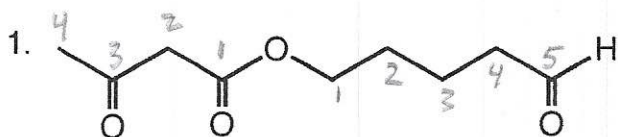


Spring 2025, Exam 3

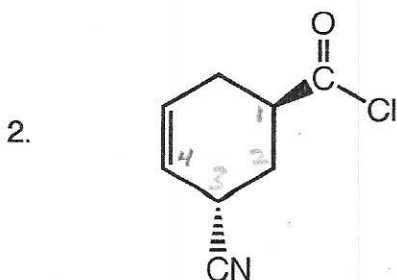
A. Nomenclature: (16 points)

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

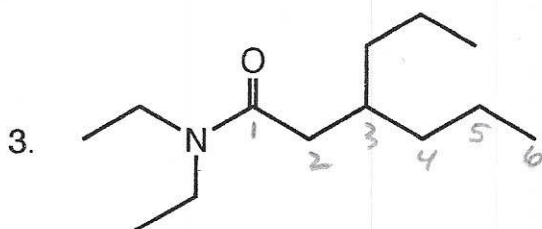
⓪ for incorrect numbering



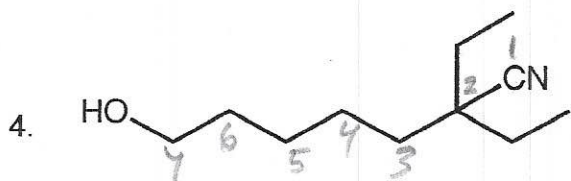
5-oxopentyl 3-oxobutanoate



trans-3-cyano-4-cyclohexenecarbonyl chloride



N,N-diethyl-3-propylhexanamide

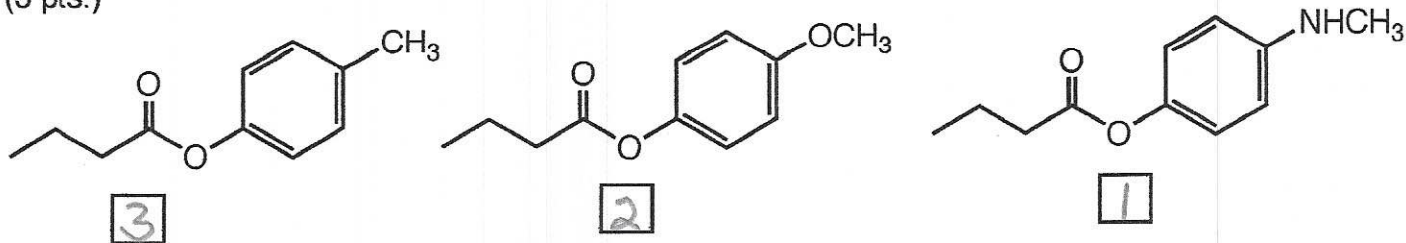


2,2-diethyl-7-hydroxyheptanenitrile

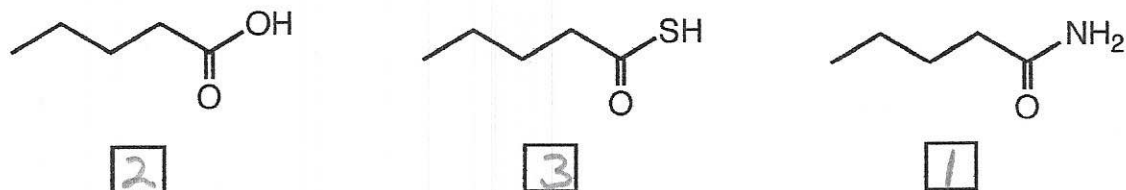


B. Facts: Total points = 15

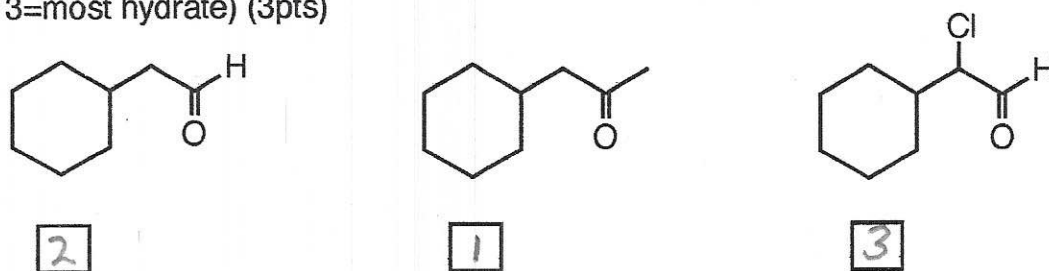
1. Rank the compounds in order of increasing reactivity with LiAlH_4 . (1=least reactive, 3=most) (3 pts.)



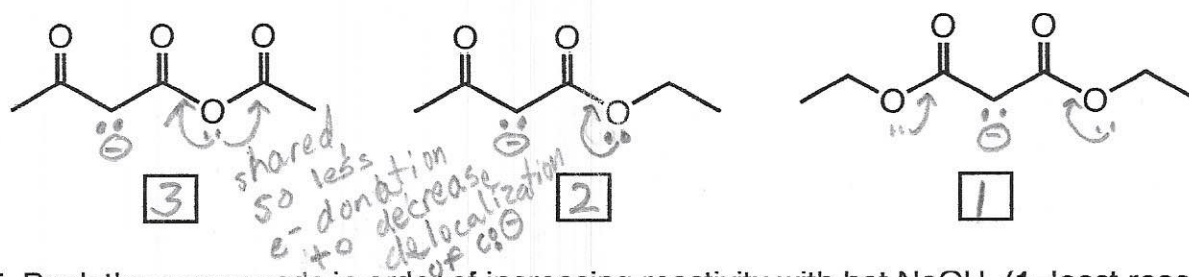
2. Rank the compounds in order of increasing acidity. (1=least acidic 3=most) (3 pts)



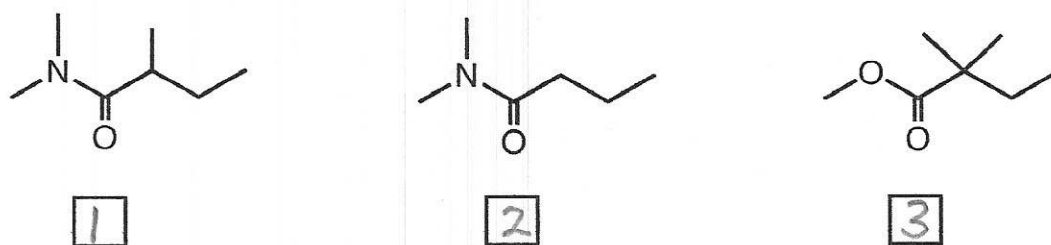
3. Rank the compounds in order of increasing amount of hydrate present in H_3O^+ at equilibrium. (1=least, 3=most hydrate) (3pts)



4. Consider the most acidic hydrogen in each compound, and then rank the compounds in order of increasing acidity. (1=least acidic, 3=most) (3 pts)

