

**NAME (Print):** \_\_\_\_\_

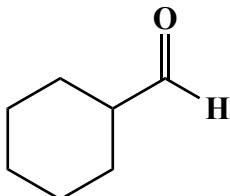
**Chemistry 320N**  
**Dr. Brent Iverson**  
**3rd Homework**  
**January 28, 2026**

**SIGNATURE:** \_\_\_\_\_

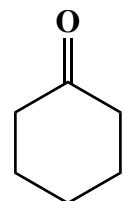
**Please print the  
first three letters  
of your last name  
in the three boxes**

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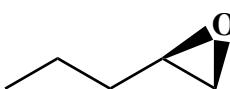
(4 pts) An important part of chemical understanding is being able to recognize the chemical reactivity of different functional groups. On the carbonyl group below, DRAW A BOX around the atom that will be attacked by nucleophiles and DRAW A CIRCLE around the atom that will be protonated in acid.



(12 pts) Being able to recognize the chemical personality of different species is one of the most important skills you can develop in Organic Chemistry. Fill in the correct circle under the structures to indicate whether that structure is considered an electrophile or nucleophile. Notice that some of the nucleophiles can also be considered bases, but we are not worrying about that for this questions.



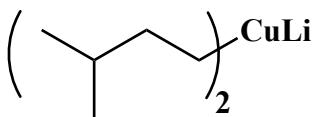
electrophile  
 nucleophile



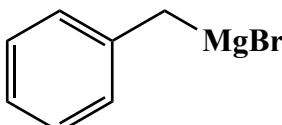
electrophile  
 nucleophile



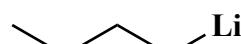
electrophile  
 nucleophile



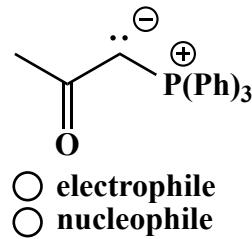
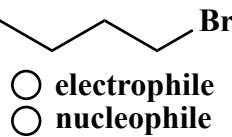
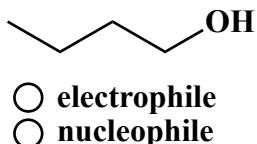
electrophile  
 nucleophile



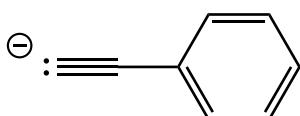
electrophile  
 nucleophile



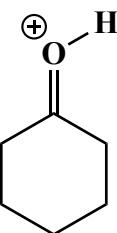
electrophile  
 nucleophile



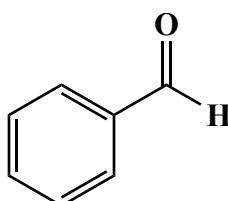
electrophile  
 nucleophile



electrophile  
 nucleophile

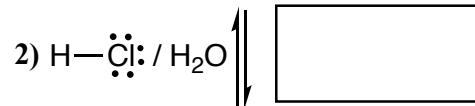
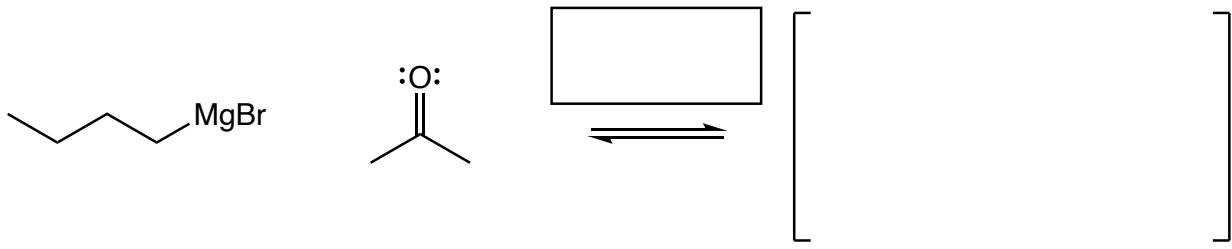


