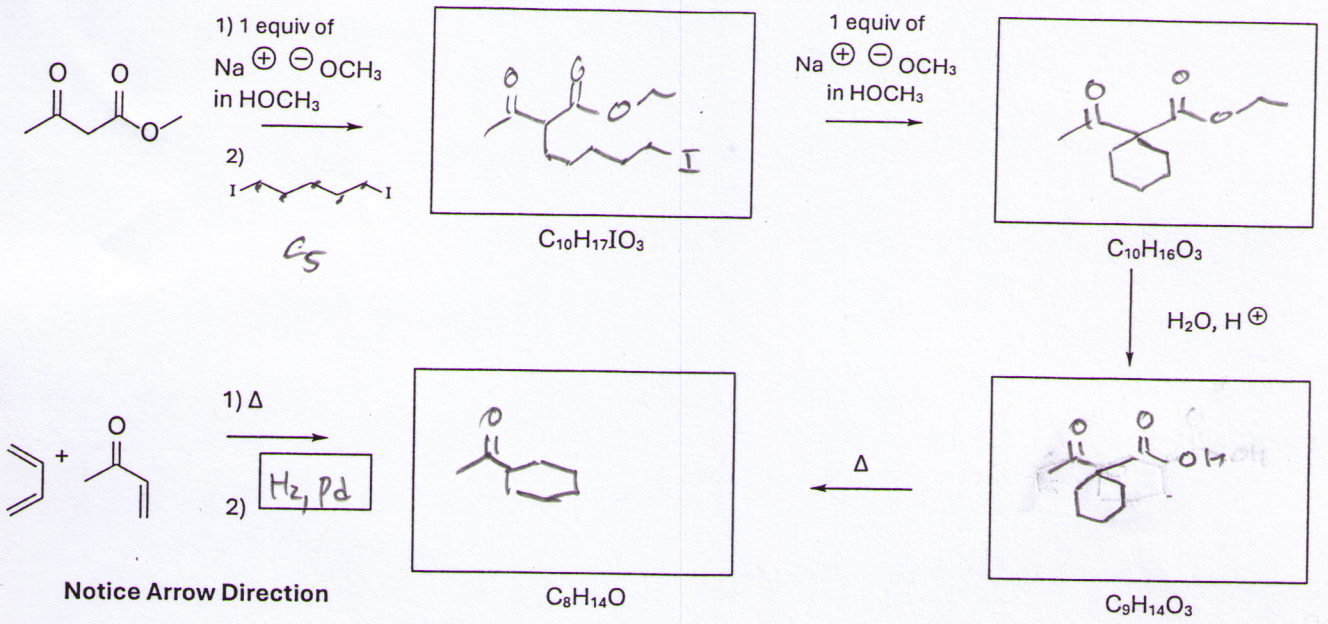
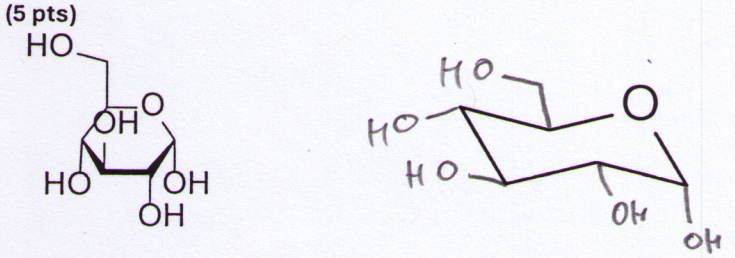
1) Show the reaction products or intermediates in the rectangles and the reactant in the smaller box.
(9 pts)



Notice Arrow Direction

2) Consider the sugar named Allopyranose, and answer the following questions accordingly
a) Convert the Haworth configuration to a more conventional chair conformation (Use the scaffold provided)

(5 pts)



Haworth

Chair
Only draw the substituents you see on the Haworth conformation

The bond angles of the axial and equatorial bonds <u>must be at their correct, conventional angles</u>!!!

1 pt Extra Credit. Print and sign name below.

Please sign the following claim.

