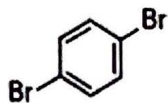


CHM 2120 – DGD – 2019 Final Exam Review

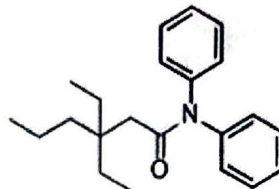
1. Name the following molecules using IUPAC nomenclature or accepted trivial names: (2 points)

a.



1,4-dibromobenzene
or
para-dibromobenzene

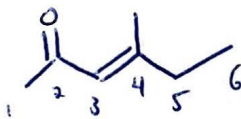
b.



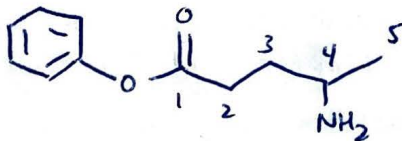
3,3-diethyl-N,N-diphenylhexanamide

2. Draw clear structures for the following molecules: (2 points)

a. (E)-4-methylhex-3-en-2-one

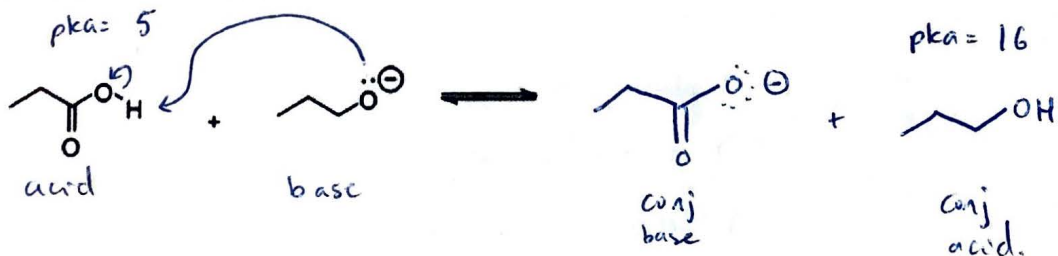


b. phenyl 4-aminopentanoate



3.

- a. Write equations for the following reaction using arrow notation. (2 points)
b. Will the reaction favour the starting materials or the products? (1 point)
c. Justify your choice. (3 points)



Comparing bases:

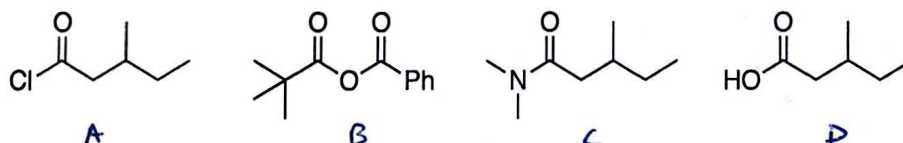
- both anionic, but conj base has resonance

Comparing acids

- \uparrow pKa = \downarrow weaker acid
- \downarrow weaker acid = \uparrow stability
- \therefore products favored.

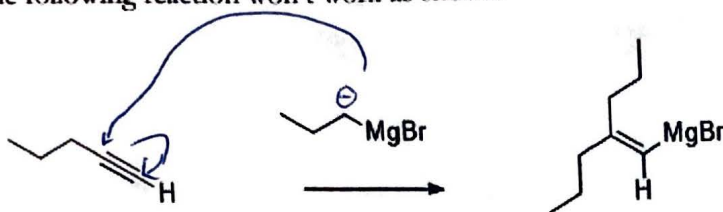
4. \therefore products more stable and favored.

Rank the following molecules in increasing order of nucleophilic reaction with MeMgBr.



A > B > C > D
most electrophilic least electrophilic.

5. The following reaction won't work as shown:



a. Show what would happen instead. (2 points)



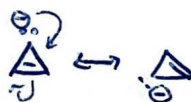
acid-base reaction instead of intended
 Nu^- reaction with alkyne.

