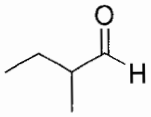
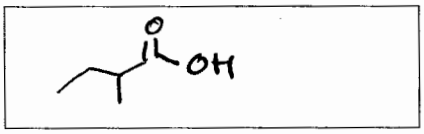
Show the reaction products or starting material in the large rectangles.
(10 pts)

1)



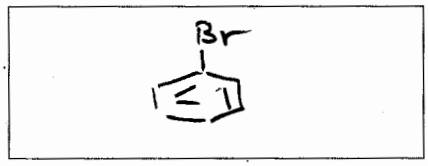
$Na_2Cr_2O_7$, H_2O, H_2SO_4



2

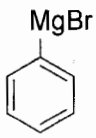
2)

Br_2, $FeBr_3$
(from CEM 351)



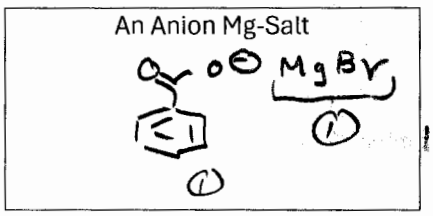
2

3)



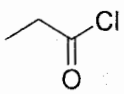
CO_2

An Anion Mg-Salt



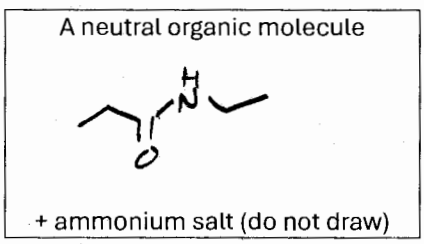
2

4)



NH_2

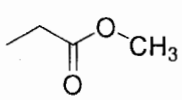
A neutral organic molecule



+ ammonium salt (do not draw)

2

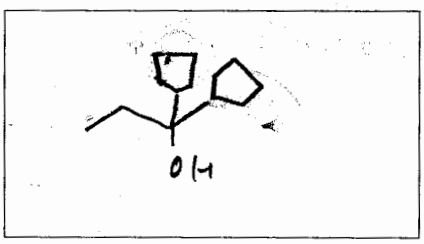
5)



