Chemistry 320 N
Dr. Eric V. Anslyn
First Midterm
February 12th, 2012

Name:_____

Signature:_____

Please print the first three alphabetic letters of your last name in the box

K	E	Y

Only tests written in permanent ink can be submitted for regrade.
Please do not write with a red pen

Honor Code:

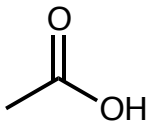
The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness and respect toward peers and community.

_____

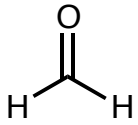
(Your Signature)

PAGE	Earned Points	Total Points
4		18
5		8
6		10
7		24
8		10
9		24
10		12
11		12
12-13		20
14-15		20
16		10
17		20
18		20
19		24
20		25
21		5
22		5
TOTAL		262
%		
T-SCORE		

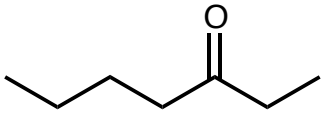
Q1- (**2pts each**) Give the common names or nicknames of the compound shown below.



Acetic Acid



Formaldehyde

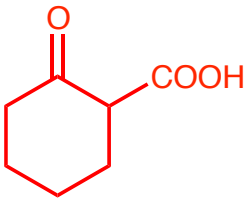


ethyl butyl ketone or 3-heptanone

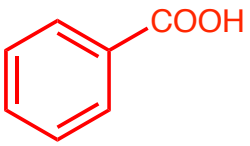
Q2- (**4pts each**) Draw the line structure of the following molecule.

Acetone

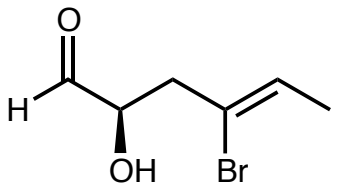
2-Oxocyclohexanecarboxylic acid
Homework problem 17.8



Benzoic Acid

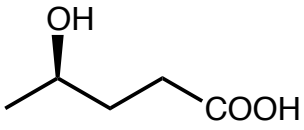


Q3- (**4pts each**) Give the IUPAC name of each compound shown below.



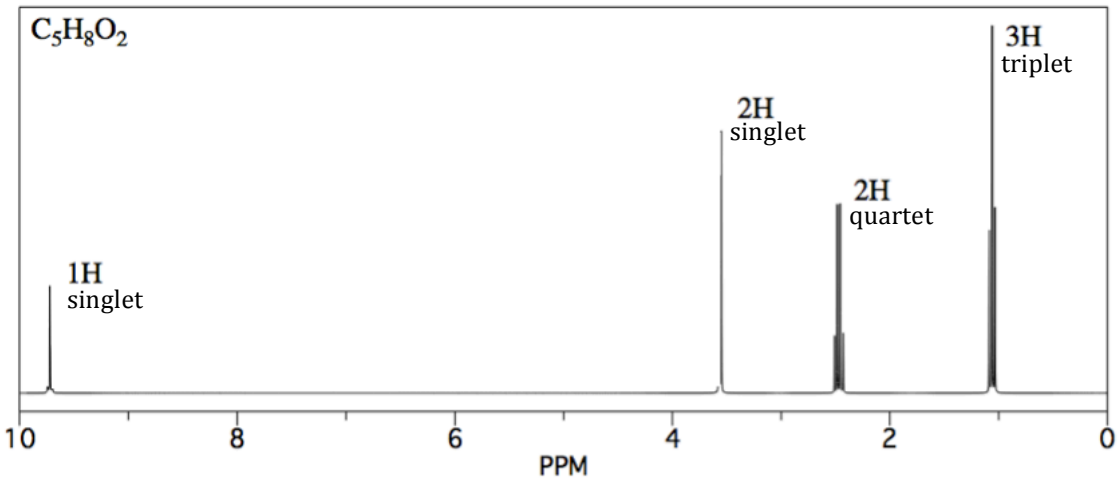
(*R, Z*)-4-bromo 2 hydroxy hex-4-enal

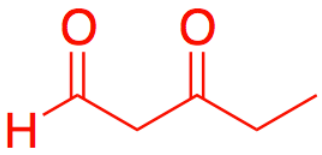
Homework problem 17.7



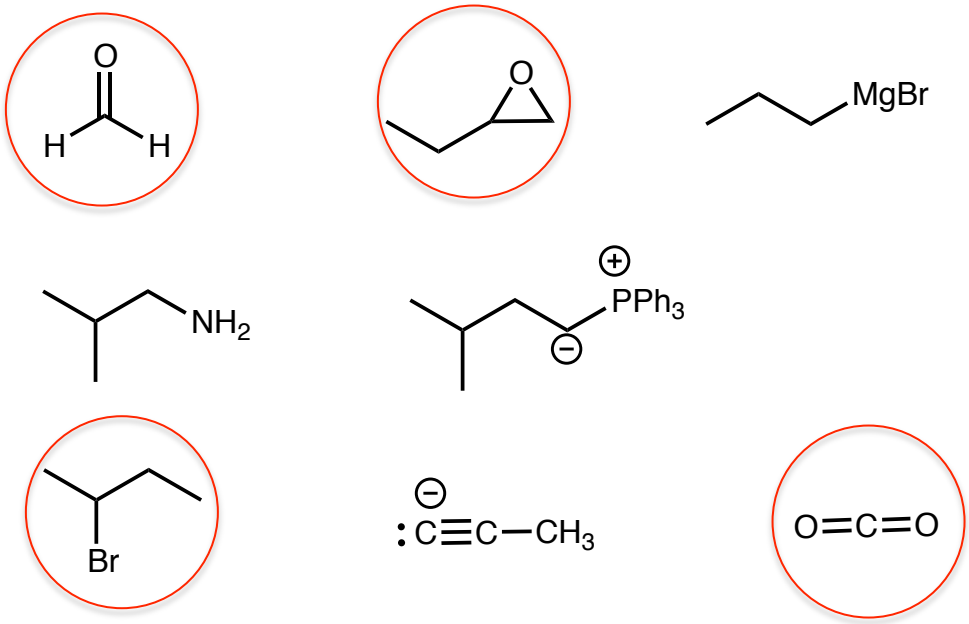
(*R*)-4-hydroxypentanoic acid

Q4- (**10pts**) Draw the structure of the compound that corresponds to the ^1H NMR spectrum below. The molecular formula is in the upper left of the spectrum. To help you, please realize that treatment of this molecule with two equivalents of H_2/Pt would creates a 1, 3-diol.

