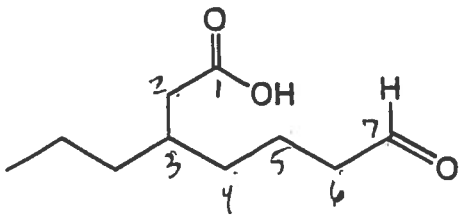
AH, Exam 3, Sp

A. Nomenclature: (16 points)
Give an acceptable IUPAC name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

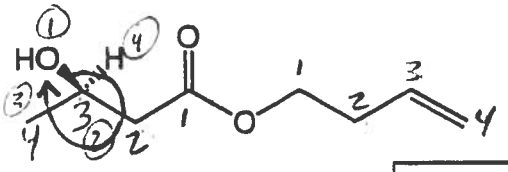
1.



7-oxo-3-propyl heptanoic acid

1 1 2

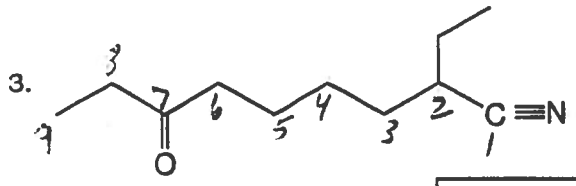
2.



3-butenyl (R)-3-hydroxy butanoate

1 1 1 1

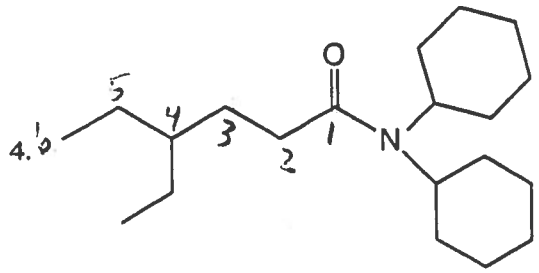
3.



2-ethyl-7-oxononanenitrile

1 1 1 1

4.



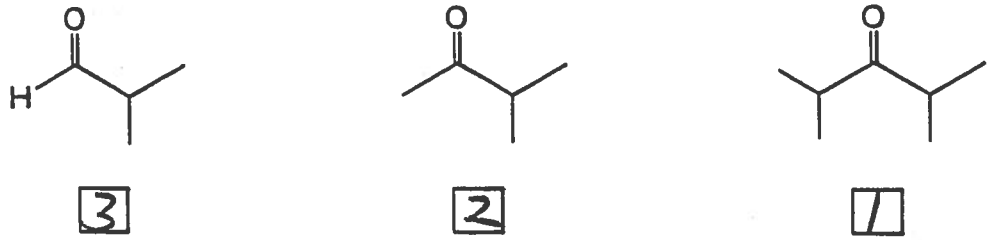
N,N-dicyclohexyl-4-ethylhexanamide

1 1 2

1pt / box

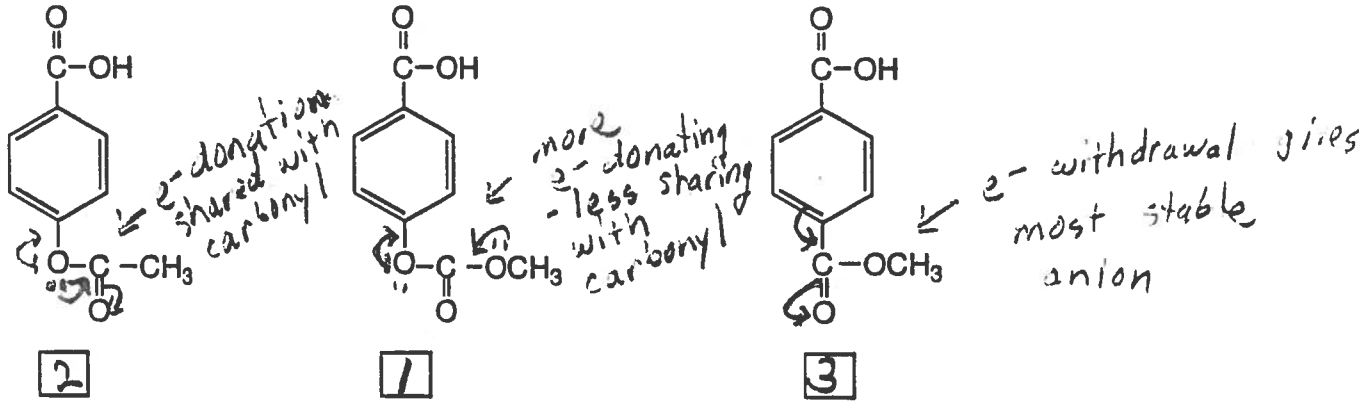
B. Facts: 12 points (3 points each)