MgBr

1) 2 equiv

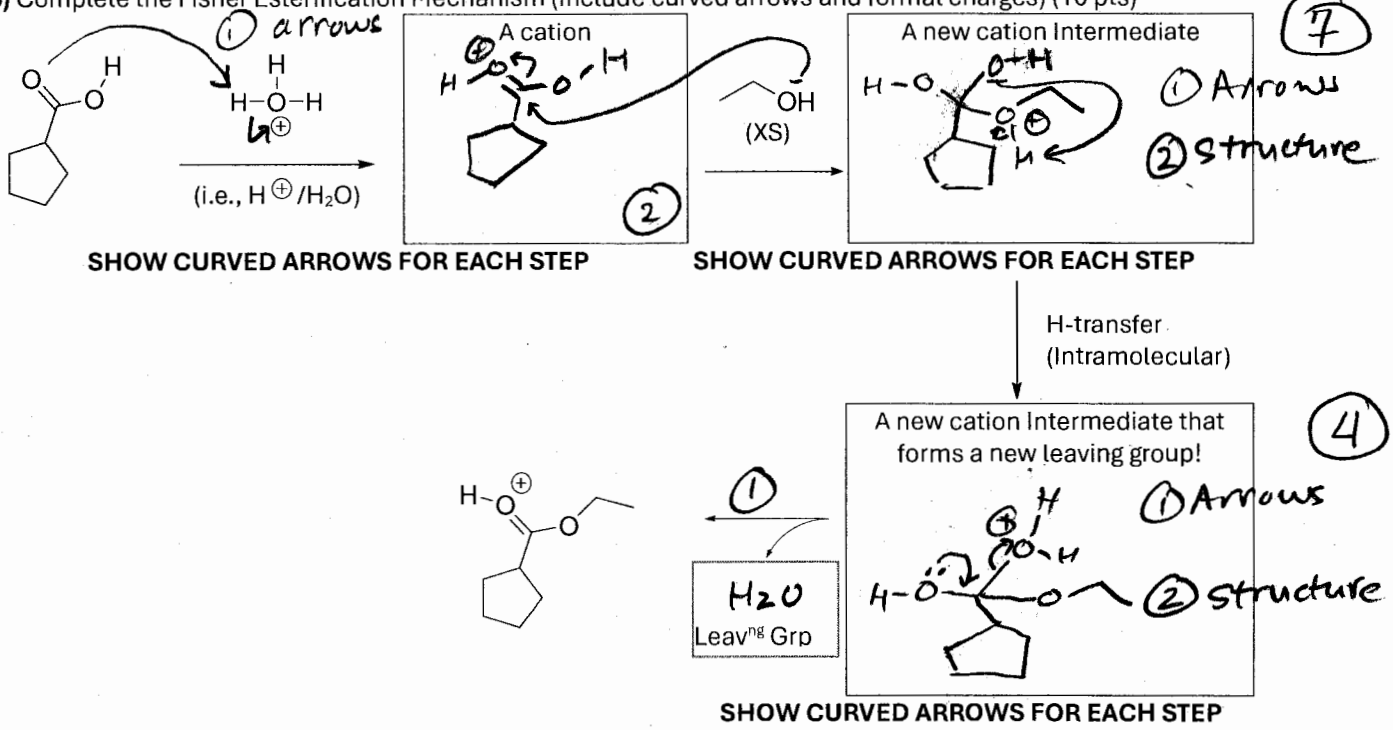
2) $H_3O^{\oplus}$ neutralizer



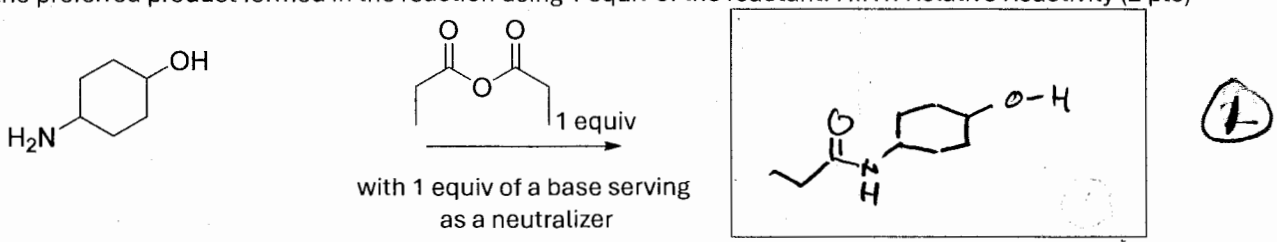
2

10

6) Complete the Fisher Esterification Mechanism (Include curved arrows and formal charges) (10 pts)



7) Draw the preferred product formed in the reaction using 1 equiv of the reactant. HINT: Relative Reactivity (2 pts)