electrophile  
 nucleophile

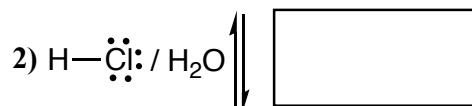
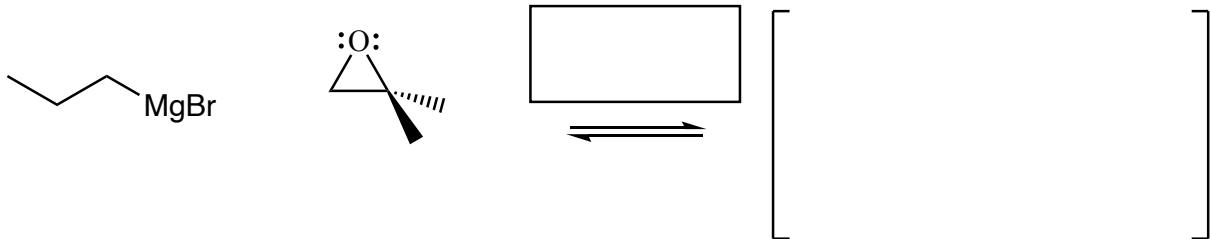


electrophile  
 nucleophile

(20 pts. total) Complete the mechanism for the following two Grignard reactions. **Be sure to show arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all the products for each step.** Remember, I said all the products for each step. **IF A NEW CHIRAL CENTER IS CREATED MARK IT WITH AN ASTERISK AND WRITE "RACEMIC" IF APPROPRIATE.** I realize these directions are complex, so please read them again to make sure you know what we want.



(You do not need to draw the Mg-containing product)



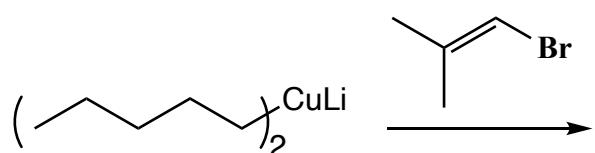
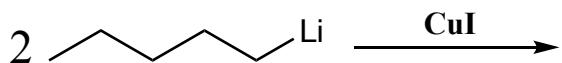
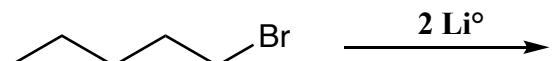
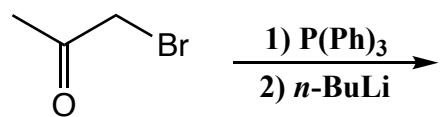
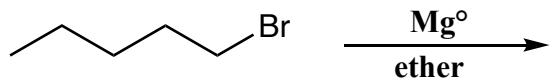
(You do not need to draw the Mg-containing product)

NOTICE THIS

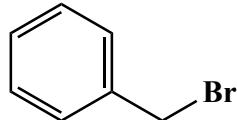


In the boxes provided adjacent to the arrows, write which of the four basic mechanistic elements are involved (i.e. "Make a bond", "Add a proton", etc.)

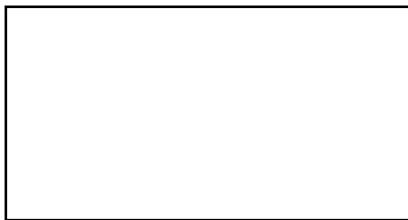
**(3 or 5 pts.)** Write the predominant product or products that will occur for each transformation. **If a new chiral center is created and a racemic mixture is formed, you must draw both enantiomers and write "racemic" under the structure. Use wedges (  $\nearrow$  ) and dashes (  $\cdots\cdots\cdots$  ) to indicate stereochemistry. To get full credit, you only need to write the the major organic product for these. You do not have to worry about the other products.**