1. Rank the following compounds in order of increasing rate of reactivity with ethanol. (1 = slowest rate, 3 = fastest rate)



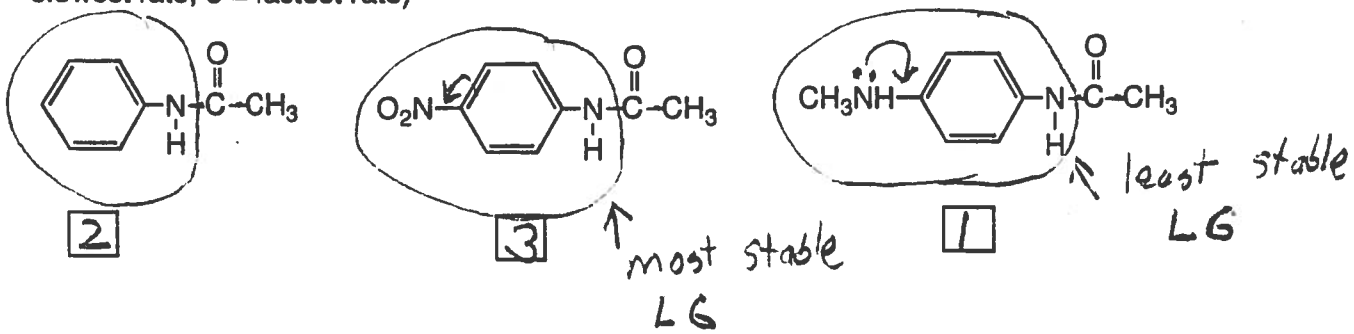
[3] [2] [1]

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



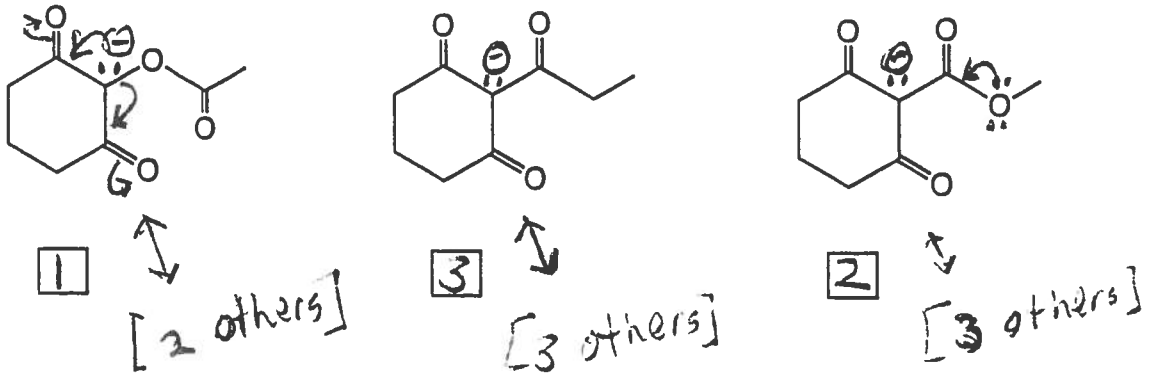
[2] [1] [3]

3. 1. Rank the following compounds in order of increasing rate of nucleophilic acyl substitution. (1 = slowest rate, 3 = fastest rate)



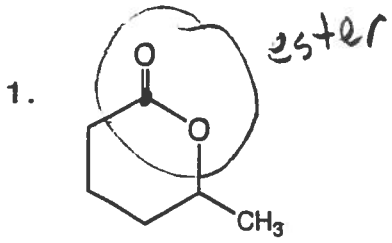
[2] [3] [1]

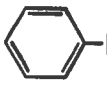
4. Rank the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic)

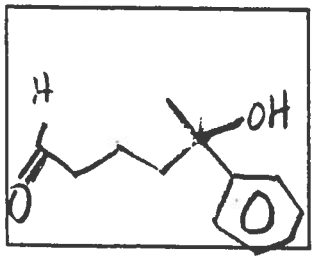


[1] [2 others] [3] [3 others] [2] [3 others]

C. Reactions: Total = 36 points, 6 points each
Please provide the 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.

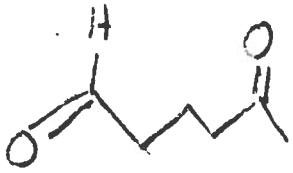
1. 