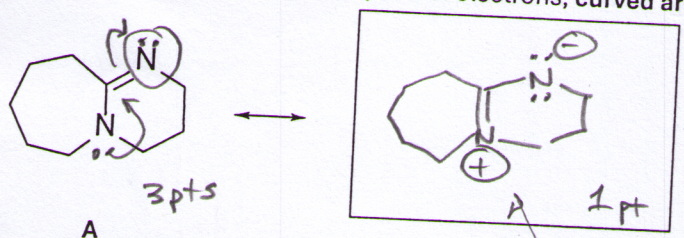
I, _____ (Print name), make a formal declaration to affirm that I am compliant with academic integrity rules and thus will not *give* or *receive* any unauthorized help on this quiz and that all work will be my own.

_____(Signature)

3) We often used resonance structures to determine electronic stability of intermediates. Use one resonance structure to show which N(itrogen) is most basic and will therefore get protonated. **(4 pts)**

CIRCLE THE *most basic* NITROGEN IN STRUCTURE A THAT WILL GET PROTONATED **ACCORDING TO THE RESONANCE STRUCTURE DRAWN IN BOX B.**

You will need to **include the lone pairs** of electrons, **curved arrows**, and **formal charges** for full credit.



3pts

A

B

1pt

This anion must agree w/ structure in A

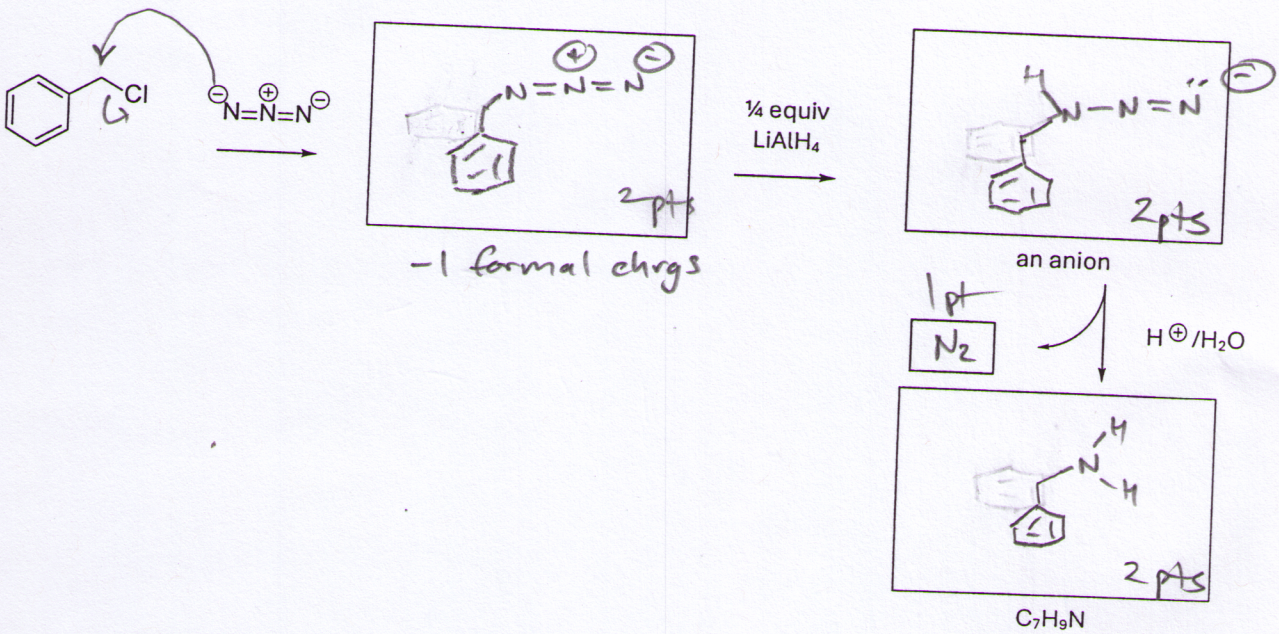
Ø if either is missing

2pts - lone pairs e⁻ MUST be shown.