6.

a. What are the three criteria for aromaticity? (3 points)

(1) planar, (2) all atoms sp^2 -hybridized, (3) $4n+2 = \pi e^-$

b. Is the following ion aromatic? Explain clearly how you came to this conclusion. (2 points)



↳ solving for n gives an integer (1, 2, 3, etc.)

- (1) planar? ✓
- (2) all atoms sp^2 ✓
- (3) $4n+2 = 2$
 $n = 0$ ✓

aromatic.

- (1) planar ✓
- (2) all atoms sp^2 ✓
- (3) $4n+2 = 4$
 $n = \frac{1}{2}$ ✗

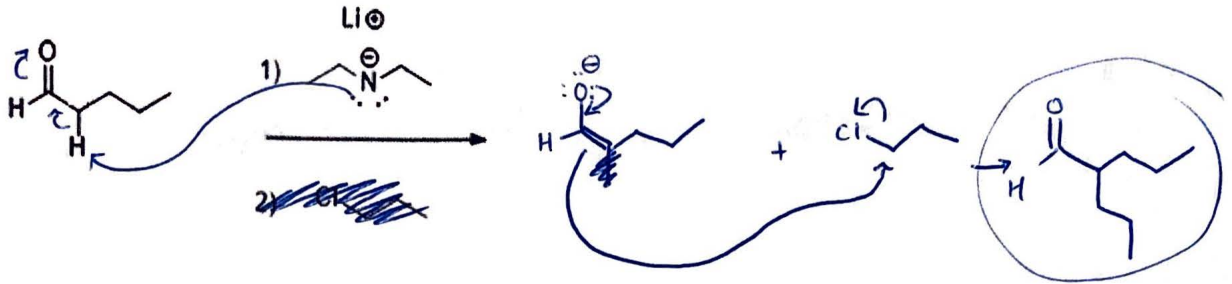
antiaromatic?

$$4n = 4$$

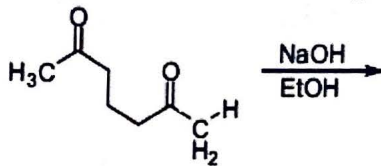
$$n = 1 \checkmark$$

anti-aromatic

7. Give a mechanism for each step in the following reaction sequence: (5 points)



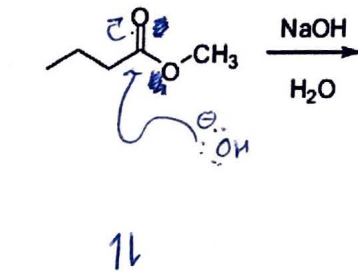
8. Provide a mechanism for the following reaction: (6 points)



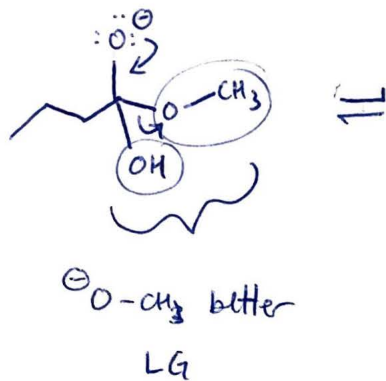
see last page(s)

9.

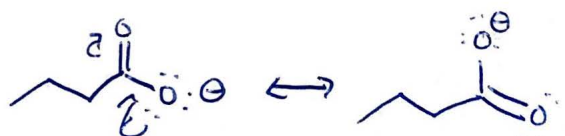
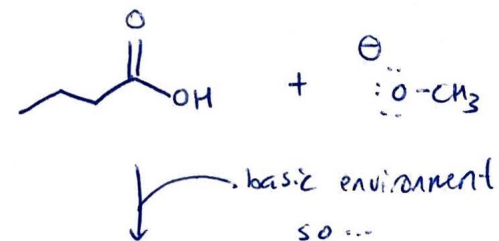
- Provide a mechanism and product for the following reaction (5 points)
- Identify and name the key intermediate in the reaction (1 point)
- Why is this reaction irreversible overall? (1 point)



Notes: ~~enolate~~ enolate pathway possible, but less productive. Formation of carboxylic acid / carboxylate is stable, so difficult to go back when product formed.

