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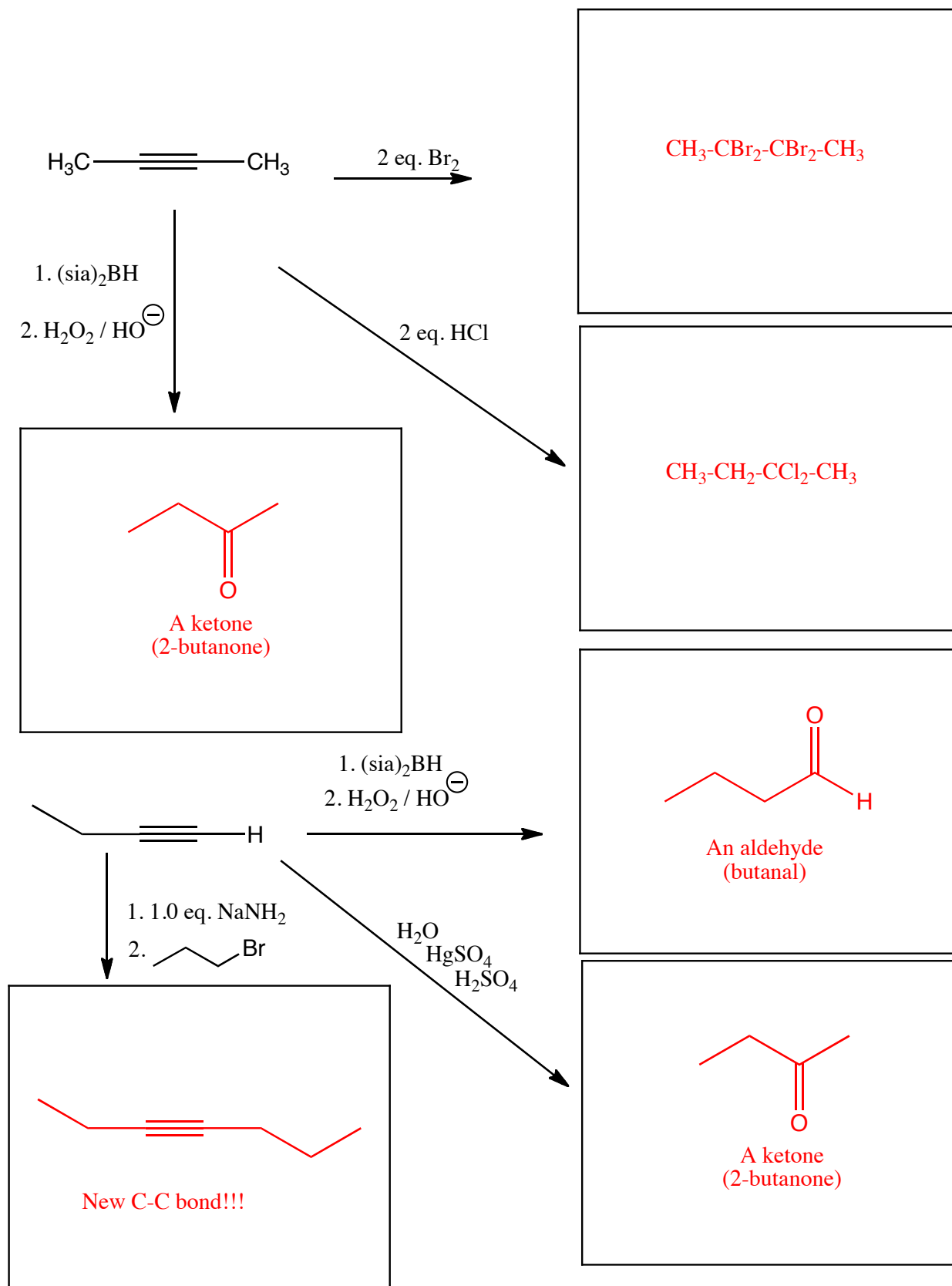
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Chemistry 320M/328M
Dr. Brent Iverson
7th Homework
October 25, 2022

