NAME (Print): ______________________________

SIGNATURE: ______________________________

Chemistry 320N
Dr. Brent Iverson
5th Homework
February 18, 2026

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

For all of the following mechanism sheets, 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. There is no need to use wedges and dashes for intermediates. FOR ALL CHIRAL PRODUCTS YOU MUST DRAW ALL ENANTIOMERS WITH WEDGES AND DASHES AND WRITE "RACEMIC' IF APPROPRIATE. Next to each set of equilibrium arrows in each mechanism, write which of the 4 most common mechanistic elements describes each step (make a bond, break a bond, etc.).**

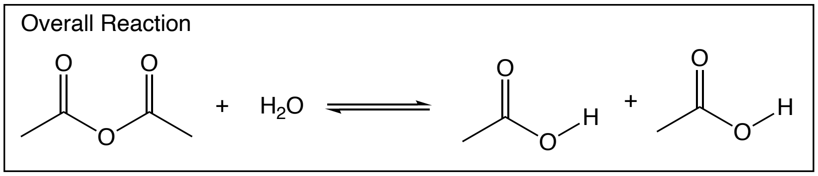
Note: we have not covered these yet. You will submit this homework next Monday, February 20 at 10 PM, and we will grade for completion only, not accuracy. We will be going through each of these mechanisms during upcoming lectures. This approach of previewing mechanisms is designed to make it so that for each of you, doing mechanisms correctly becomes your OChem superpower! Use the textbook for reference, but trust your instincts and try to reason out what happens in each of these reactions. We will see if you were correct in lecture as we work through these together!

When predicting mechanisms, remember to:

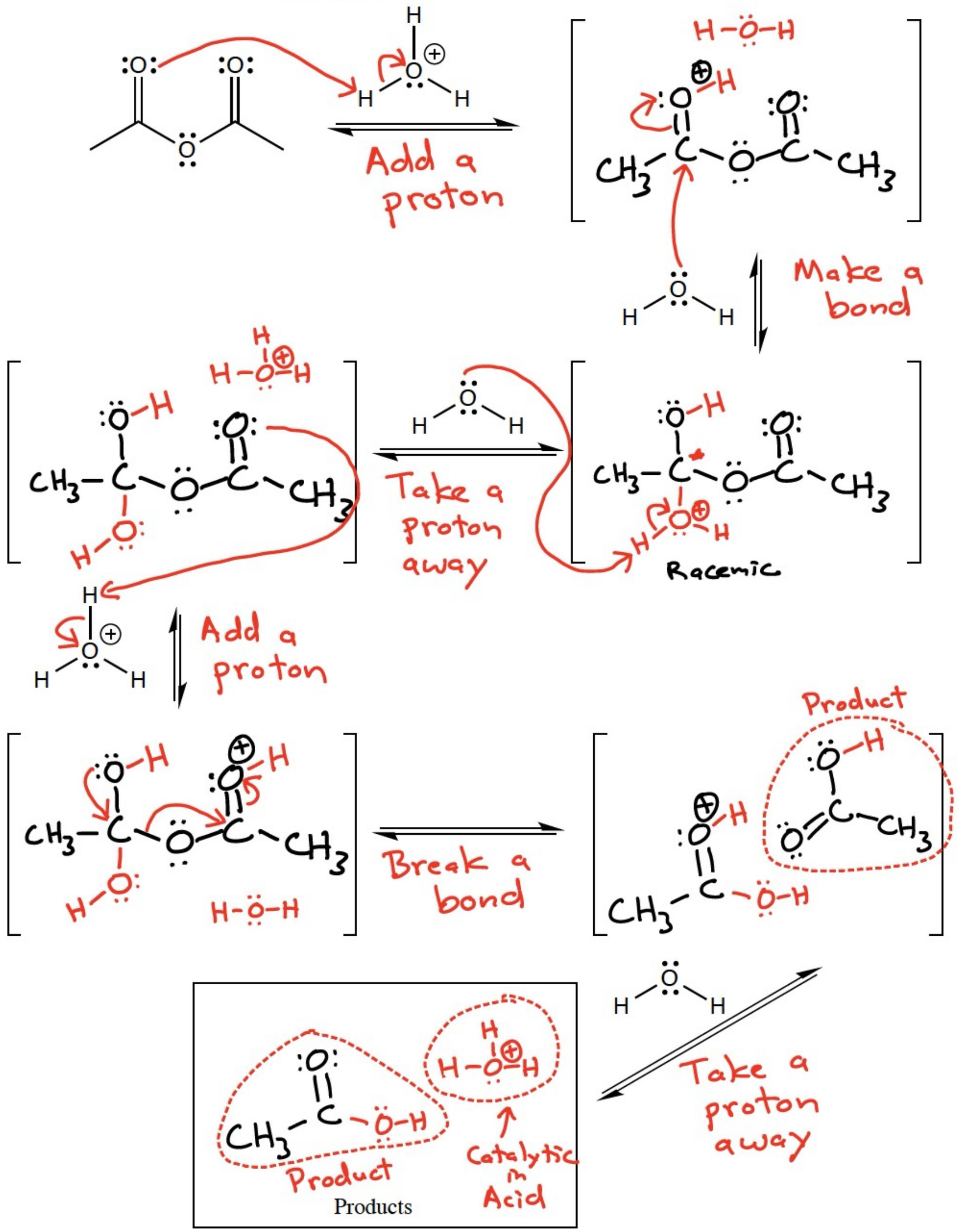
1. **Identify which bonds will be made and broken** in overall reaction (provided).
2. **Avoid "mixed media errors"**
    a. In acid, all intermediates are positively-charged or neutral
    b. In base, all intermediates are negatively-charged or neutral
    c. Only in neutral solutions might there be both positively-charged and negatively-charged intermediates.
3. **Proton transfers are fast** compared to other steps (**when in doubt transfer a proton**).
4. **Analyze** each intermediate to **PREDICT** the next step.