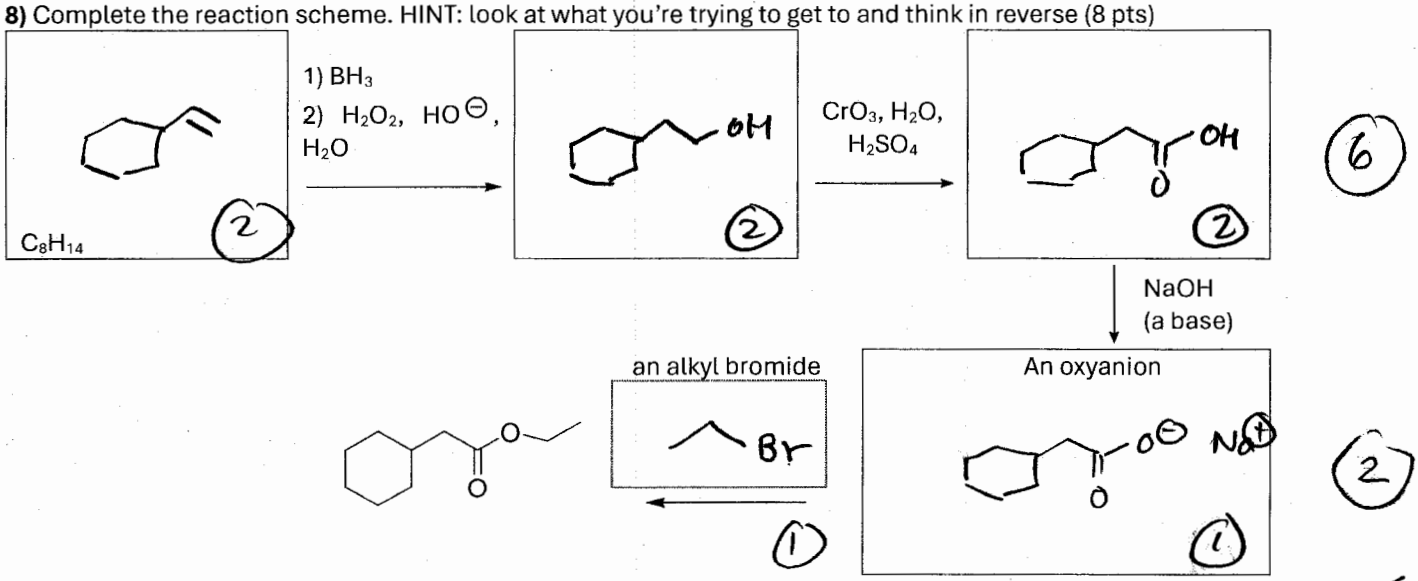


In one or two sentences, explain why the product you drew was preferred. (2 pts)

N is more nucleophilic than O because it is < electronegative. e⁻ are ∴ more reactive

1

8) Complete the reaction scheme. HINT: look at what you're trying to get to and think in reverse (8 pts)

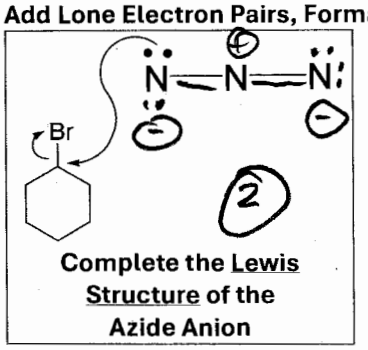


/21

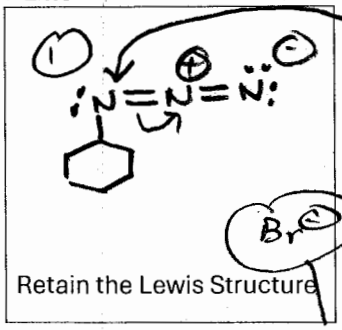
RELATED PROBLEMS MOST UNDERSTOOD THANKS TO THOSE WHO ASKED FOR CLARIFICATION DURING QUIZ!

9) Complete the reaction scheme.

Add Lone Electron Pairs, Formal Charges and Line Bonds where necessary in the Lewis Structures



