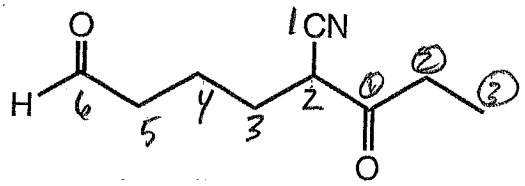
EXAM 3, Sp24

A. Nomenclature: (15 points)
Give an acceptable name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

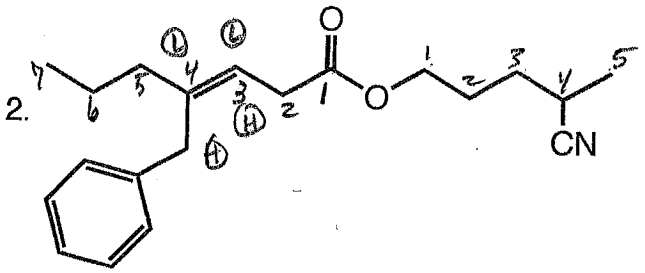
1.



6-oxo-2-(1-oxopropyl)-hexanenitrile

2 1 2

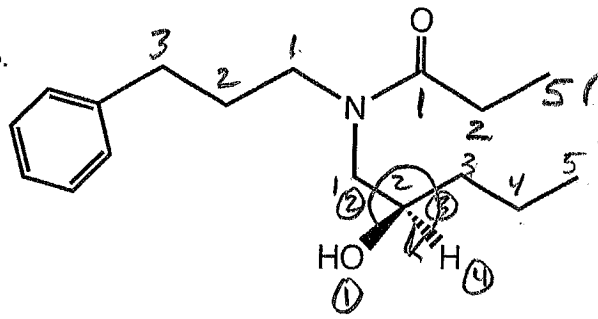
2.



4-cyanopentyl (Z)-4-benzyl-3-heptenoate

1 1 1 2

3.

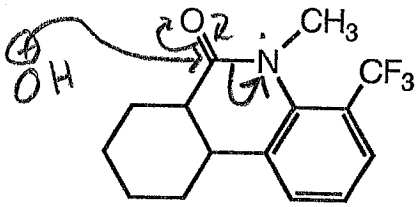


(R)-N-(2-hydroxypentyl)-N-(3-phenylpropyl)propanamide

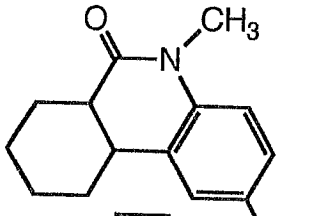
1 1 1 2

B. Facts: Total points = 15

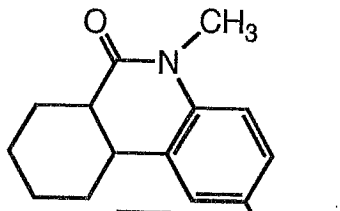
1. Place the compounds in order of increasing reactivity with NaOH/Heat. (1=least reactive, 3=most) (3 pts.)



2



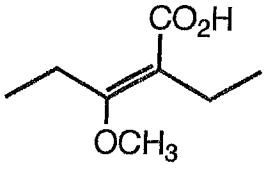
3



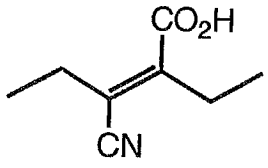
1

Stability of LG

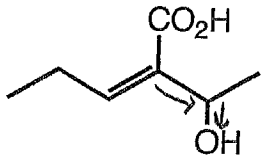
2. Place the compounds in order of increasing acidity. (1=least acidic 3=most) (3 pts)



1

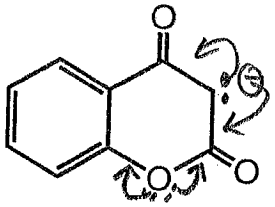


3



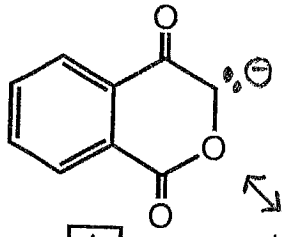
2

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



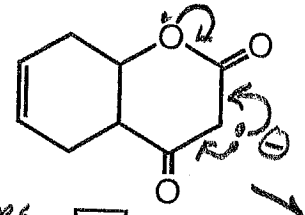
3

2 other res. contr.