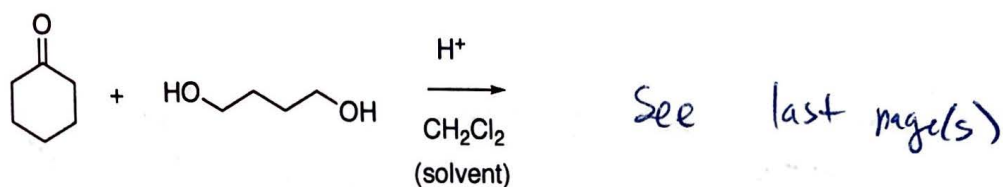


\ominus O-CH₃ better LG



10.

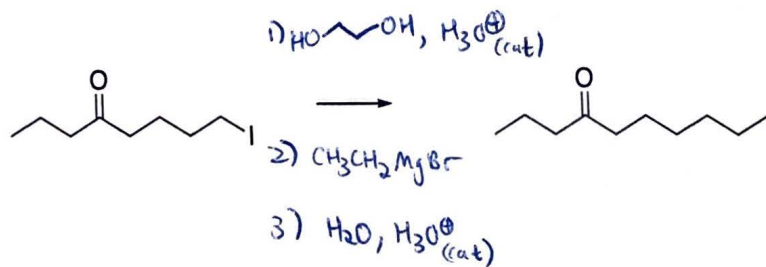
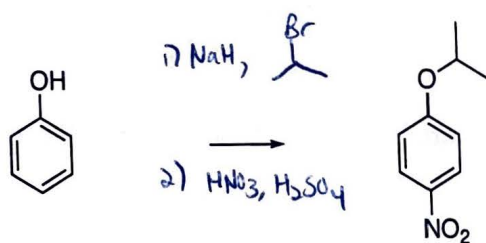
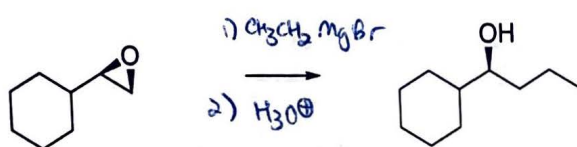
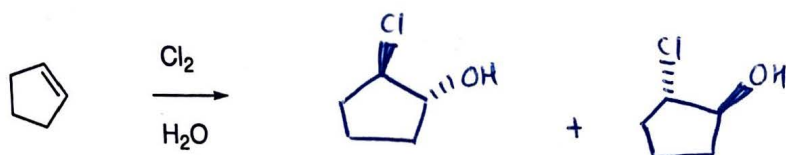
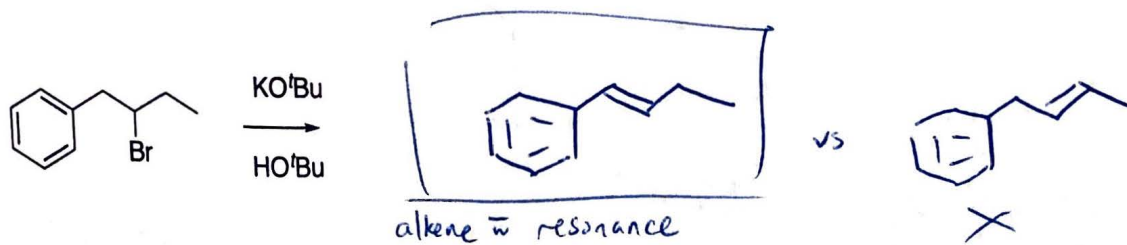
a. Provide a mechanism and product for the following reaction.



