

NAME (Print): _____

SIGNATURE: _____

**Chemistry 320N
Dr. Brent Iverson
4th Homework
February 6, 2025**

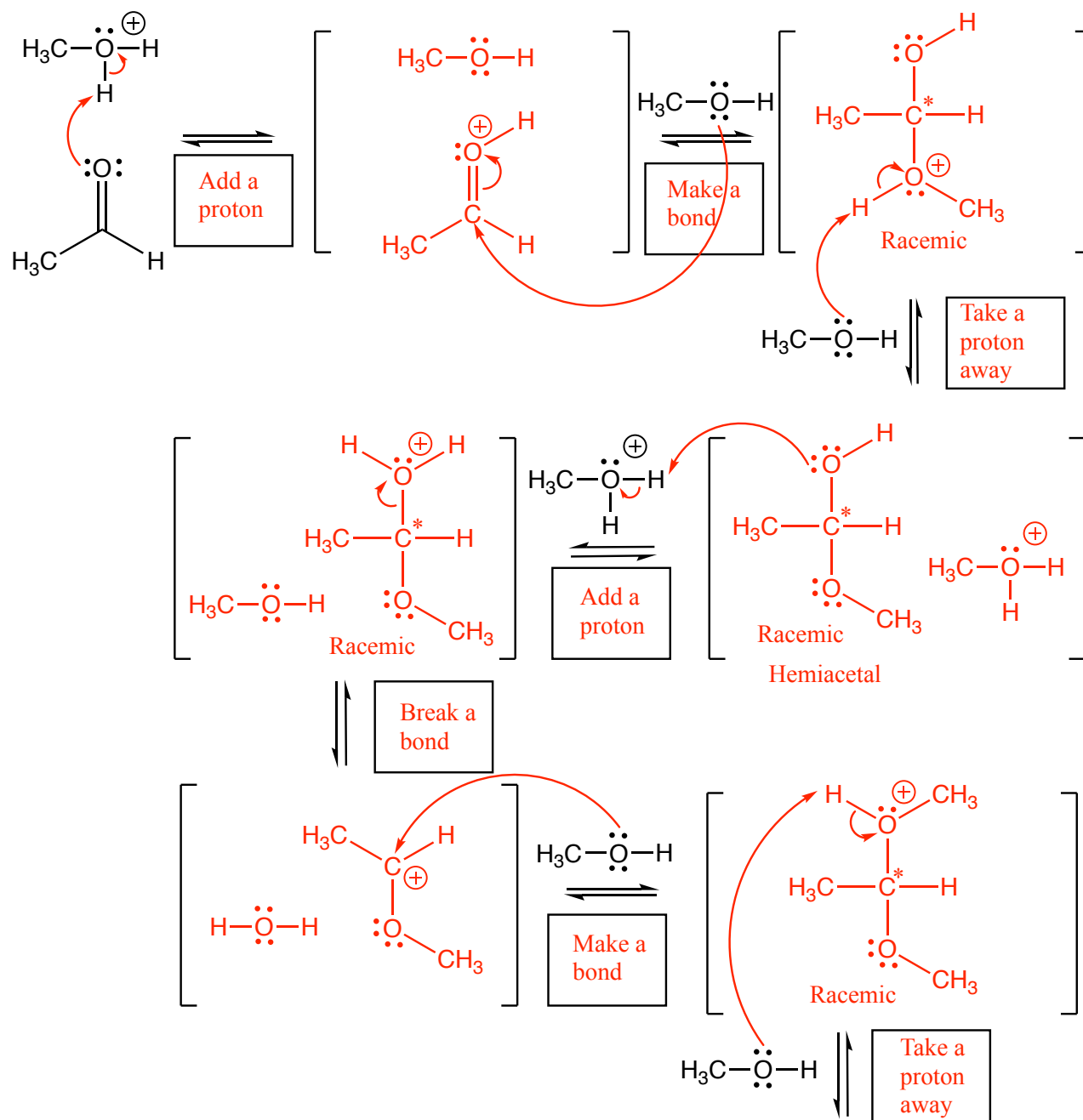
**Please print the
first three letters
of your last name
in the three boxes**