1

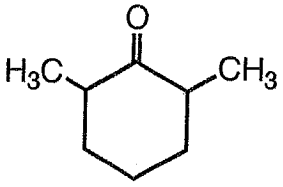
1 other res. contributor



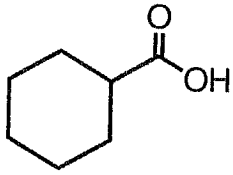
2

2 other res contributors

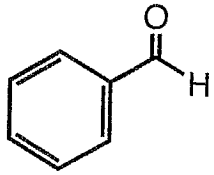
4. If a compound below will undergo keto-enol tautomeriztion in H_3O^+, place **Y** in the box. If it will not, place **N** in the box. (3 pts.)



Y

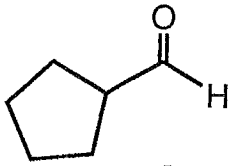


N

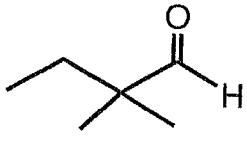


N

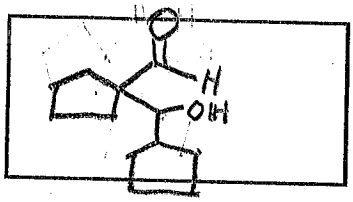
5. Draw a side product in the aldol condensation of compounds **A** and **B**. (3 pts)