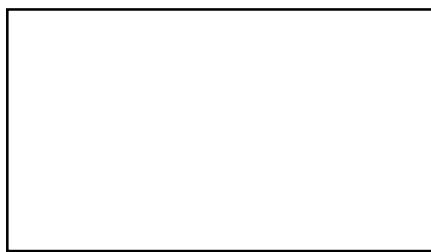
(3 or 5 pts each) Fill in the box with the product or products that are missing from the following chemical reaction equations. When a racemic mixture is formed, **you must write "racemic" under both structures EVEN THOUGH YOU DREW BOTH STRUCTURES**. For these draw all carbon containing products.



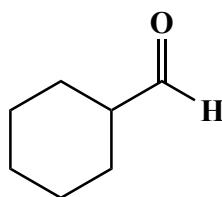
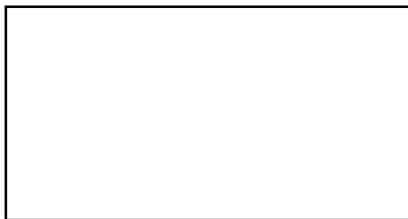
$\xrightarrow[\text{ether}]{\text{Mg}^0}$



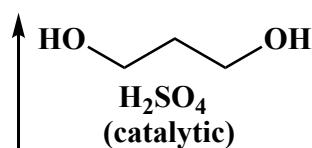
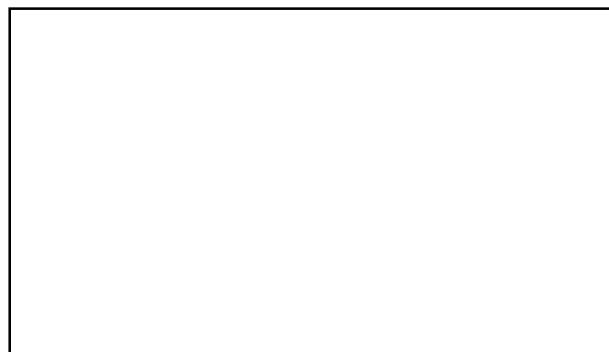
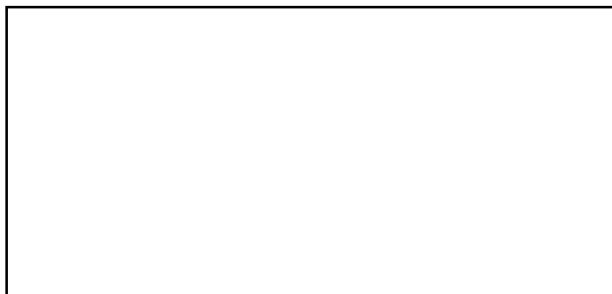
1)  $(\text{Ph})_3\text{P}$   
2)  $n\text{-BuLi}$



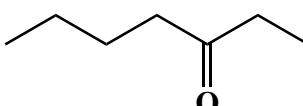
1)  $\text{CO}_2$   
2)  $\text{HCl} / \text{H}_2\text{O}$