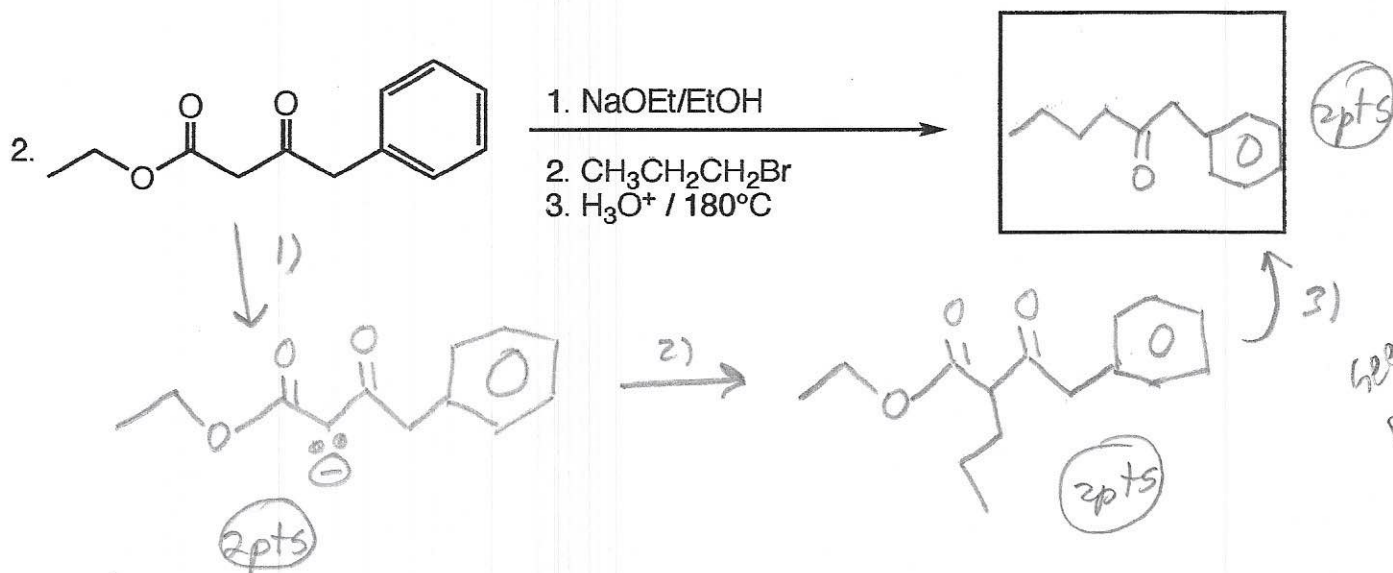
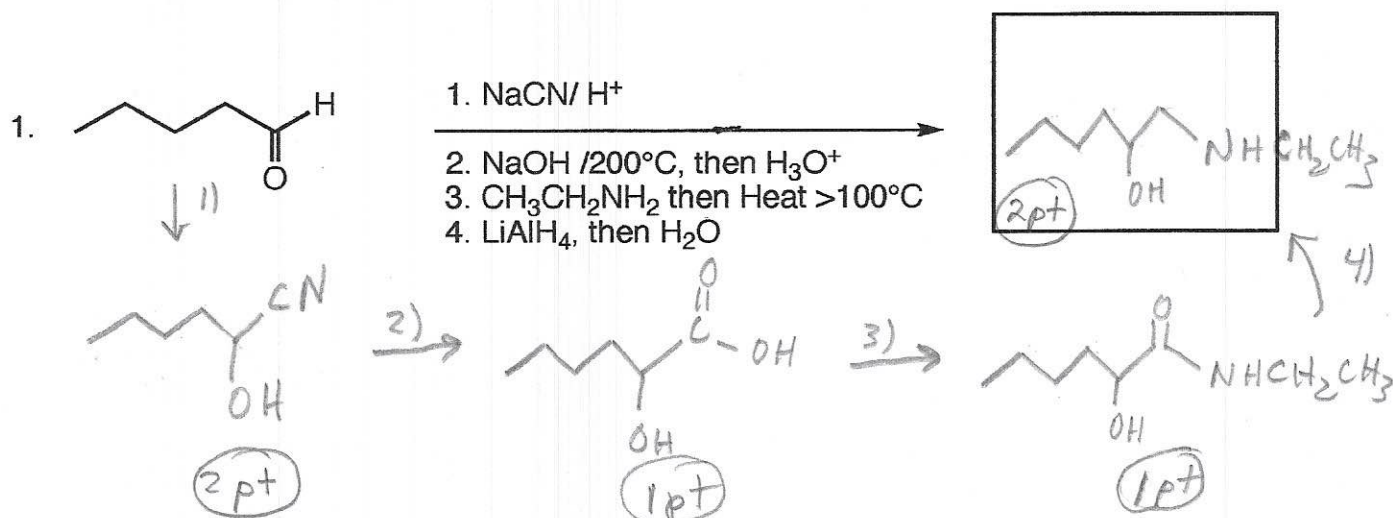


