

# Suggested Answers

**Chem 0320**  
**Dennis P. Curran**  
**Mar. 2, 2010**  
**Exam 2**

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Answer all questions on this exam. If you need more space than that provided, use the back of any page.

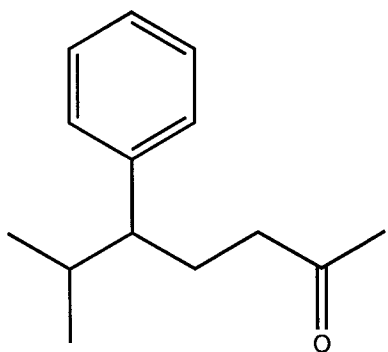
1. \_\_\_\_\_ (10 points) Names
  2. \_\_\_\_\_ (30 points) Short Answers
  3. \_\_\_\_\_ (30 points) Reactions
  4. \_\_\_\_\_ (20 points) Mechanisms
  5. \_\_\_\_\_ (10 points) Multi-step Syntheses
- TOTAL \_\_\_\_\_ (100 points)

The test has **9** pages (including this cover page) and **5** questions  
The exam ends at 12:15 pm sharp.

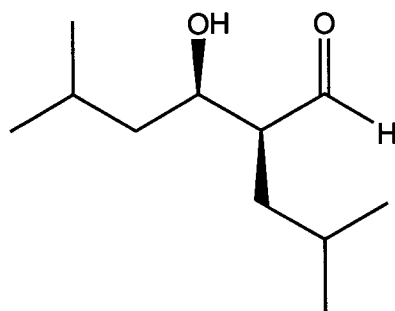
Good Luck !!!

1) Names (10 points)

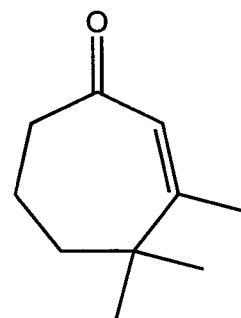
a) Provide acceptable names for the following compounds (don't forget stereochemical descriptors, *R/S*, *E/Z*, *cis/trans*, if needed). (6 points)



6-methyl-5-phenyl-  
2-heptanone



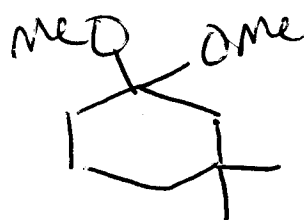
(2S,3R)-3-hydroxy-  
2-isobutyl-5-methyl  
heptanal



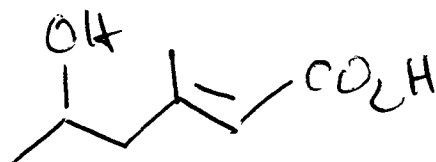
3,4,4-trimethylcyclo  
hept-2-ene

b) Draw clear structures of the following compounds. (4 points)

3,3-dimethylcyclohexanone dimethyl acetal



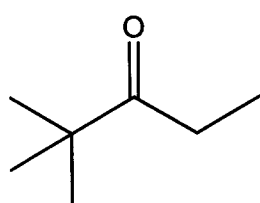
(*E*)-5-hydroxy-3-methylhex-2-enoic acid



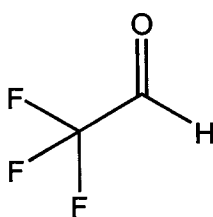
2) Short Answer Questions

**Briefly** but clearly answer the following questions (5 x 6 = 30 points).

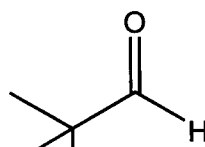
a) Arrange the following compounds in order of increasing likelihood to form a hydrate in the presence of water. Briefly explain your trend.



