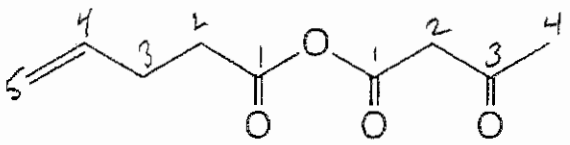
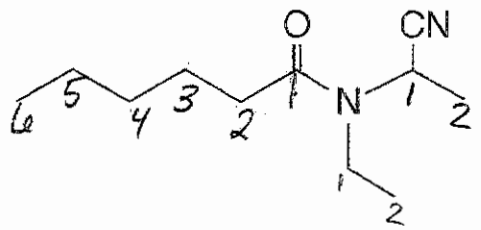
EXAM 3, Sp '05

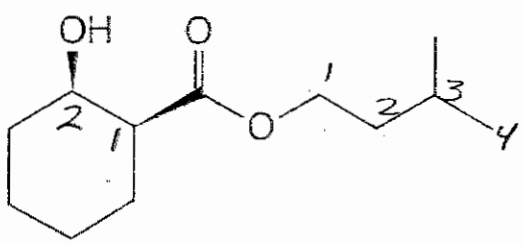
A. Nomenclature: (12 points)
Give an acceptable IUPAC name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

1. 

3-oxobutanoic 4-pentenoic anhydride

2. 

N-(1-cyanoethyl)-N-ethylhexanamide

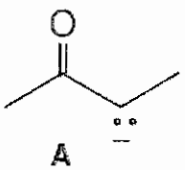
3. 

3-methylbutyl cis-2-hydroxycyclohexanecarboxylate

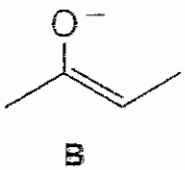
B. Facts: 20 points

2 pts / box

1. Place the letter of the more stable resonance contributor for the enolate anion in the box. (2 pts.)

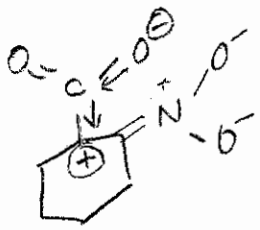


A

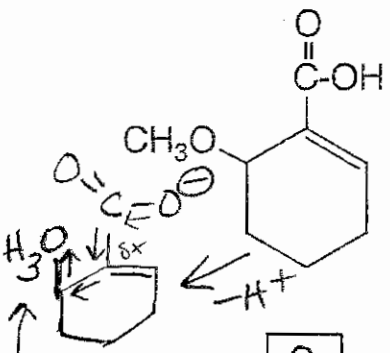


B

B

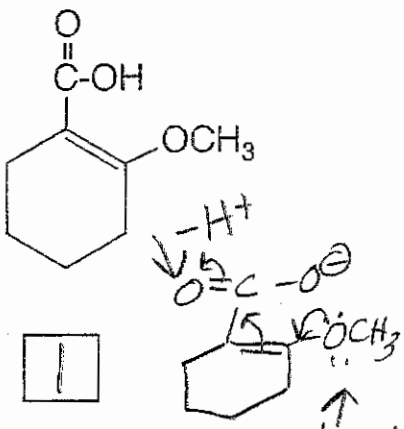


2. Rank the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (6 pts.)



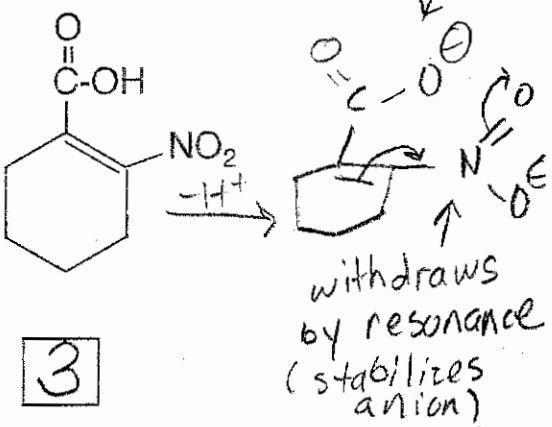
withdraws by induction (stabilizes anion)