5. Rank the compounds in order of increasing reactivity with hot NaOH . (1=least reactive, 3=most) (3 pts.).

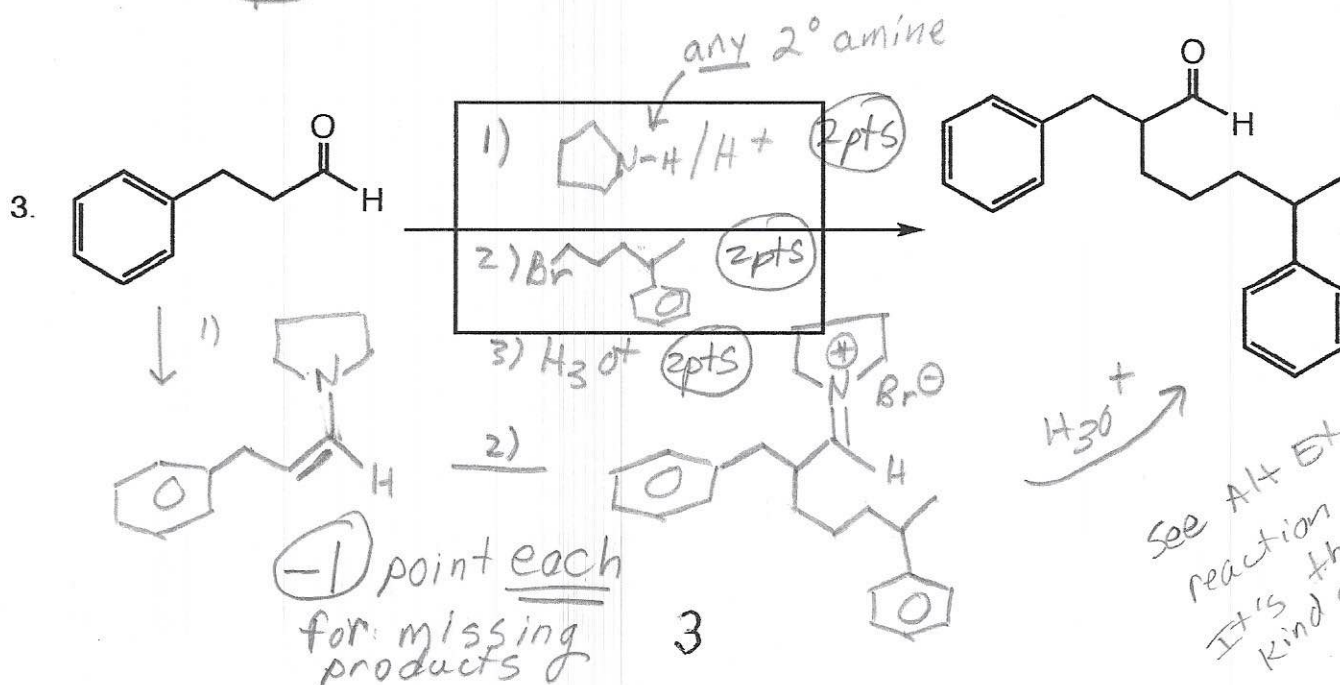


C. Reactions: Total = 36 points, 6 points each

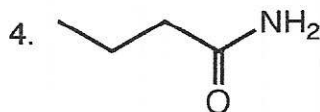
Please provide the major product or reagents in the answer box. Indicate **stereochemistry** if applicable. **Full credit is awarded only when the product of each step in a multi-step reaction is shown below the reaction.**



See Alt + Ex 3
Reaction # 6.
Almost the same



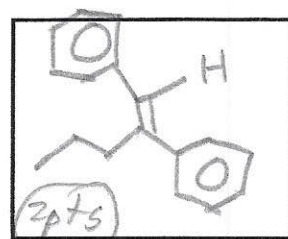
See Alt + Exam 3
Reaction # 5.
It's the same kind of reactions



1. SOCl_2

2. c1ccccc1[Mg]Br, then H_3O^+

3. c1ccccc1C=CP(c2ccccc2)(c3ccccc3)c4ccccc4

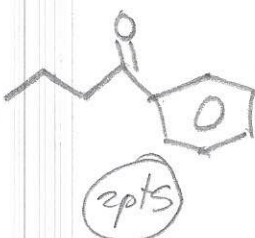


(-1) if incorrect or no stereo

↓ 1)

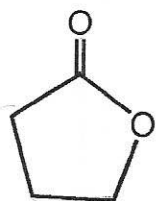


2)



3)

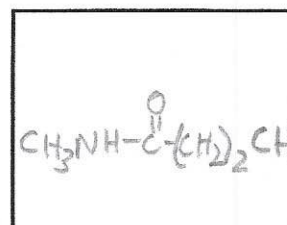
5.



