



Sp24HWSet1

Homework Problem Set 1

Iverson CH320N

Due 10:00 PM Monday, January 22

NAME (Print): _____

SIGNATURE: _____

Chemistry 320N
Dr. Brent Iverson
1st Homework
January 16, 2024

Please print the first three letters of your last name in the three boxes

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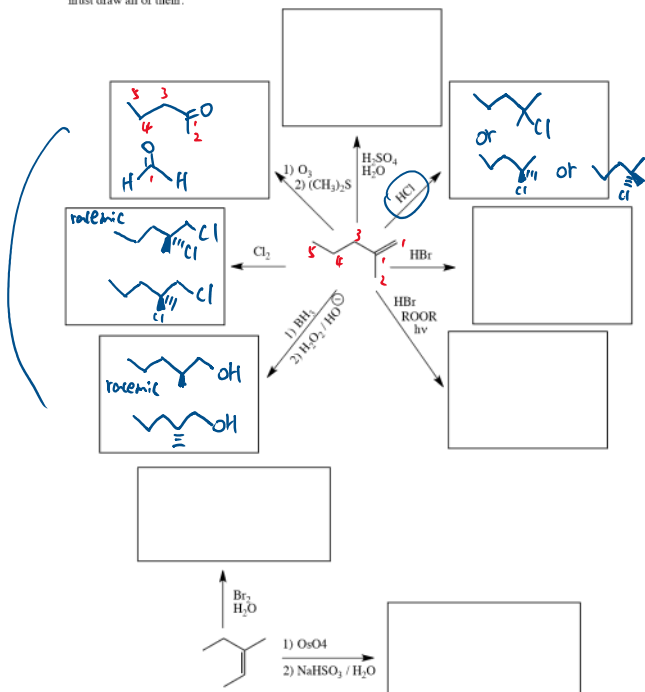
1

Homework Problem Set 1

Iverson CH320N

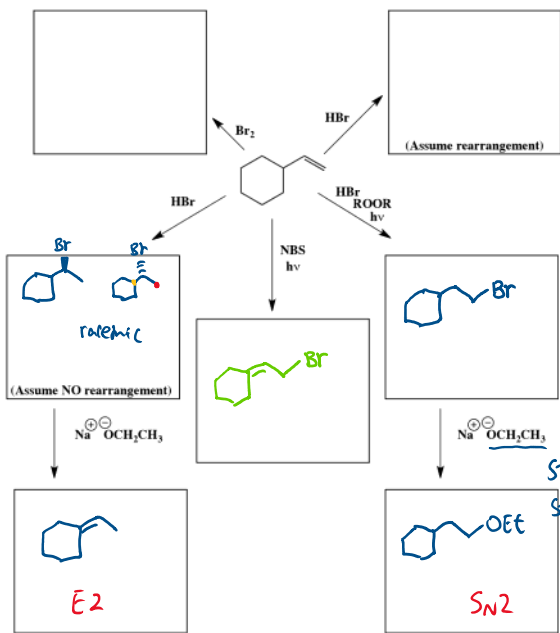
Due 10:00 PM Monday, January 22

(3 or 5 pts each) Fill in the boxes with the structures that complete the reactions. Use wedges and dashes to indicate stereochemistry when appropriate. If a racemic mixture is produced, you must draw both enantiomers and write the word "racemic". If more than one carbon containing product is produced, you must draw all of them.