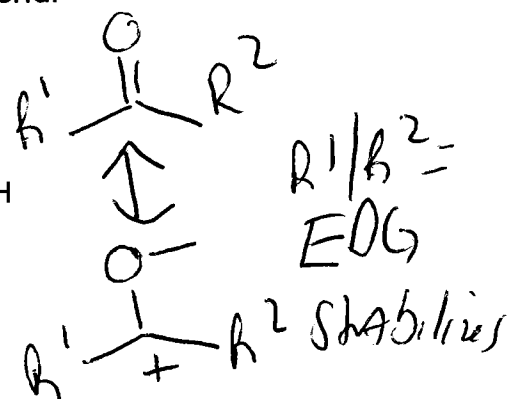
③



①



②

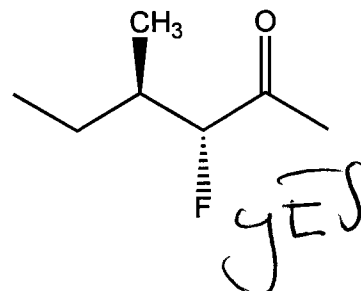
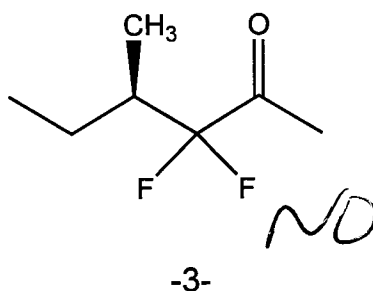
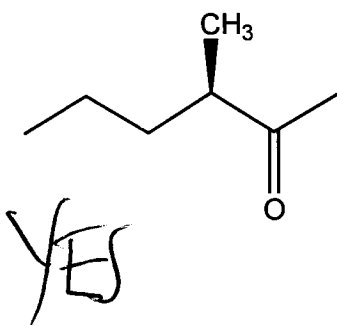
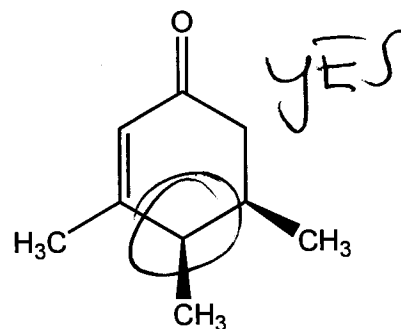
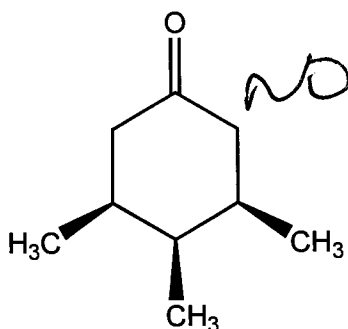
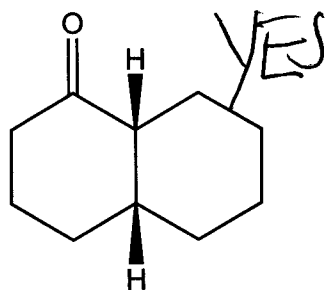


highest  $\alpha$  stabilization lowest

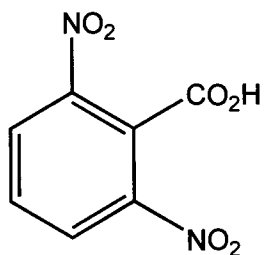
b) Draw the Lewis structure of lithium diisopropylamide (LDA).



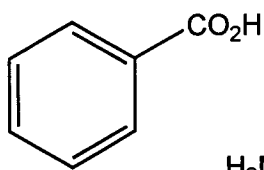
c) Indicate which of the following compounds are subject to base-catalyzed epimerization or racemization.



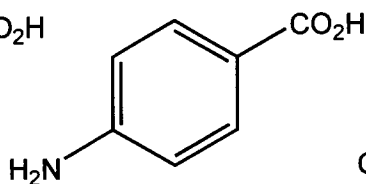
d) Arrange the following acids in order of increasing acidity (most acidic last).