1. $LiAlH_4$ then H_3O^+
2. PCC / CH_2Cl_2
3. $HOCH_2CH_2OH$ / H^+
4.  MgBr then H_3O^+

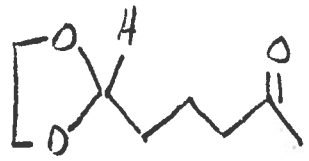


4

1)



2)

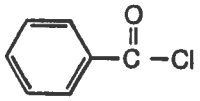


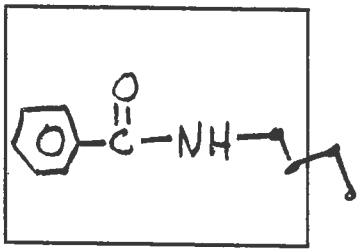
3)

2pts 1pt 2pts

2. 

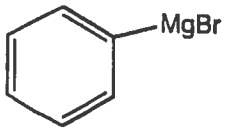
1)

1. $LiAlH_4$ then H_3O^+
2. 

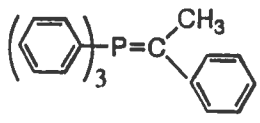


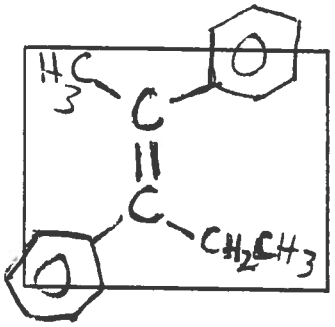
2)

3pts

3. 

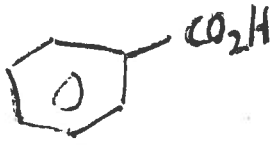
1)

1. CO_2 then H_3O^+
2. $SOCl_2$
3. $(CH_3CH_2)_2CuLi$
4. 

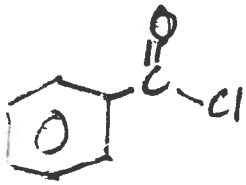


-1 incorrect stereo

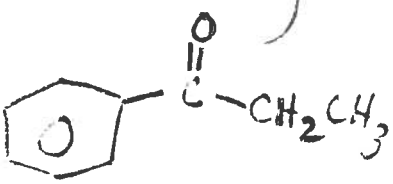
4



2)

