Answer Key

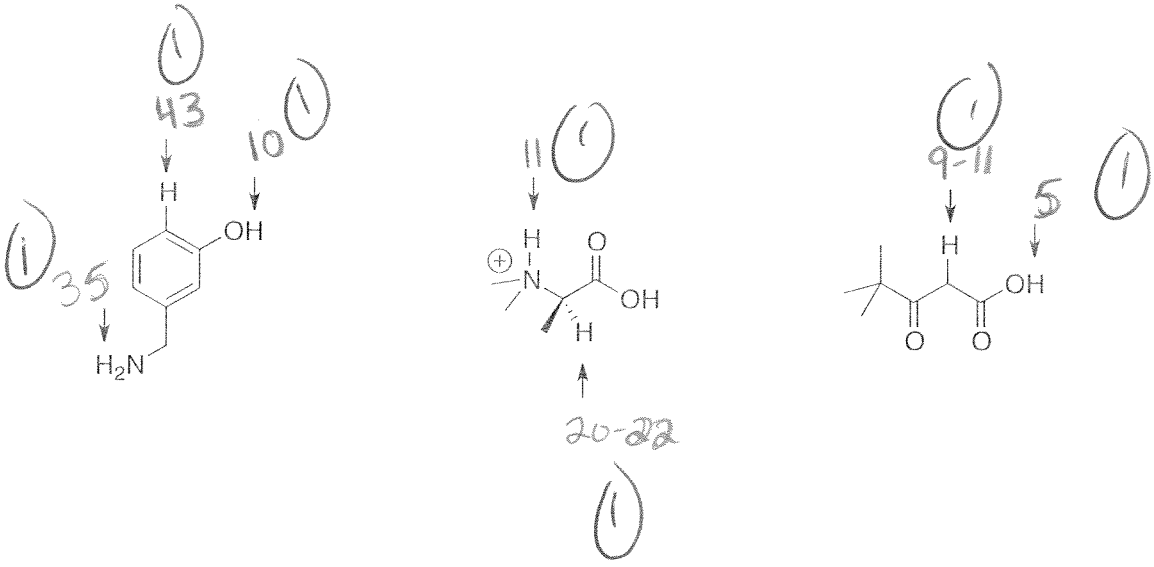
Name:
Student #:

CHM 3120

Intermediate Organic Chemistry (Fall 2012)
EXAM #2 Version A

Instructions: Please answer all questions in the space provided. If you require additional space you may use the back pages. The last page of the exam has been intentionally left blank. Model kits are permitted. There are **7 questions** (8 pages) and **60 marks** in total.

1. Provide a pKa value for the indicated proton(s) in the following molecules. **(7 marks)**



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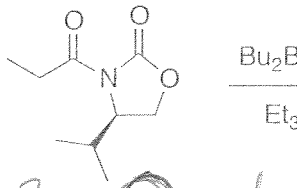
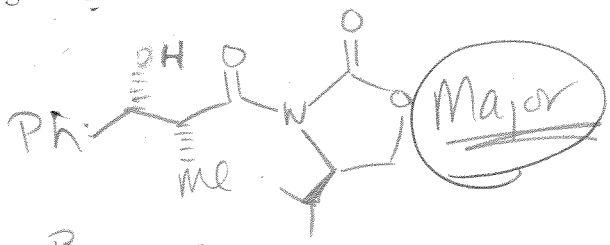
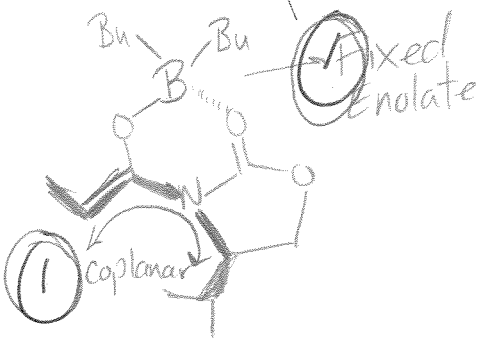
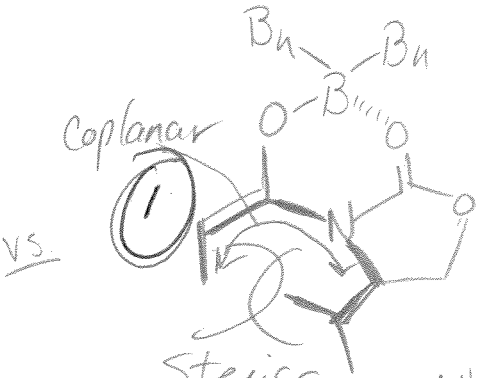
2. Consider the following reaction. What is the structure of the enolate formed under these reaction conditions? Explain using appropriate structures why this is the preferred enolate. What is the **major** product obtained from this reaction? Justify the formation of the **major** product by drawing the transition states for both the **major** and **minor** products.
(12 marks)