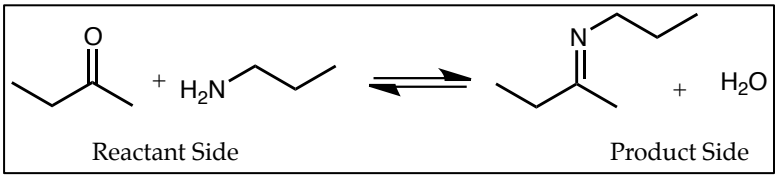




Q5- (**2pts each**) Circle the molecules below that are electrophiles.



Q6- Answer the following questions for the reaction shown below.



6a) (**2pts**) If water is in excess, which side of the reaction is favored?

Reactant Side

6b) (**2pts**) If water is removed by a Dean-Stark trap, which side of the reaction is favored?

Product Side

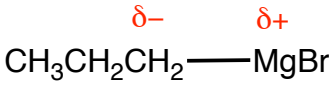
6c) (**2pts**) If the amine is in excess, which side of the reaction is favored?

Product Side

6d) (**2pts**) What is the phenomenon described in a-c called?

Le- Chatelier's Principle

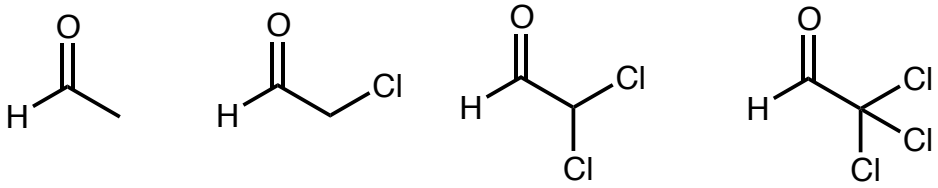
Q7a)-(**2pts**) Draw a partial positive charge (δ+) and a partial negative charge (δ-) on the appropriate atoms in the molecule shown below.



7b)-(**2pts**) From your answer to part a, why are Grignard reagents nucleophiles?

a) Carbon is more electronegative than the metal (magnesium), so the carbon-metal bond is strongly polarized with more electron density on the carbon.

Q8a) (**4pts**) Rank the molecules above from the most electrophilic carbonyl carbon (1) to the least electrophilic carbonyl carbon (4) in the spaces provided.

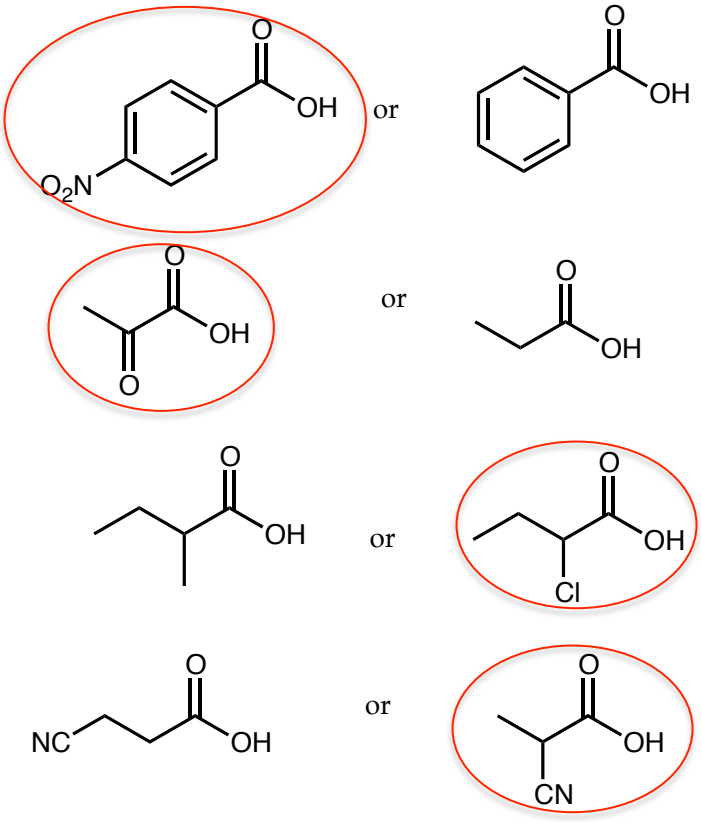


4 3 2 1

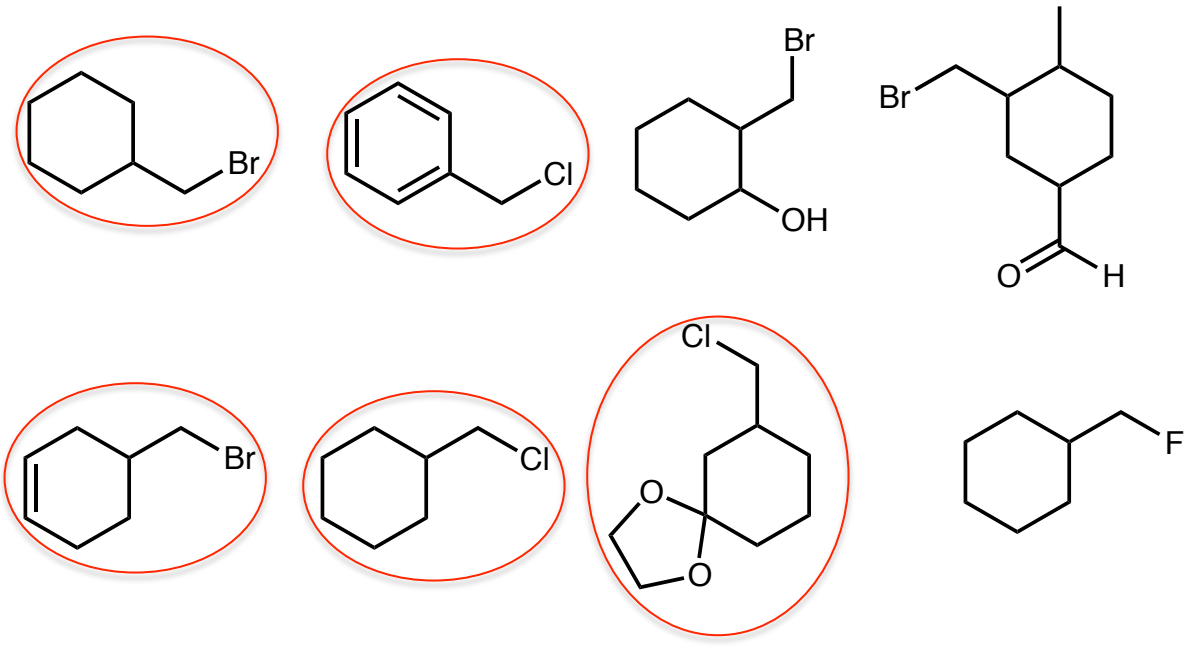
8b) (**2pts**) Give the name of the effect that describes the trend.