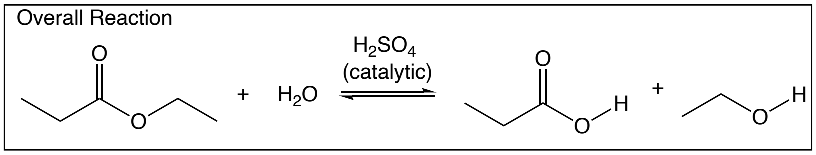
Here are the four mechanistic elements. The vast majority of mechanistic steps are one of these, and they are entirely predictable based on the personalities of the species involved:

1. **Make a Bond**
2. **Break a Bond**
3. **Add a Proton'**
4. **Take a Proton Away**

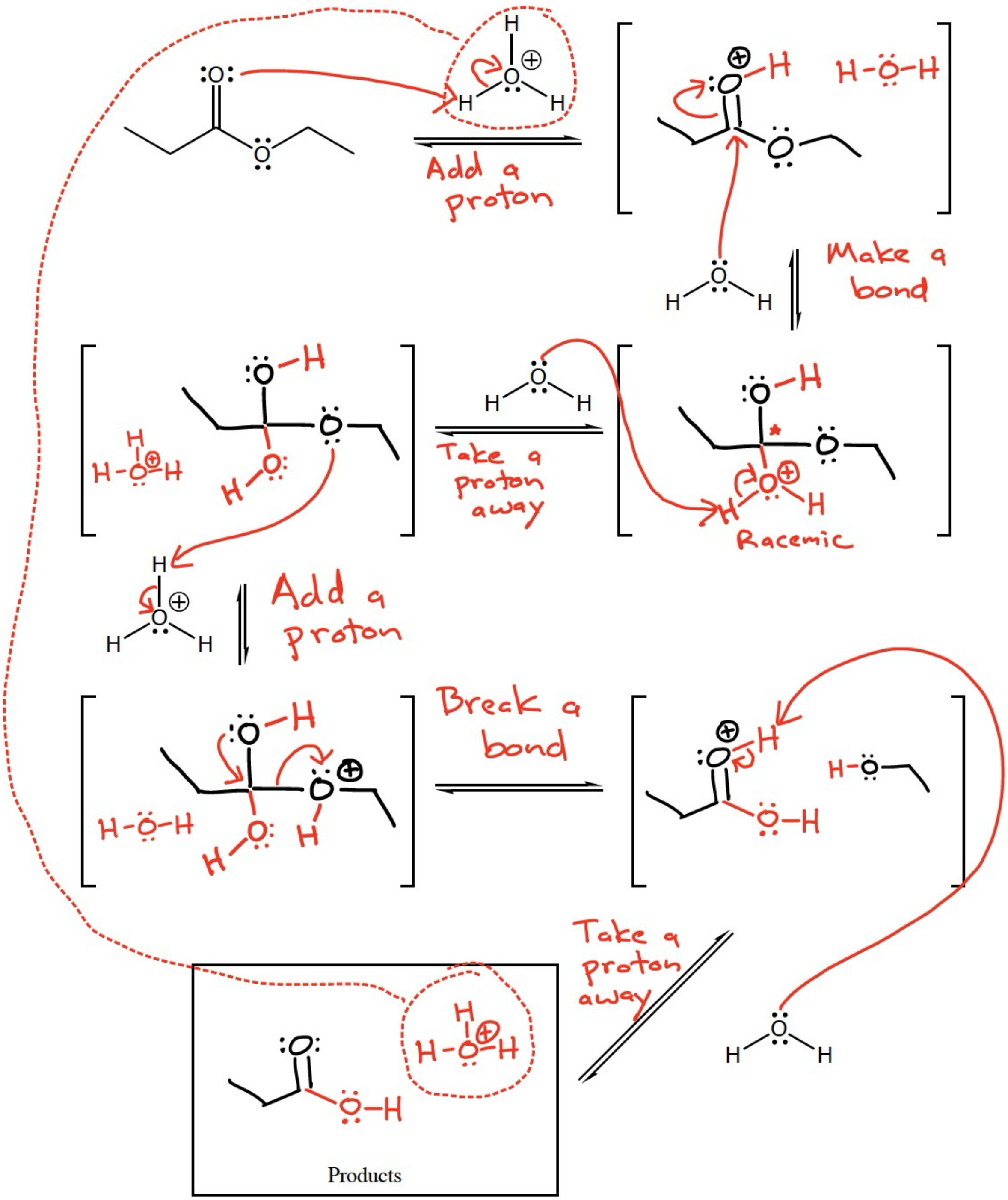


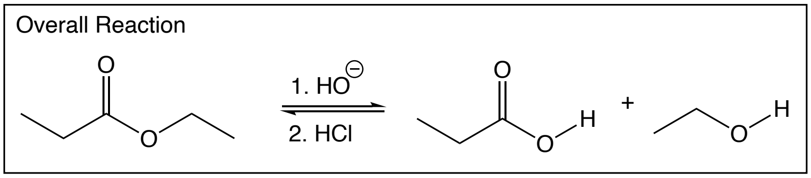
Acid Catalyzed Anhydride Hydrolysis



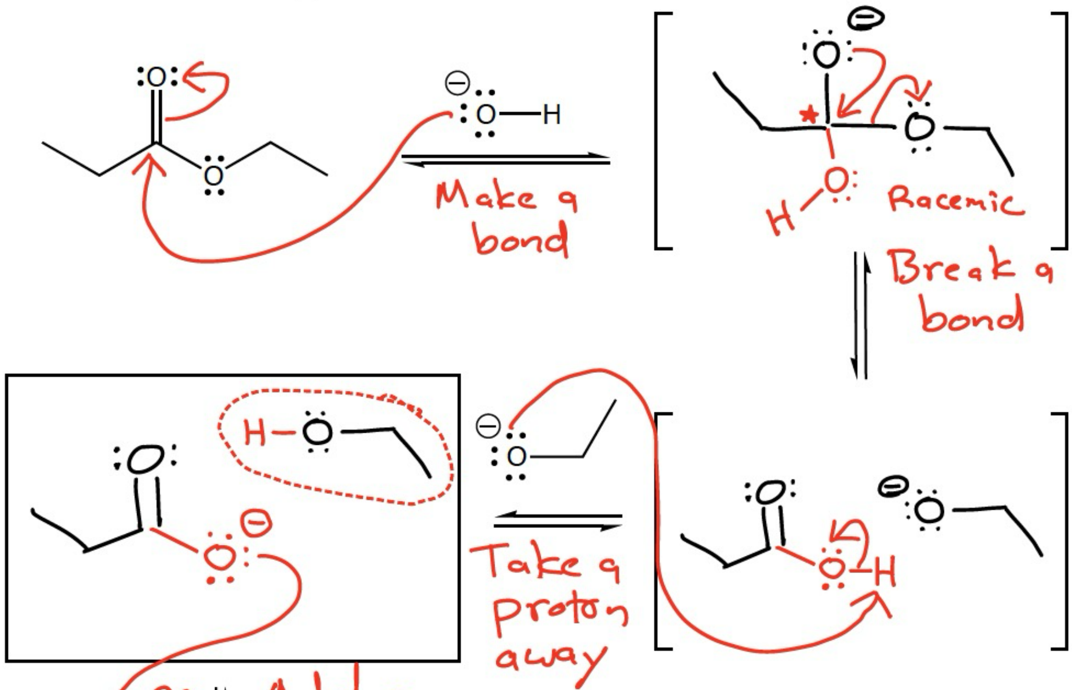


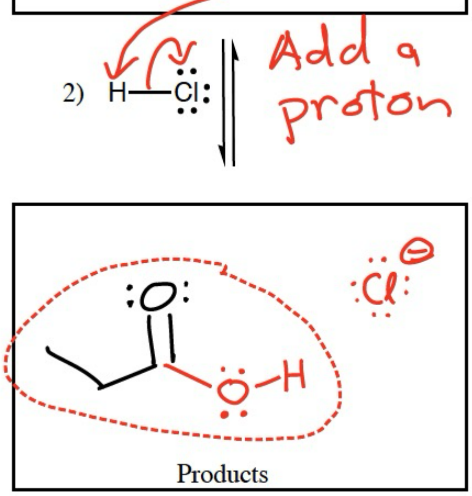
Acid Catalyzed Ester Hydrolysis