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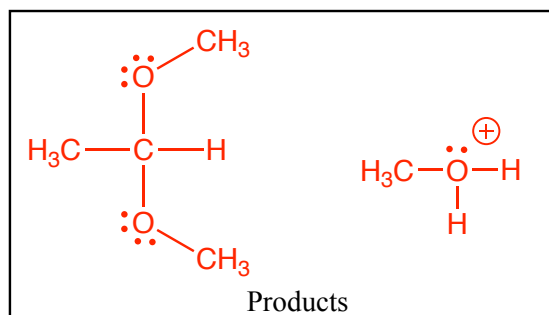
For the acetal formation mechanism on the following page, use **arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all the products for each step.** Remember, I said all the products for each step. **IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE, MARK IT WITH AN ASTERISK AND LABEL THE MOLECULE AS “RACEMIC” IF APPROPRIATE. FOR ALL CHIRAL PRODUCTS YOU MUST DRAW ALL ENANTIOMERS WITH WEDGES AND DASHES AND WRITE “RACEMIC” IF APPROPRIATE.** In the boxes provided by the arrows, write which of the 4 most common mechanistic elements describes each step (make a bond, break a bond, etc.). I put this on its own page so you have more room to draw the structures.

Signature _____

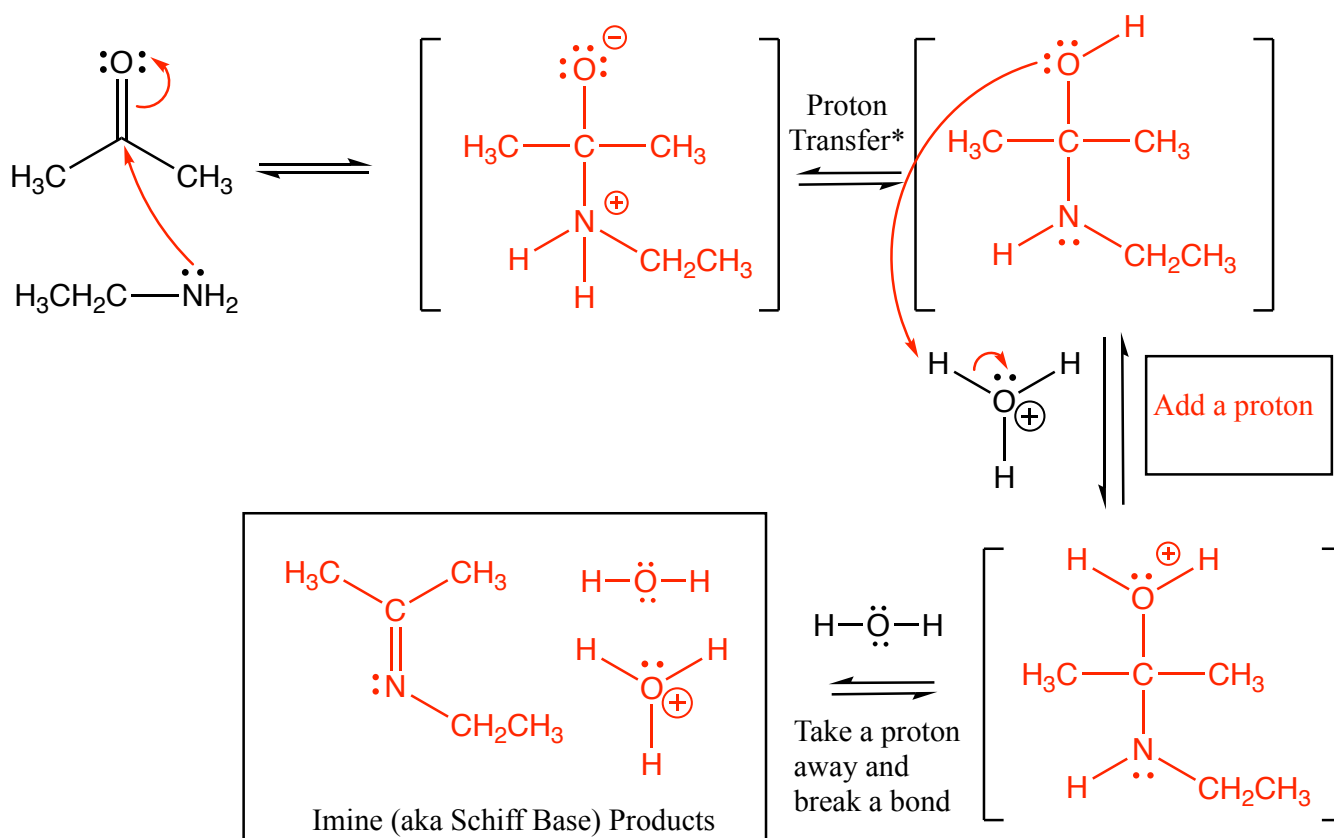
Pg 9 _____ (54)



Note: For intermediates that I drew as two contributing structures in class, you only need to draw one contributing structure. Either one will be correct. Just make sure your arrows are accurate for the contributing structure you draw.