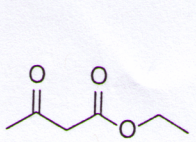
- circle 1pt

formal chrg

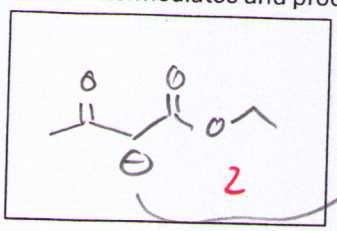
4) Complete the reaction. **(7 pts)**

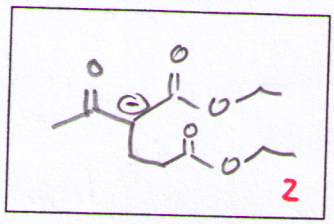


5) Some organic chemistry reactions involve multiple simple reactions that occur sequentially to form a complicated product. One example (*Synlett*, **2012**, *23*, 1199-1204) uses a Michael reaction followed by an intramolecular Claisen to synthesize a cyclic β-keto ester. Fill in the indicated intermediates and products below. **(10 pts)**



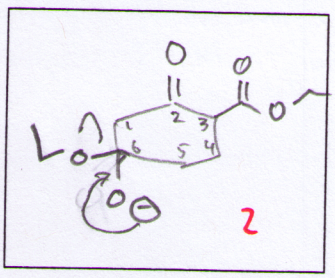
NaH
1 equiv
(a base)



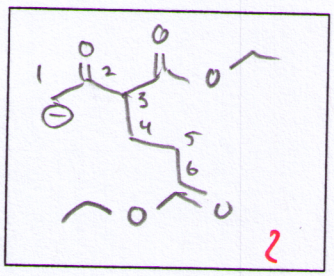


as an anion

$H^{\oplus}$

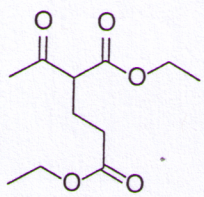


An anionic tetrahedral intermediate

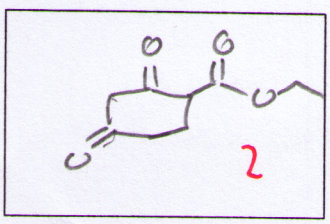


The enolate required for a favored cyclization/annulation

NaH
1 equiv
(a base)