2



donates by resonance (destabilizes anion)

1

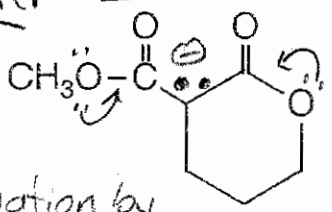


withdraws by resonance (stabilizes anion)

3

3. Rank the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (6 pts.)

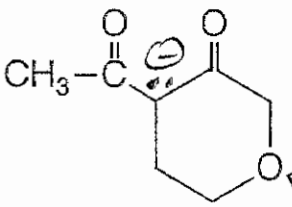
after deprotonation:



donation by 2 oxygens — much less delocalized

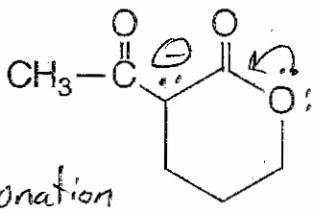
1

charge on carbon



NO donation possible, but inductive withdrawal increases delocalization of ⊖ charge

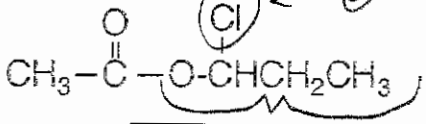
3



donation by 1 oxygen - less delocalized charge on carbon

2

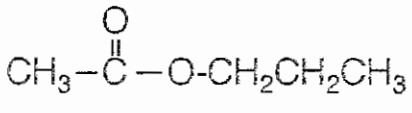
4. Rank the following compounds in order of increasing reactivity in H_3O^+. (1=least reactive, 3=most reactive) (6 pts.)



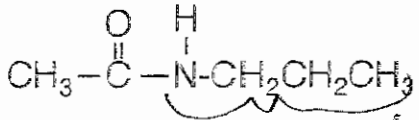
stabilizes ⊖ charge in L.G.

3

most stable L.G.