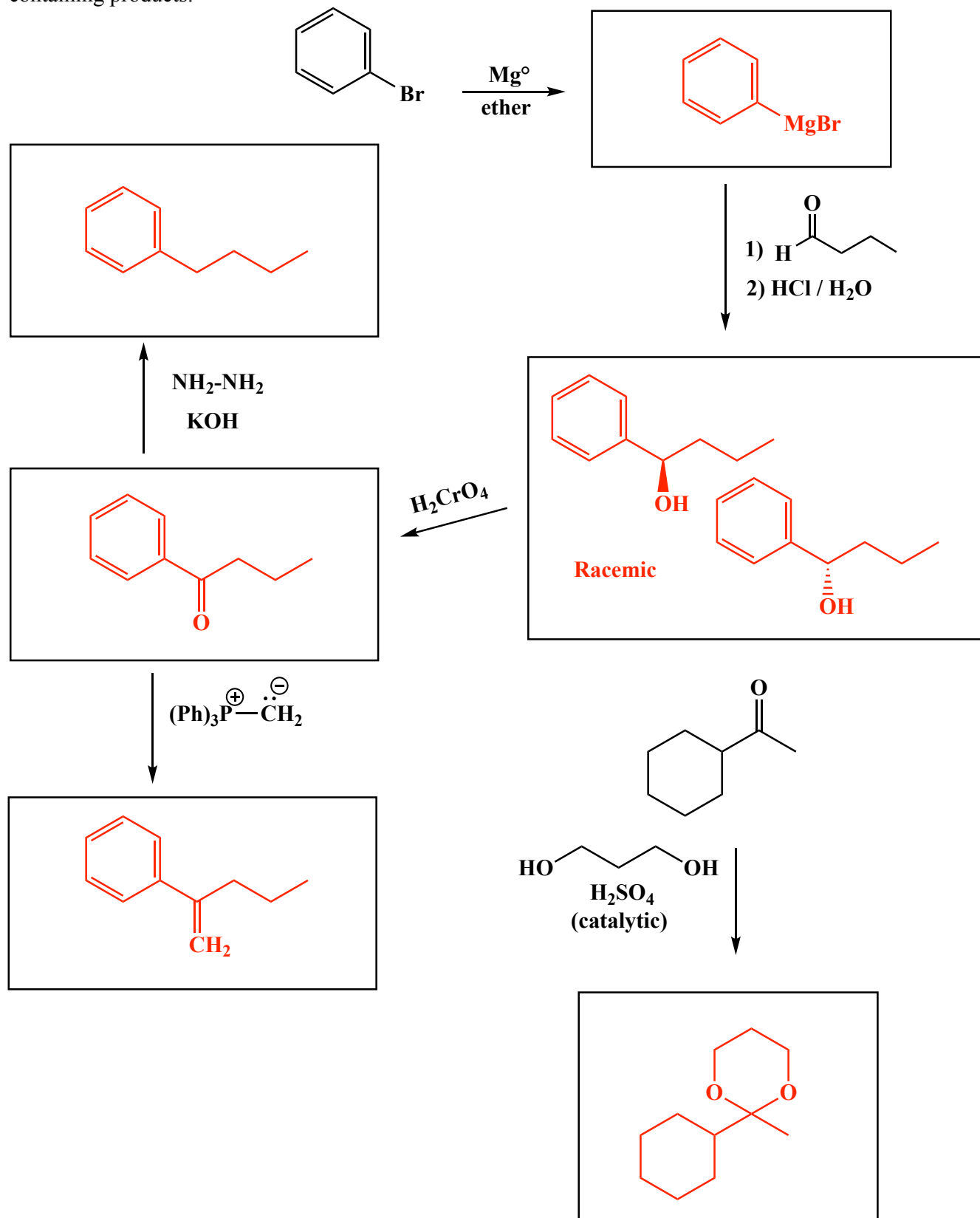
Complete the mechanism for the following imine forming reaction. **Be sure to show arrows to indicate movement of all electrons, write all lone pairs, all formal charges, and all the products for each step.** Remember, I said all the products for each step. **IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE, MARK IT WITH AN ASTERISK AND LABEL AS RACEMIC IF APPROPRIATE. IF A CHIRAL CENTER IS CREATED IN THE PRODUCTS YOU NEED TO DRAW BOTH ENANTIOMERS, AND LABEL THE PRODUCT MIXTURE AS RACEMIC IF APPROPRIATE.** In the one box provided adjacent to the middle arrow, write which of the four basic mechanistic elements are involved (i.e. "Make a bond", "Add a proton", etc.) I realize these directions are complex, so please read them again to make sure you know what we want.