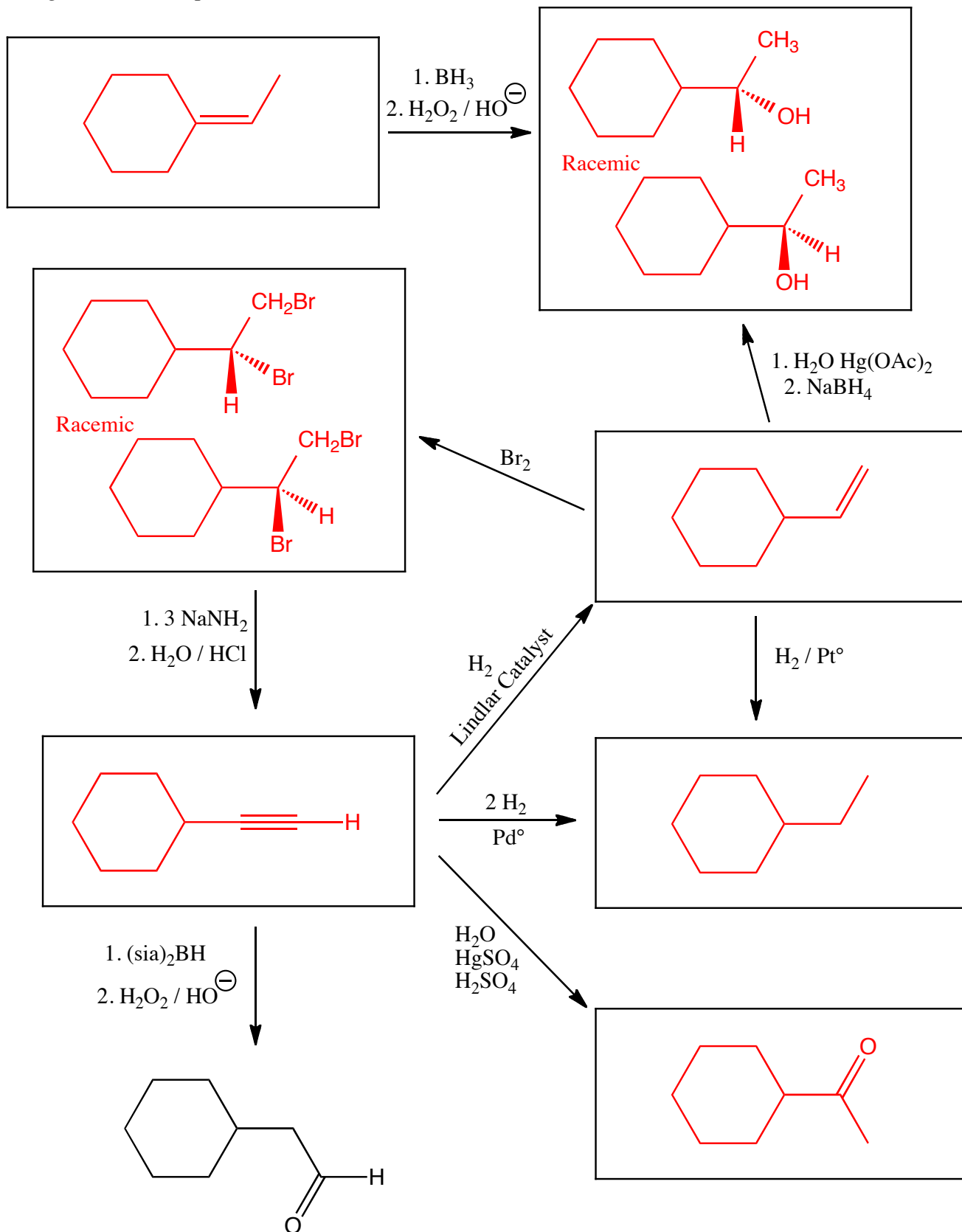
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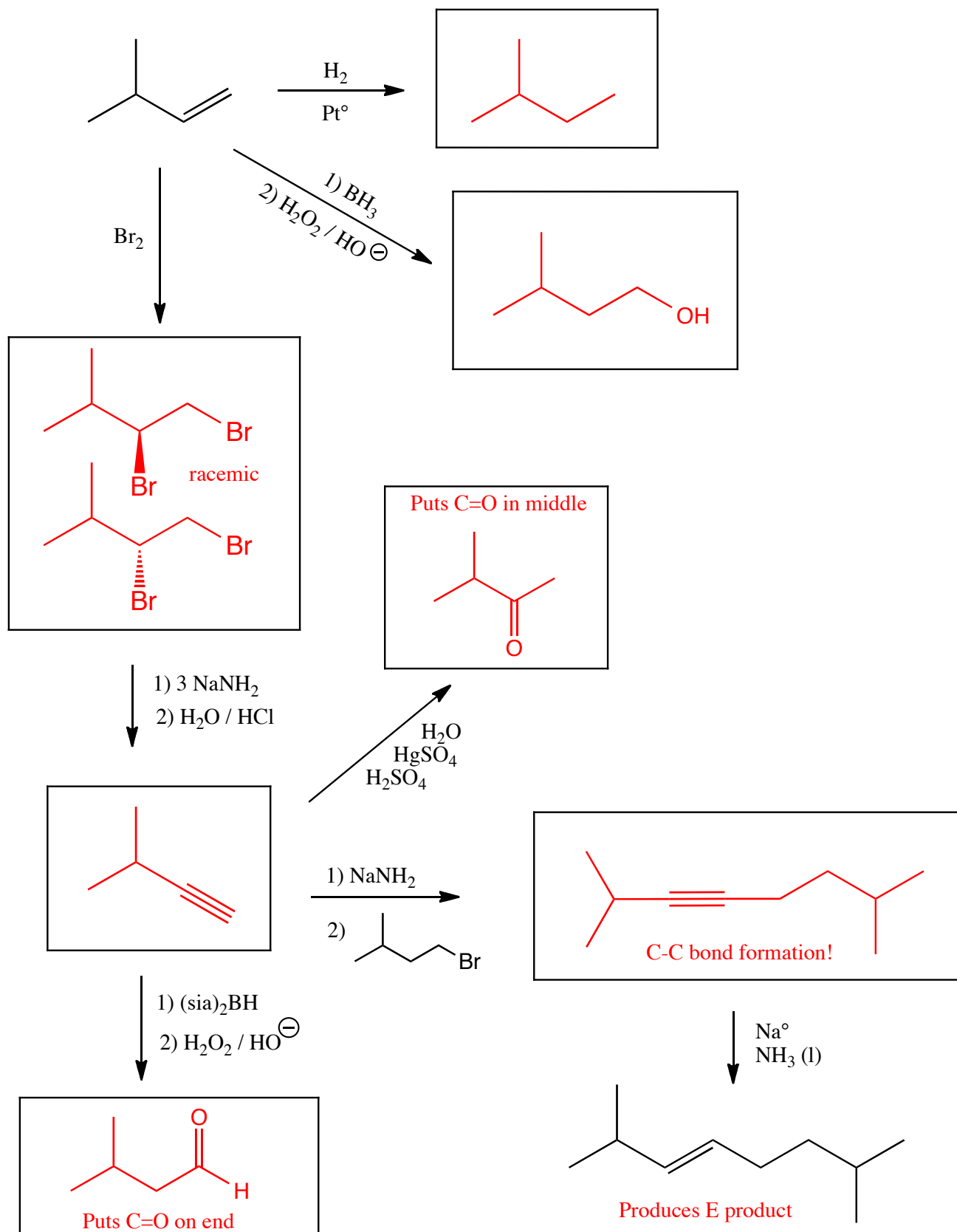
1. For the following reactions, fill in the boxes with the predominant product or products. You must indicate stereochemistry with wedges and dashes. If a racemic mixture is created, you must write "racemic" under the structures.