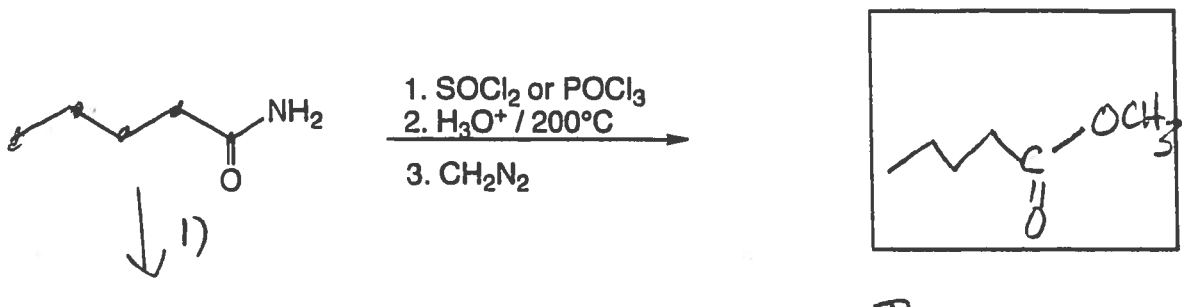


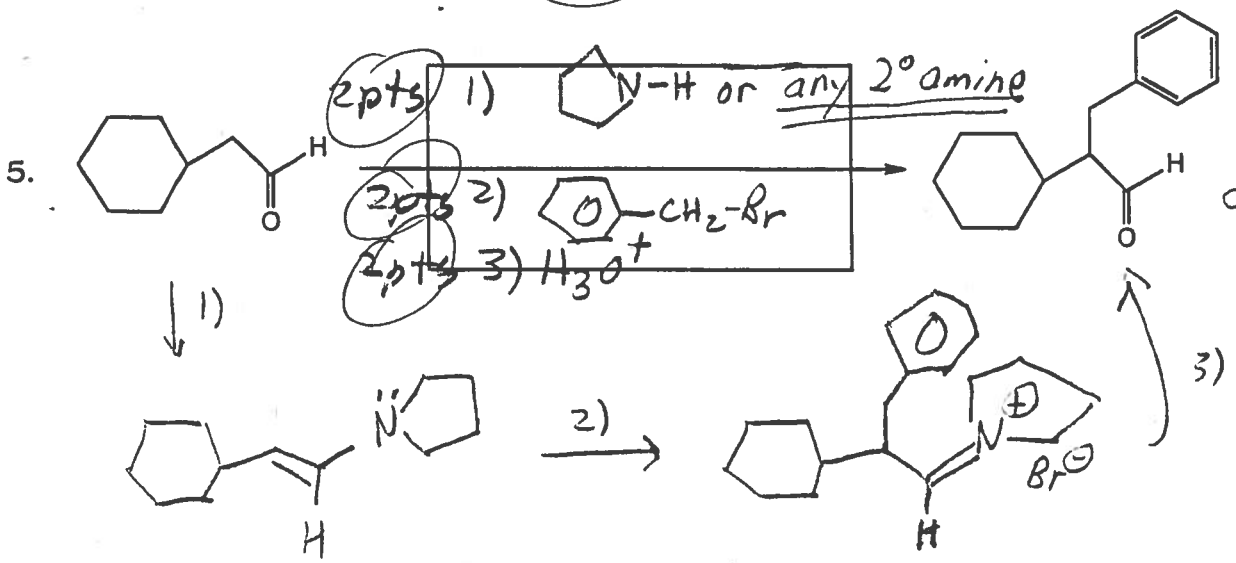
3)