A



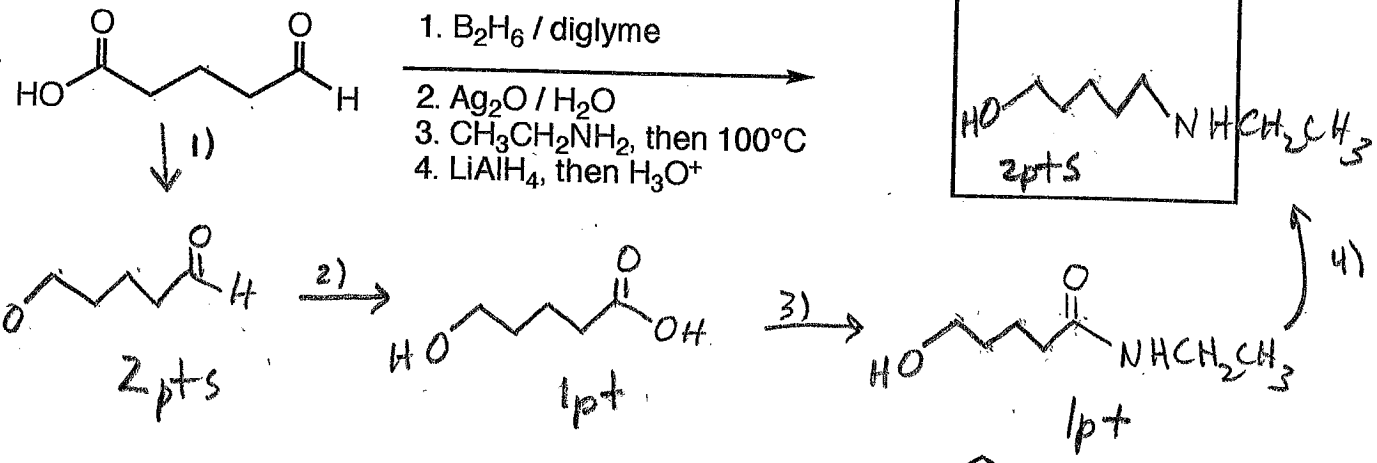
B



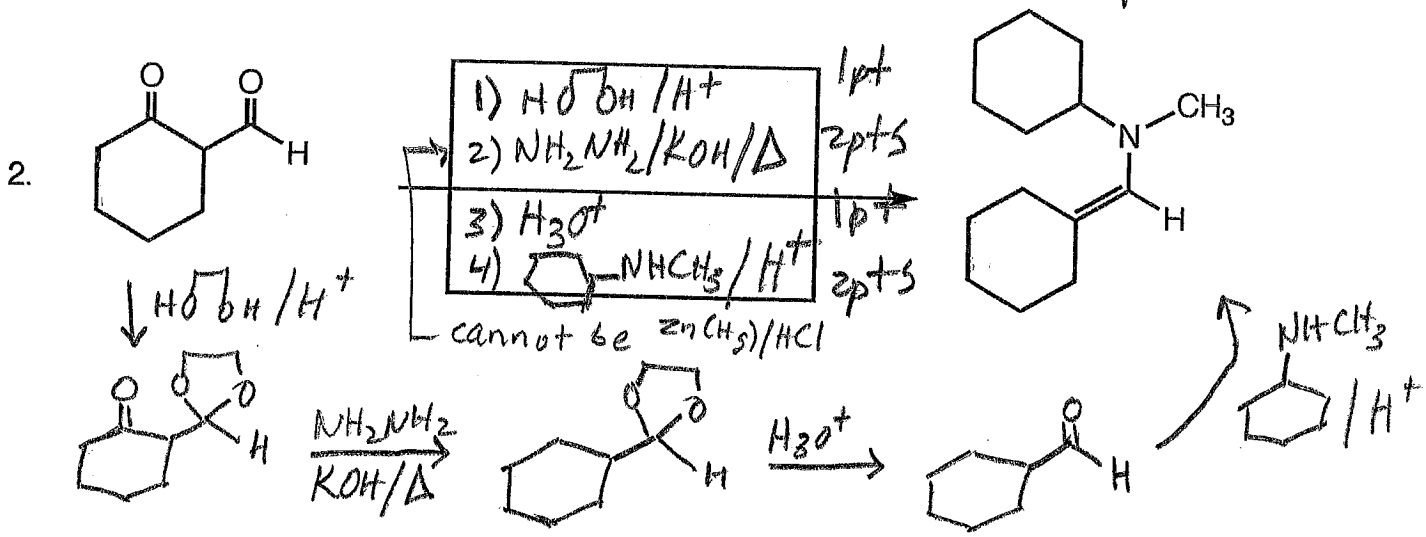
No partial credit

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.**

1.