2. (3 or 5 pts each) For the following reactions, fill in the boxes with the appropriate structures. I know this is pretty hard, but I think it will be a great way to study your alkene and alkyne reactions. Work together if that helps.



3. For the following, fill in the boxes with the product or products that are appropriate. You must indicate stereochemistry with wedges and dashes. If a racemic mixture is created, you must write "racemic" under the structures.



4. Definitions: For the following, please write the definitions of these important organic chemistry terms.

Racemic Mixture A racemic mixture is a mixture of equal amounts of two enantiomers. (Note, a 1:1 mixture of diastereomers is NOT a racemic mixture, the term racemic mixture only applies to enantiomers).

Nucleophile Any species that can donate a pair of electrons to form a new covalent bond. Nucleophiles are analogous to Lewis bases.

Electrophile Any species that can accept a pair of electrons to form a new covalent bond. Electrophiles are analogous to Lewis acids, or alternatively, like Cl_2 and Br_2 , electrophiles can be species with a weak bond that can easily break when a new bond is made.

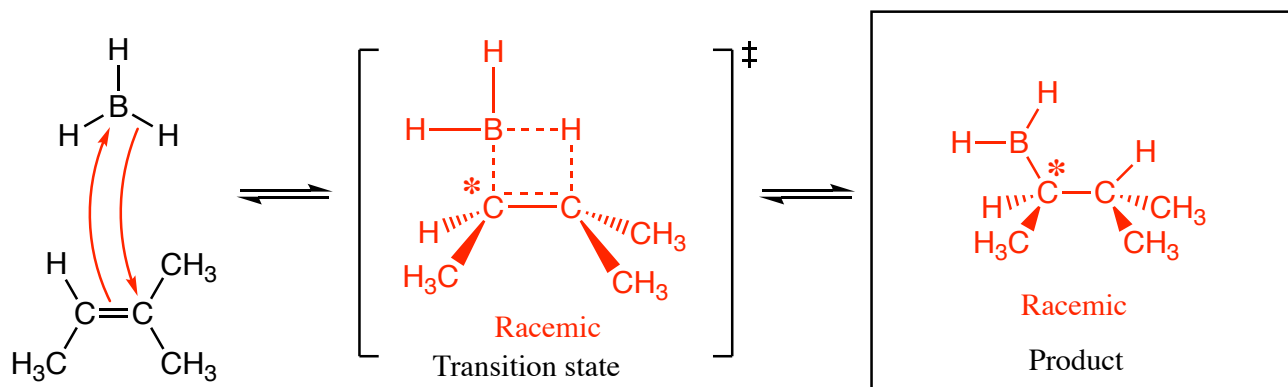
Enantiomers Enantiomers are stereoisomers that are non-superposable mirror images of each other; refers to a relationship between pairs of molecules.

Diastereomers Diastereomers are stereoisomers that are not mirror images of each other; refers to a relationship between two or more molecules.

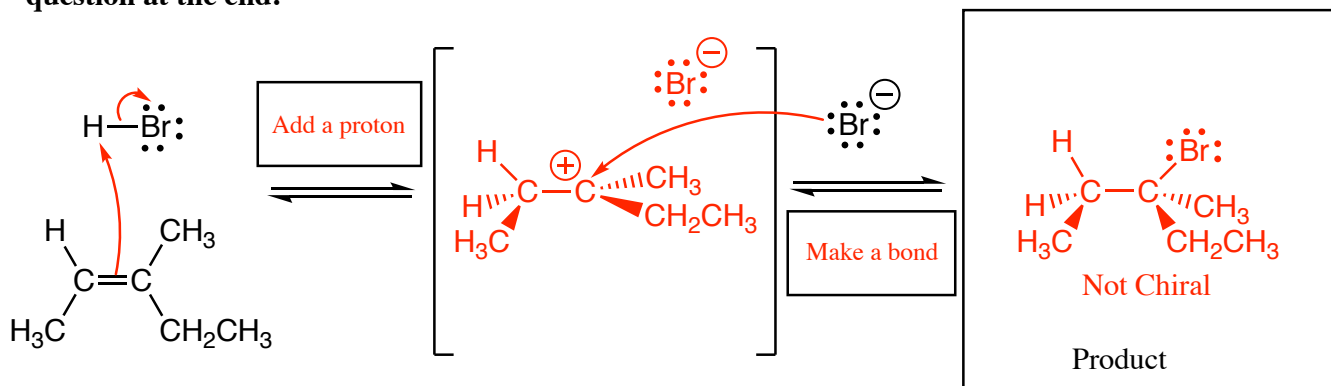
Meso Compound An achiral molecule possessing two or more chiral centers that also has chiral isomers.

Mechanisms are important. For that reason, I want each of you to work through these mechanisms one more time.