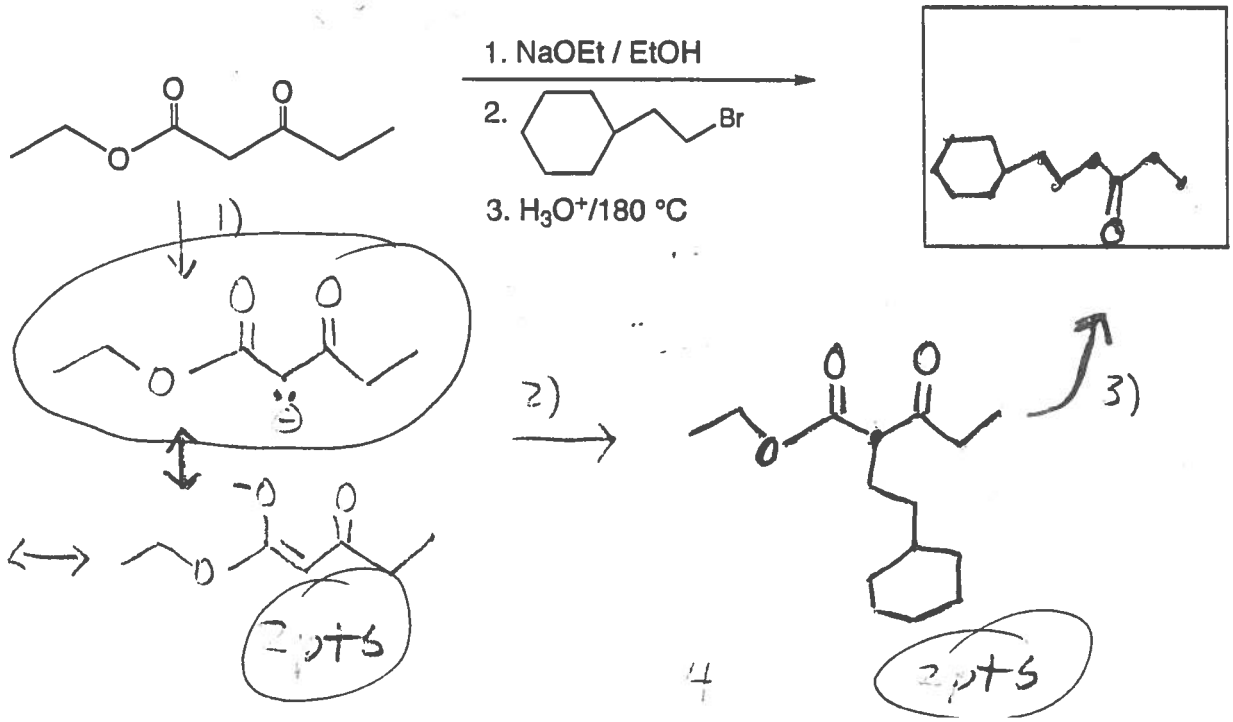
2pts 1pt 1pt

1 pt ea

4. 

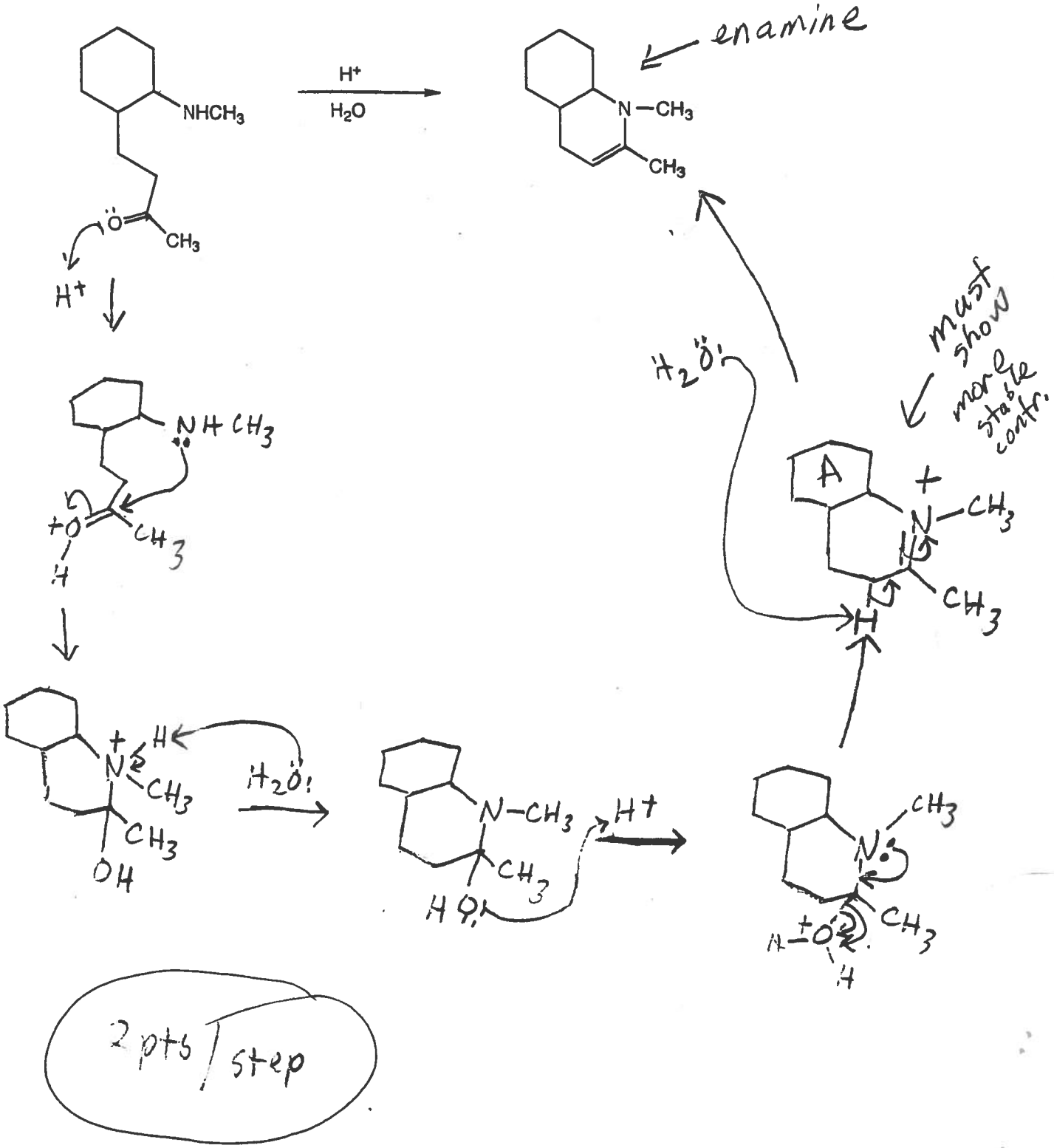
5. 