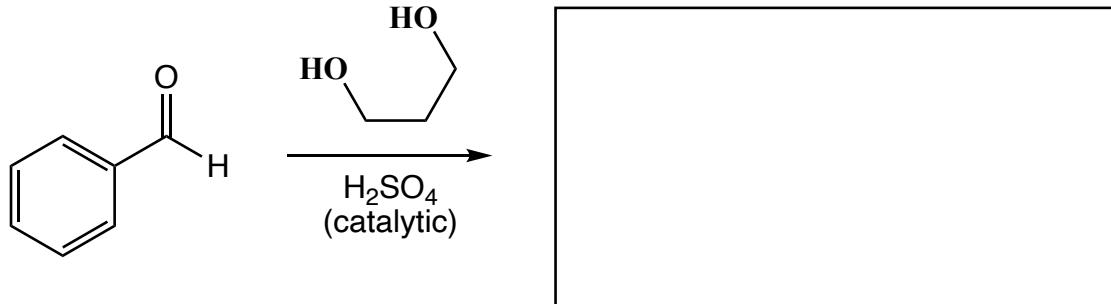
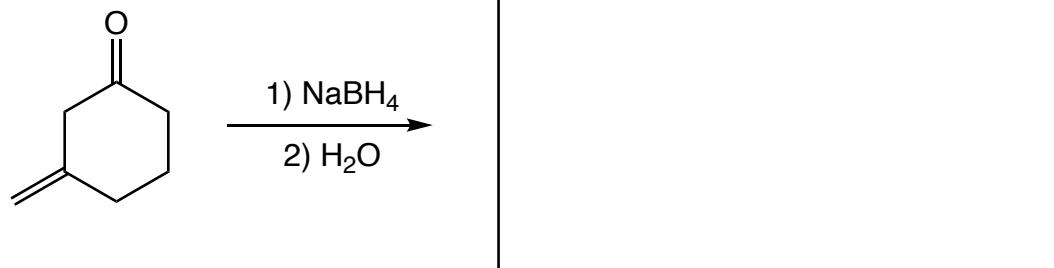
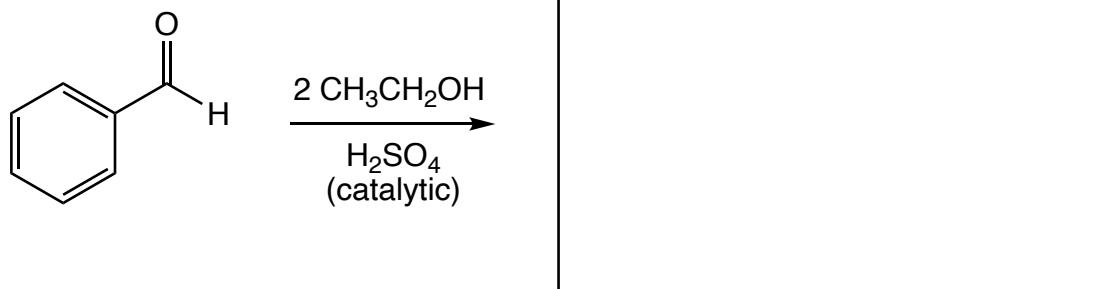
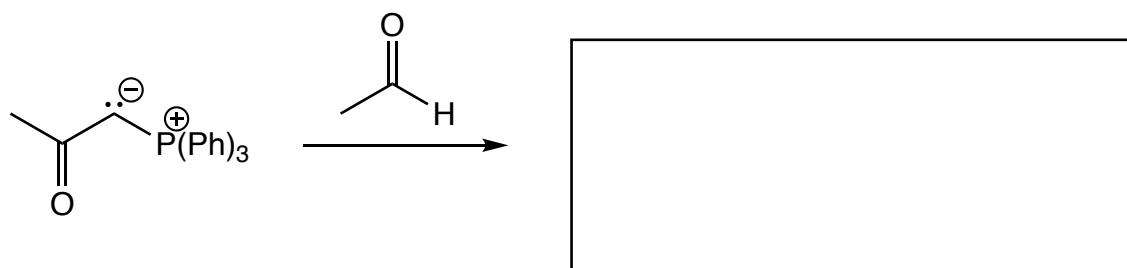
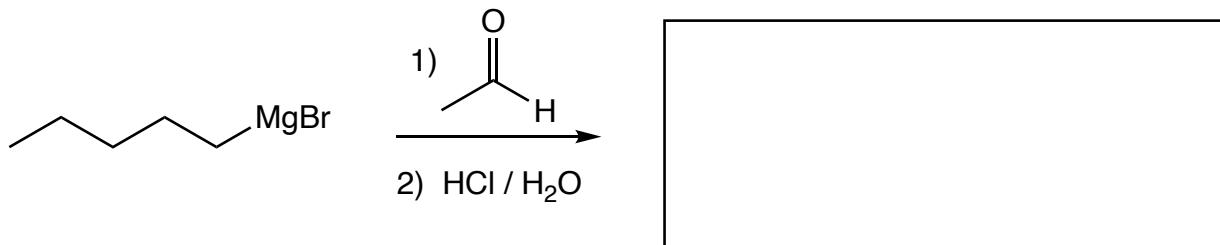
↓