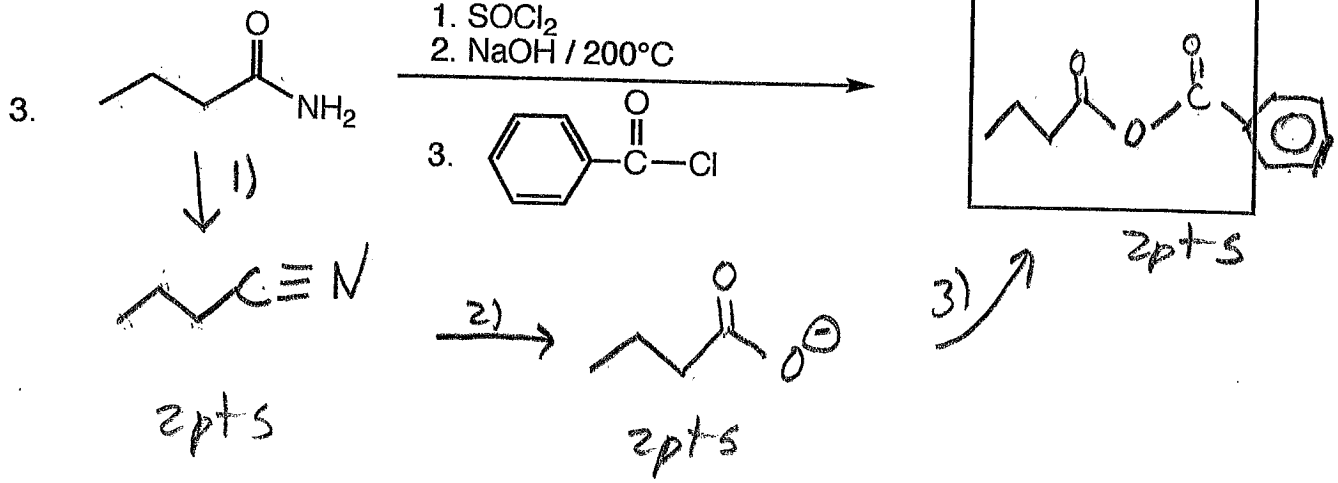


2.



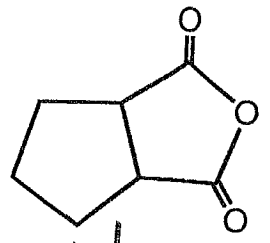
*must show product of each step. or -2

3.

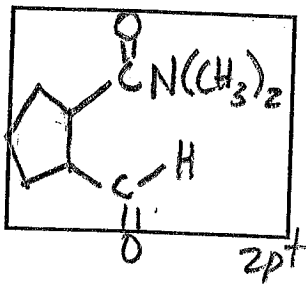


*see Ch. 21 notes → the "ester wheel"

4.

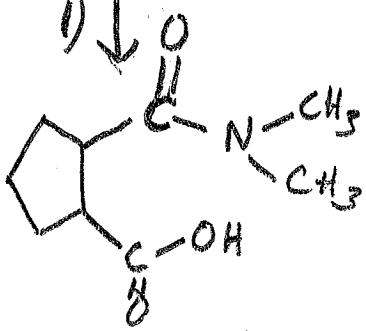


1. $(CH_3)_2NH$
2. CH_3CH_2OH (XS) /H^+
3. DIBAH (or DIBAl-H) /-78°C, then H_2O



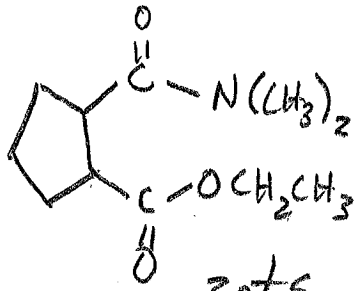
2pts

1)



2pts

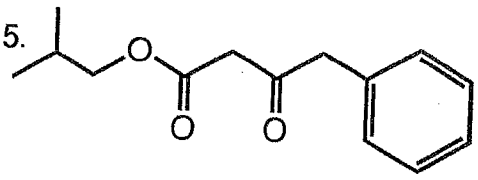
2)

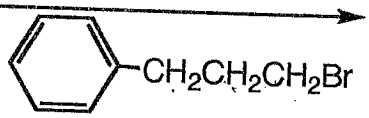


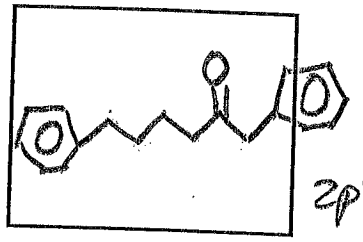
2pts

3)

5.

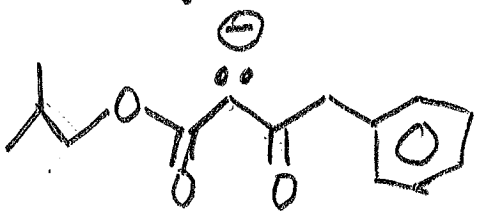


1. NaOEt/EtOH
2. 
3. H_3O^+ / 180°C



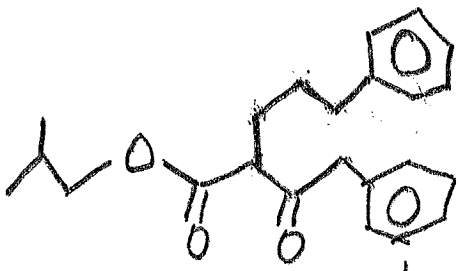
2pts

1)