Induction or inductive effect

Q9-(**2pts each**) In each pair below, circle the carboxylic acid with the lower pKa.

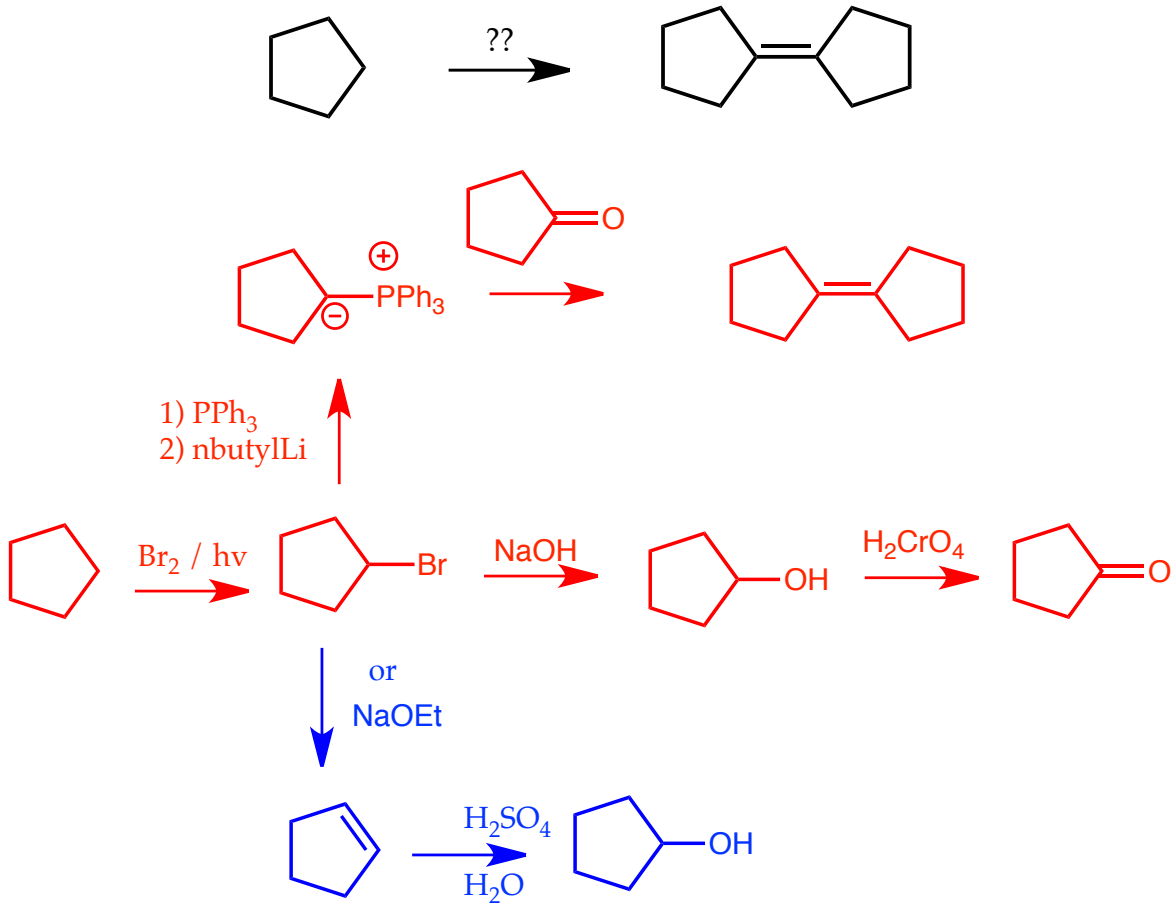


Q10-(**2pts each**) Circle the molecules below that could be used to make Grignard reagents that would successfully react with acetone in a second step to give a 3° alcohol.



Q11- (**12pts**) This is a synthesis question. You need to show how the starting material can be converted in the product shown. You may use as many reactions as you need to make the desired product. Show all the reagents. Show all the molecules that you synthesize along the way.

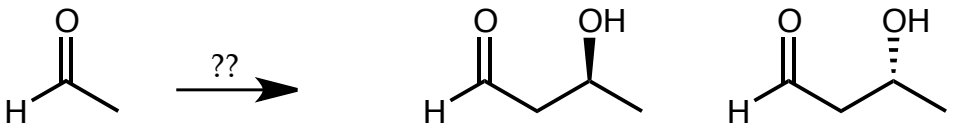
All the carbon atoms of the product should come from the starting material