2

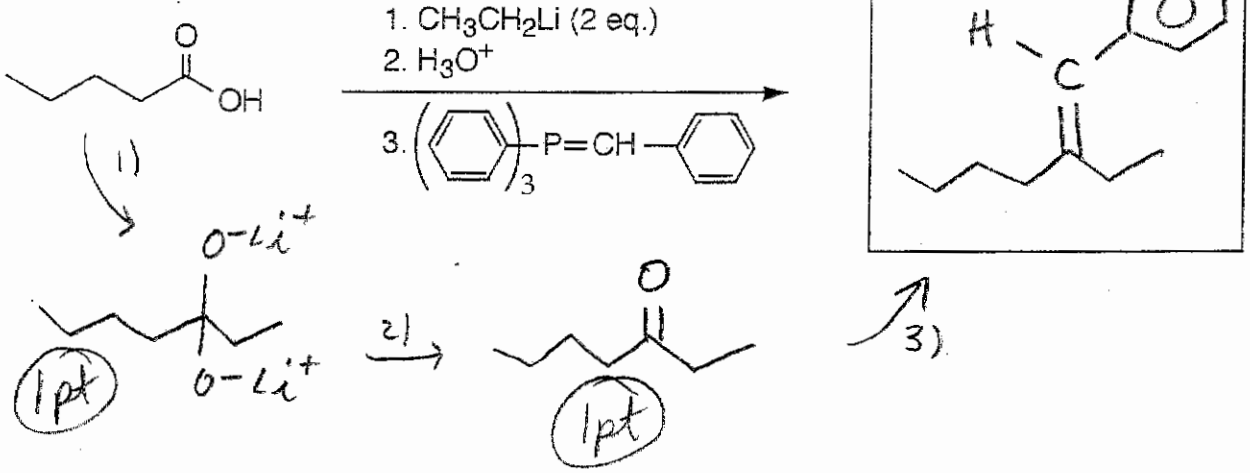


1

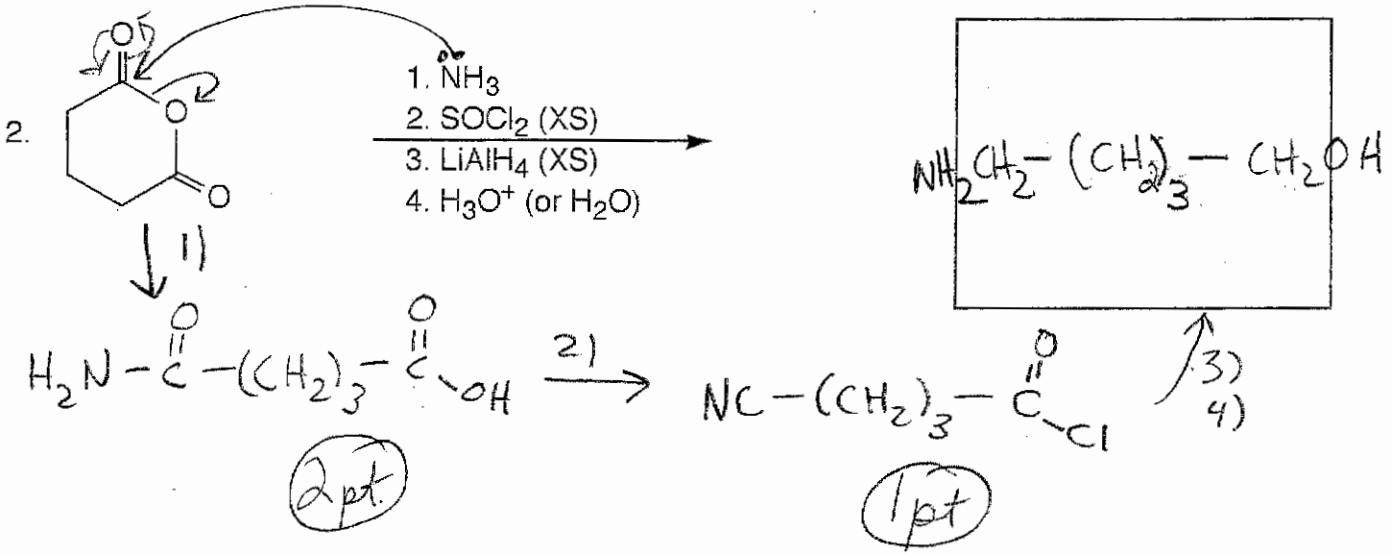
least stable L.G.

C. Reactions: Total = 30 points, 5 points each
Please provide the starting material, reagents or major product in the answer box. Be sure your drawing indicates **stereochemistry** if applicable. Partial credit is awarded only when intermediate products in a multi-step reaction are shown below the reaction.

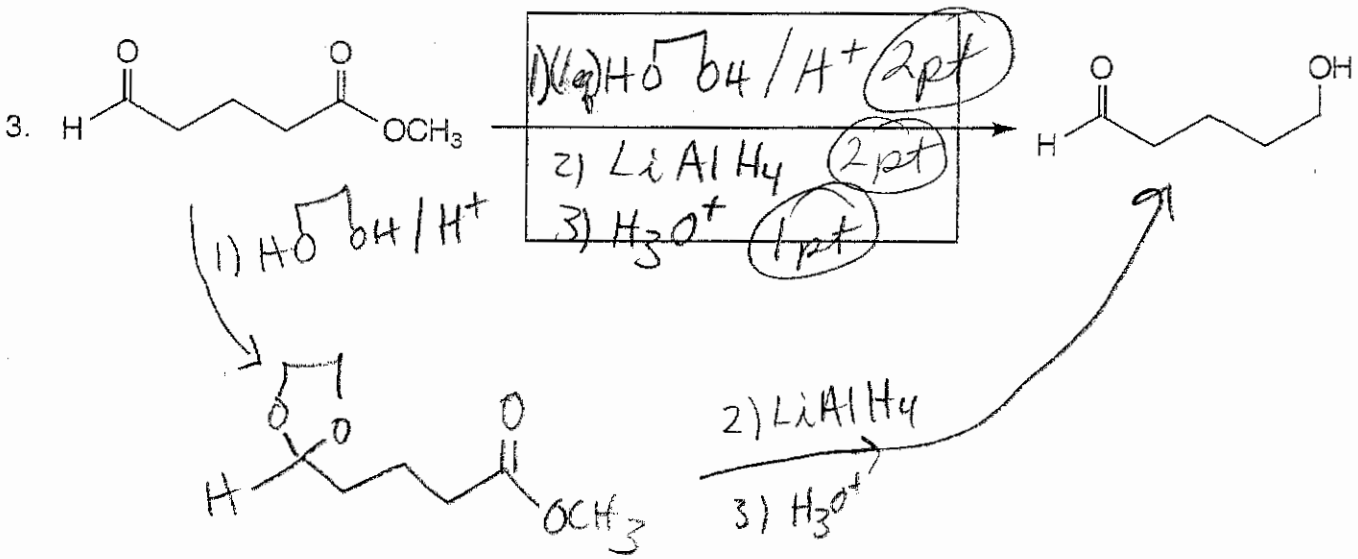
1.