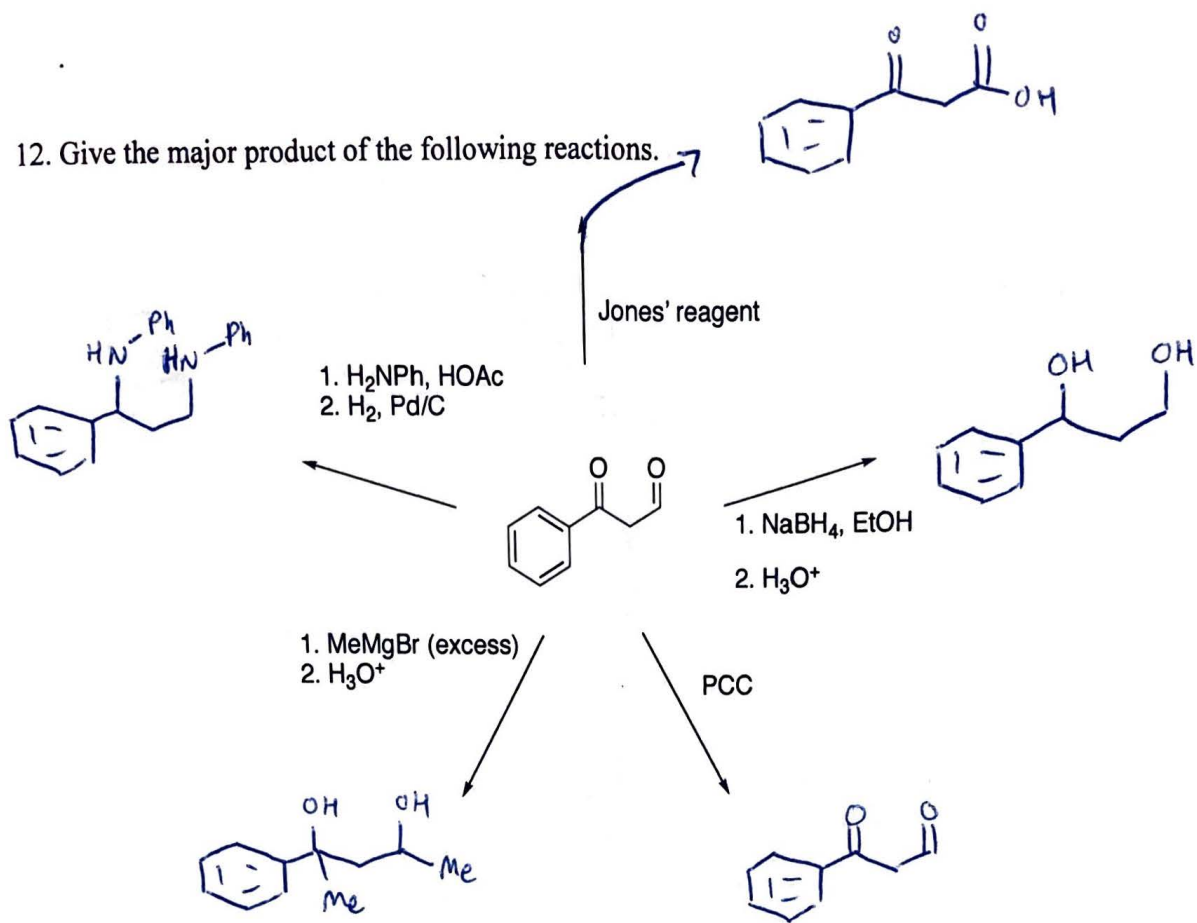
b. Spectroscopy analysis with IR of the final product recovered in the lab gave the following data:

- Strong stretch at 1715 cm^{-1}
- i. Explain what this IR data tells us about how the reaction proceeded.
 - ii. Suggest *two* ways to combat the issue described in your answer to (i), and briefly rationalize each suggestion with reference to your mechanism.