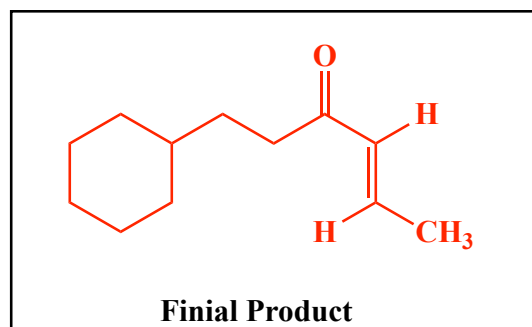
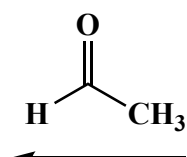
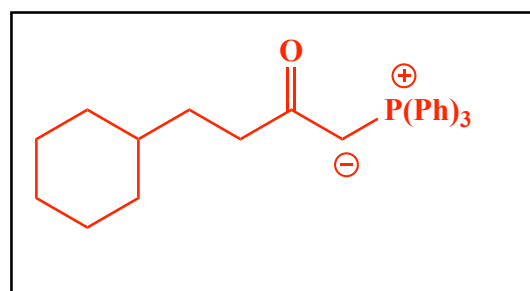
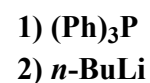
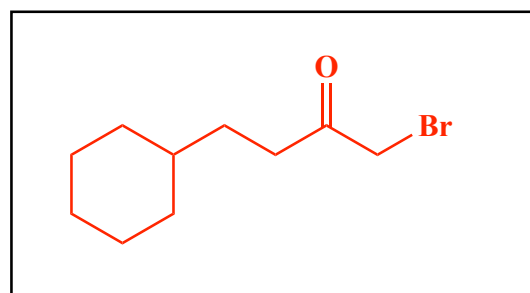
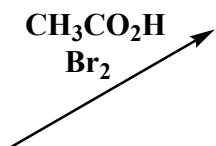
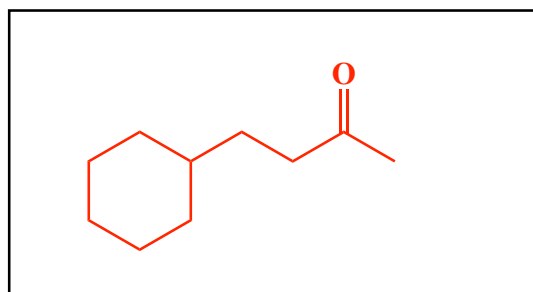
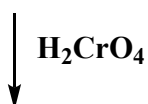
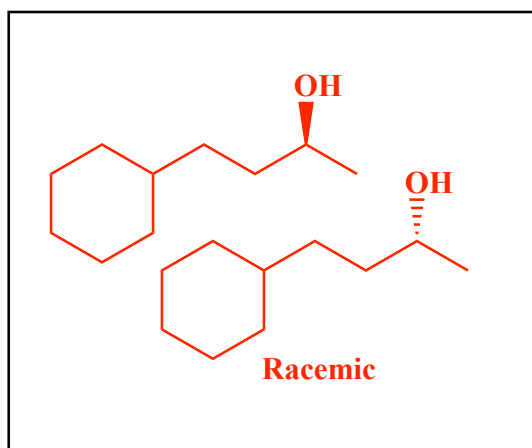
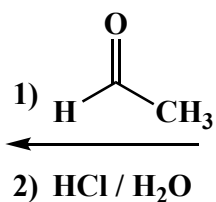
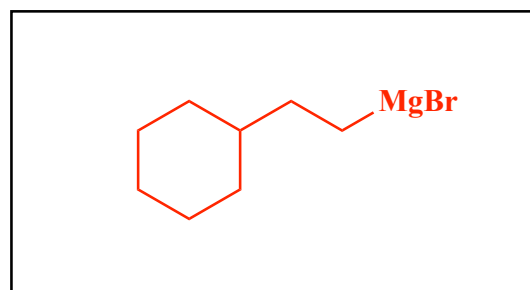
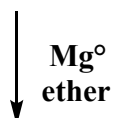
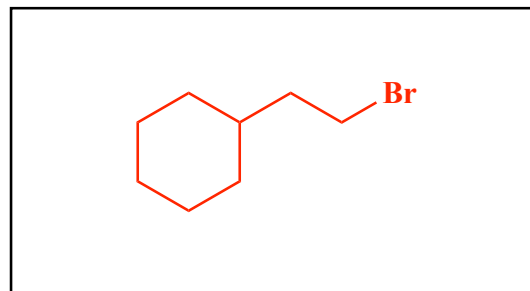
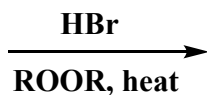
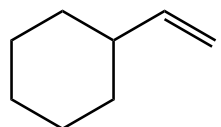
Note: I do not have arrows on this last step because it might occur as either one or two steps. For the record, we would NOT mark it wrong if you drew the correct arrows to make the products in one step.