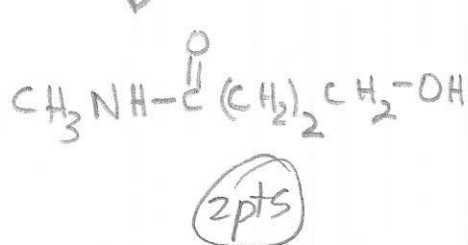
1. CH_3NH_2

2. PCC

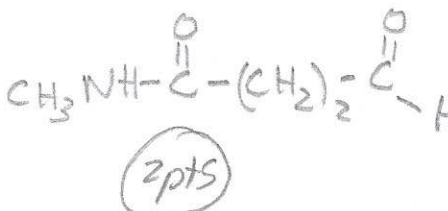
3. $\text{CH}_3\text{NH}_2 / \text{H}^+$



↓ 1)

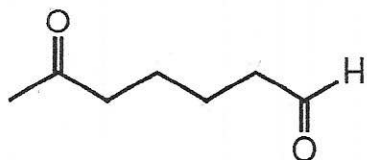


2)



3)

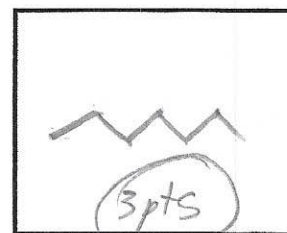
6.



mentioned in class more than once

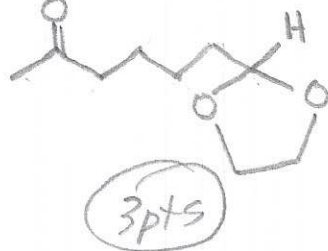
1. $\text{HOCH}_2\text{CH}_2\text{OH} / \text{H}^+$

2. $\text{Zn(Hg)} / \text{HCl}$ (AQ) (H_3O^+)