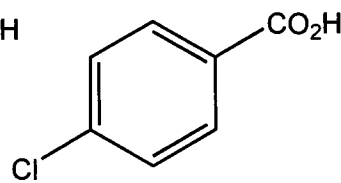
4



2



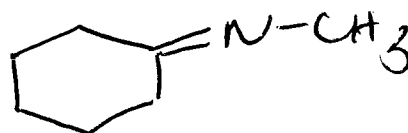
1



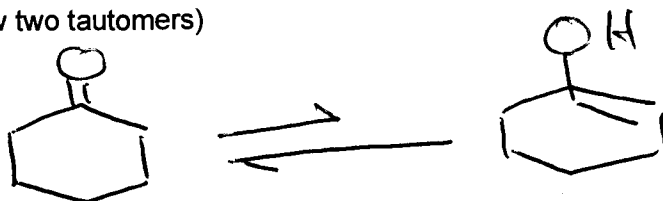
3

e) Draw a specific example of the following kinds of compounds. Do **not** use "R" groups, or "X" groups, or leave open valencies.

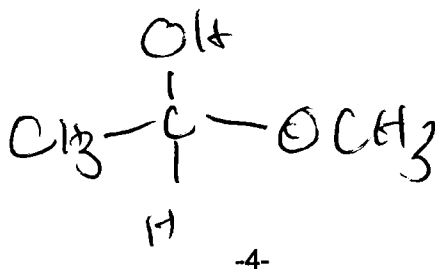
i) an imine derivative of a cyclic ketone



ii) an example of tautomerization (show two tautomers)