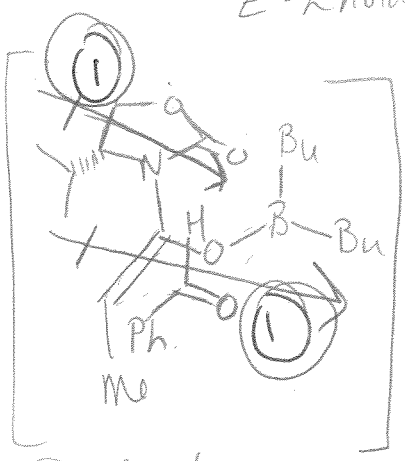


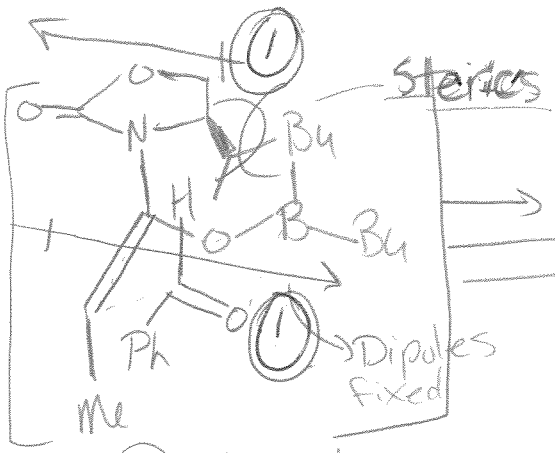


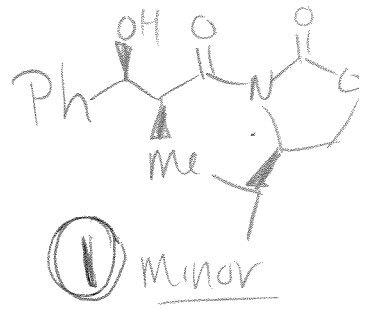




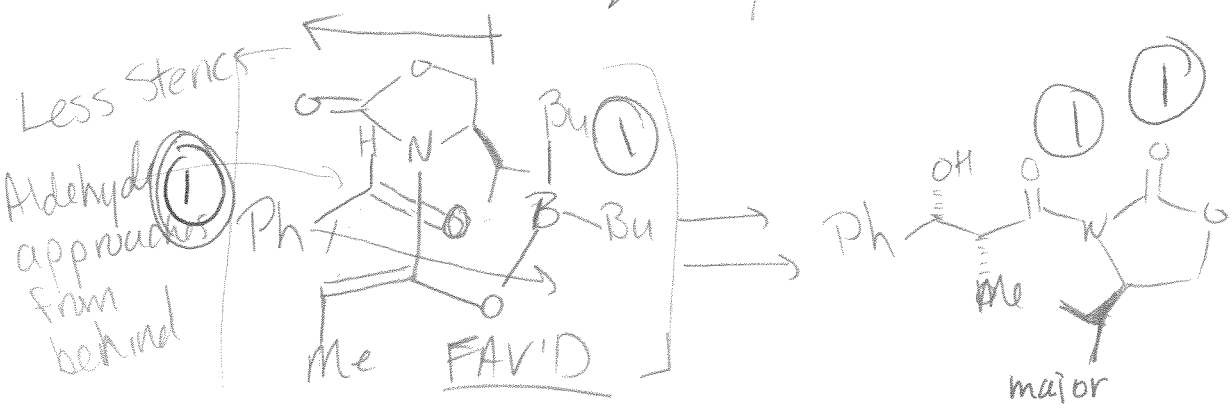
Z-Enolate Favd







1/ Collapse + reform



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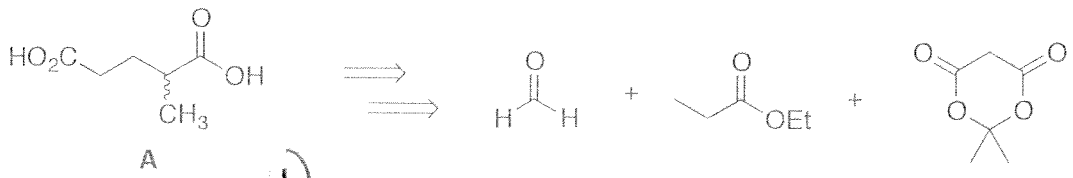
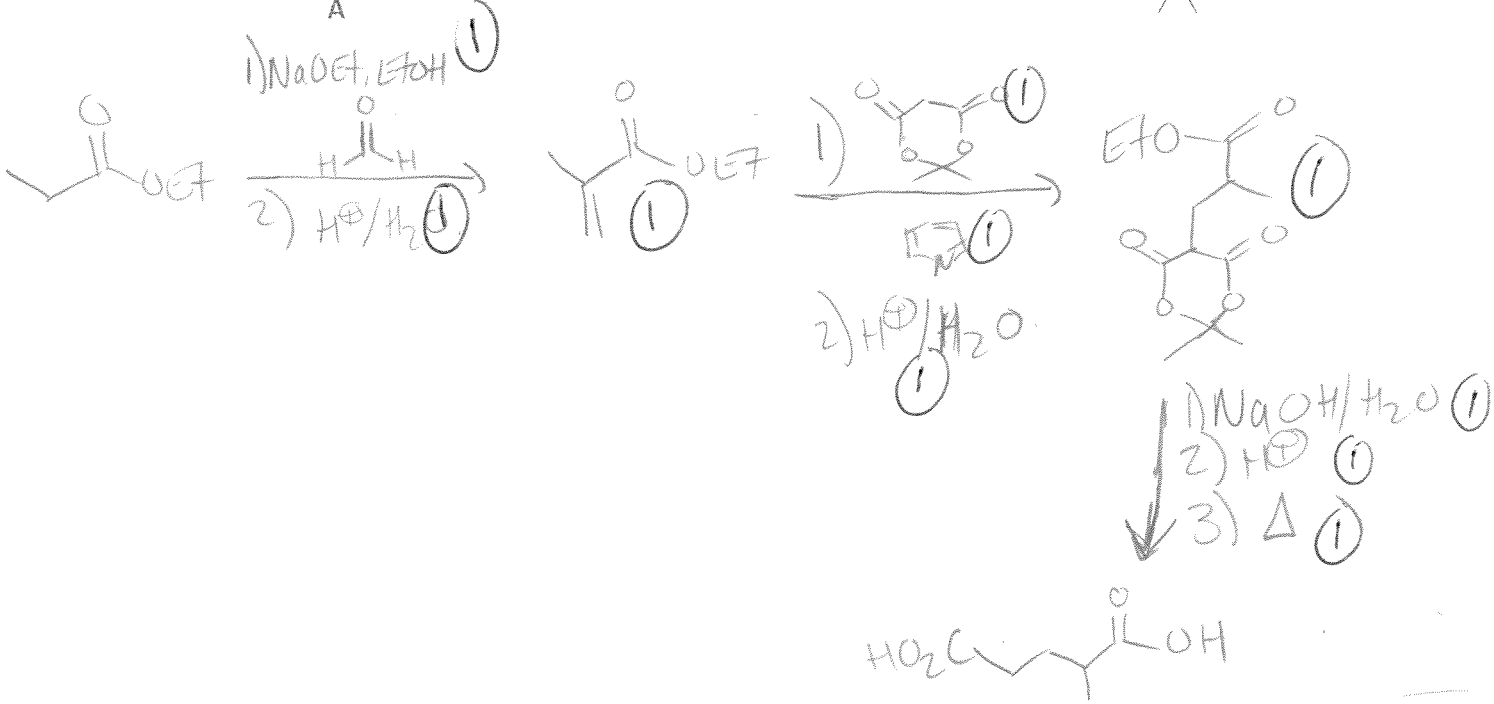
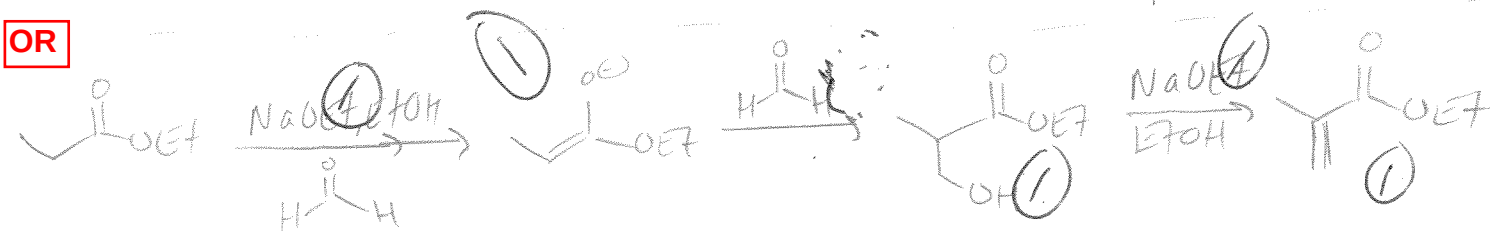
3. Propose a synthesis of compound **A** starting from the given fragments and any other reagents you require. For full marks, you must show all intermediates. **(10 marks)**

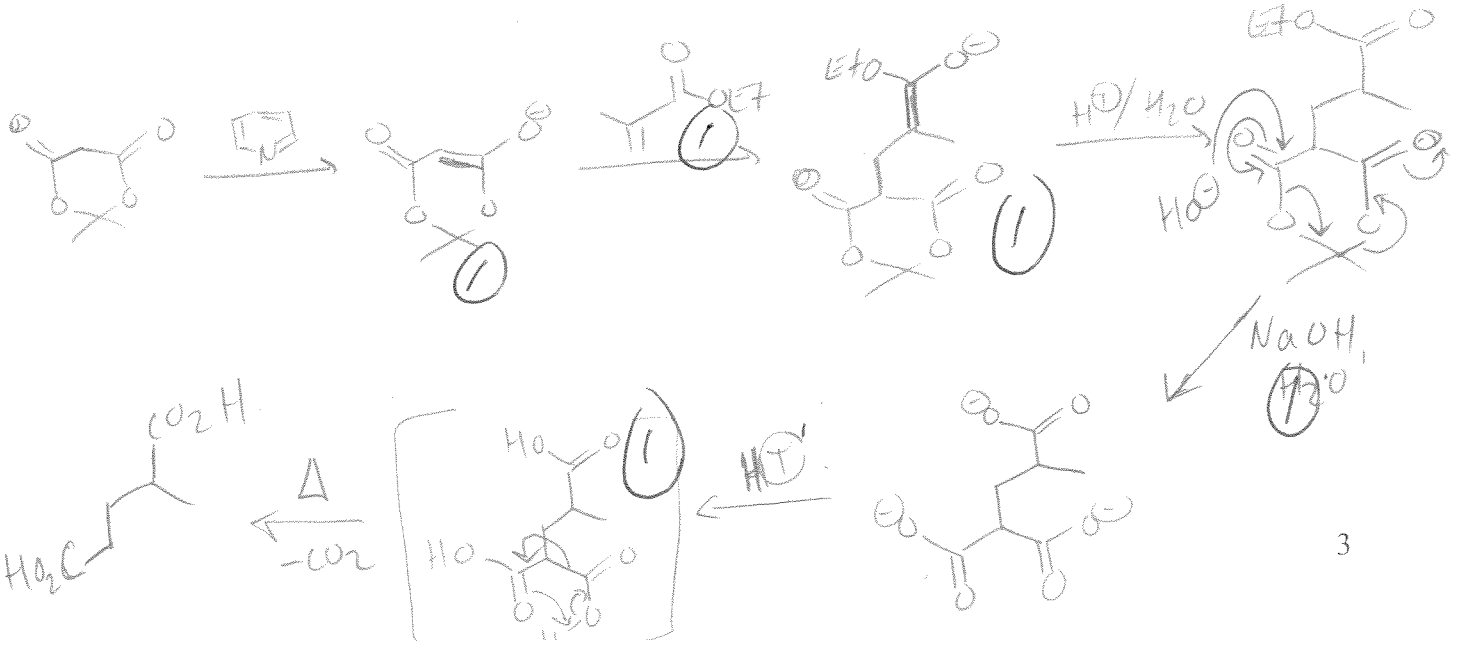


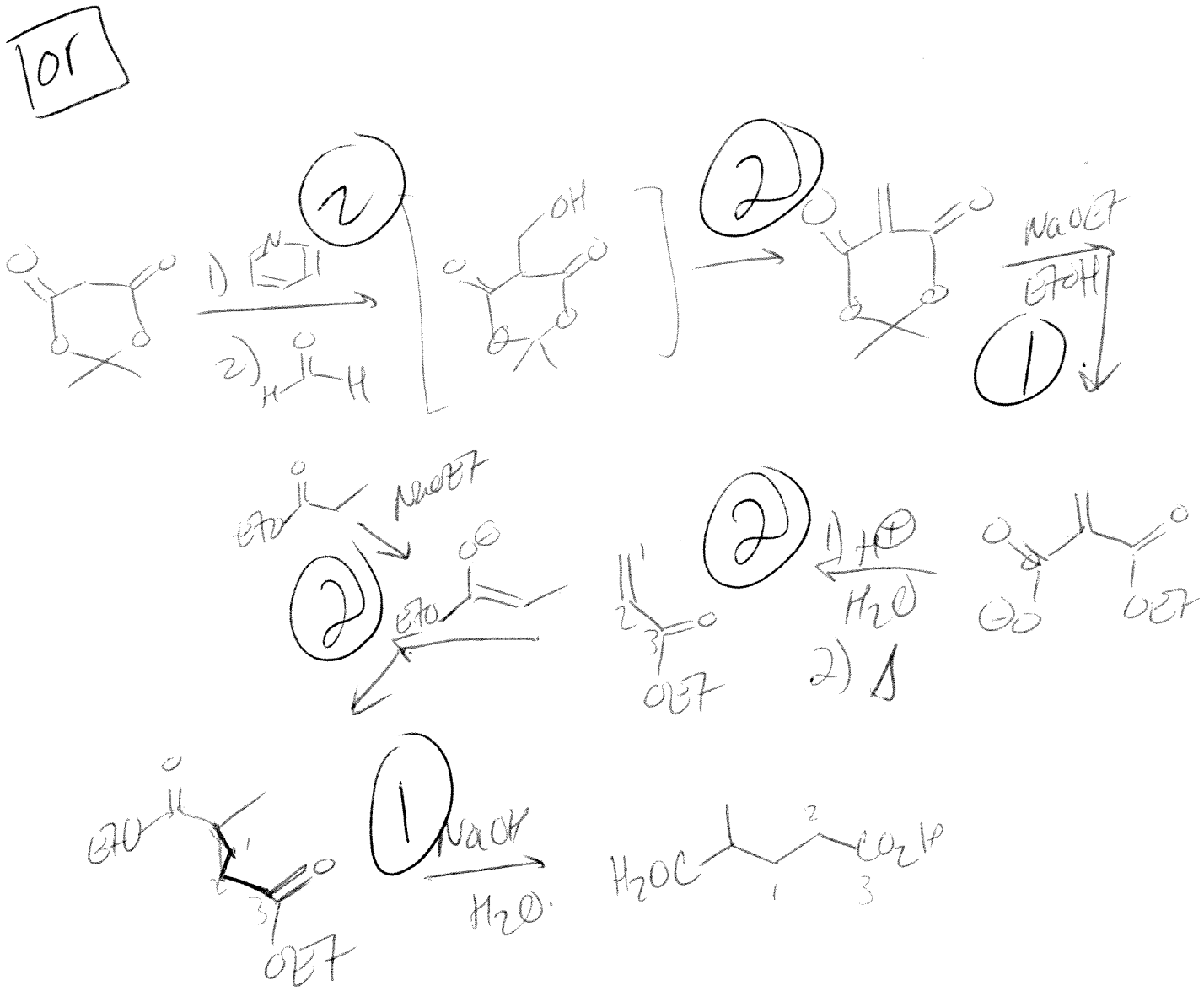
A



OR






10r
2
1)
2)
OH
2
NaOEt
EtOH
1
NaOEt
EtO
2