$\xleftarrow{\text{HCN}}$

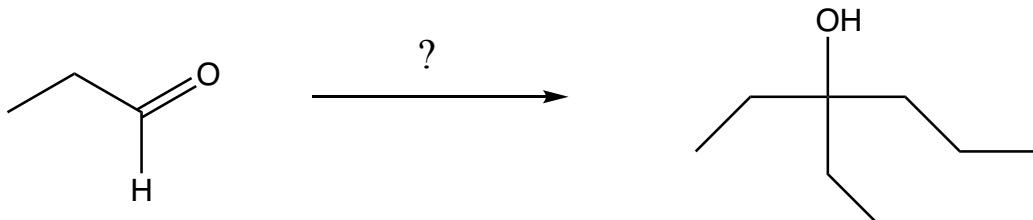


**(3 or 5 pts.)** Write the predominant product or products that will occur for each transformation. **If a new chiral center is created and a racemic mixture is formed, you must draw both enantiomers and write "racemic" under the structure. Use wedges (  $\nearrow$  ) and dashes (  $\cdots\cdots\cdots$  ) to indicate stereochemistry. To get full credit, you only need to write the the major organic product for these. You do not have to worry about the other products.**



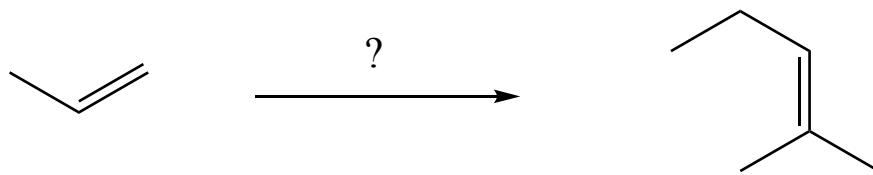
These are synthesis questions. You need to show how the starting material can be converted into the product(s) shown. You may use any reactions we have learned. Show all the reagents you need. Show each molecule synthesized along the way and be sure to pay attention to the regiochemistry and stereochemistry preferences for each reaction. If a racemic molecule is made along the way, you need to draw both enantiomers and label the mixture as "racemic".

(16 pts) **All of the carbon atoms of the products must come from the starting material for this one!**

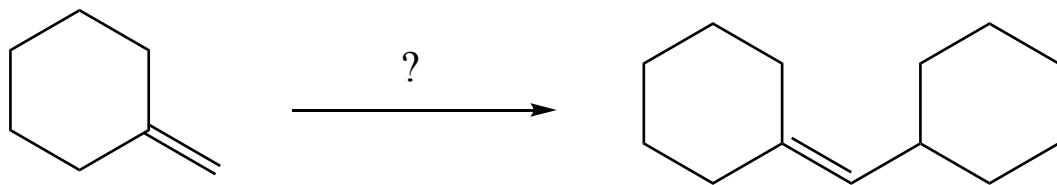


(15 pts) **All of the carbon atoms of the products must come from the starting material for this one!**

You have seen this before, try not to look at the answer before attempting it.



(13 pts) All of the carbon atoms of the products must come from the starting material for this one!



(13 pts) **All of the carbon atoms of the products must come from the starting material for this one!**

Note this one needs a protecting group that is not listed as a starting material because it is removed before the final product is made, so the carbons of the protecting group do not end up in the product. In practice, protecting groups like the one you will use here can be recycled.