α-alkylation of aldehyde

6. 

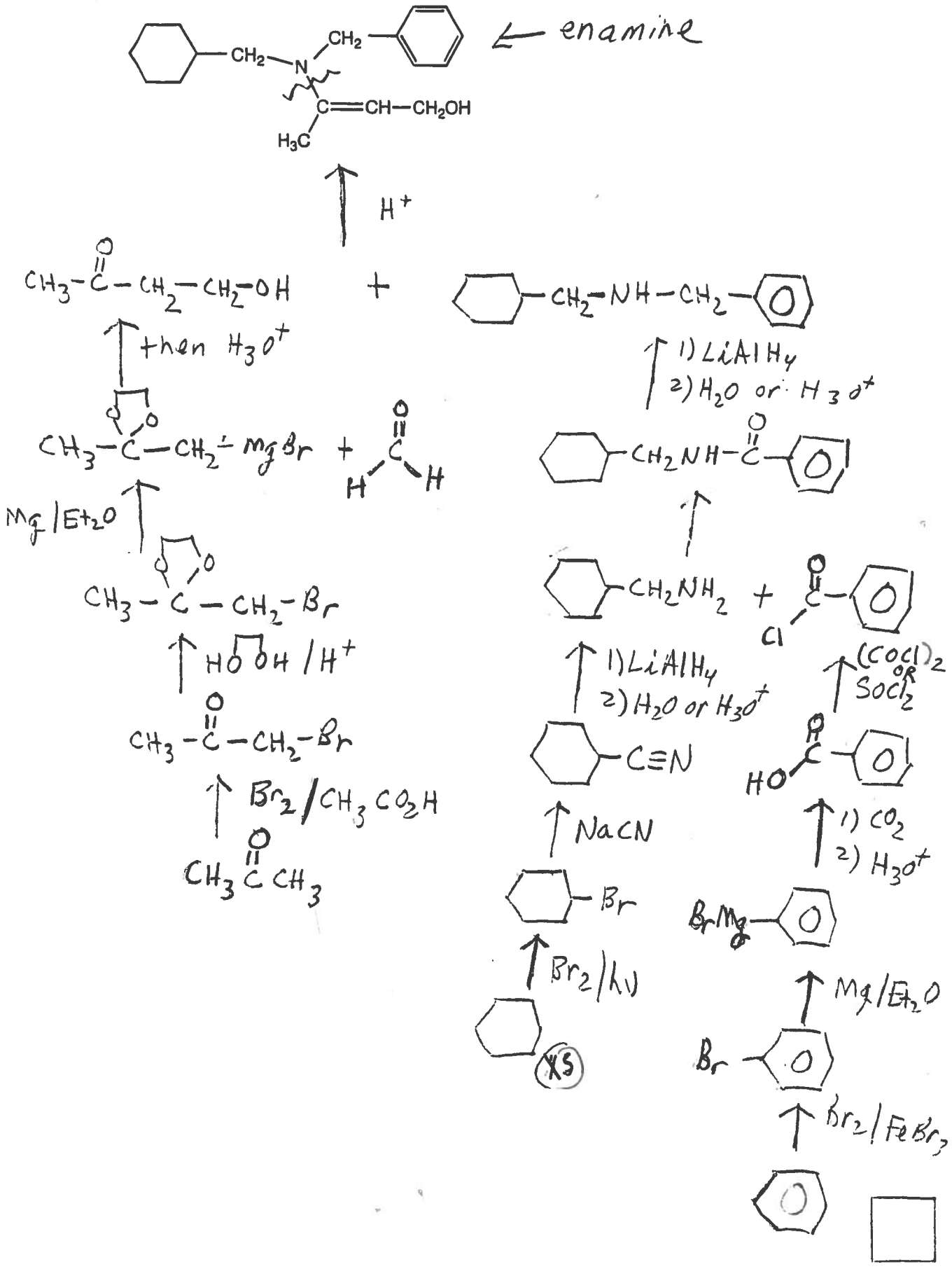
Was this a synthesis hint?