2pts

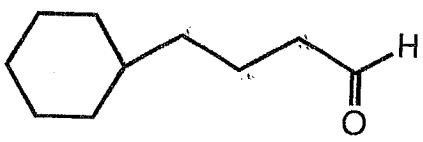
2)



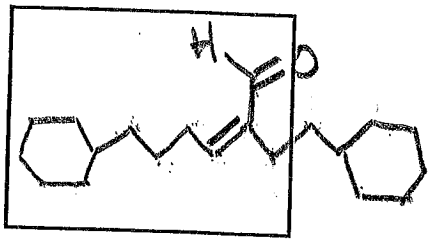
2pts

3)

6.

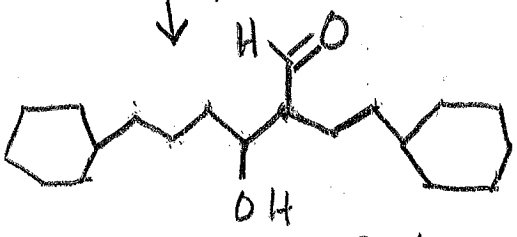


1. NaOEt/EtOH
2. Heat



3pts

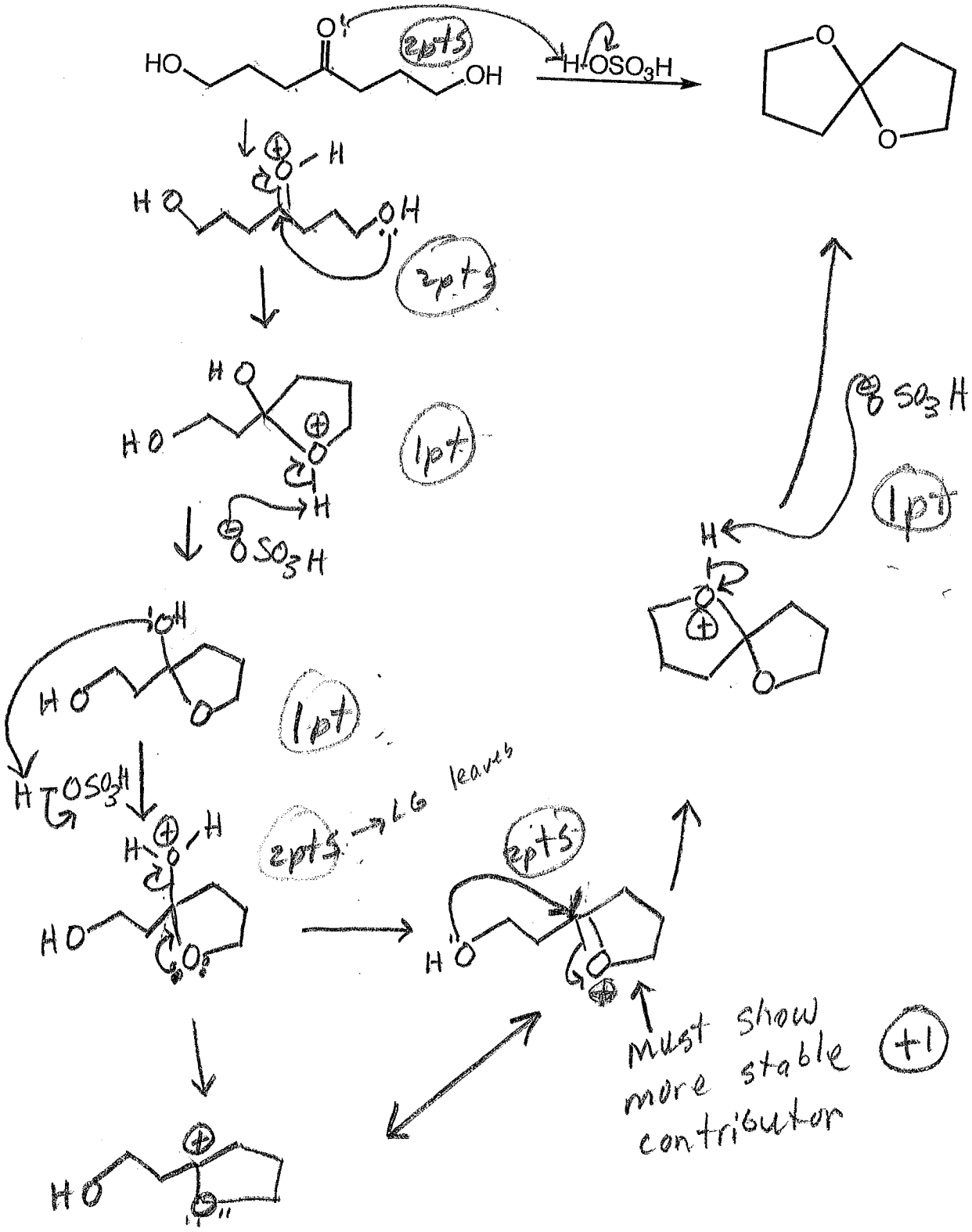
1)