Note: this last step might actually occur as two steps in some cases.

(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.

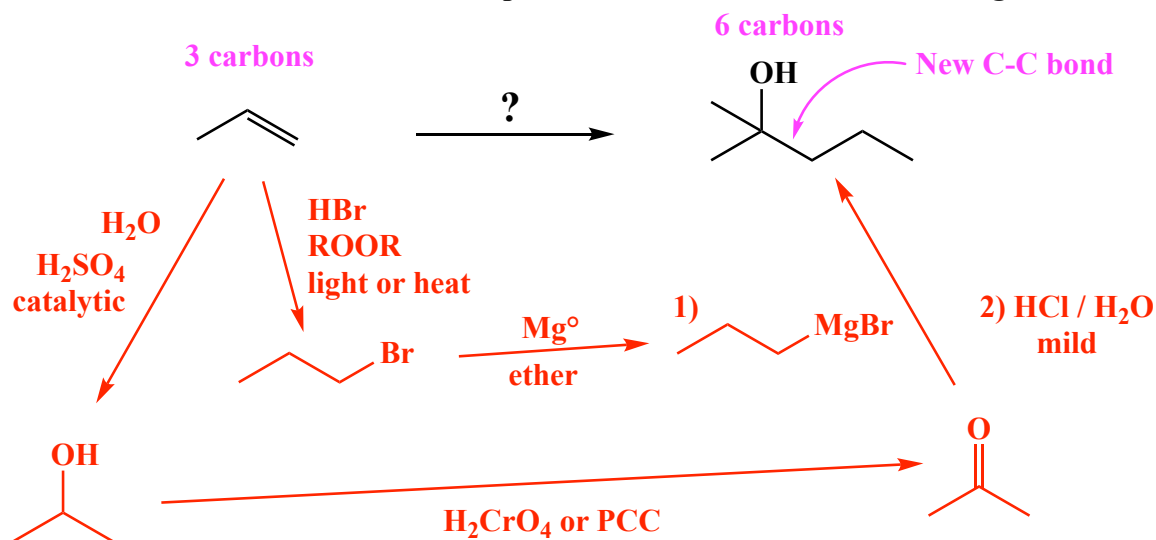


(3 or 5 pts each) Fill in the box with the product or products that are missing from the following chemical reaction equations. When a racemic mixture is formed, **you must write "racemic" under both structures EVEN THOUGH YOU DREW BOTH STRUCTURES**. For these draw all carbon containing products.



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 you make a racemic mixture, you can either draw both enantiomers or simply draw one structure and label all chiral centers with an asterisk (*). Either way, you must write racemic if appropriate.