Complete the Lewis Structure of the Azide Anion

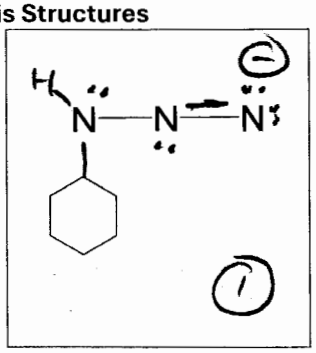


Retain the Lewis Structure

from $LiAlH_4$

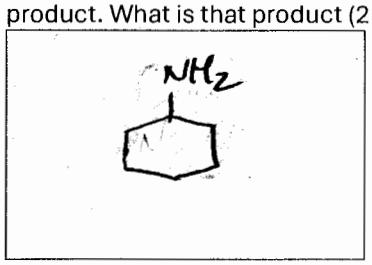
Complete the curved arrow above

optional



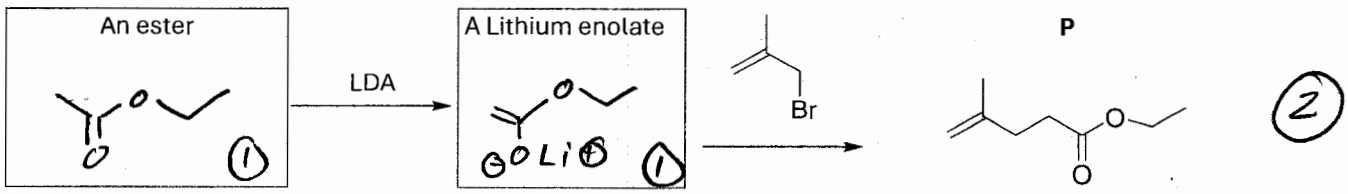
(4)

10) After a stable gas is lost, H_3O^+ is added to decompose the LiAl complex, a mild base is added to yield a neutral product. What is that product (2 pts)



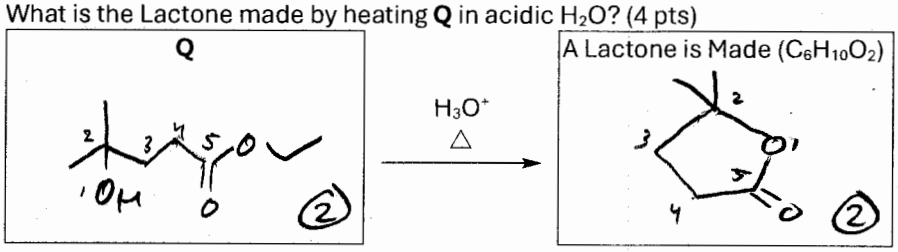
(2)

11) Complete the following reaction. HINT: Look "downstream" and infer earlier structures from those provided. LDA (Lithium diisopropyl amide) function as a base (2 pts)

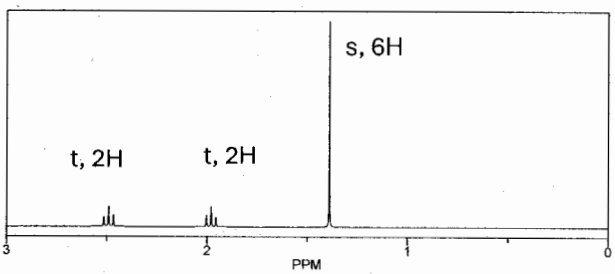


(2)

12) Product **P** above is treated with 1) $Hg(OAc)_2$, H_2O, then 2) $NaBH_4$. These steps convert **P** to **Q**. What is **Q**? What is the Lactone made by heating **Q** in acidic H_2O? (4 pts)



(4)