Base-Promoted Ester Hydrolysis - Saponification





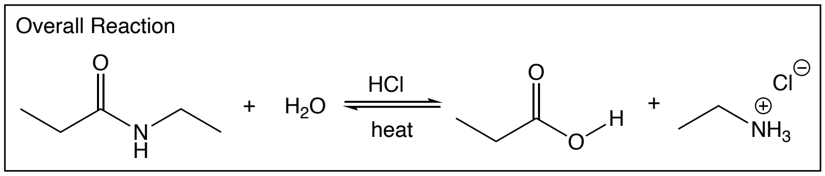
NOT catalytic in base

Mechanism B

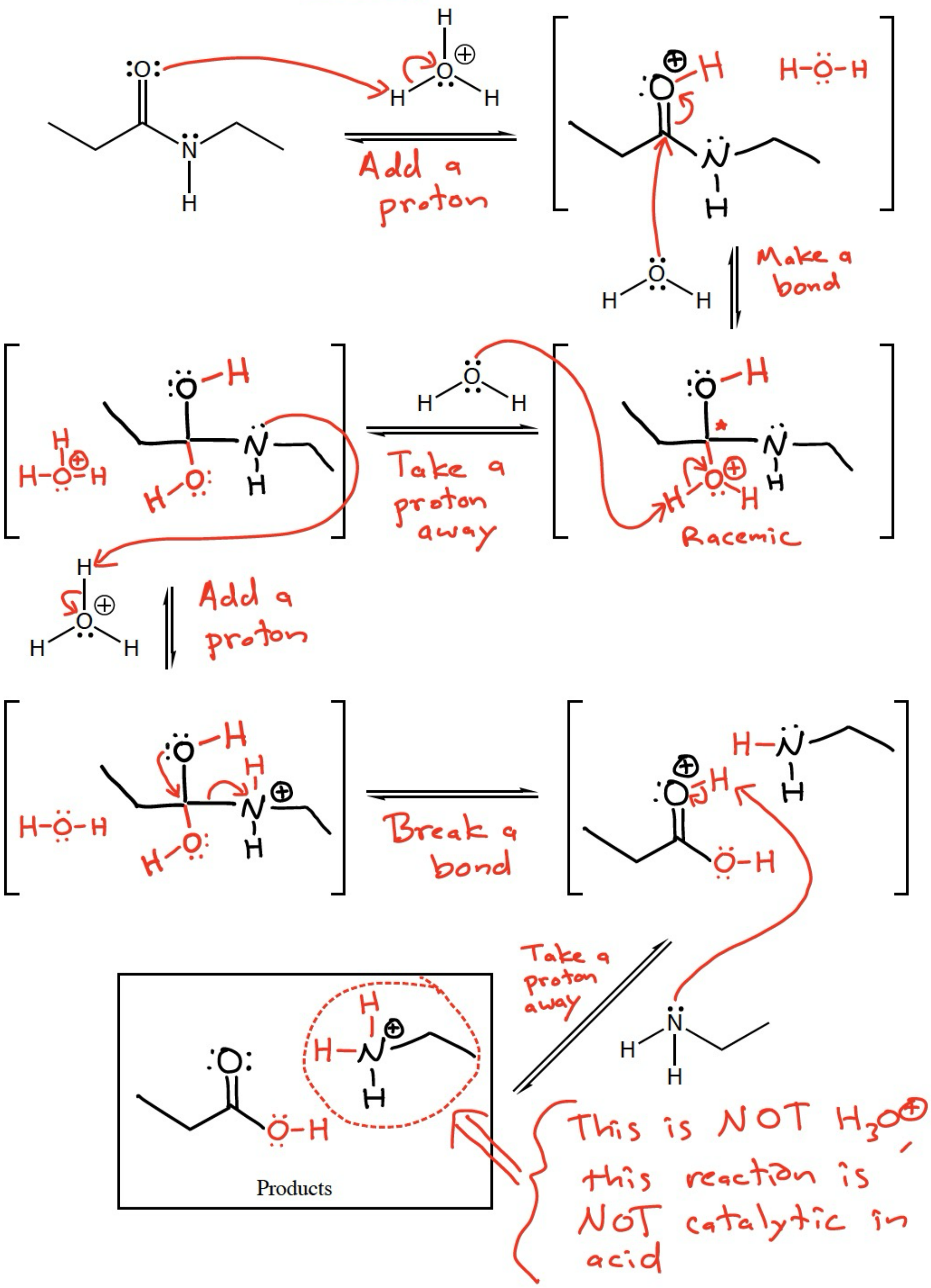
Driving force → converts

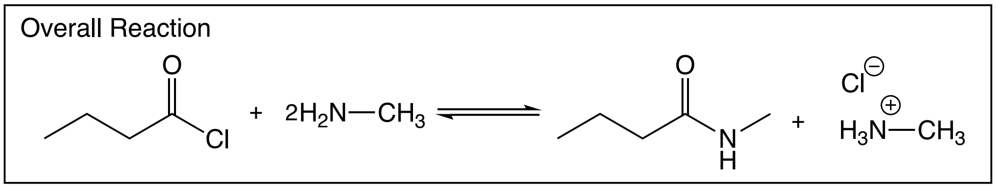
$HO^{\ominus}$ to $R-C(=O)-O^{\ominus}$