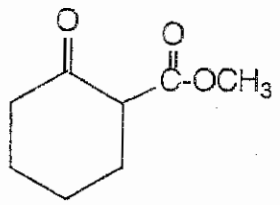
2.

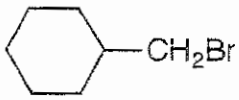


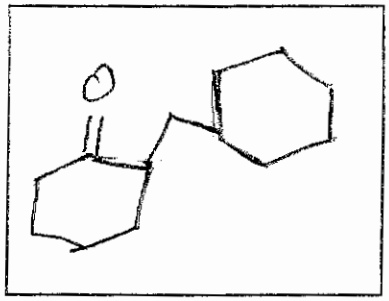
3.

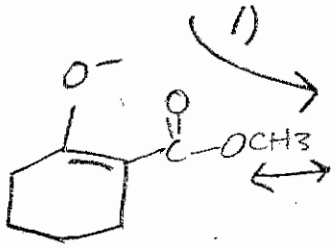


4.

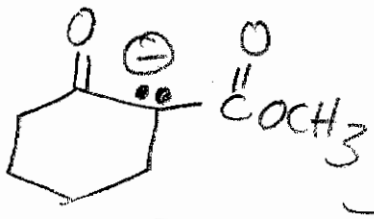


1. NaOEt/EtOH
2. 
3. H_3O^+ / HEAT



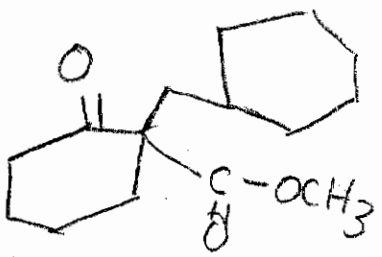


1)



1pt

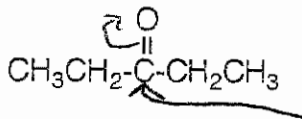
2)



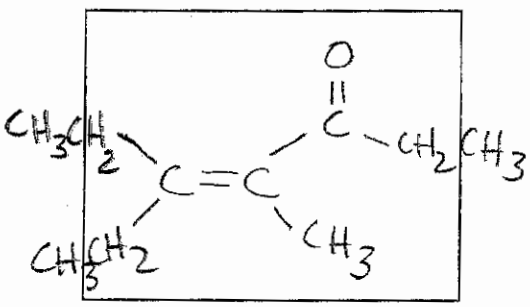
3)

2pt

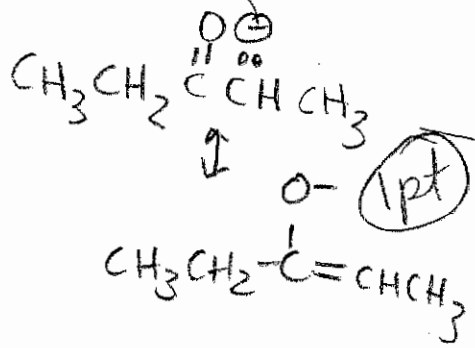
5.