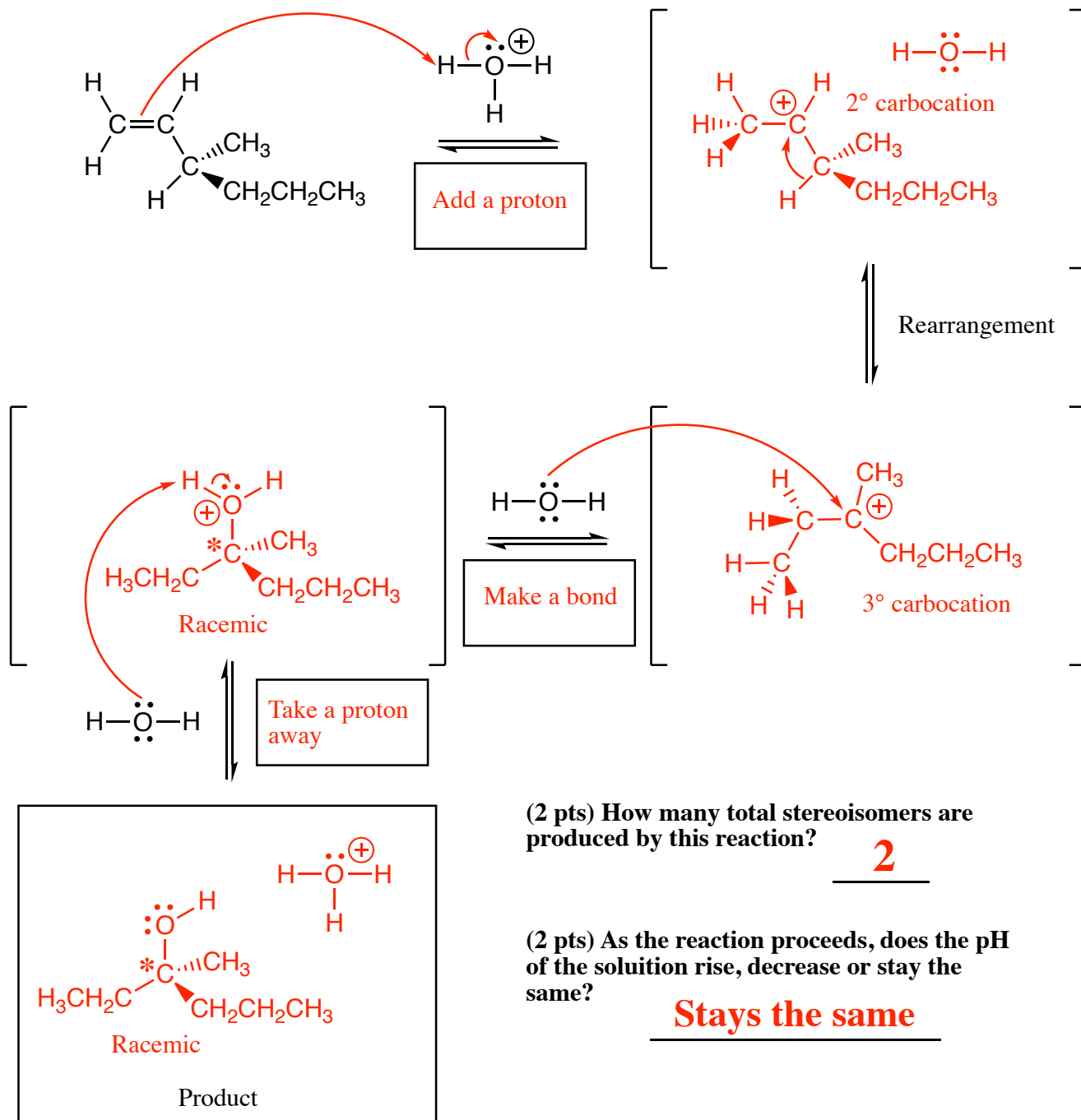
13. (14 pts) Complete the following mechanism for the first step of the hydroboration reaction. Use arrows to indicate the movement of all electrons and be sure to show all electron pairs and formal charges. For this one, we are asking you to draw a transition state. Used dotted lines to indicated any bonds that are being made or broken in the transition state. **Note that you should only draw arrows on the structure to the left, not the transition state. YOU ONLY NEED TO DRAW ONE STEREOISOMER OF A CHIRAL TRANSITION STATE OR PRODUCT (using wedges and dashes as appropriate) IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE OR PRODUCT, MARK IT WITH AN ASTERISK AND LABEL THE MOLECULE AS “RACEMIC” IF APPROPRIATE.** Be sure to notice the questions at the end.



14. (14 pts) Complete the mechanism for the following alkene HX addition 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. **YOU ONLY NEED TO DRAW ONE STEREOISOMER OF A CHIRAL INTERMEDIATE OR PRODUCT (using wedges and dashes as appropriate) IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE OR PRODUCT, MARK IT WITH AN ASTERISK AND LABEL THE MOLECULE AS “RACEMIC” IF APPROPRIATE.** In the boxes provided, write which of the 4 mechanistic elements describes each step (make a bond, break a bond, etc.). Be sure to notice the question at the end.



15. (29 pts) Complete the mechanism for the following acid-catalyzed alkene hydration reaction with a rearrangement. **For this mechanism we will ONLY consider the rearranged product. 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. YOU ONLY NEED TO DRAW ONE STEREOISOMER OF A CHIRAL INTERMEDIATE OR PRODUCT (using wedges and dashes as appropriate) IF A NEW CHIRAL CENTER IS CREATED IN AN INTERMEDIATE OR PRODUCT, MARK IT WITH AN ASTERISK AND LABEL THE MOLECULE AS “RACEMIC” IF APPROPRIATE. In the three boxes provided, write which of the 4 most common mechanistic elements describes each step (make a bond, break a bond, etc.). Be sure to notice the question at the end.**



(2 pts) How many total stereoisomers are produced by this reaction? 2

(2 pts) As the reaction proceeds, does the pH of the solution rise, decrease or stay the same?

Stays the same