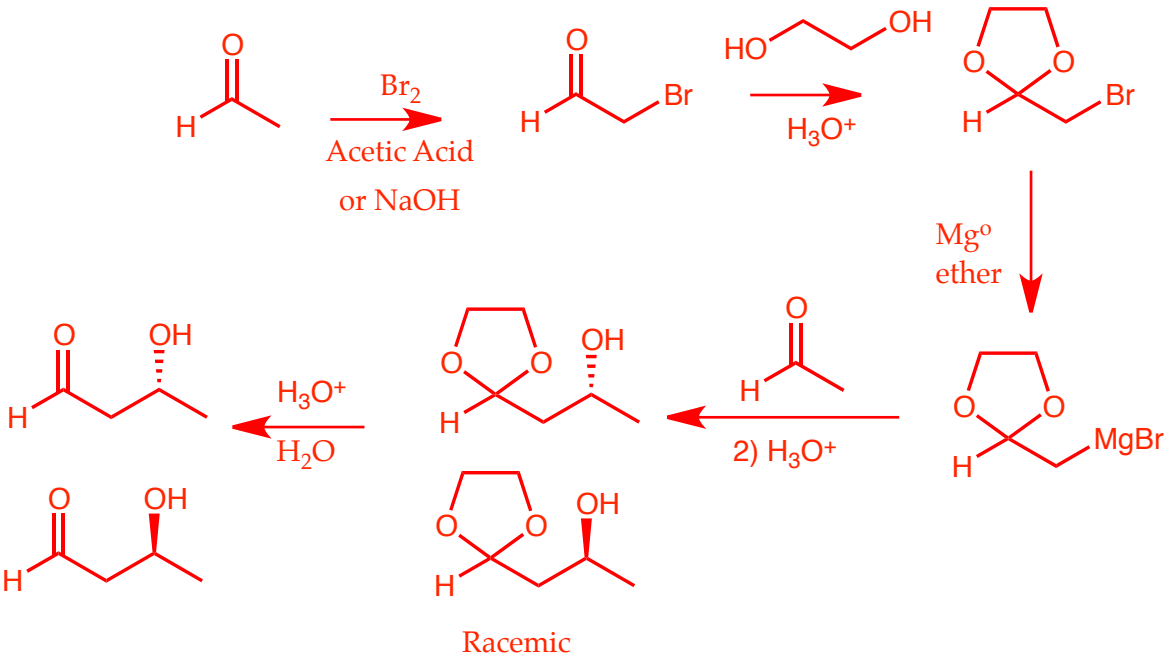
Points_____ 10

Q12- (**12pts**) This is also a synthesis questions but **right out of your notes**. You need to show how the starting material can be converted in the product shown. You may use as many reactions as you need to make the desired product. Show all the reagents. Show all the molecules that you synthesize along the way. pay close attention to regiochemistry and stereochemistry. If you make a racemic mixture show all products and make sure you label **RACEMIC.**

All the carbon atoms of the product should come from the starting material



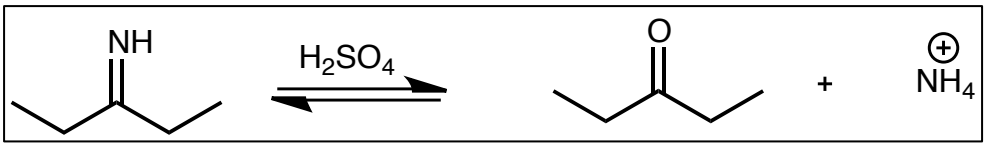
Racemic



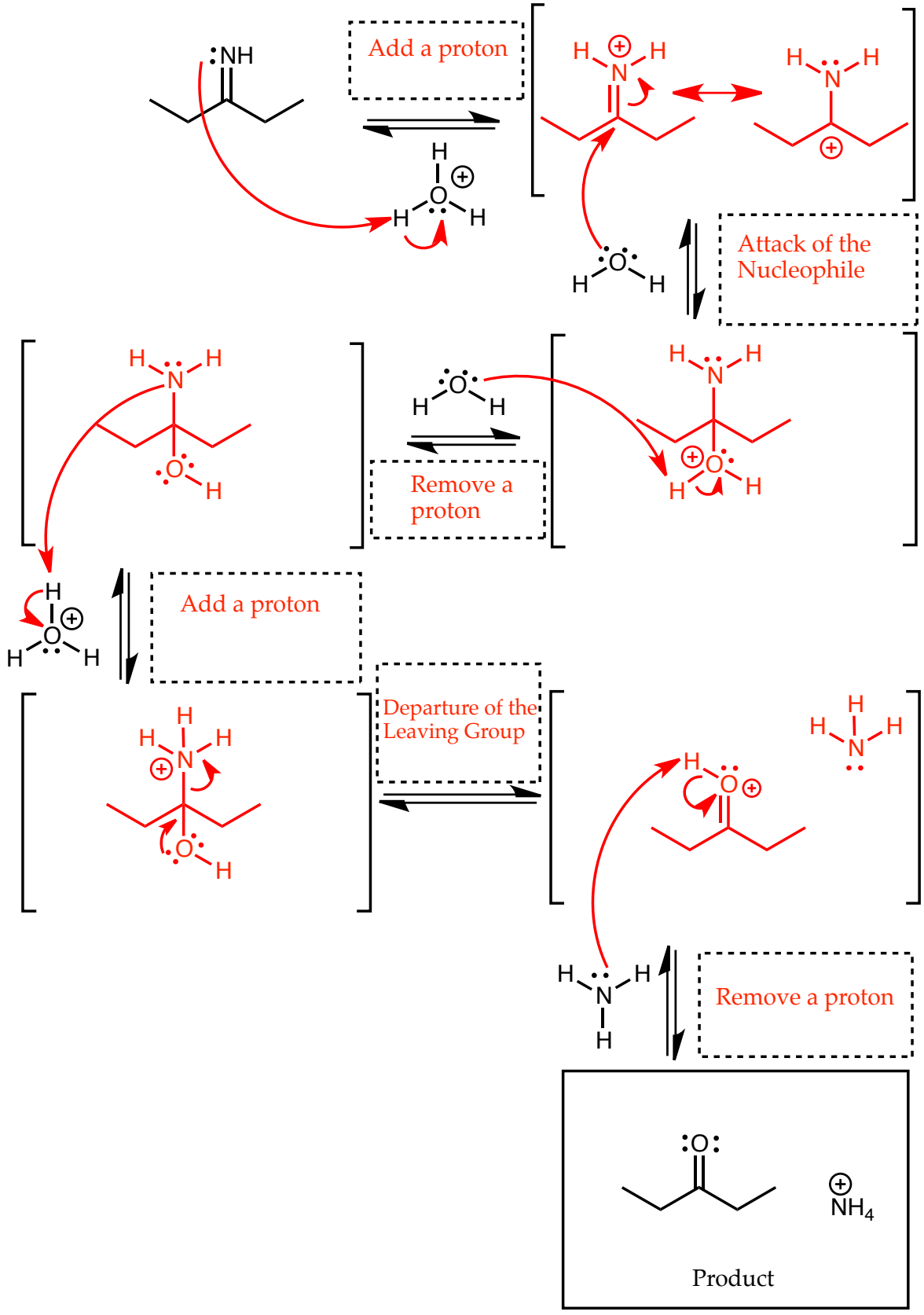
Racemic

Q13- (**20pt**) Draw the mechanism for the following reaction. Draw all the arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all products for each step. In the dashed box provided write what mechanistic element is involved in the transition.