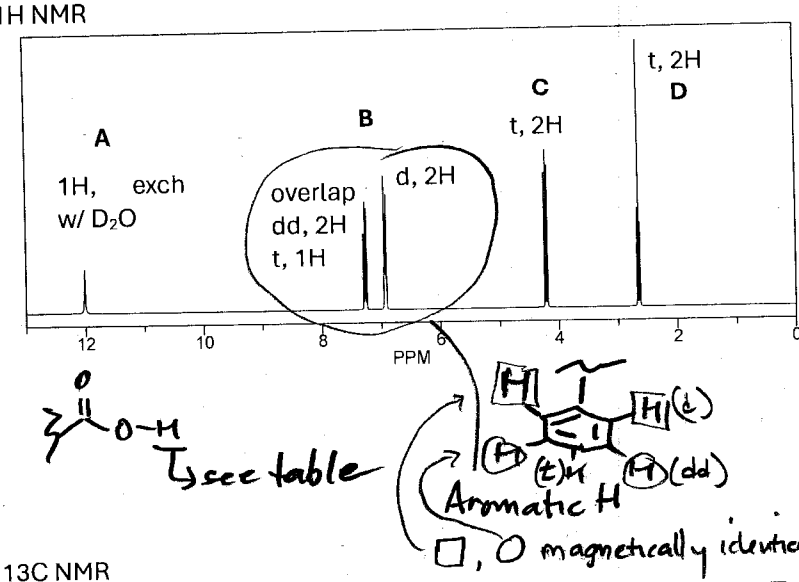
1H NMR of the Lactone

/12

5 DOUS

$C_9H_{10}O_3$

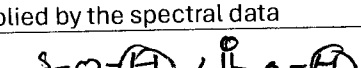
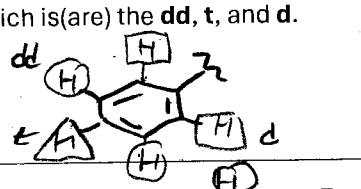
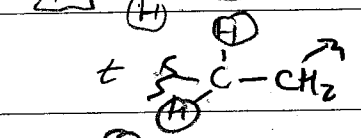
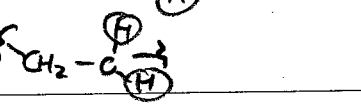
1H NMR



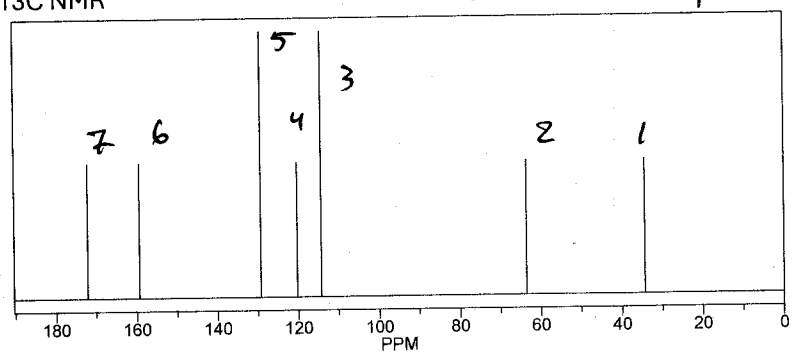
see table

Aromatic H

□, ○ magnetically identical

Draw the fragments/connectivities implied by the spectral data	5 pt
A 	1
B (detail these H's by showing which is(are) the **dd**, **t**, and **d**. 	2
C 	1
D 	1

13C NMR



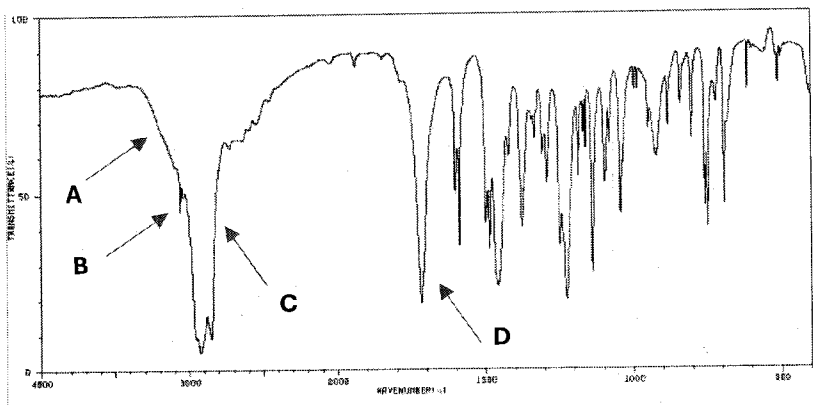
Interpret what is implied by the 13C NMR data (1 pt).

2 C are related to 2 others by symmetry

branchpoint 

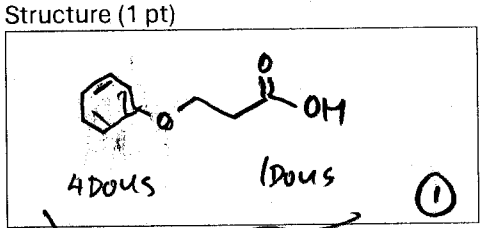
(1)

branchpoint symm



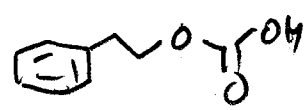
Identify the functional groups inferred by the absorbances	4 pts
A O–H stretch	1
B C_{sp_2}–H stretch	1
C C_{sp3}–H stretch	1
D 	1