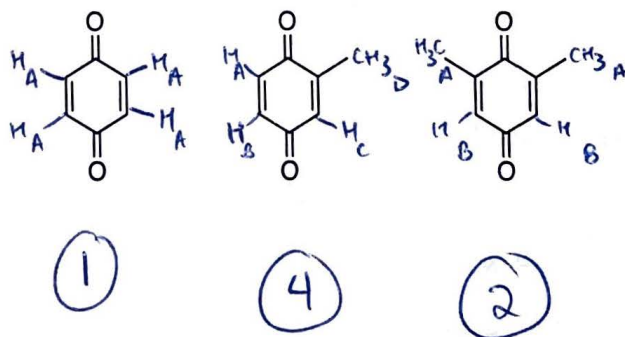
11. Give the missing reagent(s) or the major product for each of the following reactions.

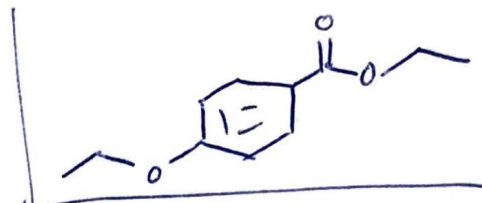


12. Give the major product of the following reactions.



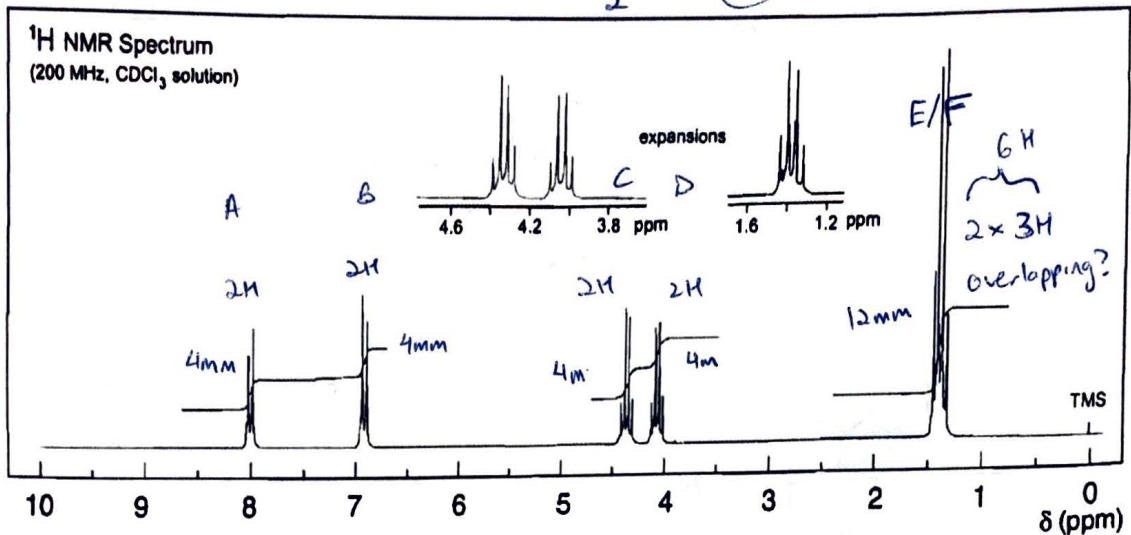
13. How many unique proton signals would be expected in the ^1H NMR of the following molecules?


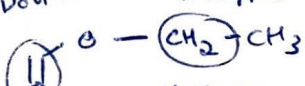
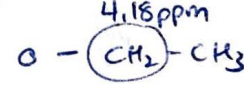
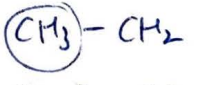
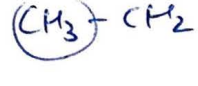