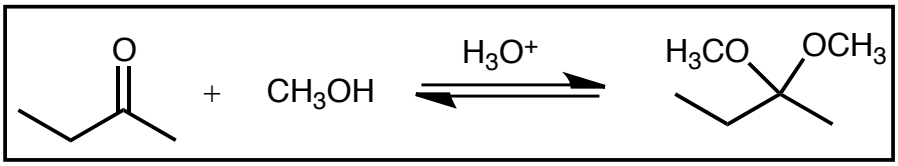
- Attack of the Nucleophile
- Add a proton
- Remove a proton
- Departure of the leaving group.



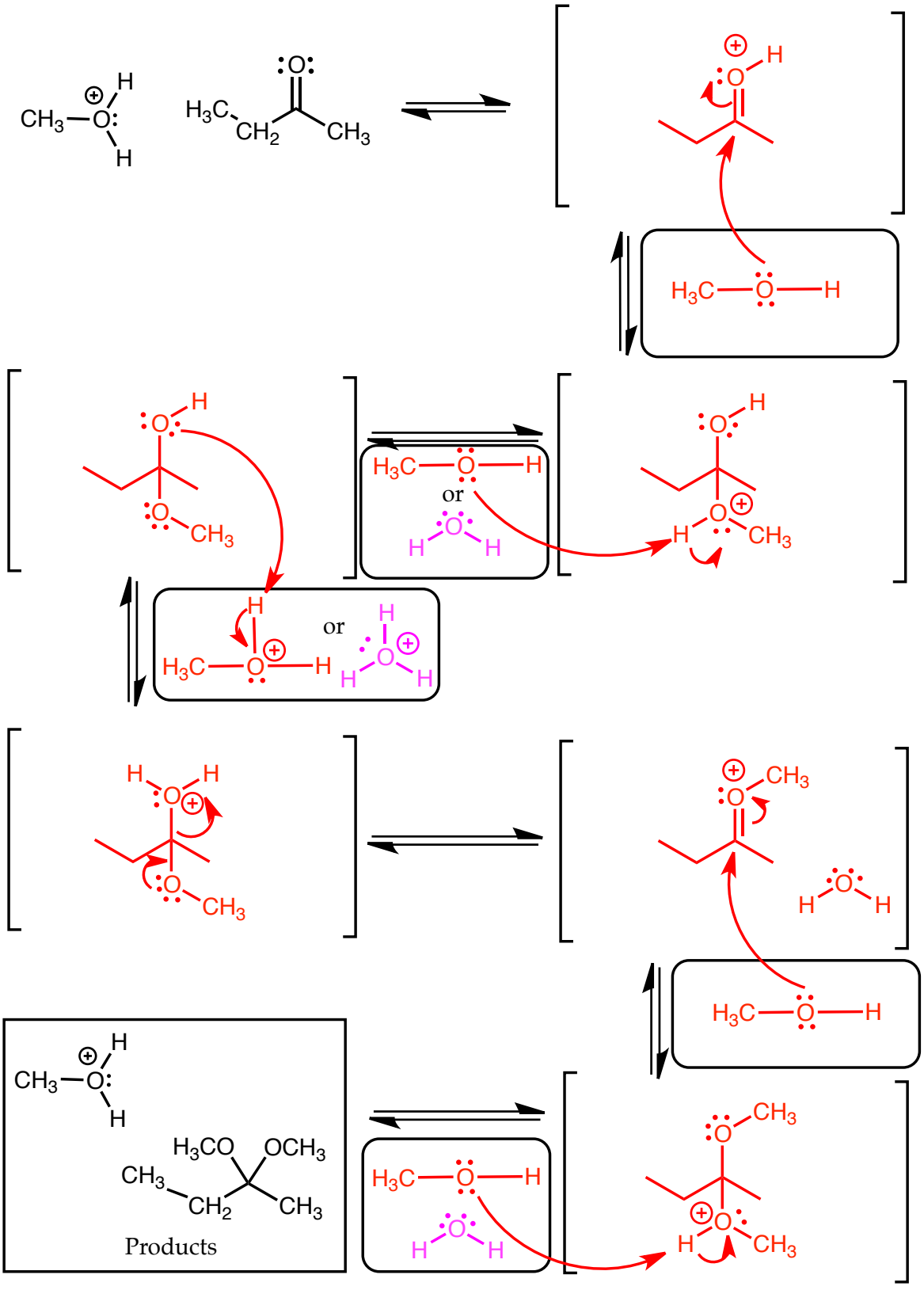
DRAW THE MECHANISM ON THE NEXT PAGE


Add a proton
Attack of the Nucleophile
Remove a proton
Add a proton
Departure of the Leaving Group
Remove a proton
Product

Q16- (**20pt**) Draw the mechanism for the following reaction. Draw all the arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all products for each step. In the boxes provided **draw the reagent required for the transformations**. In other words, do not write the mechanistic elements this time.