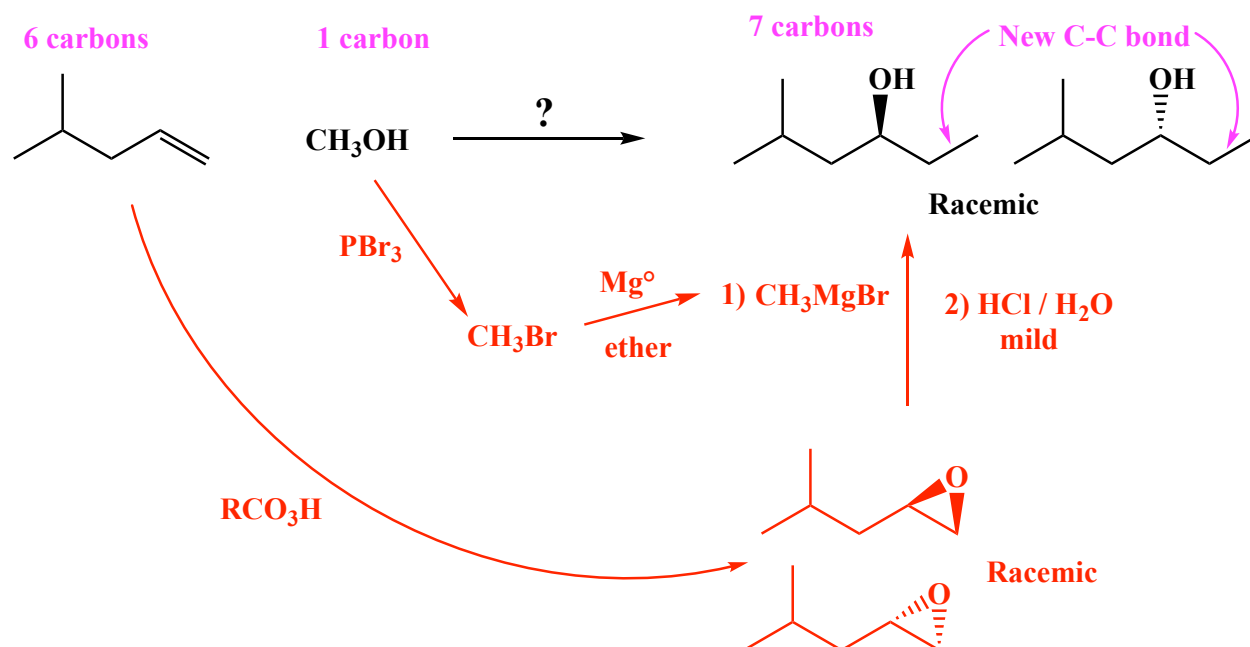
(13 pts) **All of the carbon atoms of the products must come from the starting materials.**



Recognize that the product has 6 carbons, and the starting material has 3. Therefore there must be a new C-C bond linking two three carbon units as indicated. Notice also, that the OH group of the product is on a carbon making the new C-C bond, the KRE of an ketone reacting with a Grignard reagent. Predict the last step to be the reaction between acetone with propylGrignard. **Recognize** the propylGrignard as coming from propene via reaction with HBr in the presence of ROOR and heat or light. **Recognize** that acetone can be made from propene via reaction with H₂O in the presence of catalytic H₂SO₄ followed by oxidation with H₂CrO₄ or PCC

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 you make a racemic mixture, you can either draw both enantiomers or simply draw one structure and label all chiral centers with an asterisk (*). Either way, you must write racemic if appropriate.

(10 pts) All of the carbon atoms of the products must come from the starting materials.