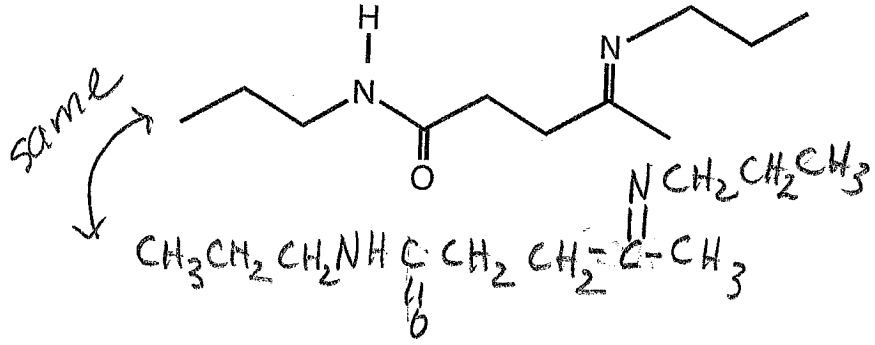
3pts

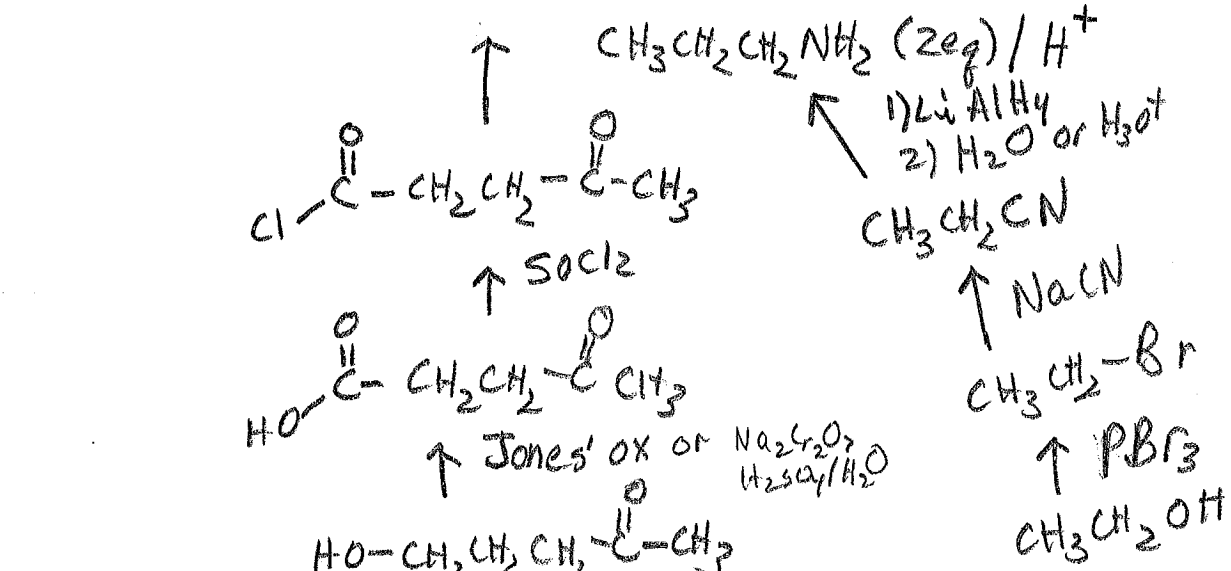
2)