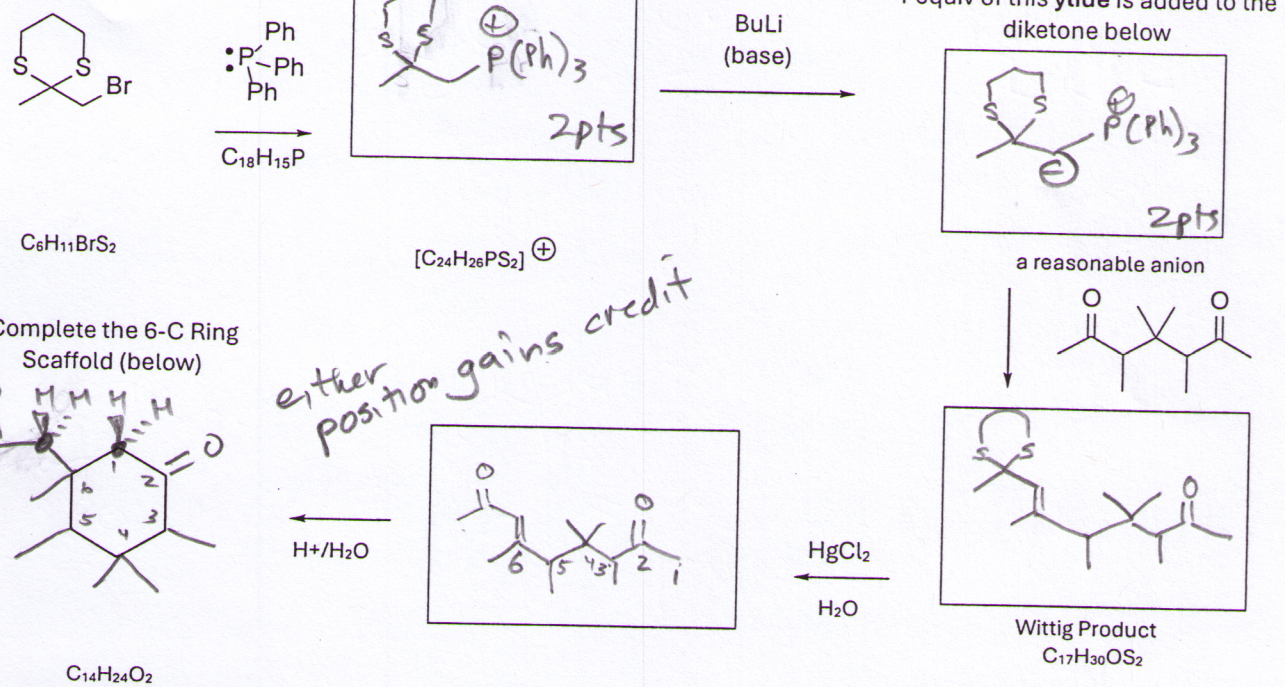


Product after protonation/tautomerization

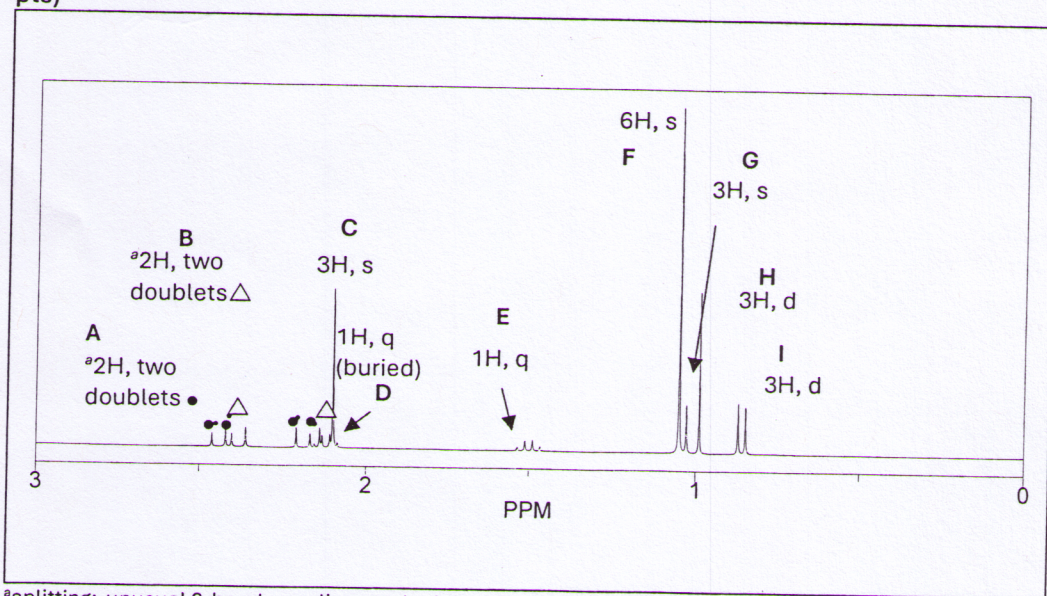


a cyclized product
($C_9H_{12}O_4$)

6) The theme continues: As we progressed through CEM 352, we continued to understand that the chemical transformations examined in earlier chapters were translational and continued to be applied in later chapters. Complete the following transformation. Hints are included to help you arrive at rational intermediates. **(10 pts)**



7) The product above corresponds to the following spectroscopic data. As we have practiced in class, fill in the identity of the ^{1}H-NMR fragments. See Footnote Below. Try not to overcomplicate this problem just because you see new concepts. **(7 pts)**