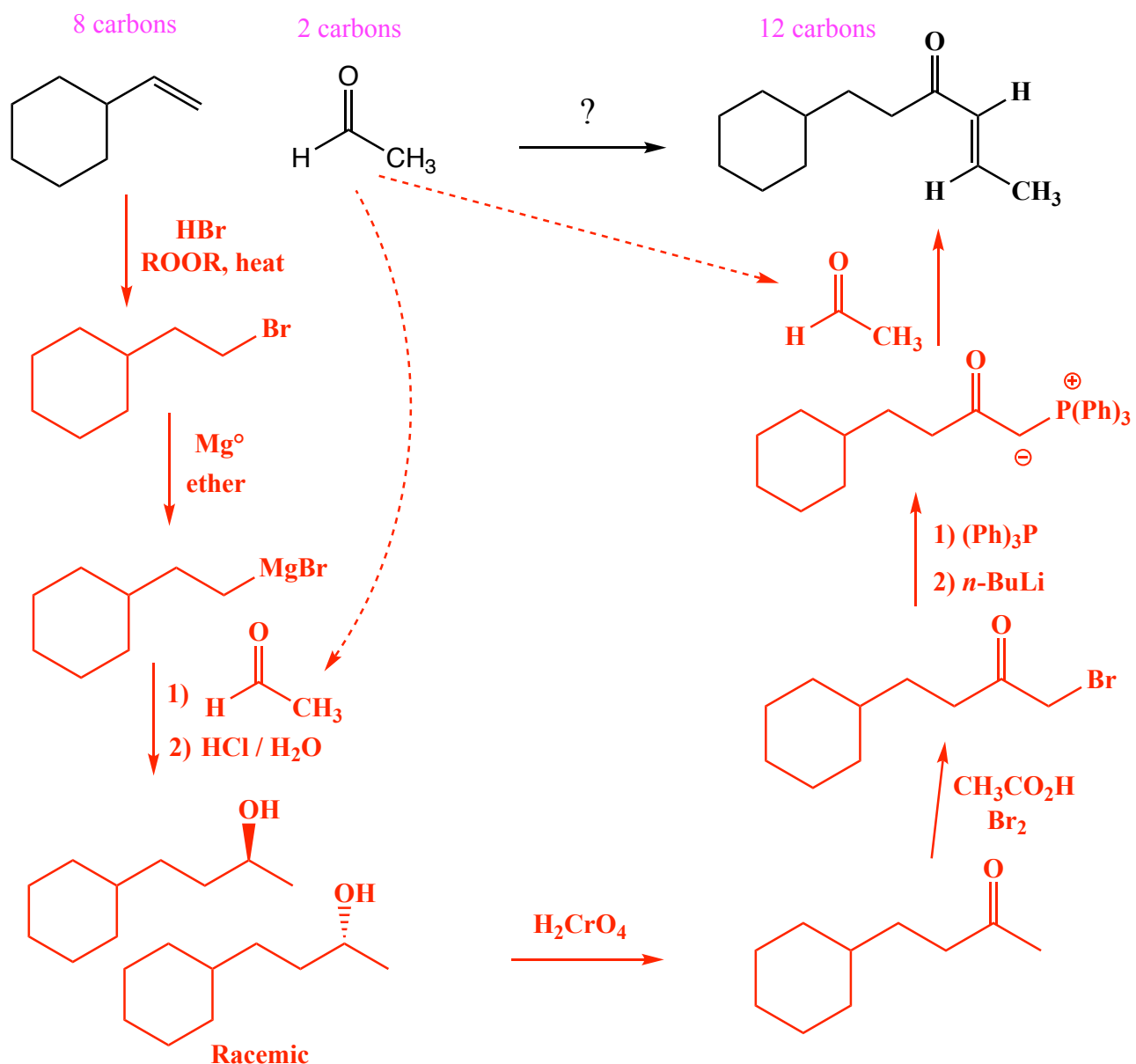


Recognize that the product has 7 carbons, and the starting materials have 6 and 1, respectively. Therefore they must combine implying a new C-C bond as indicated. Notice also, that the OH group of the product is two bonds away from the new C-C bond, the KRE of an epoxide reacting with a Grignard reagent. Predict the last step to be the reaction between the racemic epoxide shown with methylGrignard.

Recognize the methylGrignard coming from methanol via reaction with PBr_3 followed by Mg° in the presence of ether. **Recognize** the epoxide comes from reaction of the starting alkene with a peracid.

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".

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



Recognize that the product has 12 carbons and one starting material has 8, the other 2 carbons. Therefore, the product must have two new carbon-carbon bonds. Recognize further that the product is an *E* alkene, so predict the last reaction is a Wittig reaction between the starting acetaldehyde and the carbonyl containing Wittig reagent shown. The Wittig is made from an α -halogenated ketone, which in turn, comes from a methyl ketone. Recognize the methyl ketone has 10 carbons, so propose it comes from oxidation of the racemic alcohol that is the product of the Grignard reaction between acetaldehyde and an 8 carbon Grignard reagent. The 8 carbon Grignard reagent is made from the alkene starting material following reaction with HBr under free radical conditions.