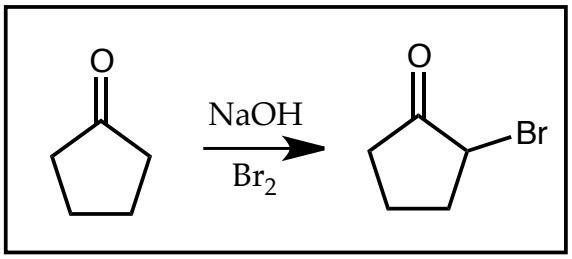


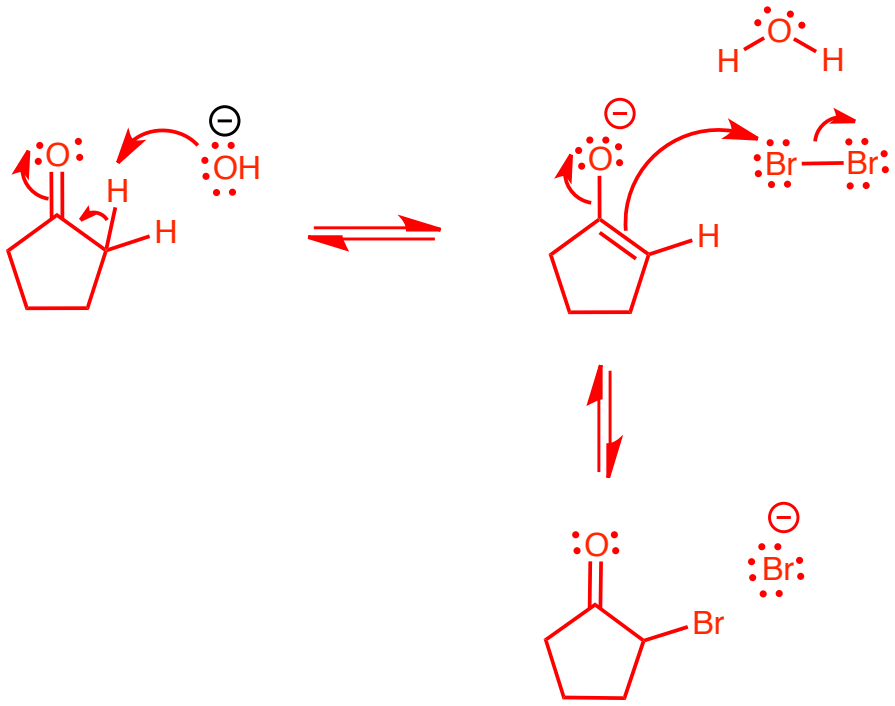
DRAW THE MECHANISM ON THE NEXT PAGE


or
or
Products

Q17-(**10pts**) Draw the mechanism for the following reaction without boxes this time. Draw all the arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all products for each step.

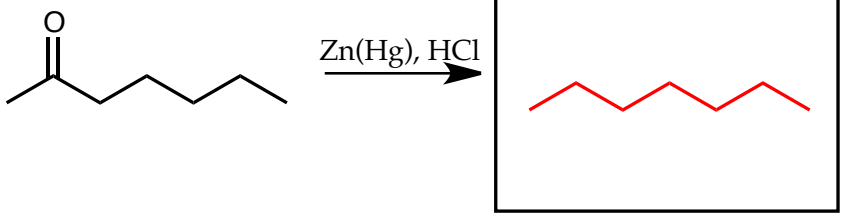
DRAW THE MECHANISM ON THIS PAGE



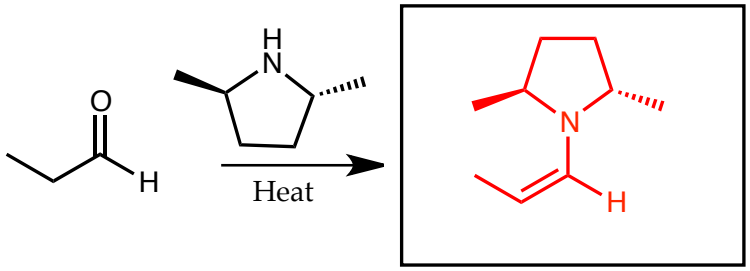


Q18-(**4pts**) Fill in the boxes with the major product or the most likely starting material or the reagent required to achieve the following transformation. If a chiral center is created and a racemic mixture is formed you must draw both enantiomers and write racemic under the structure. Use wedges ( ) and dashes ( ) to indicate stereochemistry. To get full credit you only need to write the major organic product for these. You do not have to worry about the other products. (Cat=catalytic)

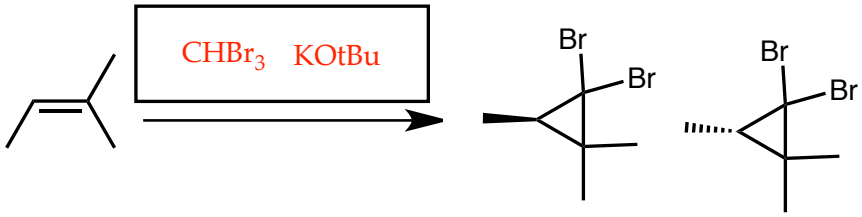
a)



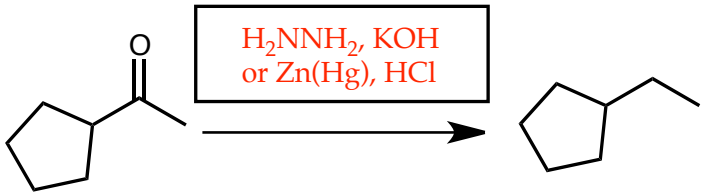
b)



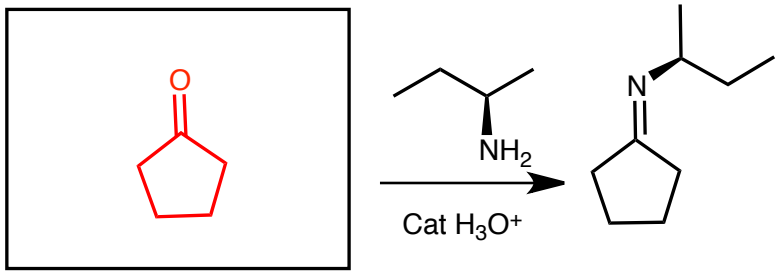
c)



d)