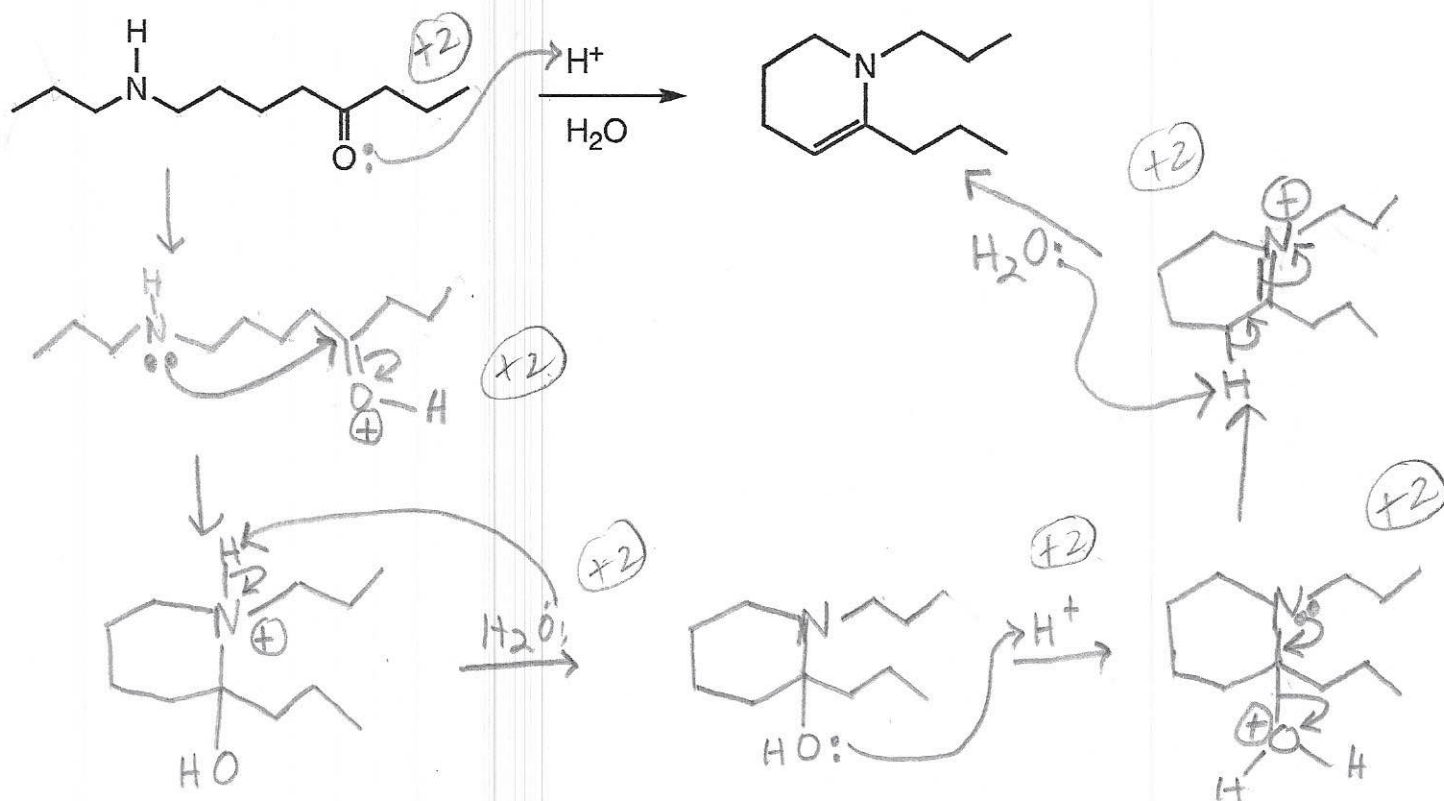
(-2) if aldehyde is not reduced

↓ 1)



D. Mechanism: (12 points)

Provide a clear mechanism to explain the formation of the 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. If