D. Mechanism: (12 points)
Provide a clear mechanism to explain the formation of the product 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.

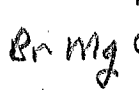


E. Synthesis: 12 Points
Synthesize the molecule below using any of the following reagents: **alcohols or alkenes of three carbons or less**, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.





extra penalties:

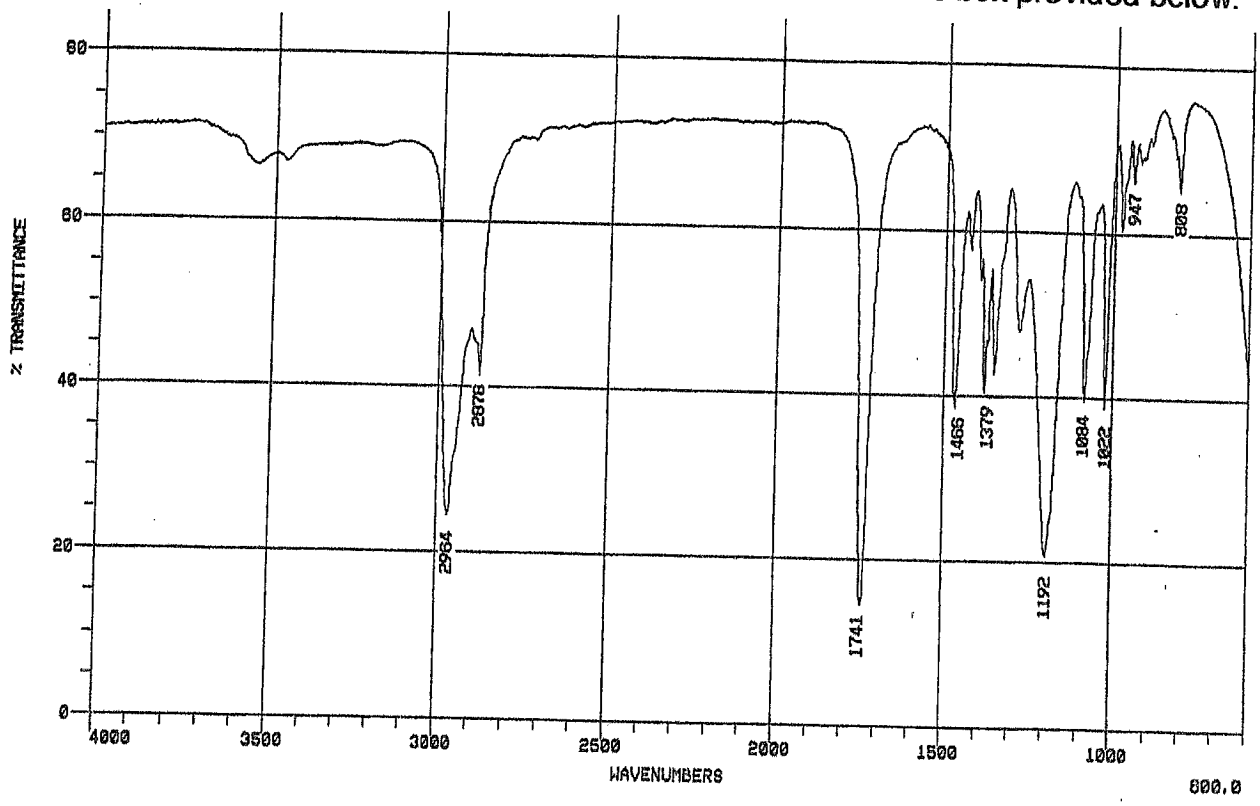


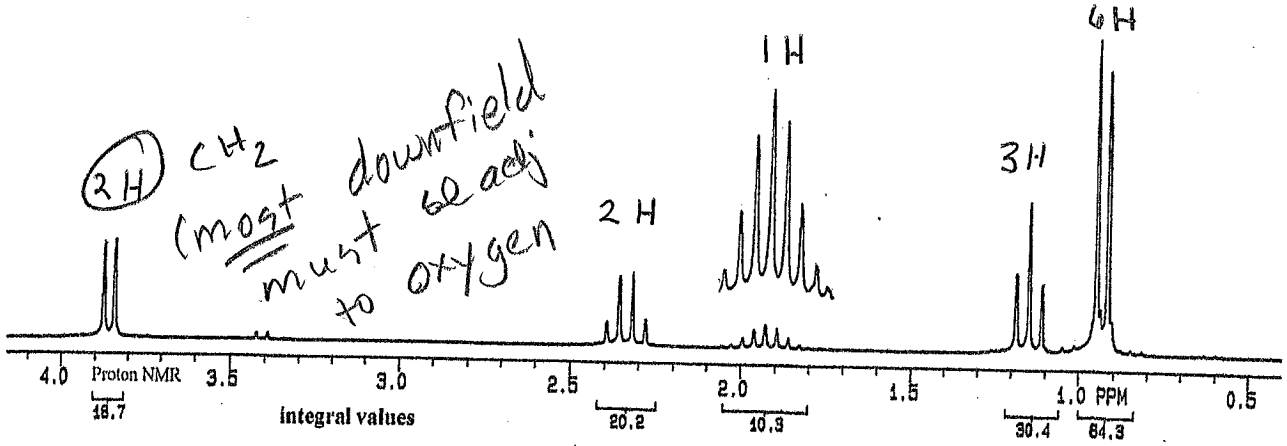
(-3)