1. NaOH
2. HEAT

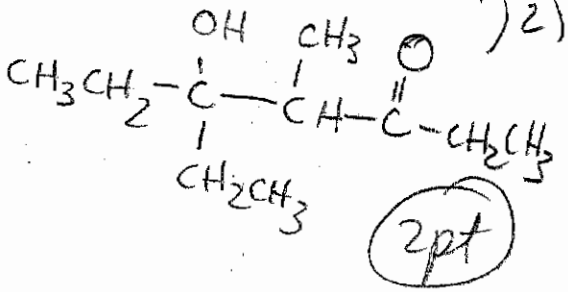


1)



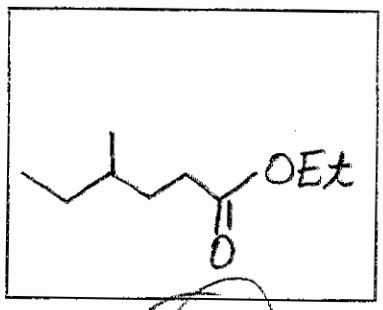
1pt

2)



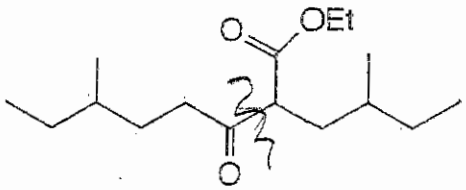
2pt

6.