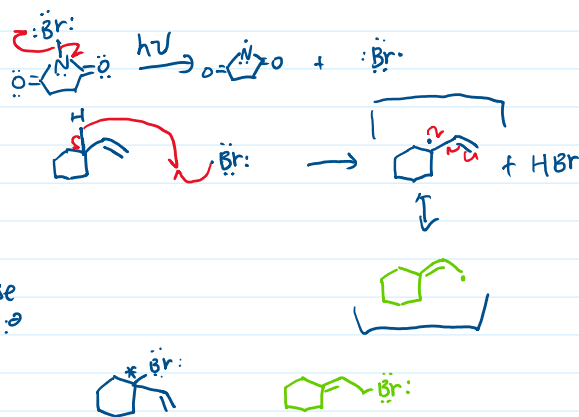


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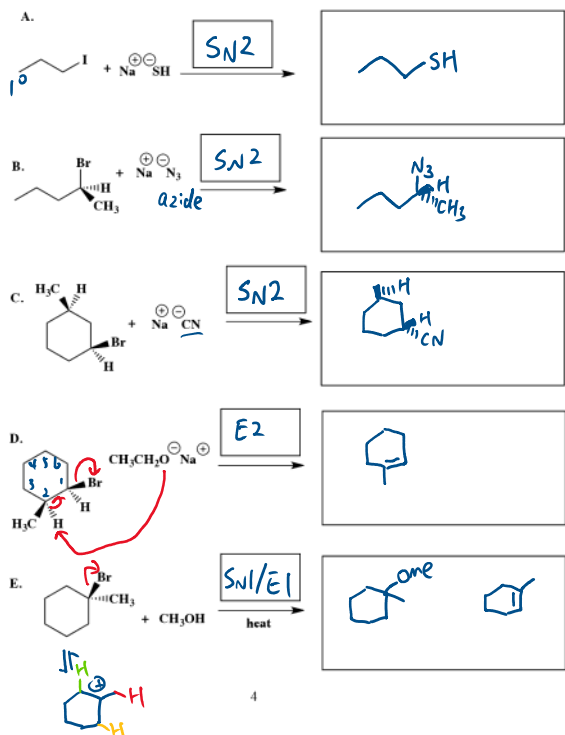
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3

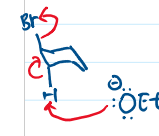


(5 or 7 pts each) The following reactions all involve substitution and/or elimination. Fill in the box above the arrow with the mechanism that will be followed (S_N2, E2, etc.). Then draw only the predominant product or products and please remember that you must draw the correct stereoisomers. For S_N1/E1 reactions you must draw both types of products.

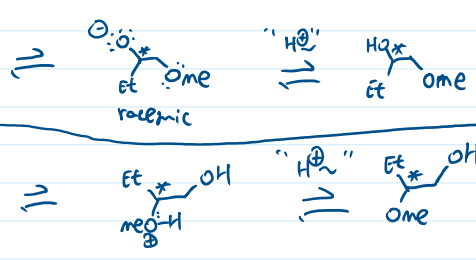
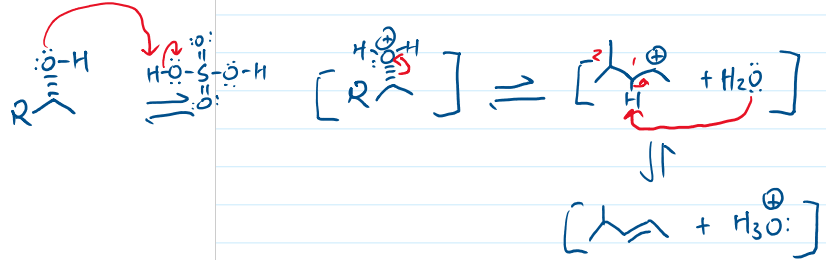
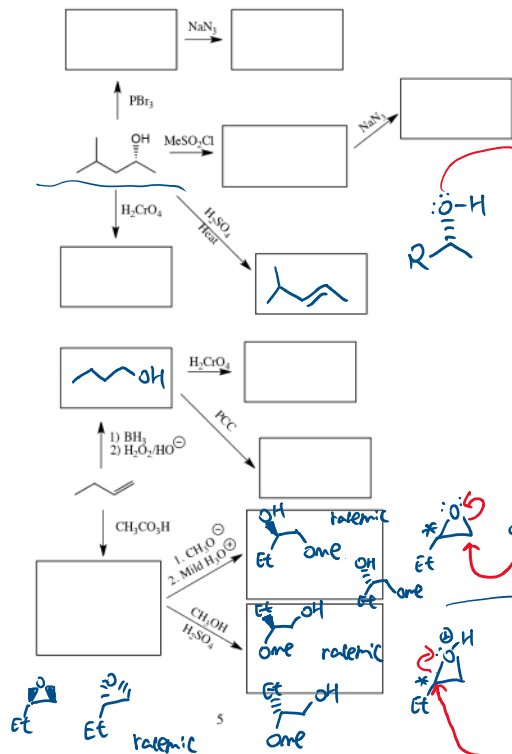