1) HO
H2O
2) H
OEt
1
NaCN
H2O
H2C
CO2H

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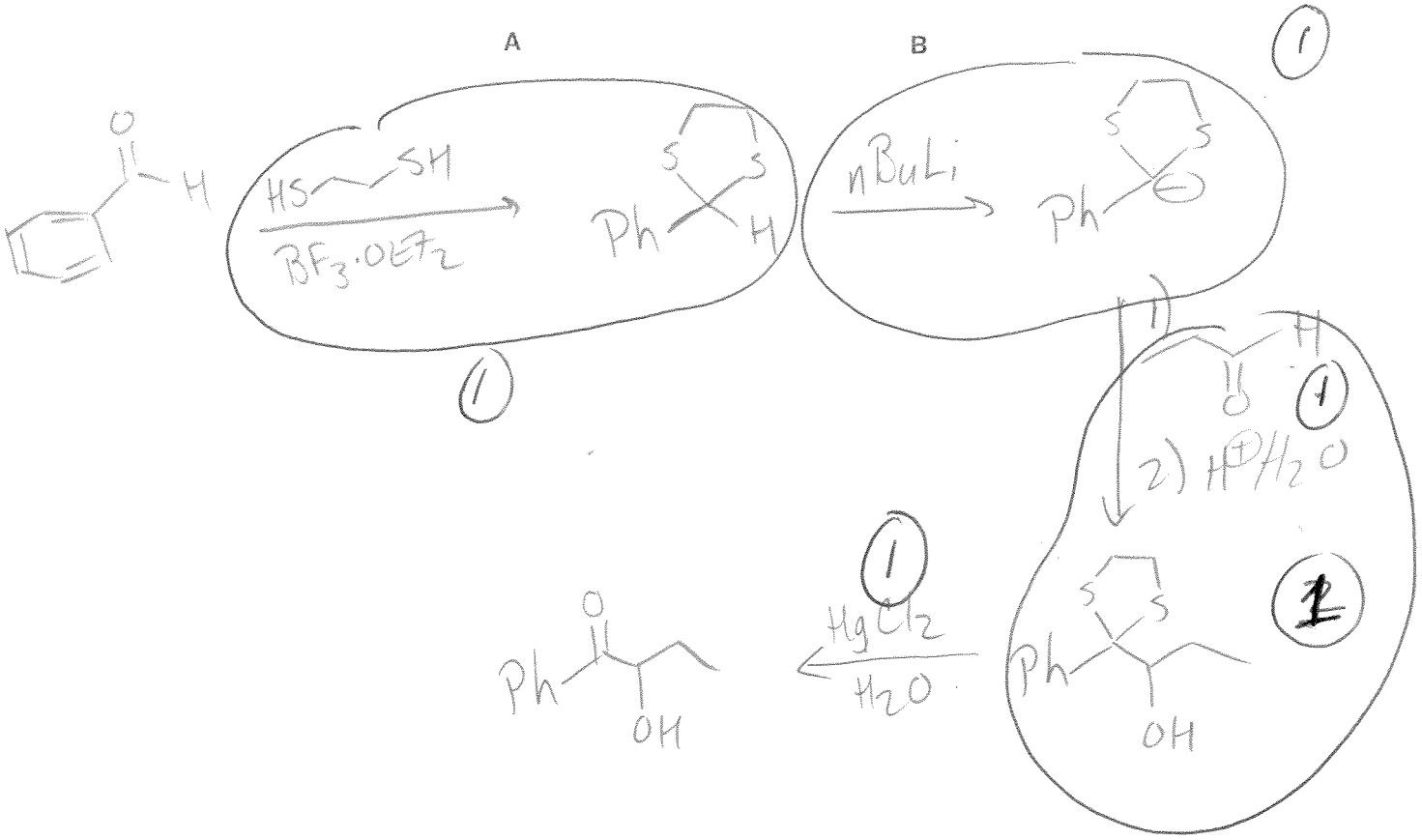
4. Propose a synthesis of **A** starting from **B** and any other reagents you require. For full marks, you must show all intermediates. **(5 marks)**