more than one resonance contributor may be drawn, be sure to draw the most stable one. Please do not show transition states.



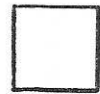
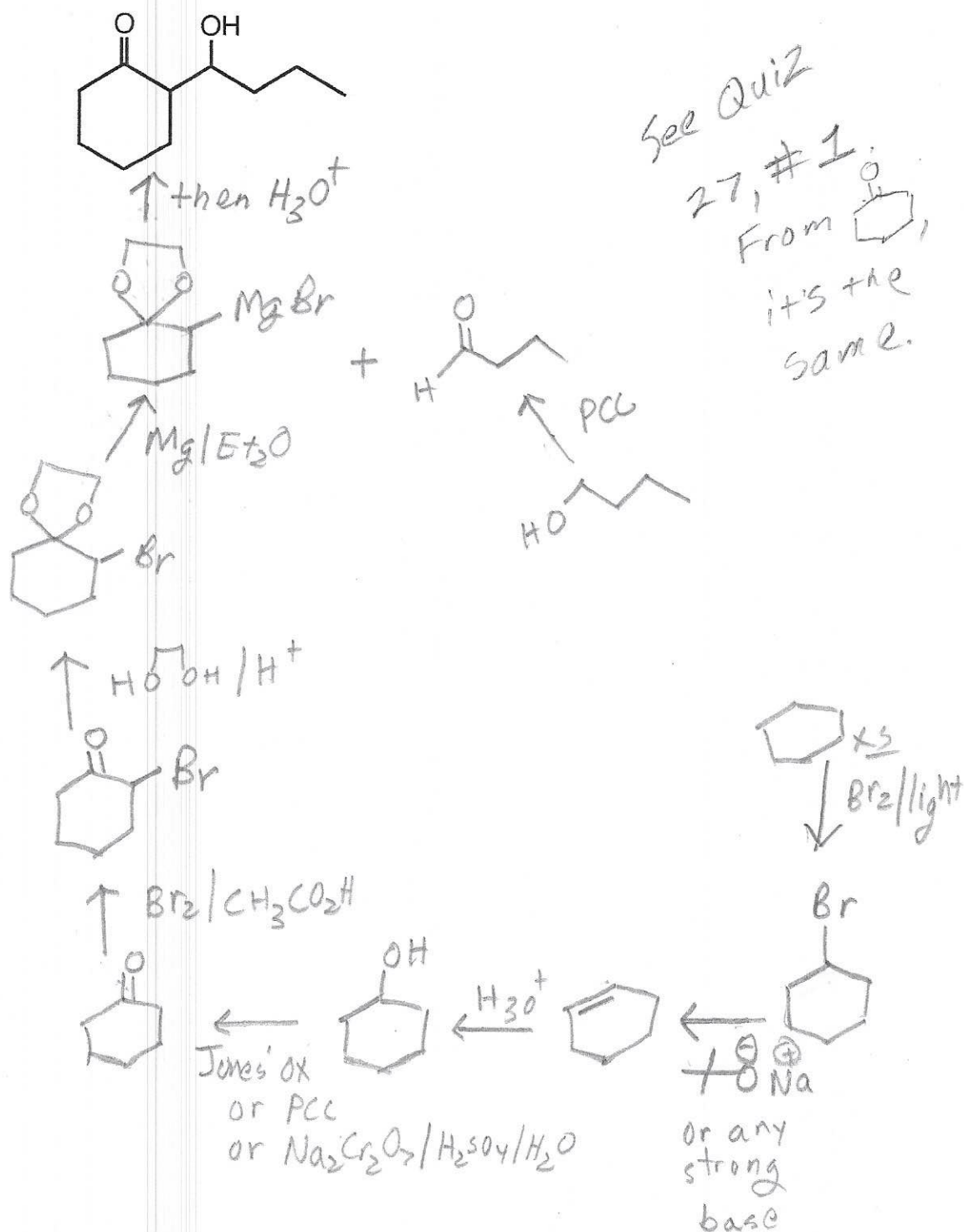
2pts per step