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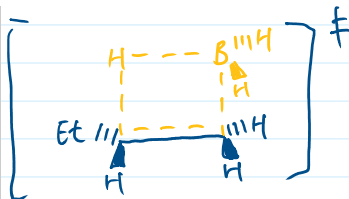
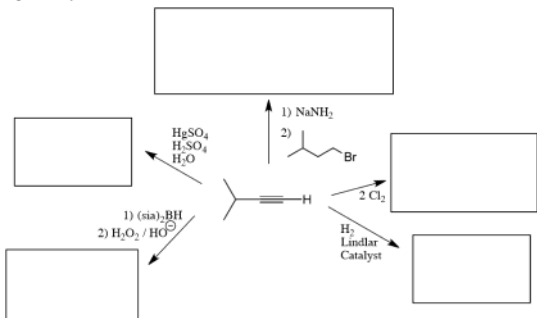
H-N₃
H-CN



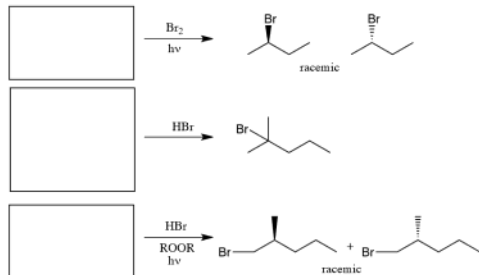
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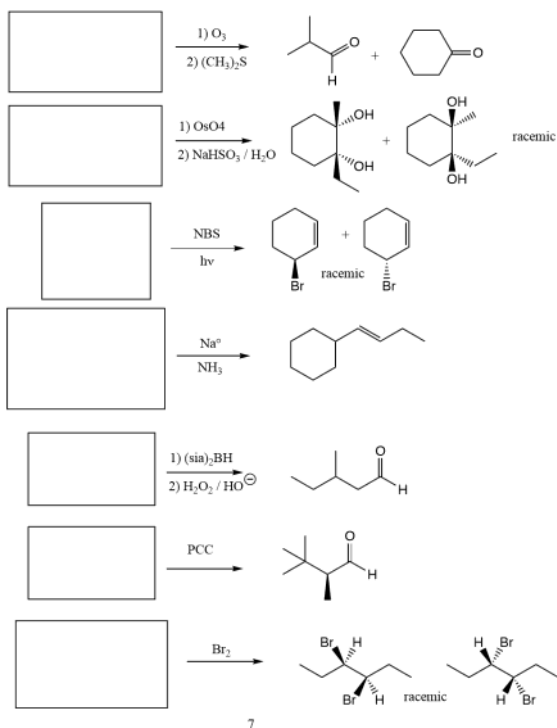
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(3 pts each) Fill in the boxes with the structures that complete the reactions. Use wedges and dashes to indicate stereochemistry when appropriate. This format is intended to get you more comfortable with working backwards in synthesis problems.

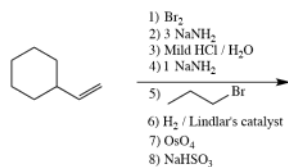
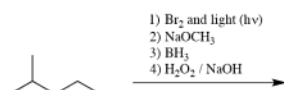


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7

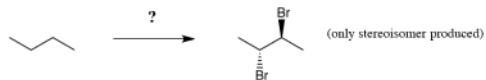
(7 and 9 pts) For the following sequences of reactions, work through all the different steps and then write the final product(s). Assume only the predominant product is formed at each step. You must indicate stereochemistry with wedges and dashes. You must draw all stereoisomers produced as predominant products and write "racemic" under the structures when appropriate. Assume no rearrangements take place.



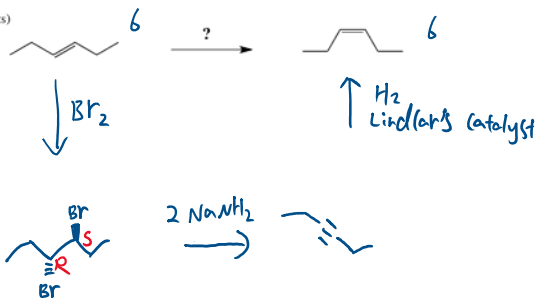
8

These are synthesis questions. You need to show how the starting material can be converted into the product(s) shown. You may use any reactions we have learned provided that the product(s) you draw for each step is/are the predominant one(s). Show all the reagents you need. Show each molecule synthesized along the way and be sure to pay attention to the regiochemistry and stereochemistry preferences for each reaction. You must draw all stereoisomers formed, and use wedges and dashes to indicate chirality at each chiral center. Write racemic when appropriate.