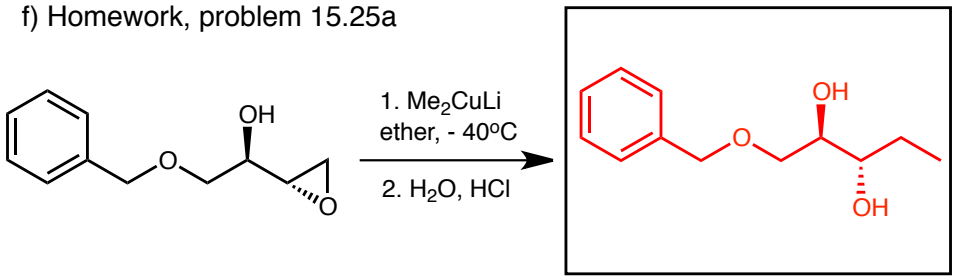
e)



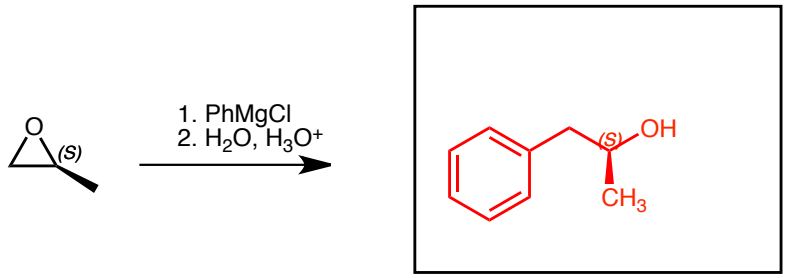
Points_____

Q18 continued……

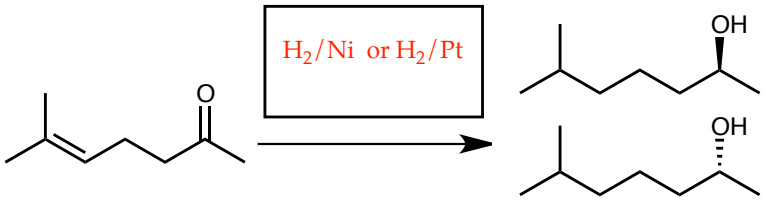
f) Homework, problem 15.25a



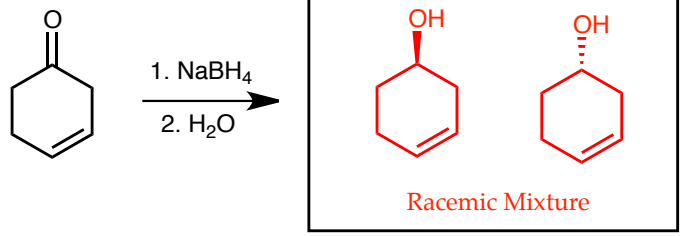
g)



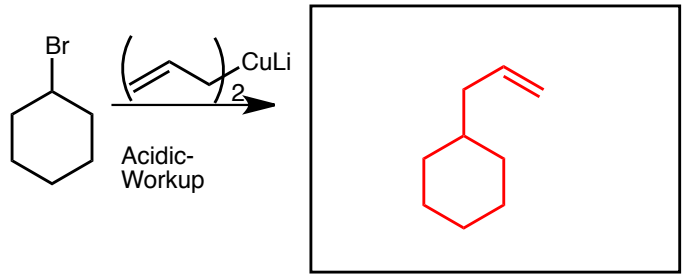
h)



i)

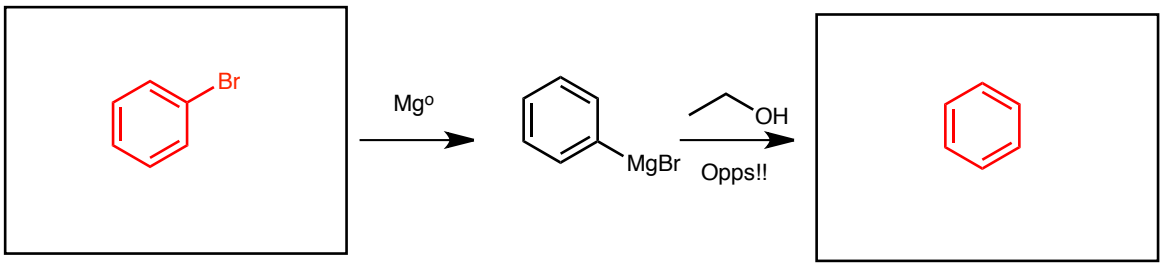


j)

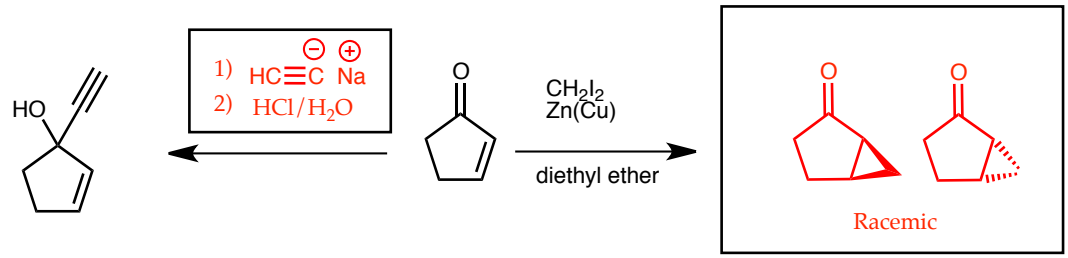


Q18-continued……

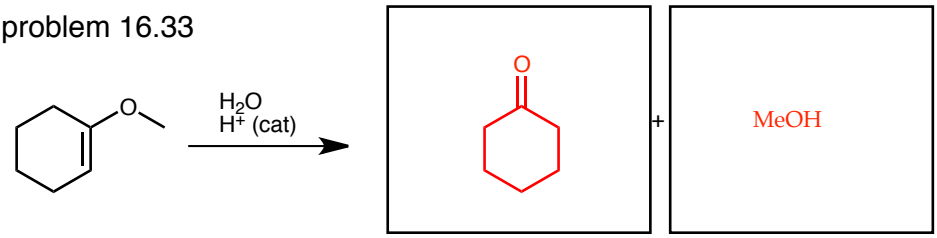
k)