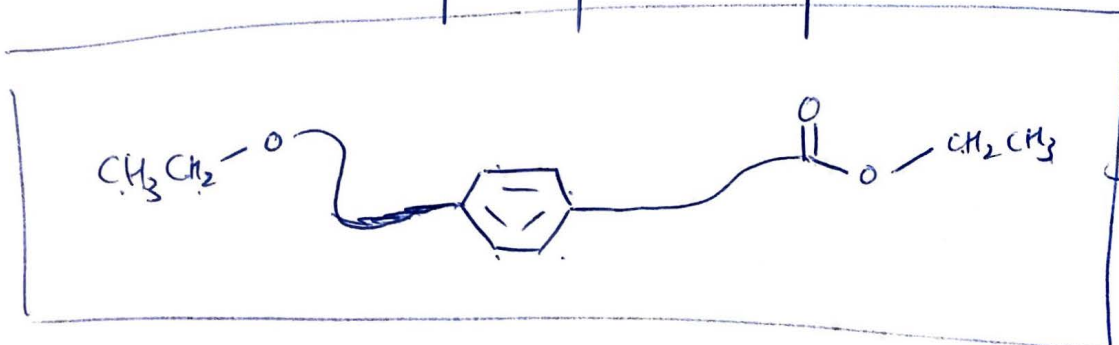


14. Determine the structure of the compound ($C_{11}H_{14}O_3$) represented in the NMR spectrum below. Be sure to show your work in the space below (chemical shift, multiplicity, integration).

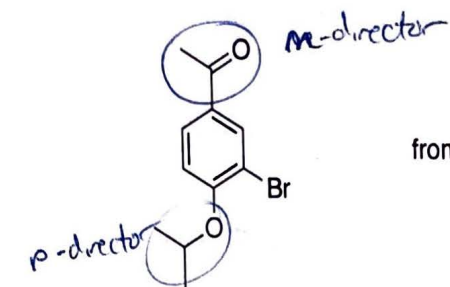
$$DoU = \frac{22 - 14 + 2}{2} = 5$$



Peak	chem shift (ppm)	Int	multiplicity	Notes
A	8.0	2H	d	}  4 DoU ✓
B	7.0	2H	d	
C	4.47	2H	q	1 DoU ✓ 4.47 ppm 
D	4.18	2H	q	4.18 ppm 
E/F	1.45	2x3H	overlapping t? Tough to say	 ?  ?



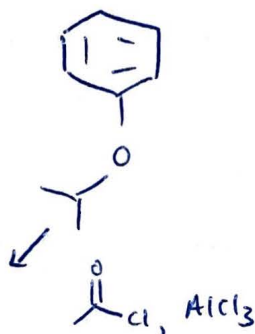
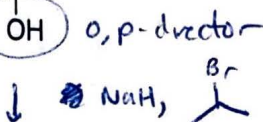
15. Propose a synthesis of the following molecule from the starting materials shown.



from

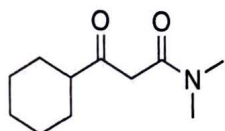


and any molecules with three carbons

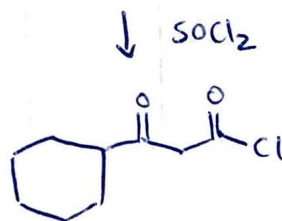
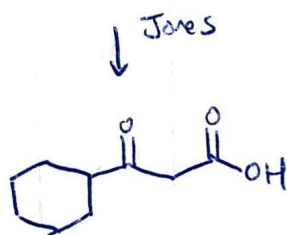
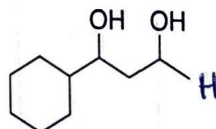


* Sequence is important here! Can't add Br first b/c it would go to both ortho & para.