D. Mechanism: (12 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.**



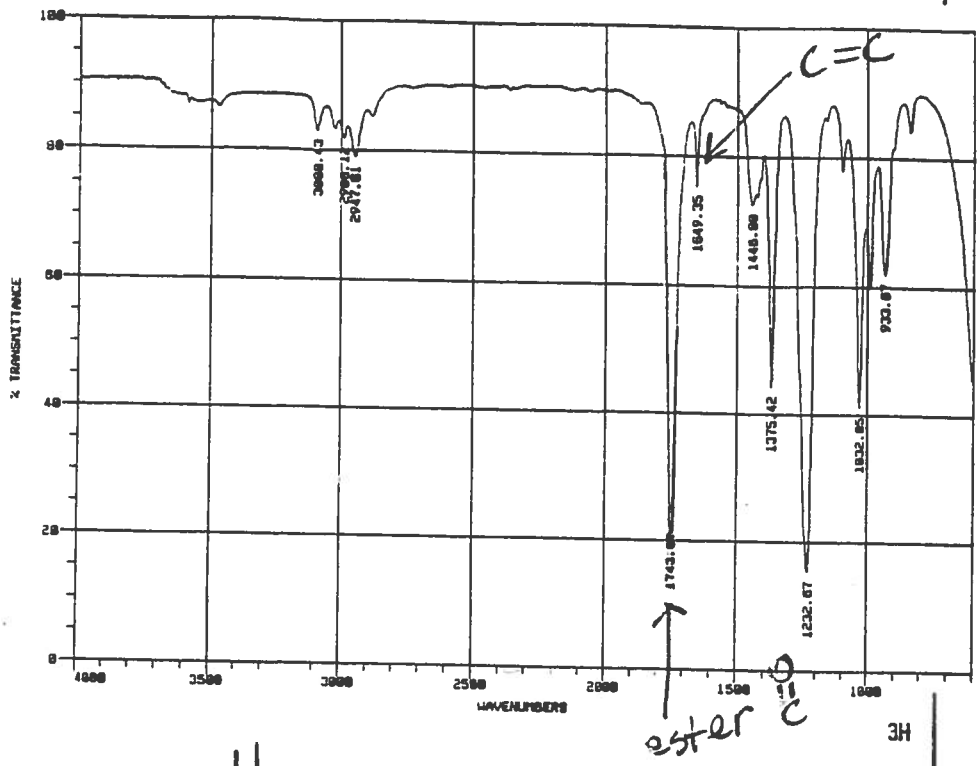
E. Synthesis: 12 Points

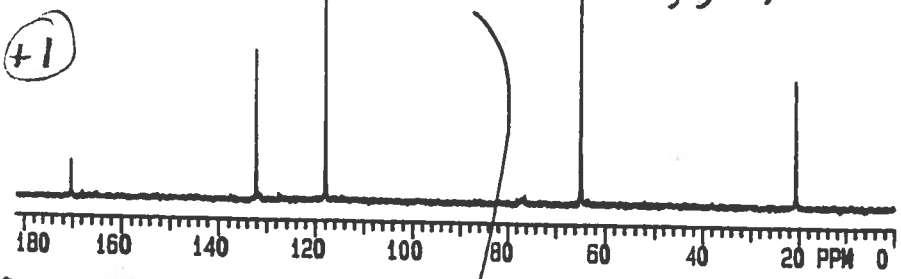
Synthesize the molecule below using any of the following reagents: any aldehydes or ketones of **three carbons** or less, benzene, cyclohexane, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.



F. Spectroscopy: 12 Points

A compound with the formula $C_5H_8O_2$ 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.





any other C - (+1)

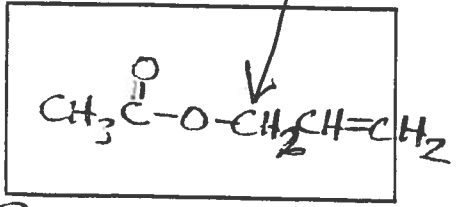
ester - (+2)

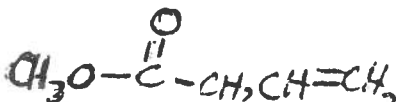
alkene - (+1)

CH_3 adj. to zero → (+1)

CH_2 adj. to 1H → (+1)

CH adj. to multiple → (+1)





10 pts