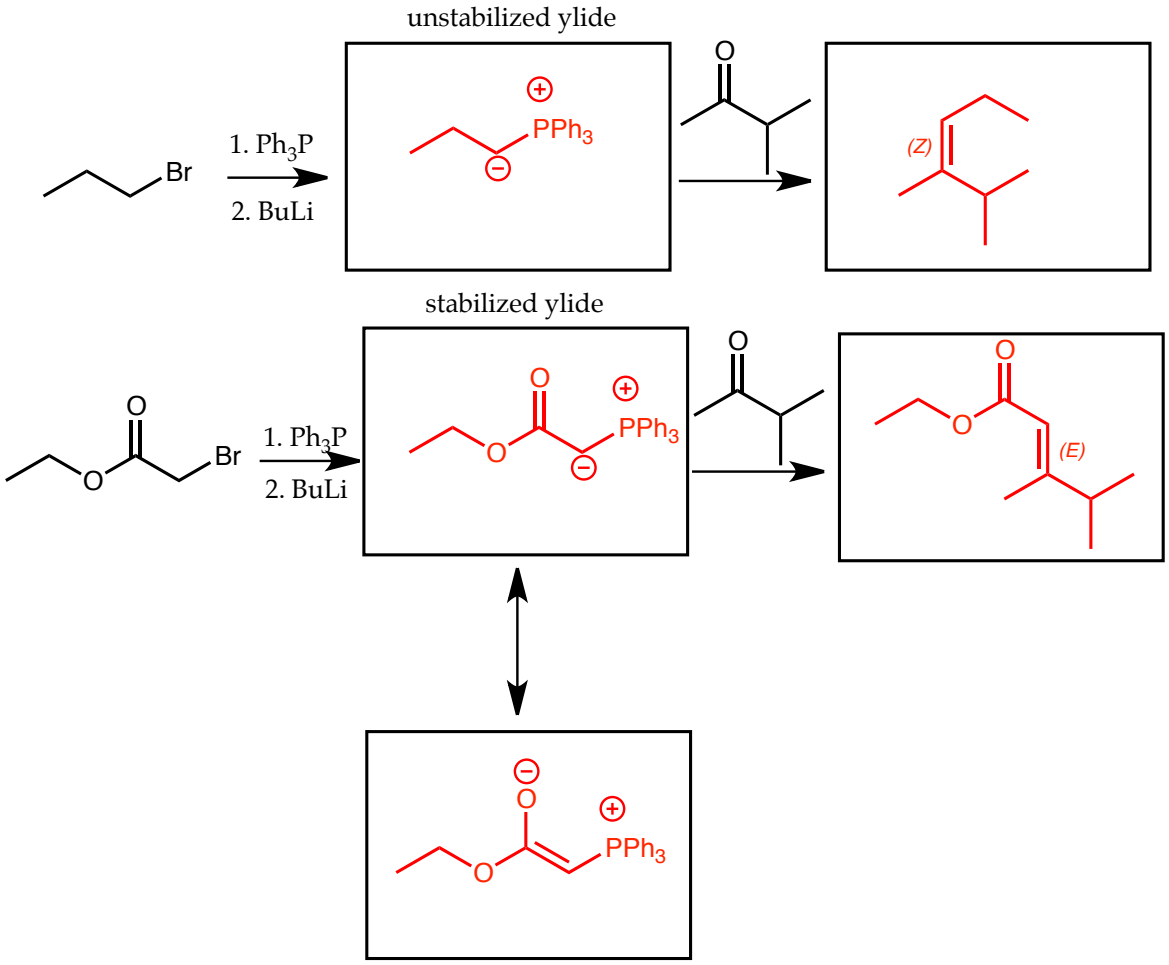
l)



m) Homework, problem 16.33

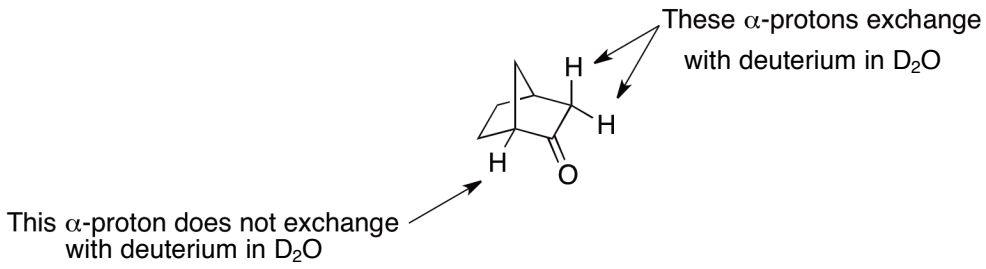


Q20-(**5pts each**) In class, Dr. Anslyn told you that you get a mixture of E and Z products with the Wittig reaction. However, if you read section 16.6 in the textbook, you know that this reaction is actually selective for the E or Z isomer of the product depending on the type of ylide used in the reaction. Unstabilized ylides give predominantly Z products, while stabilized ylides give predominantly E products. Based on this information, draw the ylide and final product for each reaction above in the boxes provided. For the stabilized ylide, draw both resonance structures to demonstrate how this ylide is stabilized.

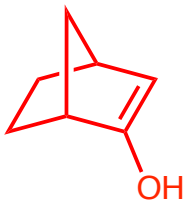


Points_____ 20

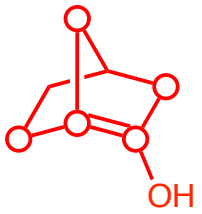
Q21-(**5pts**) The following bicyclic ketone has two α-carbon atoms and three α-hydrogen atoms. When this molecule is treated with D_2O and an acid catalyst, two of the three α-protons (shown in the figure) exchange with deuterium. The α-proton at the bridgehead does not.



Why doesn't the third α-proton exchange?
(**Homework problem 16.45**)
Hint: Draw the possible enols, and think about the structure of alkenes and enols. These structures are not required for full credit, but may help you explain your answer better.



Left



Right

The enol on the right cannot form because it requires formation of a trans double bond in a 5 or 6 membered ring. This causes too much strain so the enol doesn't form and no exchange occurs.

OR

The enol on the right cannot form because all of the indicated carbons cannot be in one plane. No exchange occurs.

Q22- BONUS QUESTION (**5pts**) **–**In Professor Anslyn's opinion, who is the greatest female singer and dancer of the 20th century.

Judy Garland