More stable anion → favored → MOTIVE

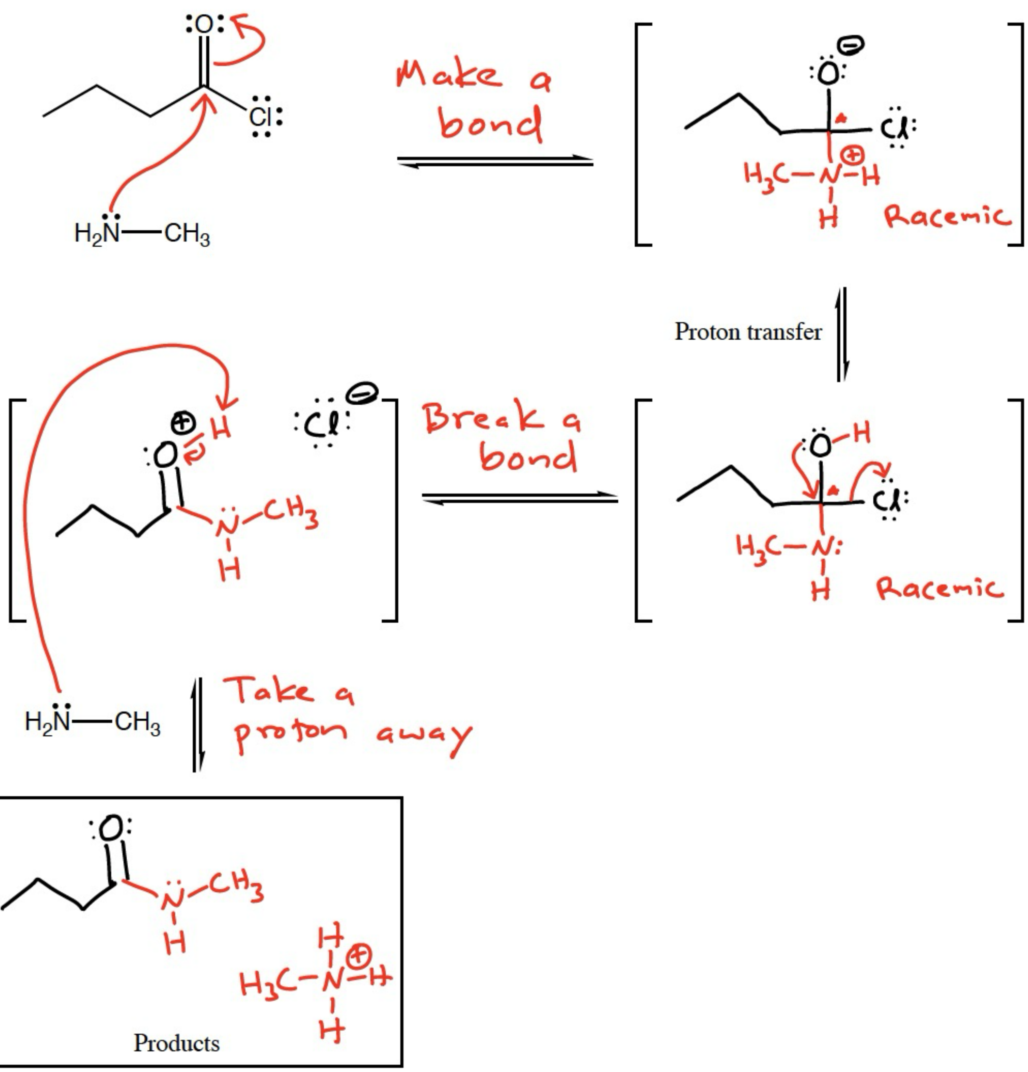


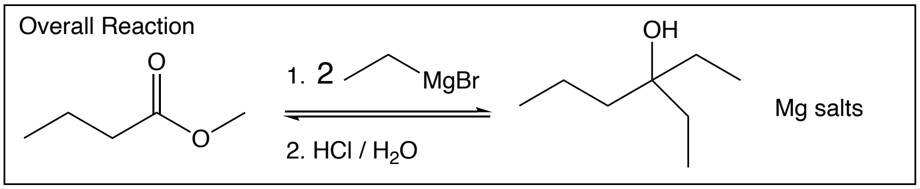
Acid Promoted Amide Hydrolysis



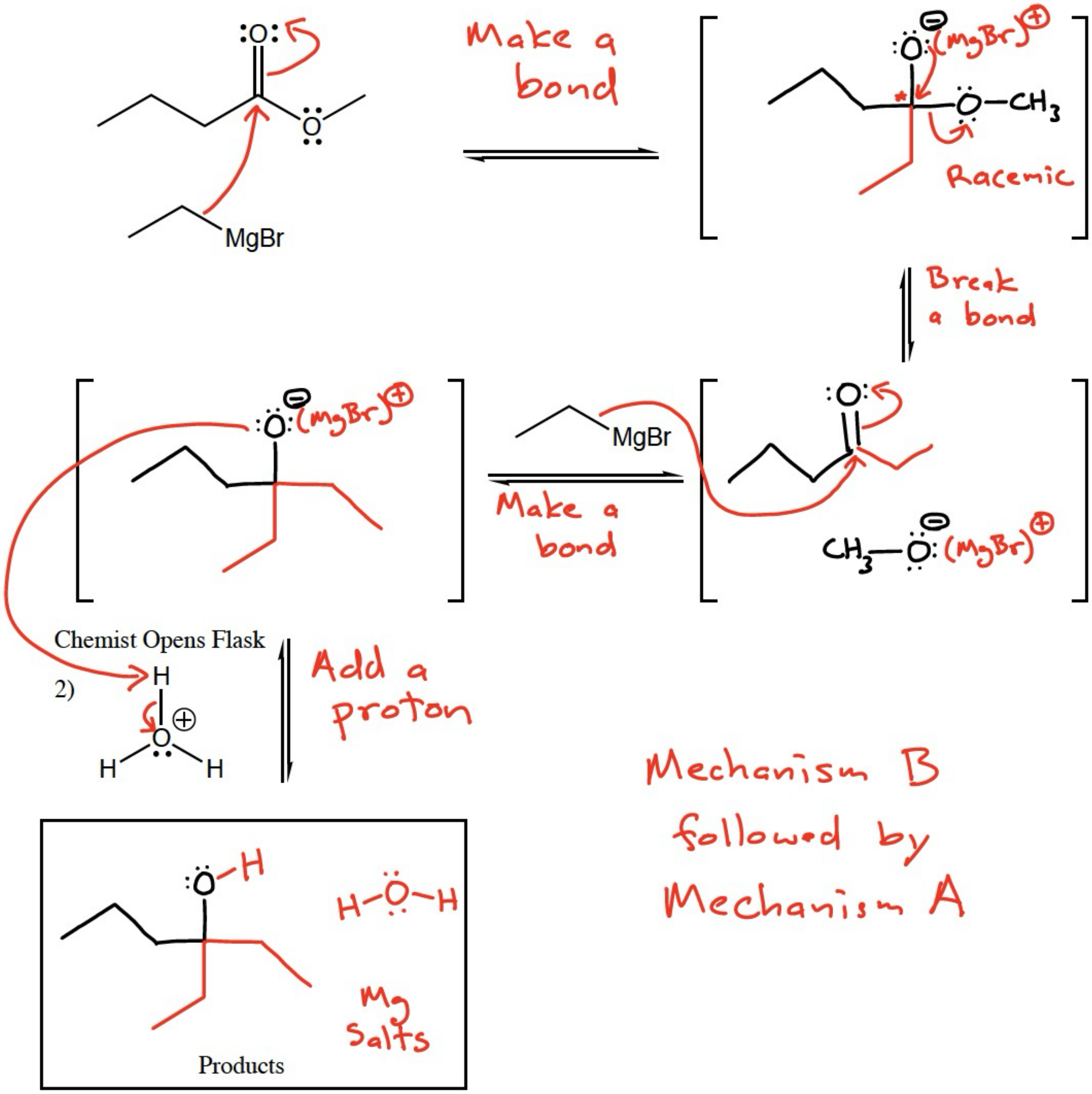


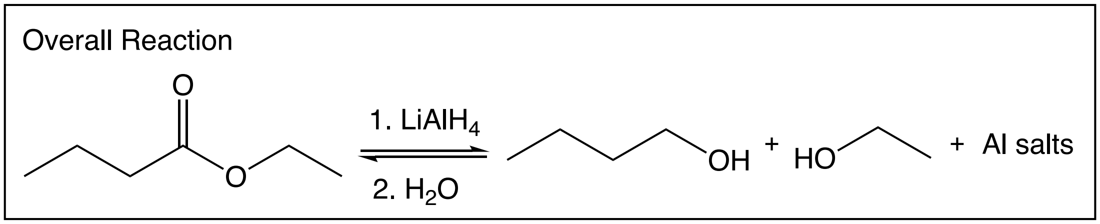
Acid Chlorides Reacting with Amines