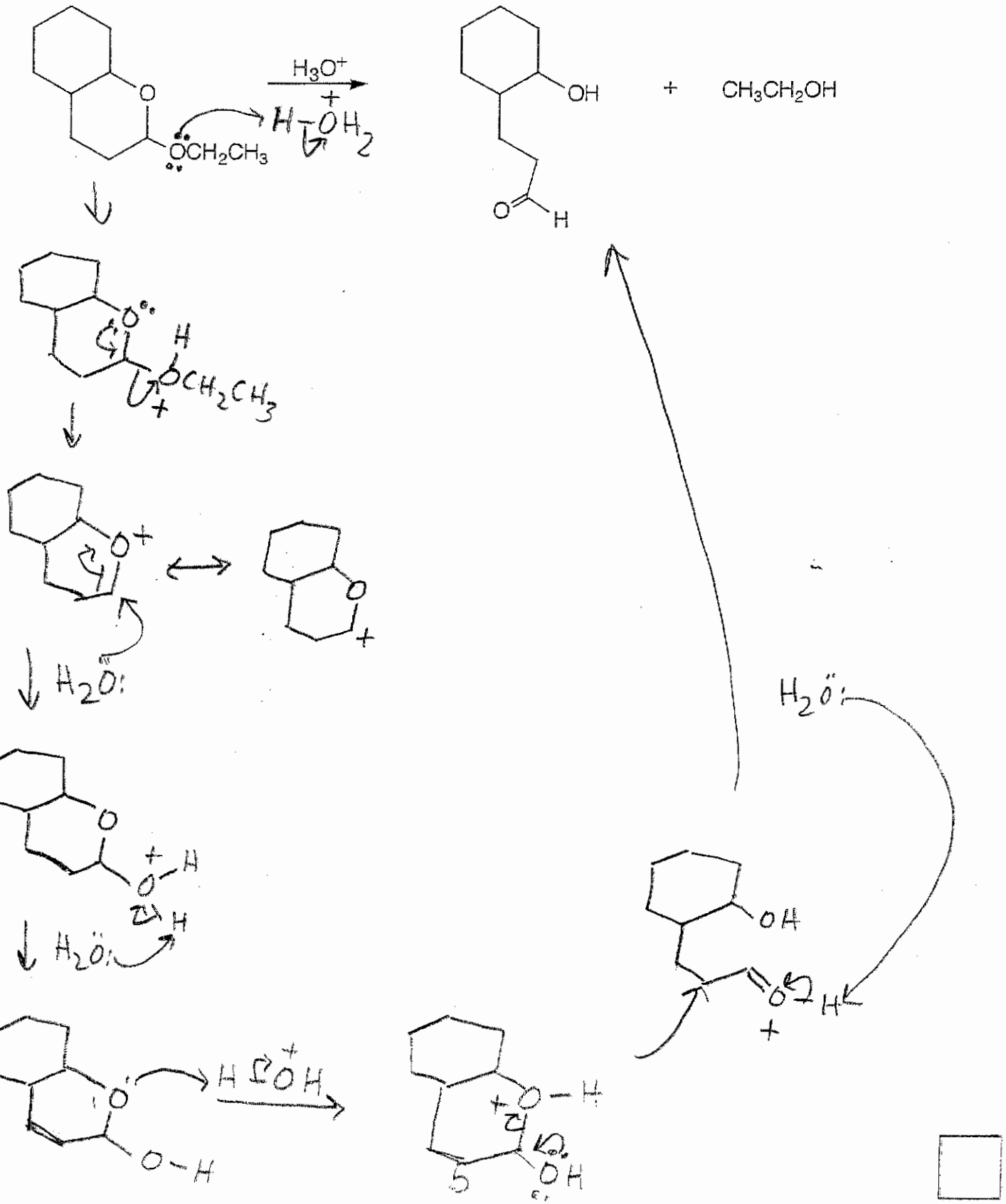
5pt

1. NaOEt/ EtOH
2. H_3O^+