A **B**



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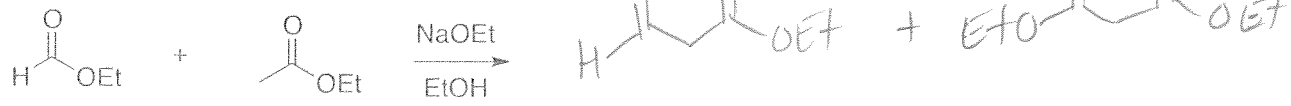
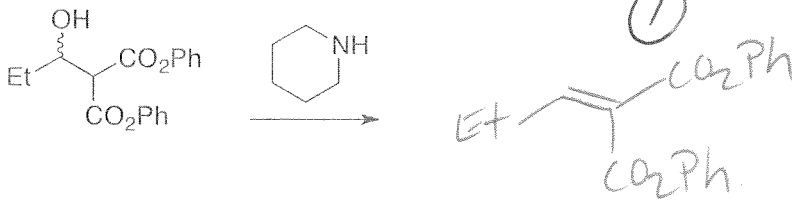
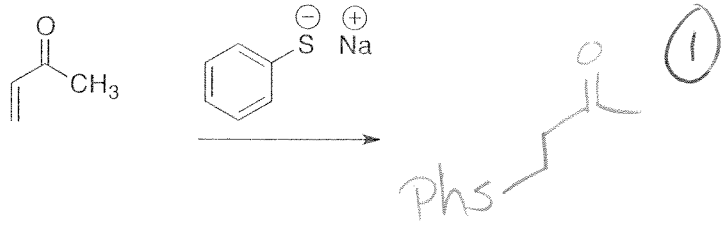
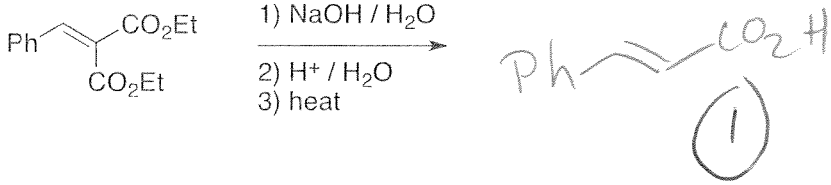
5. Provide the major product(s) for the following reactions. Assume appropriate aqueous work-up.
(6 marks)

a) 

b) 

c) 

d) 

e) 