See the mechanism
on Alt Exam 3
on class webpage.
It's the same!



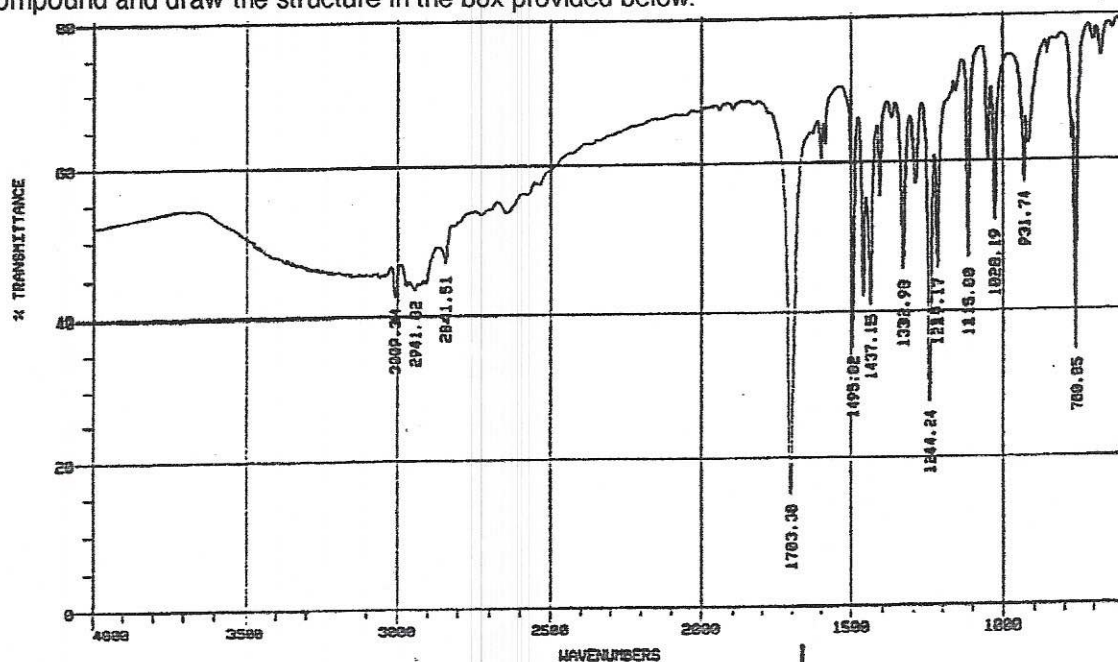
E. Synthesis: 11 Points

Synthesize the molecule below using any of the following reagents: cyclohexane, **alcohols of four carbons or less**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.