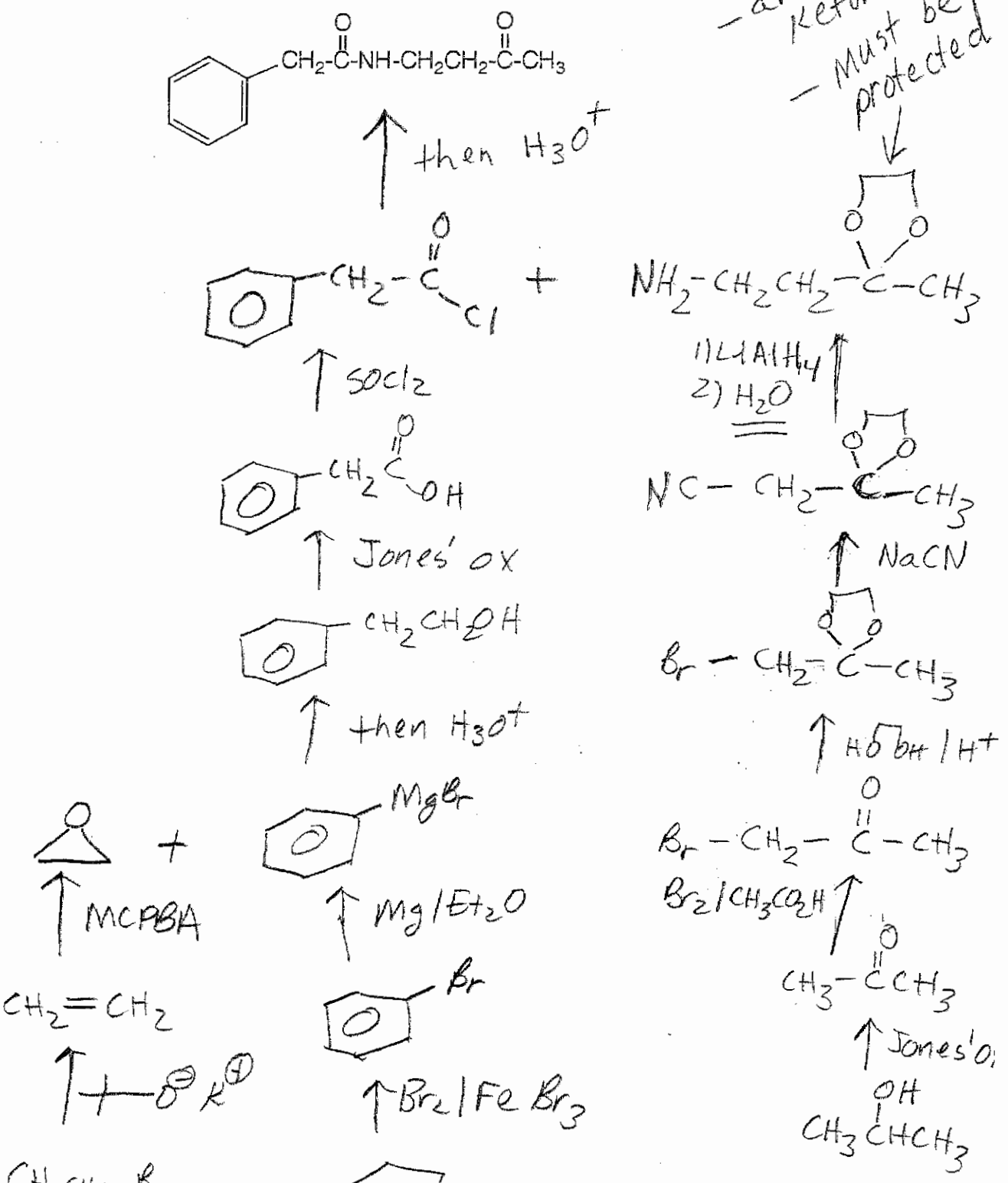
D. Mechanism: (13 points)