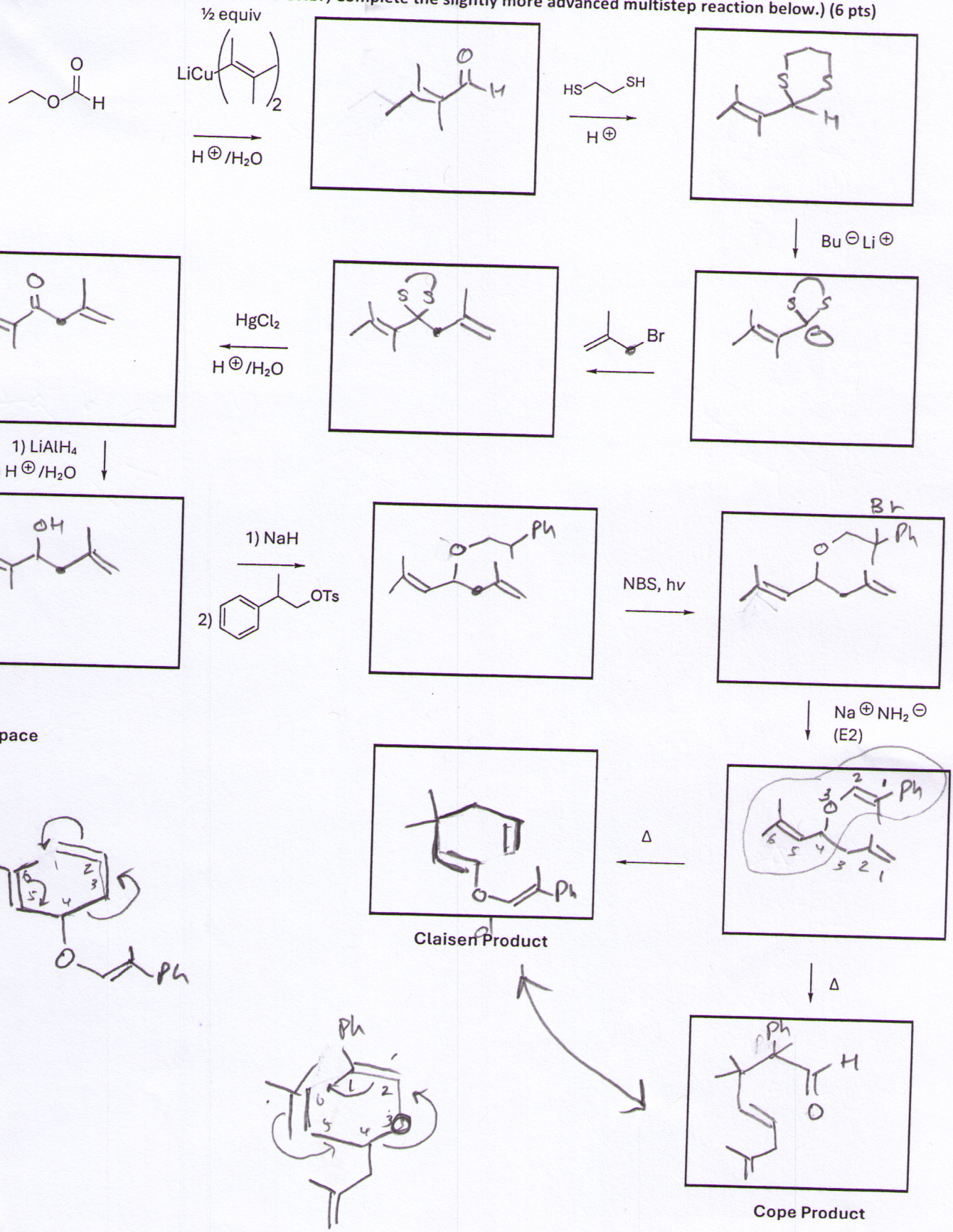


A	H_b-C-H_a no H on adjacent Cs
B	H_b-C-H_a no H on adjacent Cs
C	$\equiv X-CH_3$
D	H_3C-CH
E	$H_3C-C(H)$
F	$\equiv X-CH_3$
G	$\equiv X-CH_3$
H	$\equiv C-CH_3$
I	$\equiv C-CH_3$

[a]splitting: unusual 2-bond coupling results from non-equivalent CH_2 hydrogens (H_b-C-H_a) because they are diastereotopic. Here, H_b and H_a split each other into a doublet.

1 PT EXTRA CREDIT: Place a good-sized DOT (●) on the Carbon atom of the $C_{14}H_{24}O_2$ product you drew above the ^{1}H NMR spectrum that is attached to the protons identified as B. Consider factors influencing relative upfield/downfield.

Honors Question (FOR HONORS STUDENTS ONLY; Complete the slightly more advanced multistep reaction below.) (6 pts)



Workspace