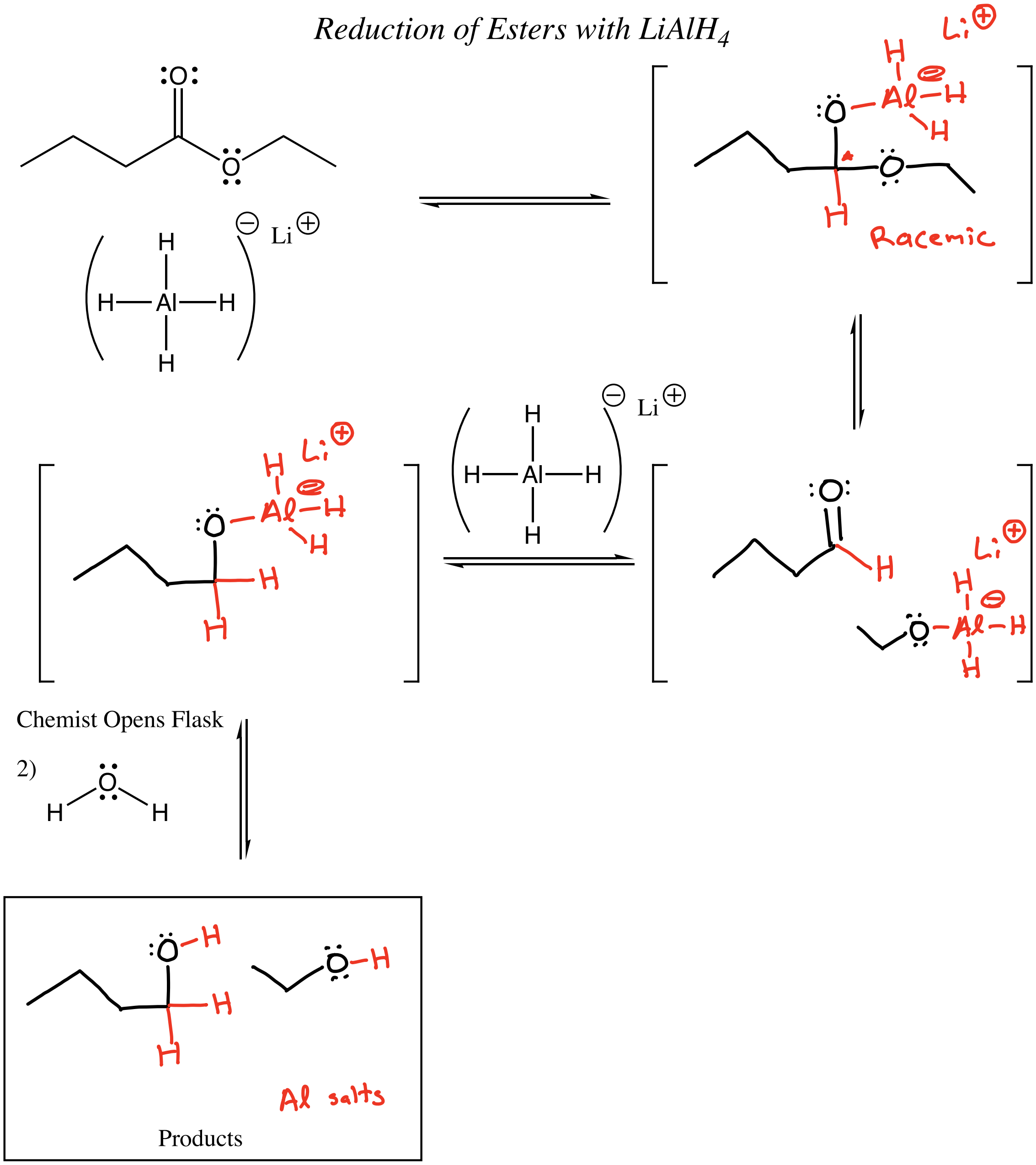


Grignard Reacting with Esters

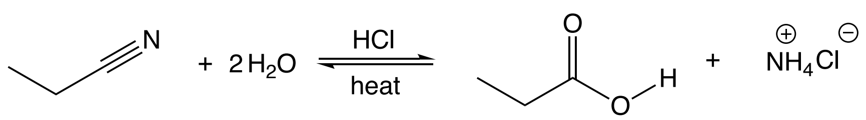




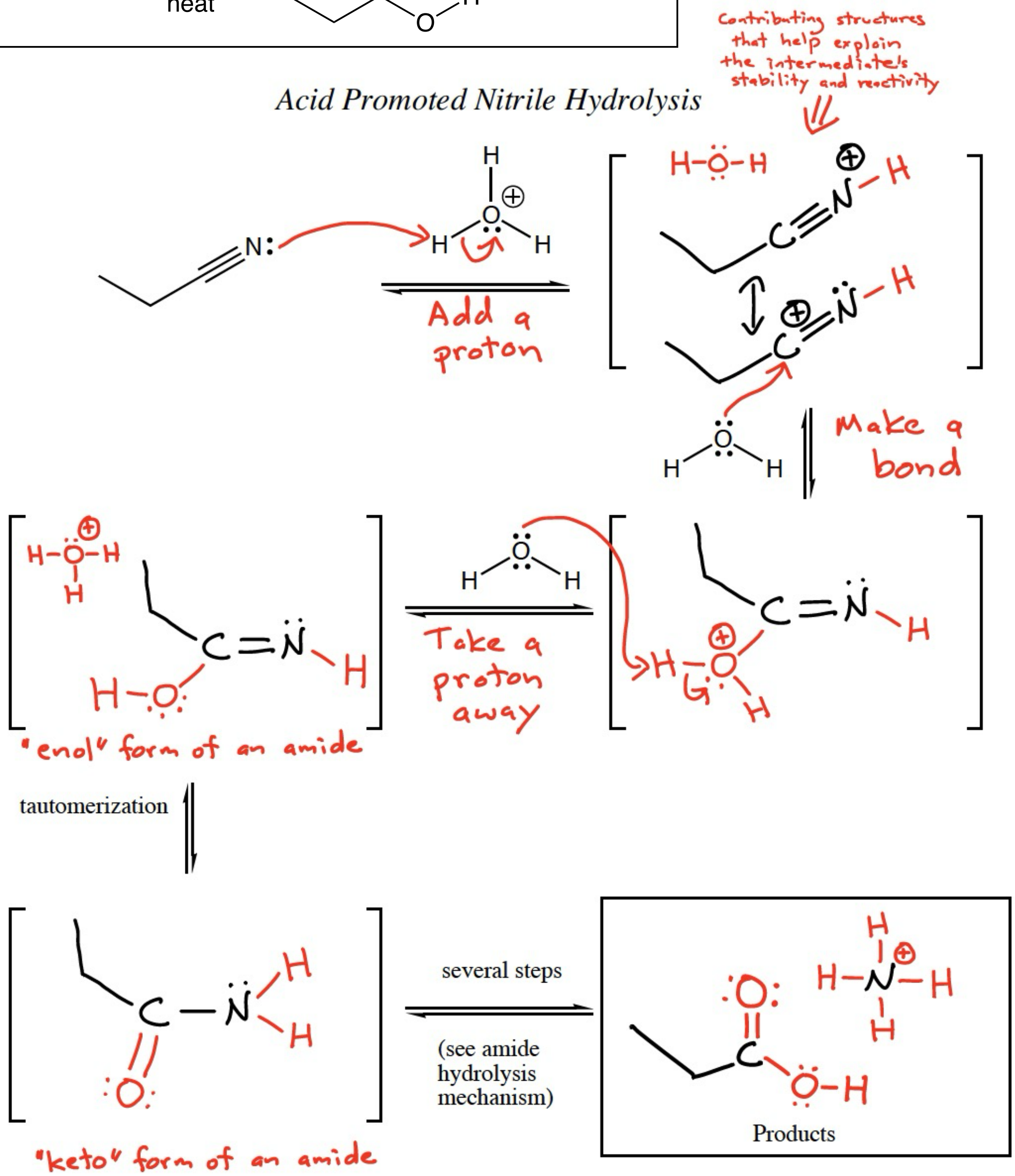
Reduction of Esters with $LiAlH_4$



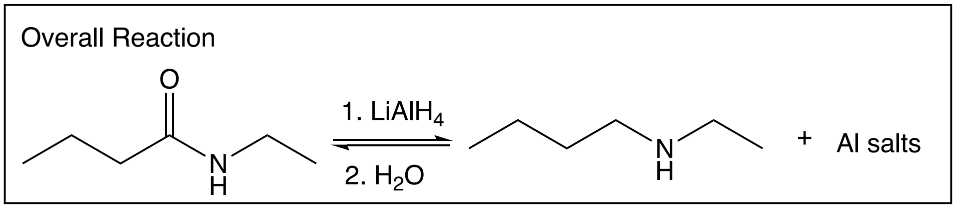
Overall Reaction