F. Spectroscopy: 10 Points

A compound with the formula $C_{10}H_{12}O_3$ exhibits the IR, 1H NMR, and ^{13}C NMR spectra shown below. Please identify this compound and draw the structure in the box provided below.



partial credit:

ortho or meta disubst. → 2pts

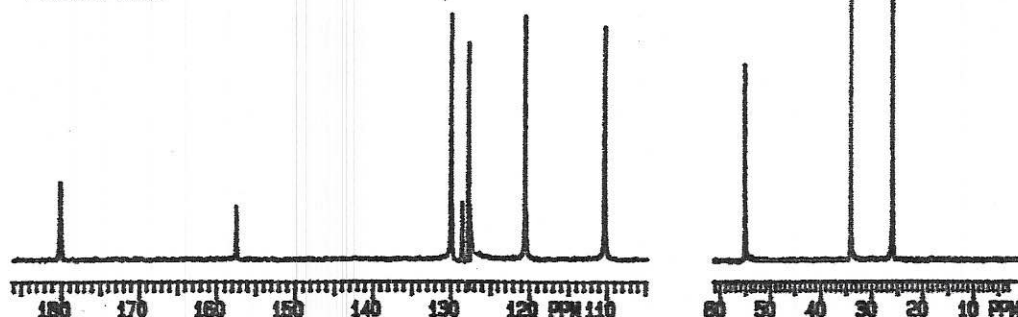
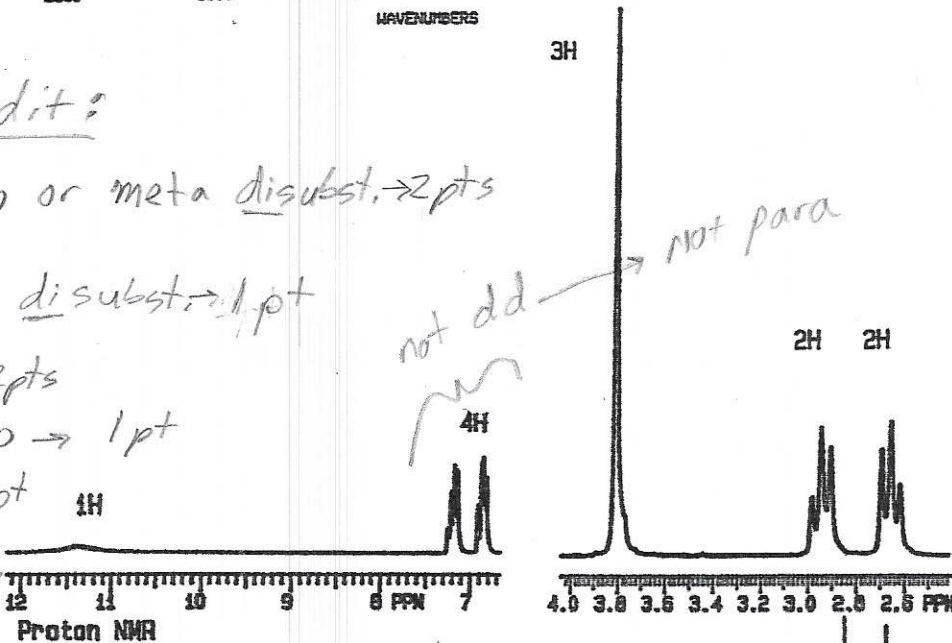
para disubst. → 1pt

CO_2H → 2pts

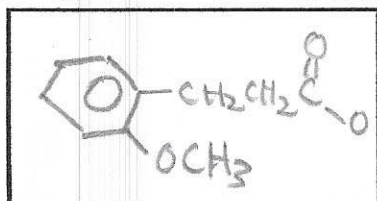
other $C=O$ → 1pt

OCH_3 → 1pt

CH_2 adj. to only
2H → 1pt
each



Carbon 13 NMR



correct groups
but para (-2)

