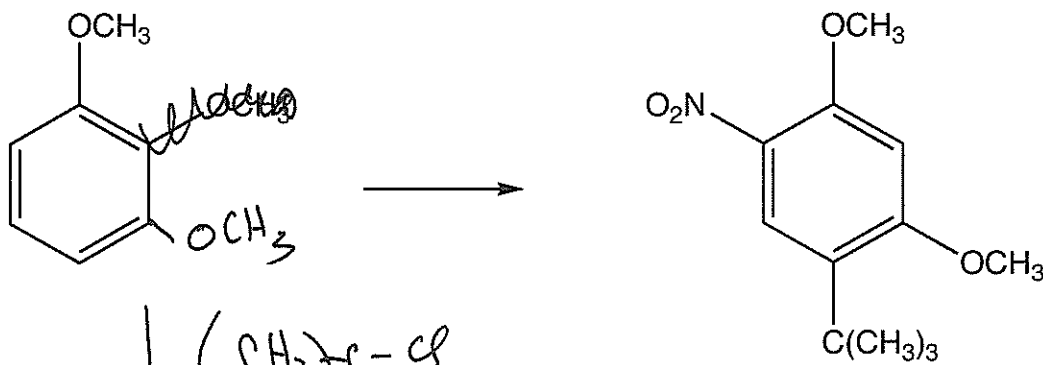


\downarrow Zn(Hg)
HCl

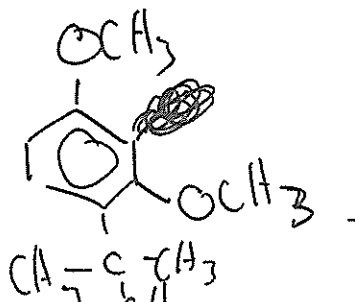


$\text{CH}_3\text{C}(=\text{O})\text{O}-\text{O}-\text{C}(=\text{O})\text{CF}_3$
 AlCl_3

d)

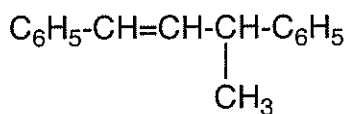


\downarrow $(\text{CH}_3)_3\text{C}-\text{Cl}$
 AlCl_3

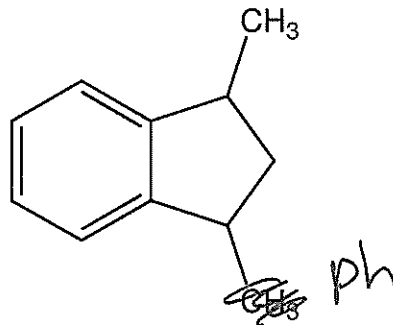


HNO_3
 H_2SO_4

12. (10 pts) When $C_6H_5CH=CH_2$ is refluxed in H_2SO_4/H_2O , two "styrene dimers" are formed as major products. One is 1,3-diphenyl-1-butene and the other is 1-methyl-3-phenylindan. Suggest a mechanism.



1,3-diphenyl-1-butene



1-methyl-3-phenylindan