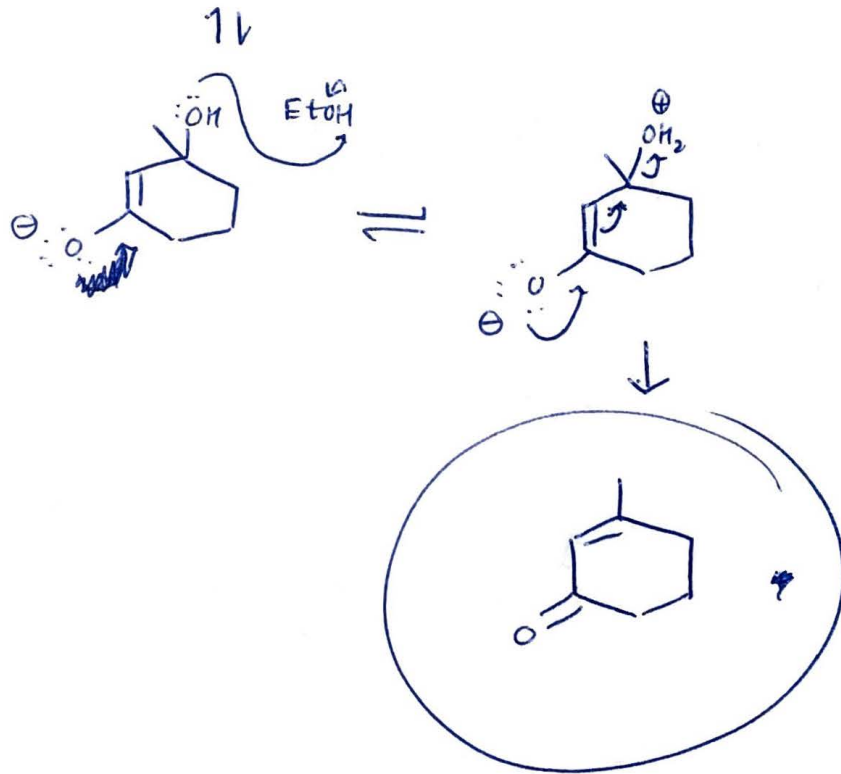
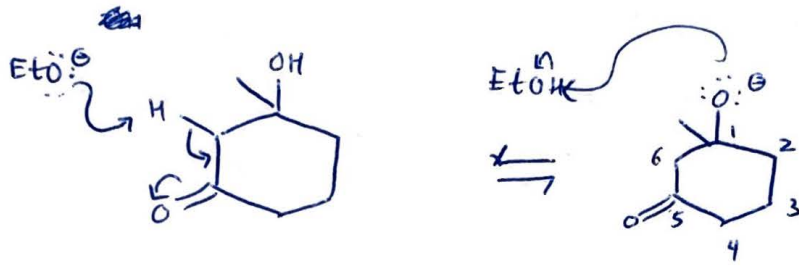
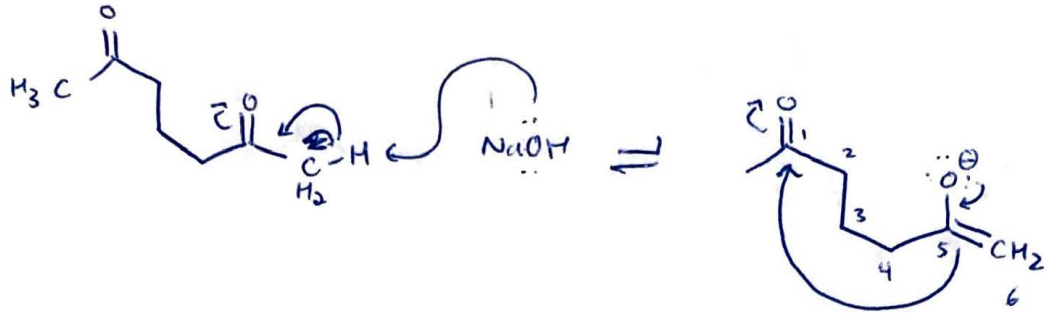
16. Propose a synthesis of the following molecule from the starting materials shown.