Structure (1 pt)



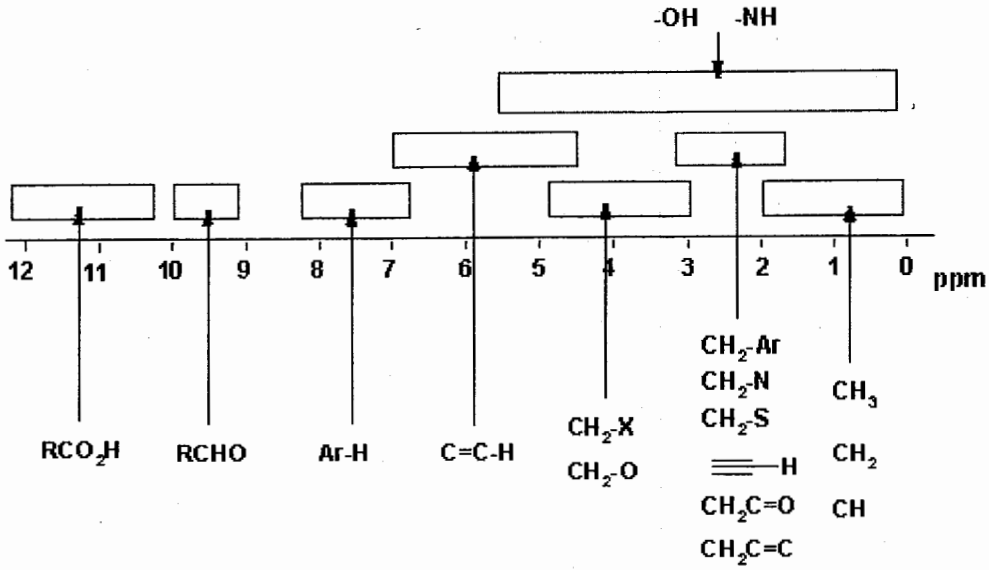
4 DOUS 1 DOUS (1)

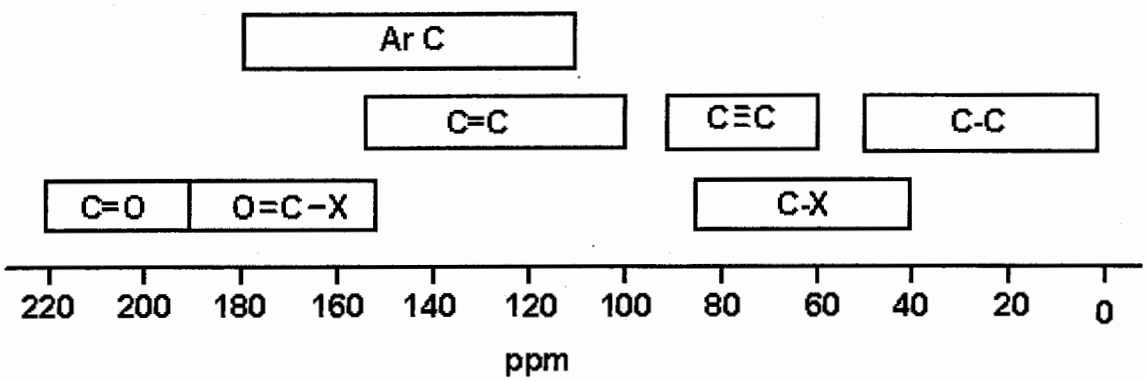
5 DOUS

OR 

is OKAY

11


-OH
-NH
12
11
10
9
8
7
6
5
4
3
2
1
0
ppm
RCO2H
RCHO
Ar-H
C=C-H
CH2-X
CH2-O
CH2-Ar
CH2-N
CH2-S
H
CH2C=O
CH2C=C
CH3
CH2
CH


Ar C
C=C
C≡C
C-C
C=O
O=C-X
C-X
220
200
180
160
140
120
100
80
60
40
20
0
ppm