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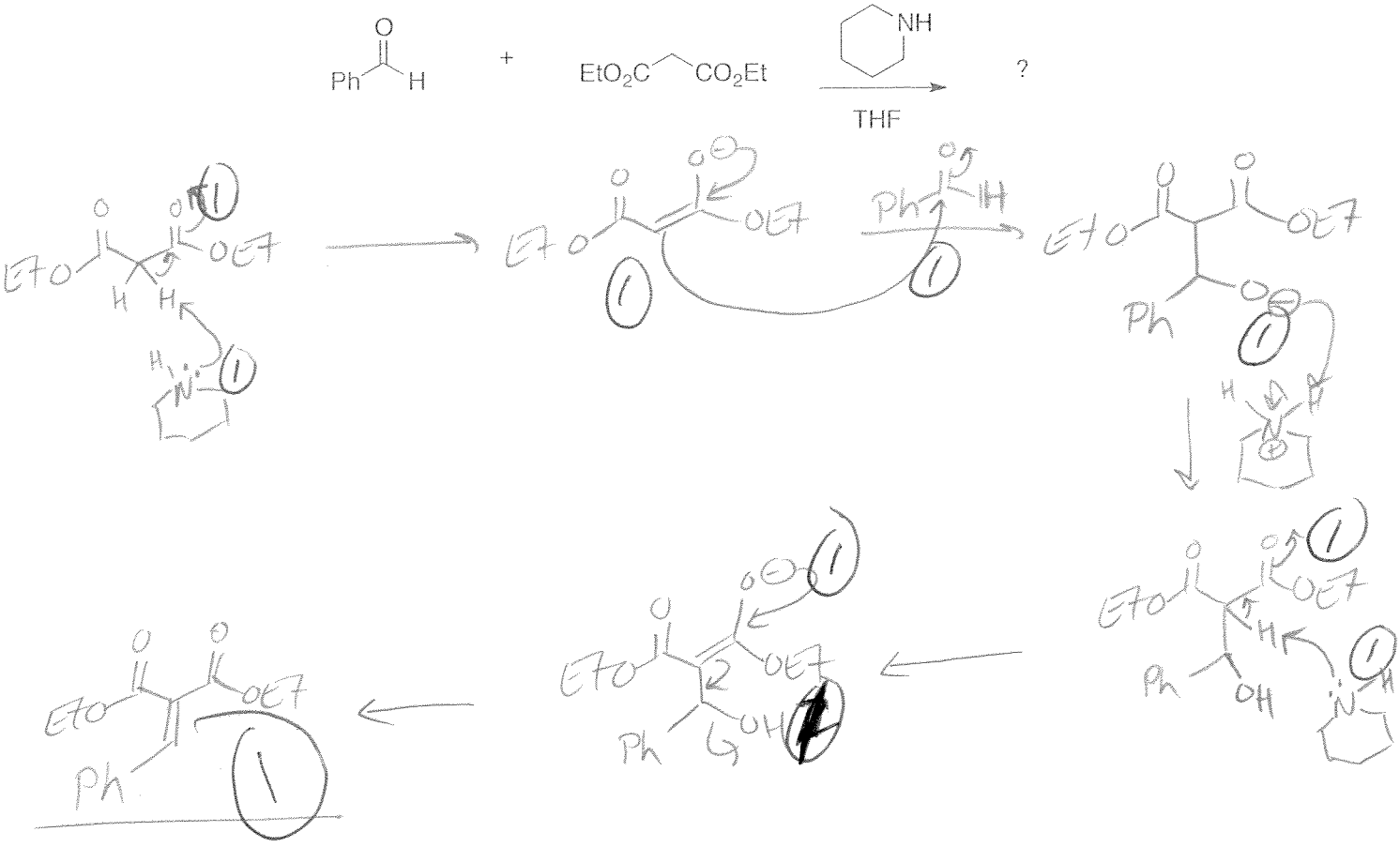
6. What is the product from the following reaction? Provide a **detailed mechanism** including all proton transfers for the formation of this product.
(10 marks)



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7. Consider the following molecule. Draw the LCAO representation of the π molecular orbitals for the ground state. Clearly label all bonding and antibonding orbitals, identify the HOMO and LUMO, and show the symmetry of each molecular orbital.
(10 marks)