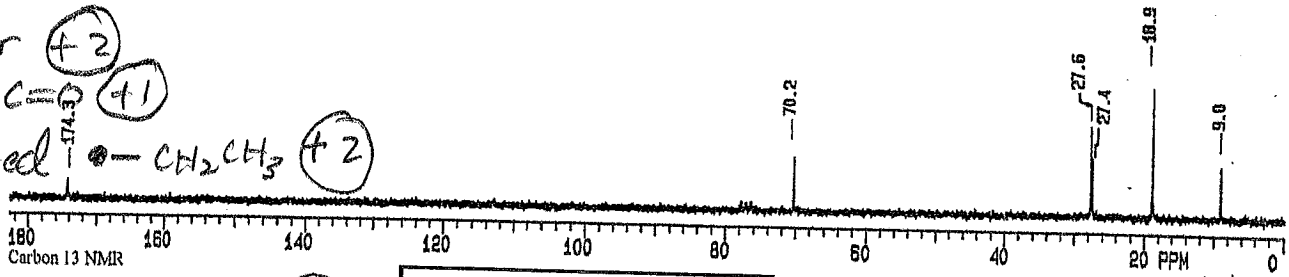
any RMgX with -OH or NH (-2)

F. Spectroscopy: 10 Points

A compound with the formula $C_7H_{14}O_2$ exhibits the IR, ^1H NMR, and proton decoupled ^{13}C spectra shown below. Please identify this compound and draw the structure in the box provided below.







CH_2 adj. to only 1 H (+1)

2 identical CH_3's adj. to only 1 H (+2)

CH adj to 2 diff sets of H → (+1)

$CH_3CH_2CO\text{-}CH_2CH(CH_3)_2$

$CH_3CH_2\text{-}O\text{-}C(=O)\text{-}CH_2CH(CH_3)_2$

−2