Provide a clear mechanism to explain the formation of the product. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges. When more than one resonance contributor may be drawn, be sure to draw the most stable contributor.**



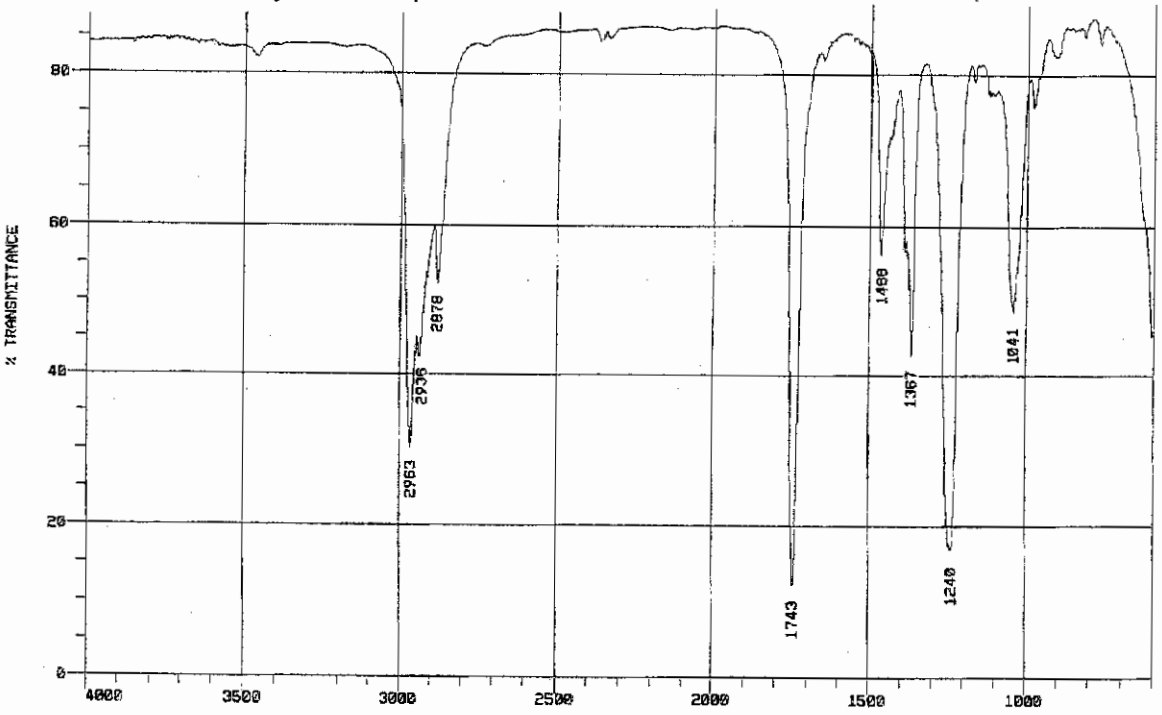
E. Synthesis: 13 Points

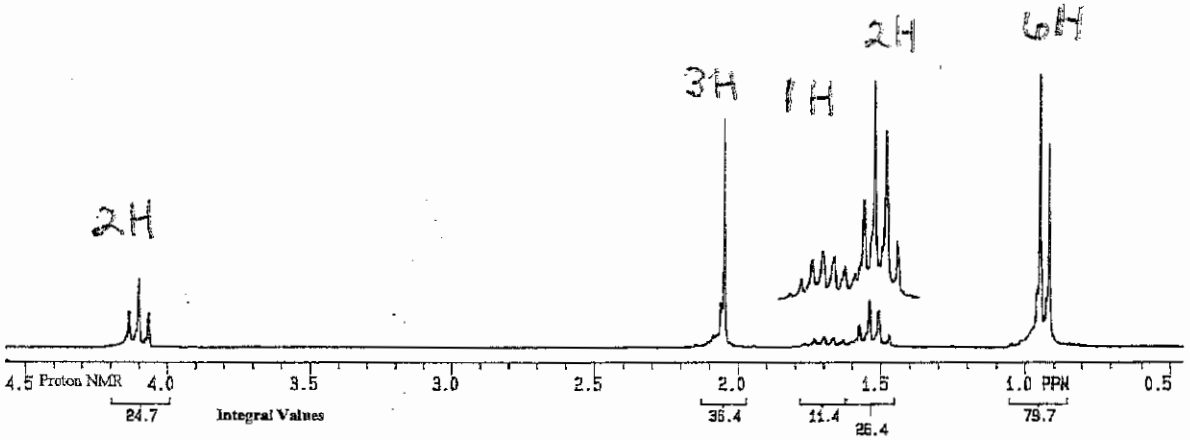
Synthesize the molecule below using any of the following reagents: benzene, alcohols of **three carbons or less**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.

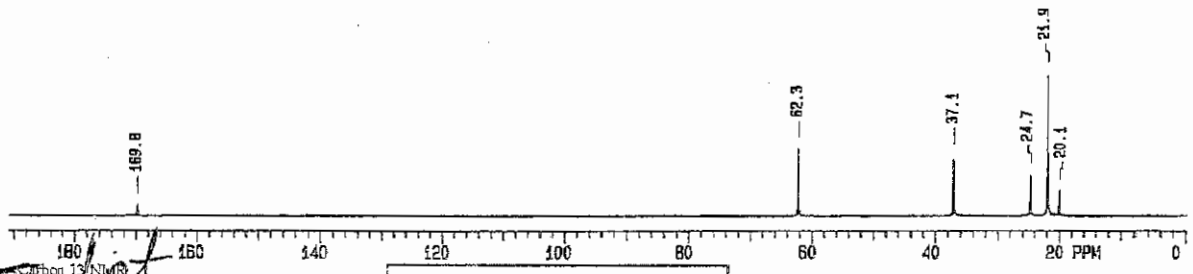


F. Spectroscopy: 12 Points

A compound with the formula $C_7H_{14}O_2$ 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.







C=O — 1pt

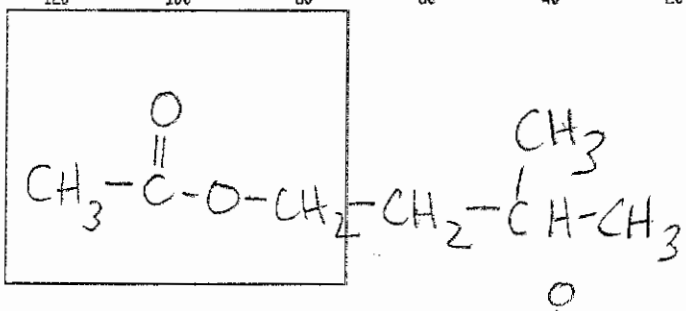
ester — 1pt

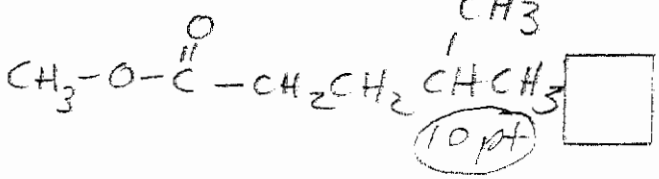
O-CH_2— 1pt

O-CH_2CH_2- 1pt

Isolated CH_3 — 1pt

[illegible] adj. to 1 H — 1pt each





(10 pt)