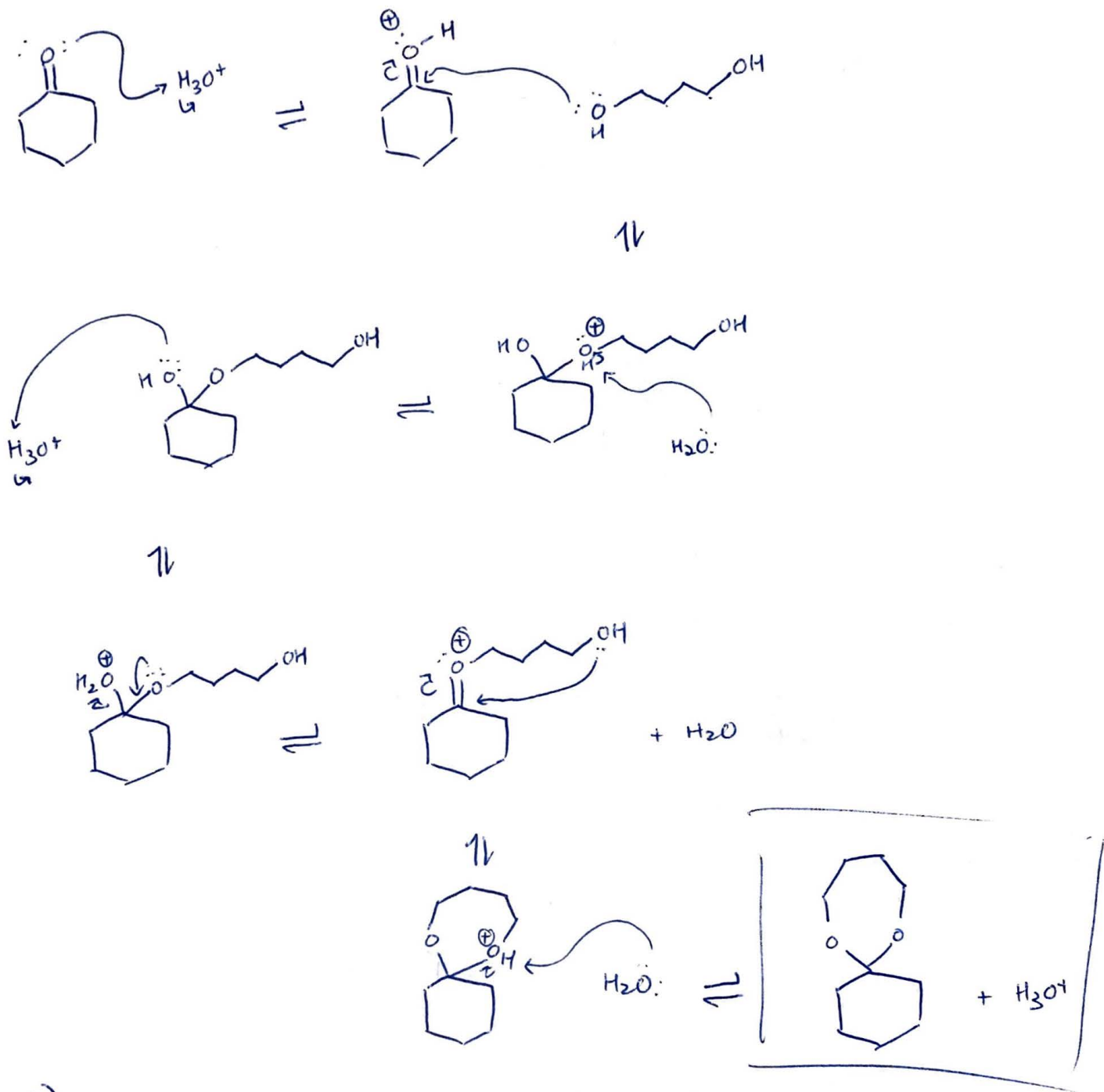
from



8.



0. a)



b) $\text{C}=\text{O}$; lots of starting material present.

c) remove H_2O to drive equilibrium towards products