A) (8 pts)



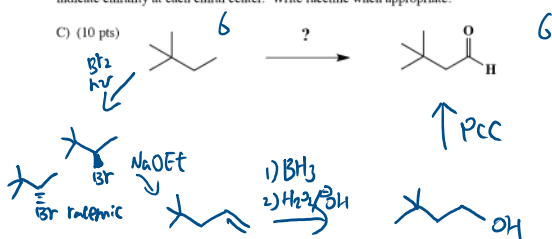
B) (8 pts)



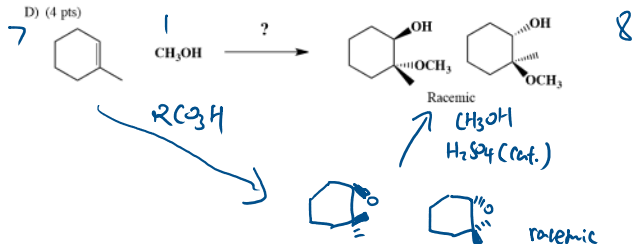
9

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C) (10 pts)



D) (4 pts)



10



Differences Between the Reagents

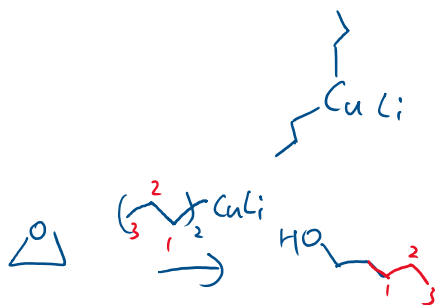
Alkyl lithium Reagents



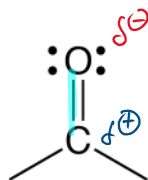
Grignard Reagents



Gilman Reagents ([Watch the Gilman Reagent video](#))



Functional Groups Such as Carbonyl Groups Undergo Characteristic Reactions



Here are the keys to understanding mechanisms in 320N!!

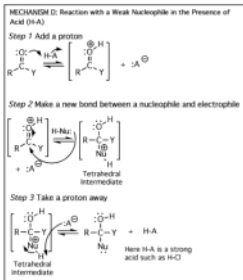
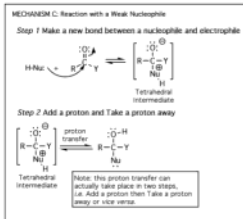
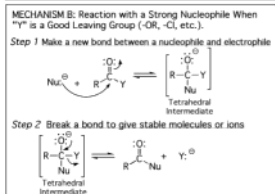
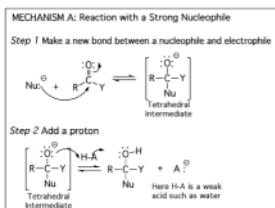
1) There are basically four different mechanisms elements that make up the steps of carbonyl reactions.

- A) Make a bond between a nucleophile and an electrophile
- B) Break a bond to give stable molecules or ions
- C) Add a proton
- D) Take a proton away

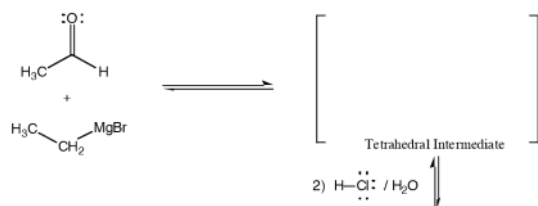
2) These same four mechanism elements describe most of the other mechanisms you have/will learn!!! (Yes, organic chemistry really is this simple if you look at it this way!!)

There are basically four different mechanisms that describe the vast majority of carbonyl reactions and these mechanisms are different combinations/ordering of the four mechanism elements listed above. In this class, I have termed them "Mechanism A", "Mechanism B", "Mechanism C", and "Mechanism D". They all involve a nucleophile attacking the partially positively charged carbon atom of the carbonyl to create a tetrahedral intermediate. Different reaction mechanisms are distinguished by the timing of protonation of the oxygen atom as well as the presence or absence of a leaving group attached to the carbonyl.