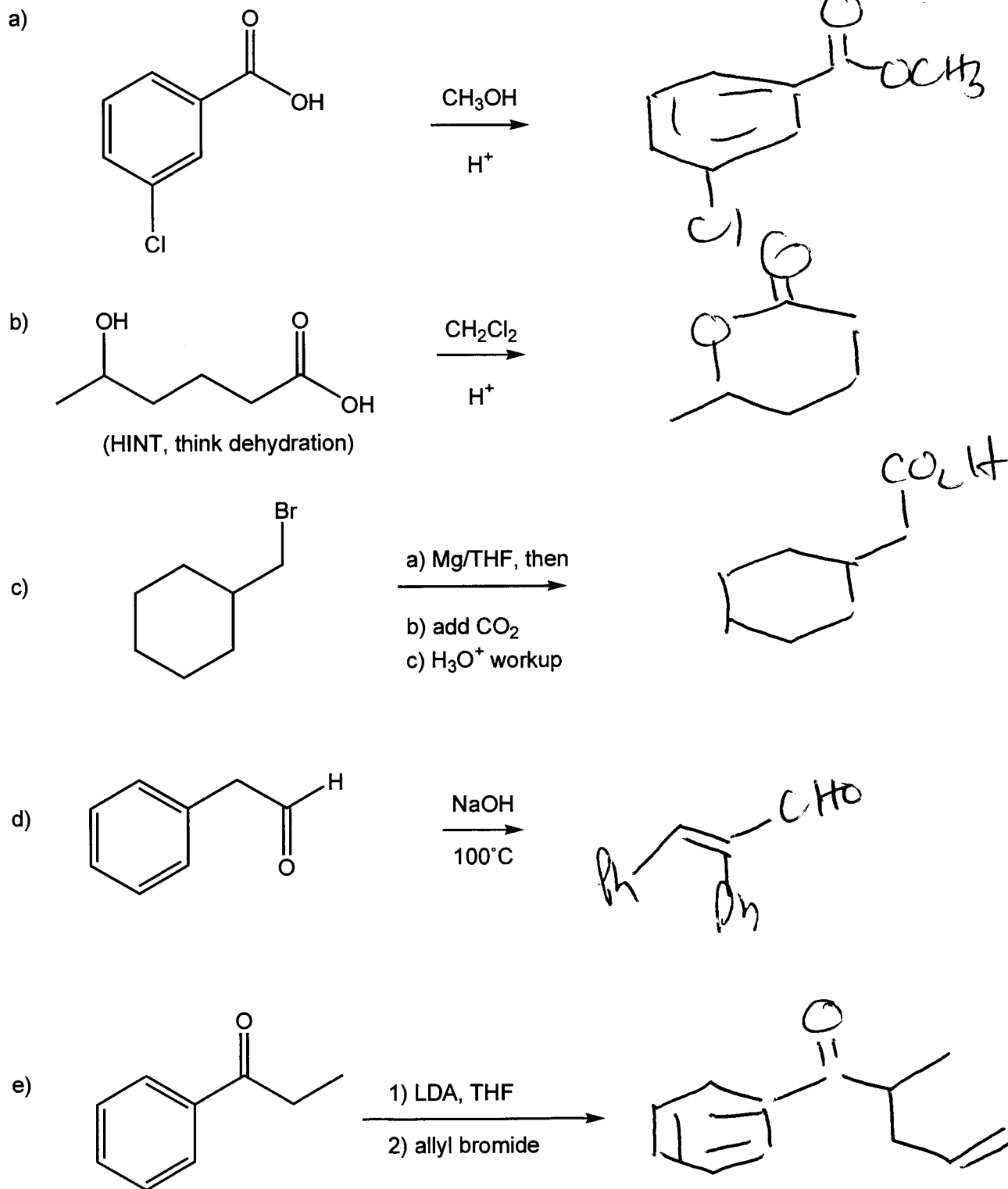


iii) a hemi-acetal of an aldehyde

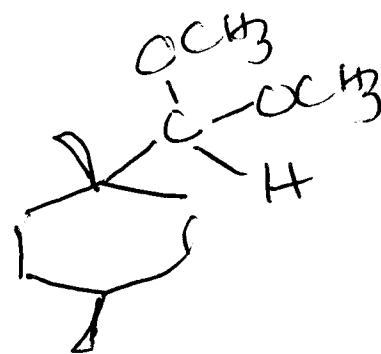
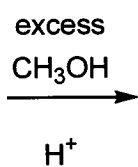
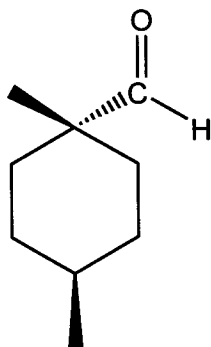


3) Reactions (10 x 3 = 30 points)

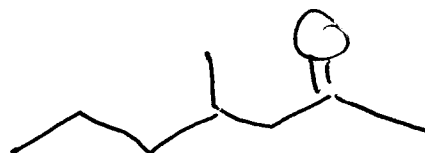
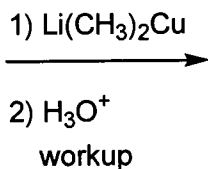
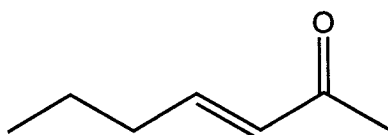
Show the products of the following reactions:



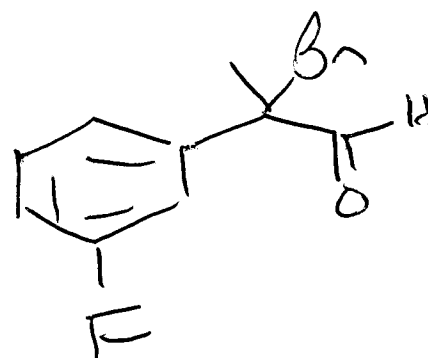
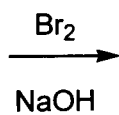
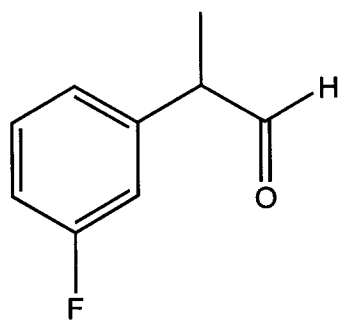
f)



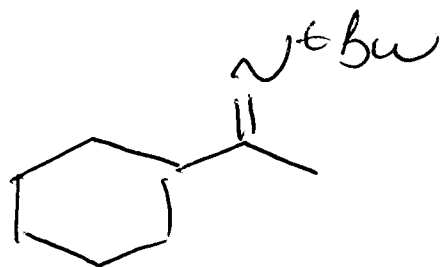
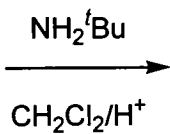
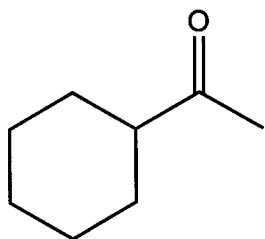
g)



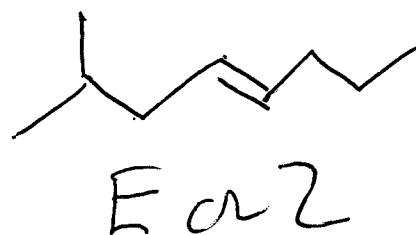
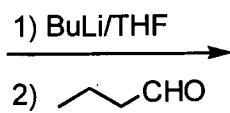
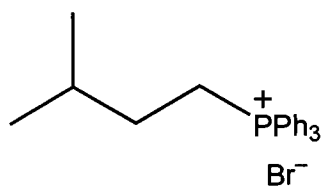
h)



i)



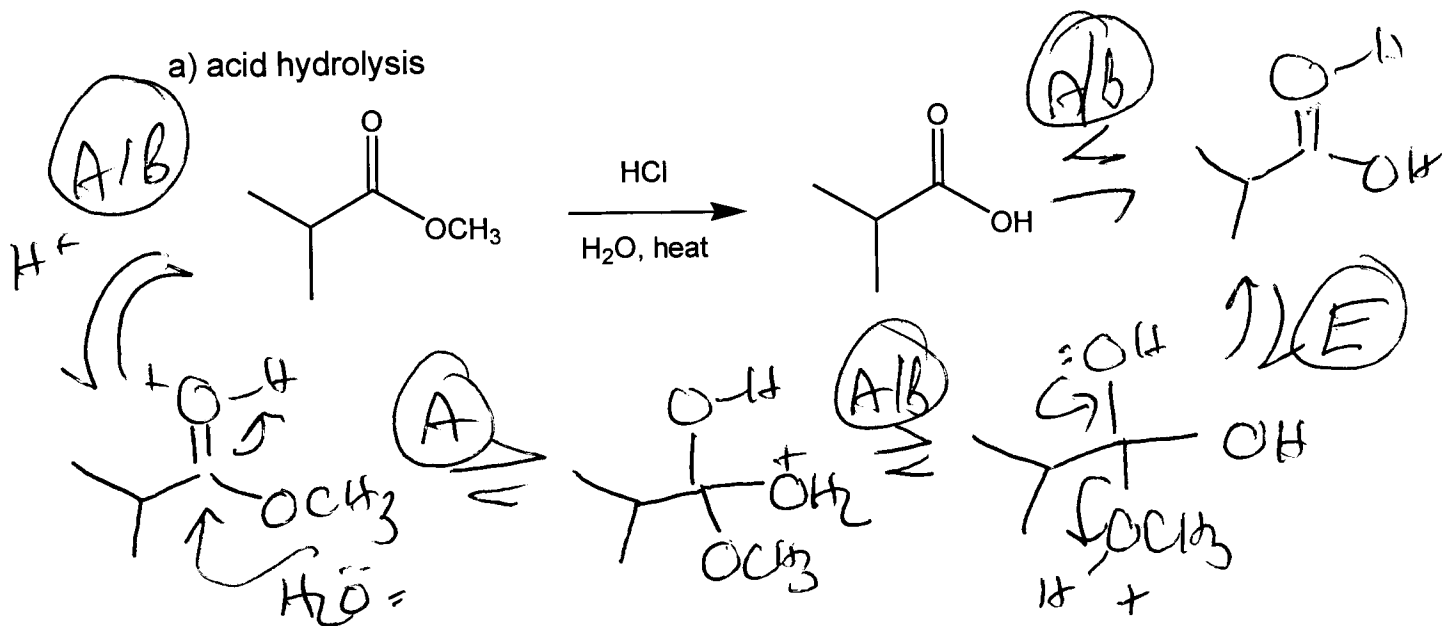
j)



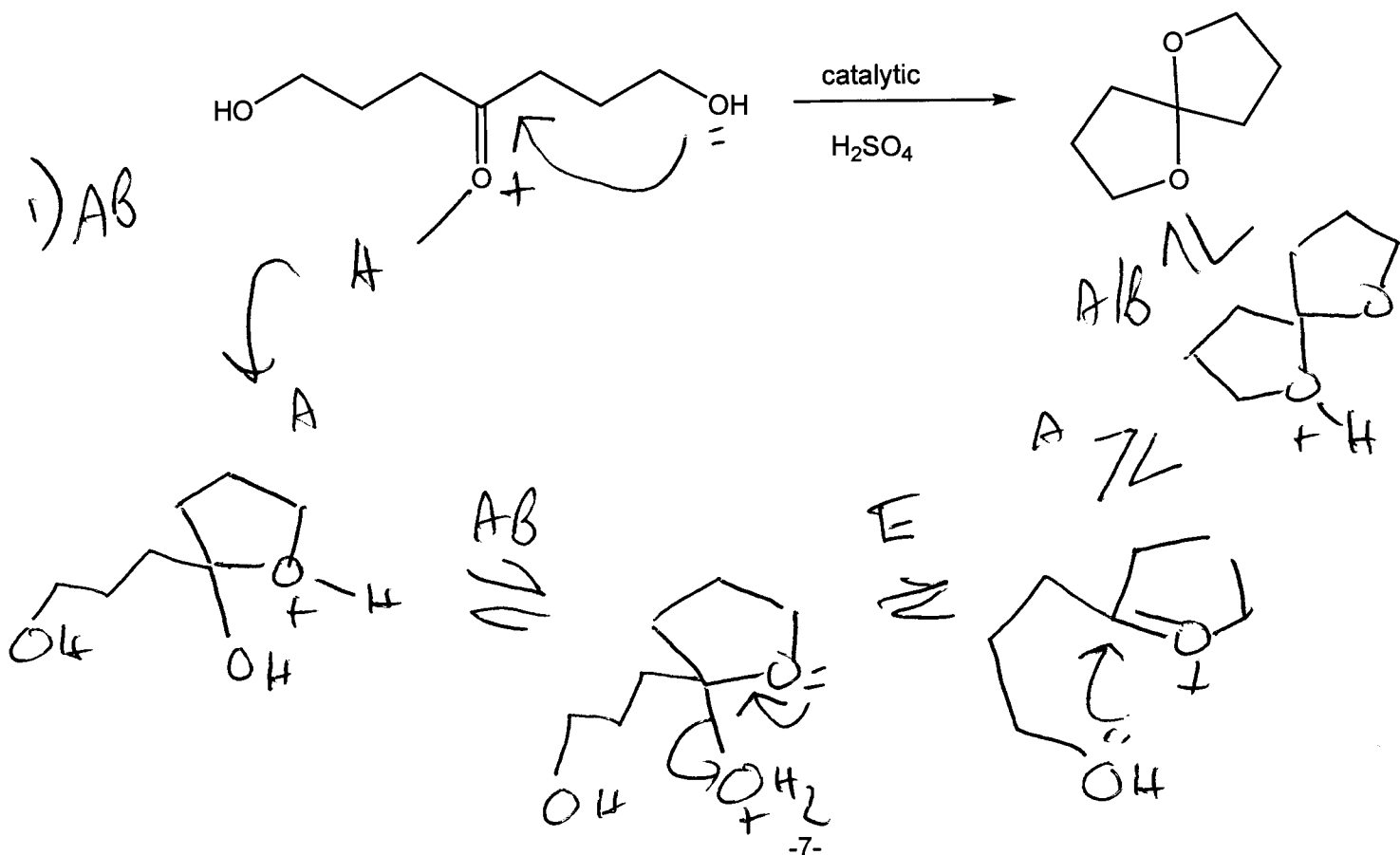
4) Mechanisms

Show a clear, step-by-step mechanism for the following reactions. Use arrows to track electron flow (4 x 5 = 20 points):

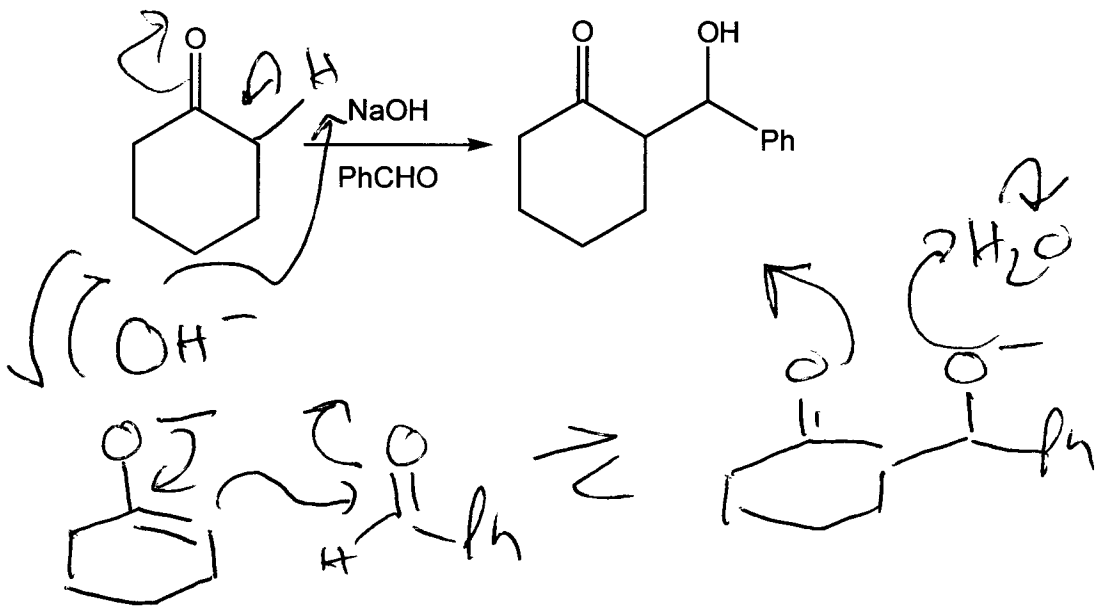
a) acid hydrolysis



b) spiroacetal formation (an intramolecular acetal-forming reaction)

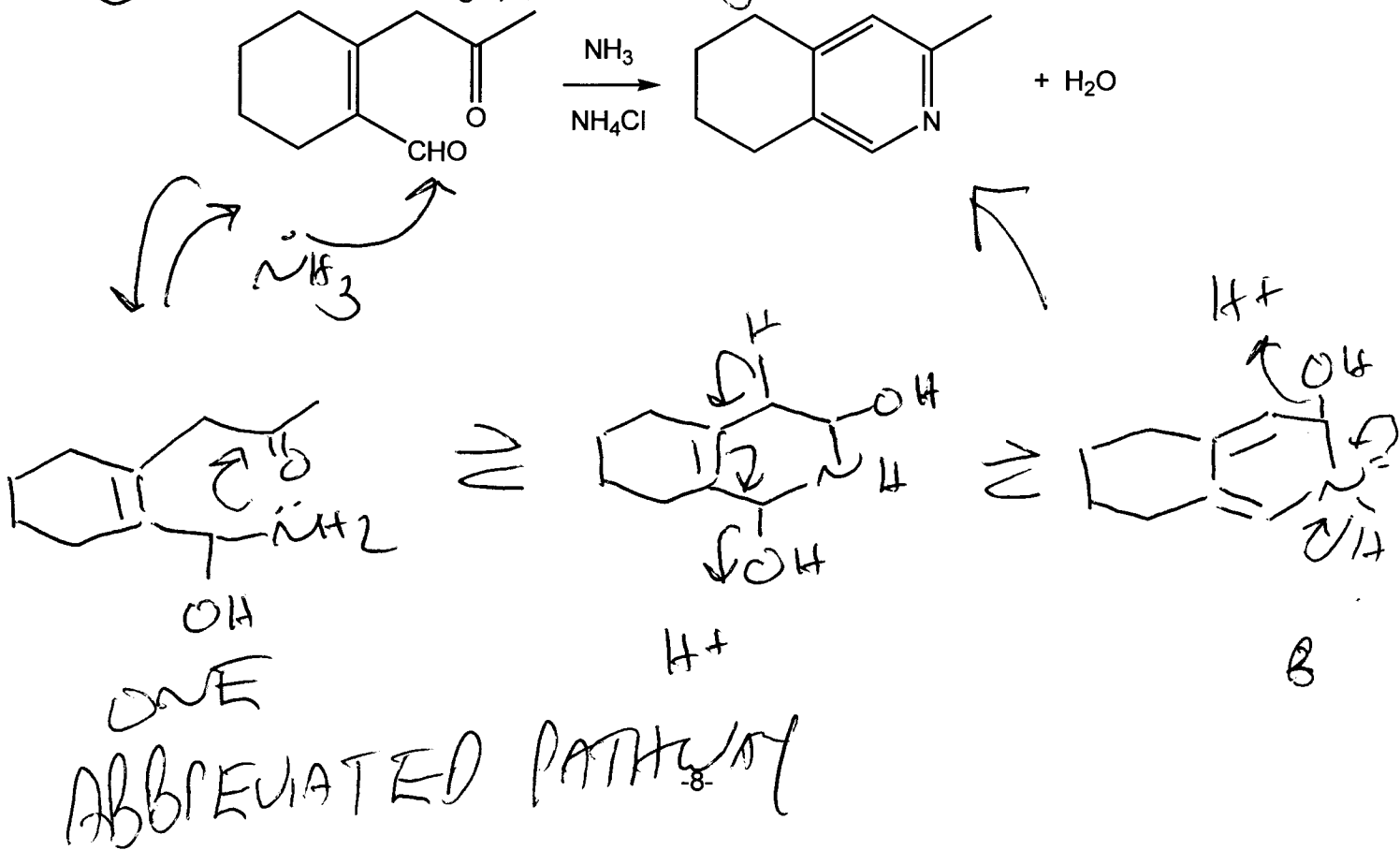


c) Cross-aldol reaction.



d) Formation of a pyridine ring (HINT, think imine/enamine formation).

ORDER OF STEPS MAY BE DIFFERENT

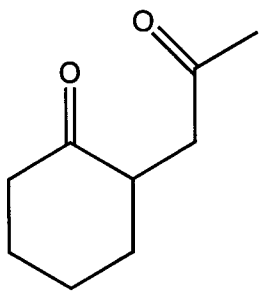




5) Multi-step Synthesis (10 points)

Propose an efficient sequence of reactions for **two of the following three** transformations.

a)



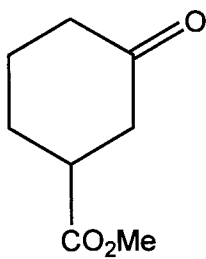
1) base/heat (aldol)

2)  $H_2$  Pd

3) LDA, then  $CH_3COH$

4) acid or base dehydration

b)



1) MeOH,  $H^+$  (make ketone)

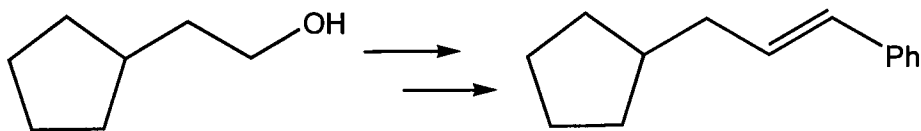
2)  $LiAlH_4$

3)  $SOCl_2 / Et_3N$

4)  $NaCN$

5)  $H_3O^+$

c)



1)  $SOCl_2$  (or  $MSOCl$ , etc)

2)  $Ph_3P$ , heat

3) BuLi, then  $PhCHO$