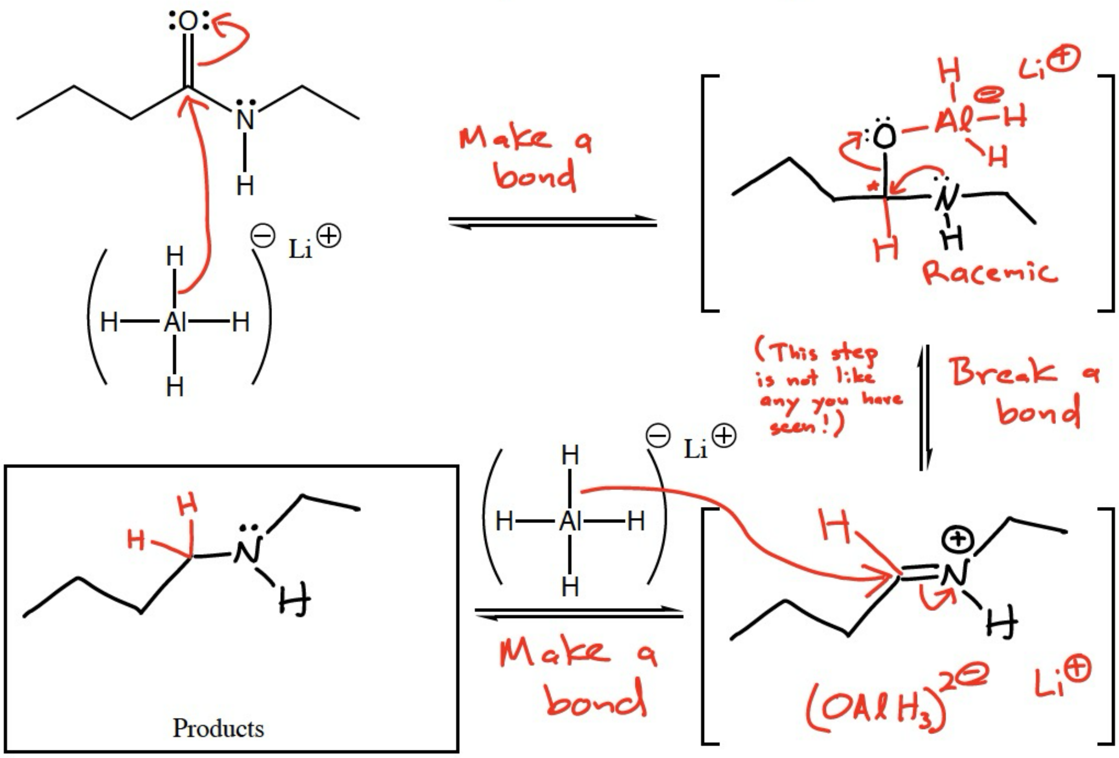
Acid Promoted Nitrile Hydrolysis



OK, the one on the next page has a twist! It has a unique step that you have not seen before. Hint: It has a lot to do with a Lewis acid-Lewis base complex that behaves differently than you might expect.



Reduction of Amides with $LiAlH_4$



Note: In this reaction the chemist opens the flask and adds water in a second step that quenches any excess $LiAlH_4$. Therefore, you need a second step to add water when using this reaction in synthesis even though it is not shown in the mechanism above.