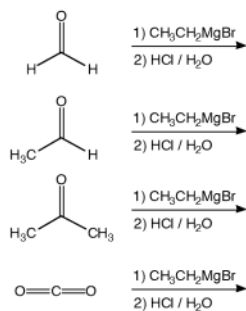
Four Mechanisms for the Reaction of Nucleophiles with Carbonyl Compounds



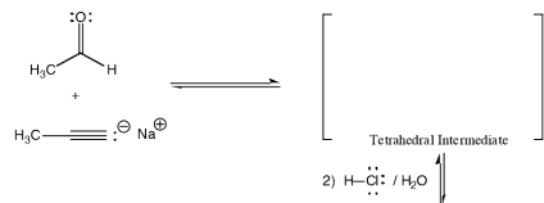
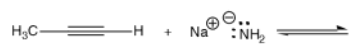
Grignard Reagent Reacting with an Aldehyde or Ketone



Key Recognition Element (KRE):



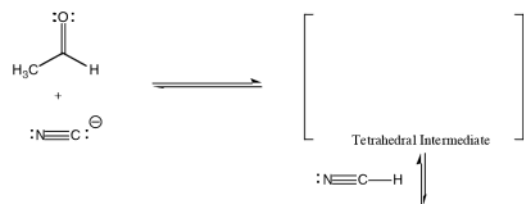
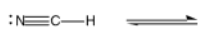
Alkyne Anion Reacting with an Aldehyde or Ketone



Key Recognition Element (KRE):



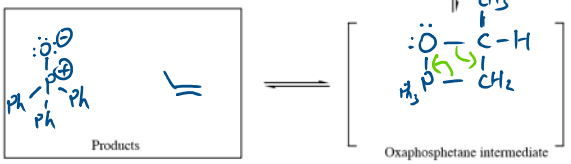
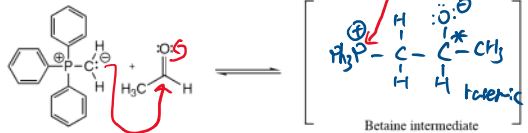
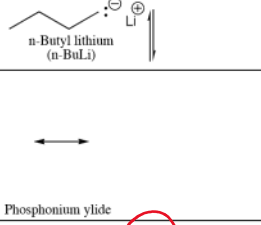
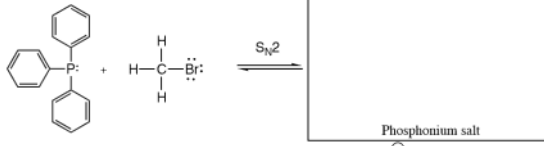
HCN Reacting with an Aldehyde or Ketone



Key Recognition Element (KRE):

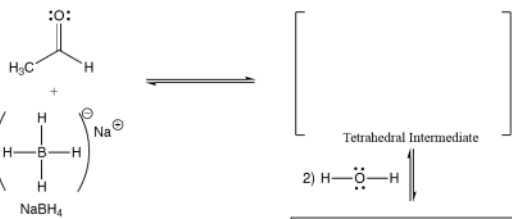


Wittig Reaction

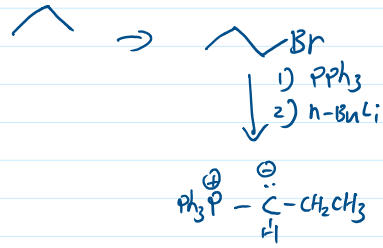
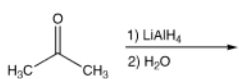
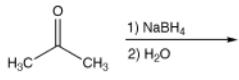
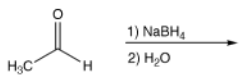


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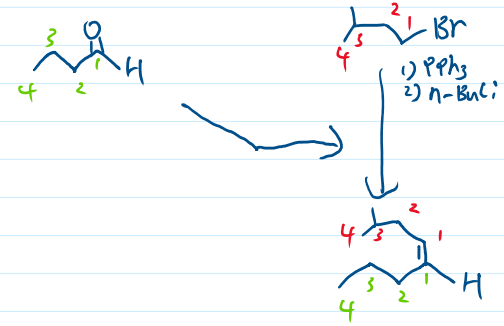
Sodium Borohydride Reacting with an Aldehyde or Ketone



Key Recognition Element (KRE):



1) Z alkene: alkyl ylide



2) E alkene:

