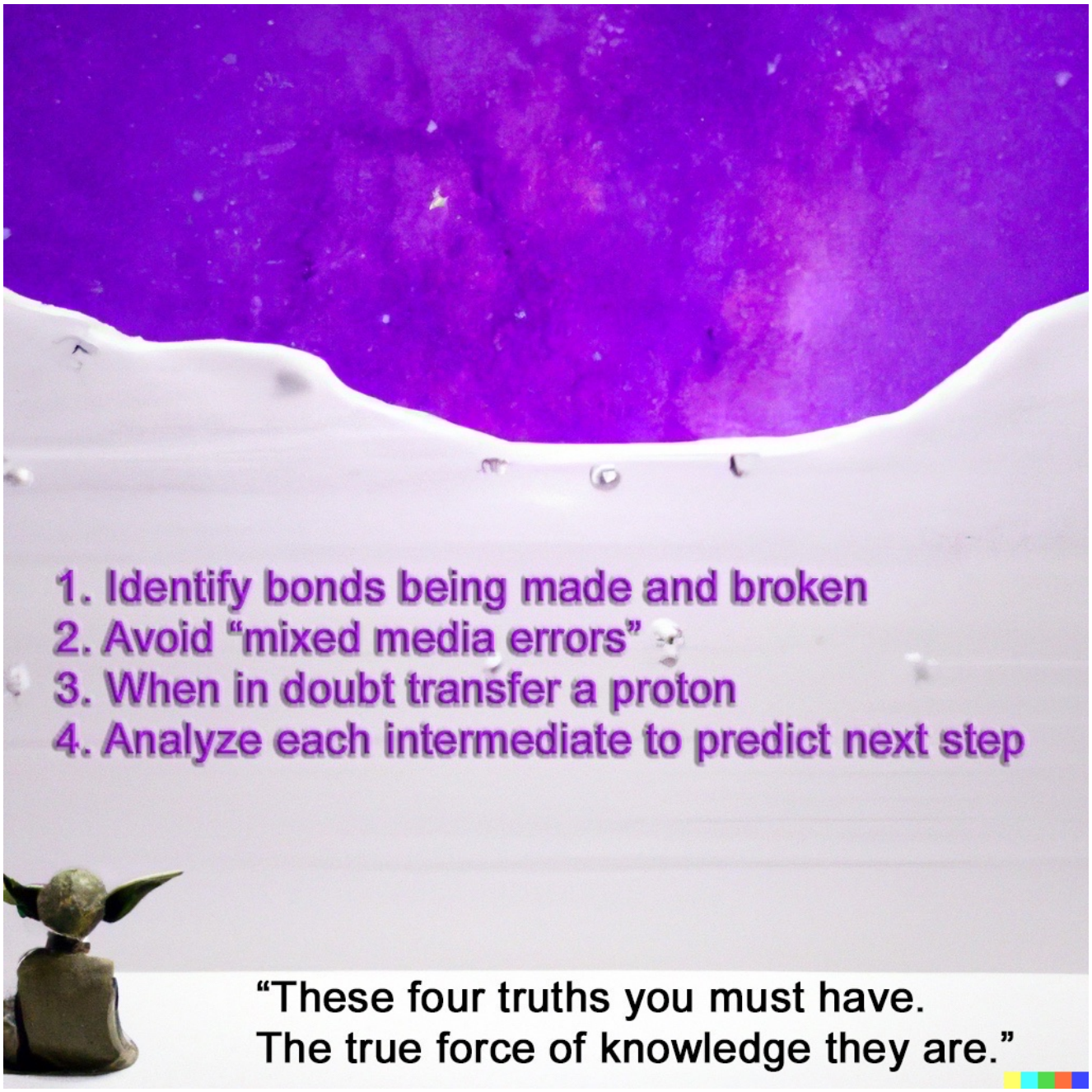

1. Identify bonds being made and broken
2. Avoid “mixed media errors”
3. When in doubt transfer a proton
4. Analyze each intermediate to predict next step
“These four truths you must have.
The true force of knowledge they are.”

For mechanisms, keep the following in mind:

1) Identify the bonds to be made and broken in the overall reaction

2) Avoid "mixed media errors"

   a) In acid, all the intermediates are positively-charged or neutral

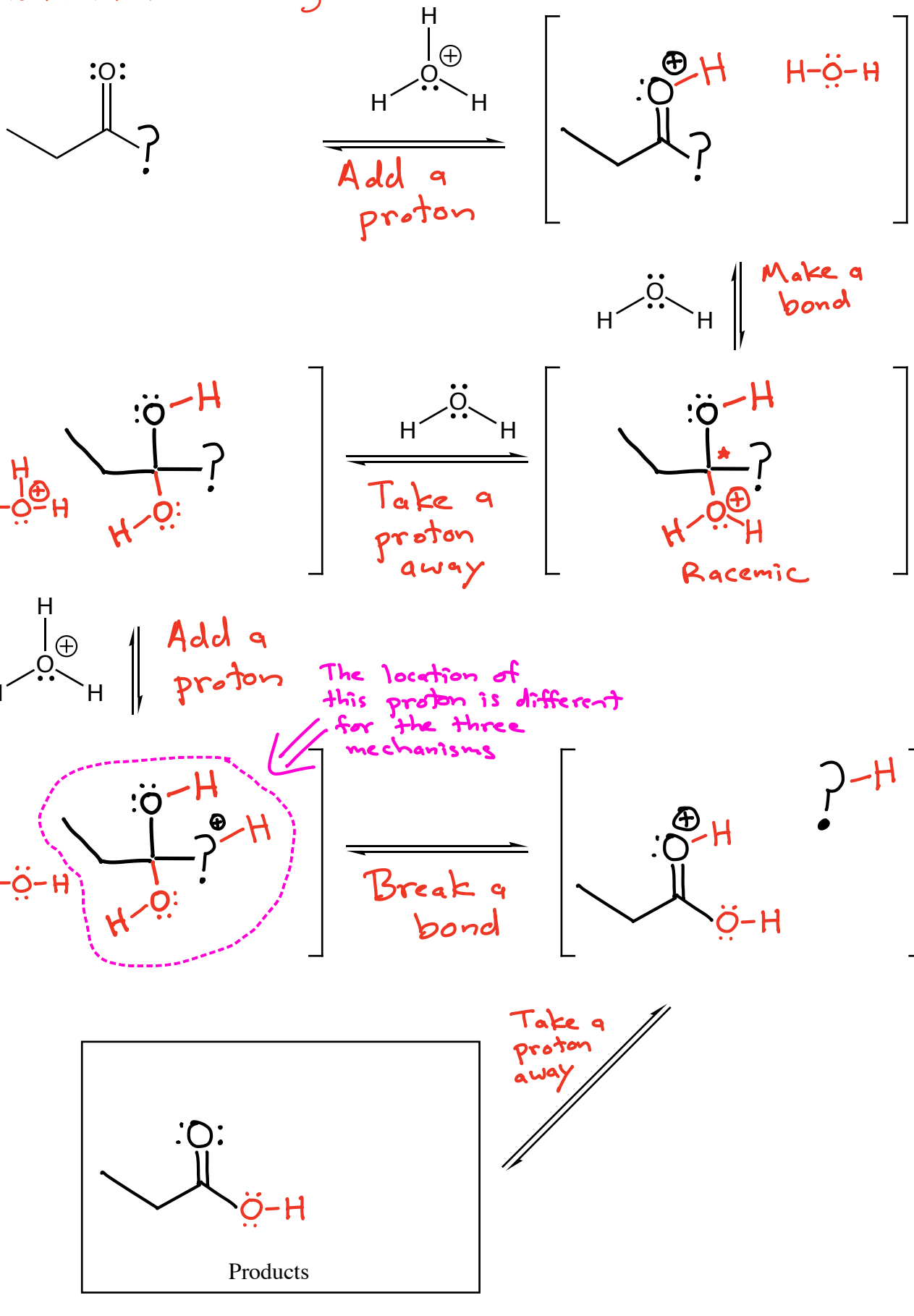
   b) In base, all the intermediates are negatively-charged or neutral

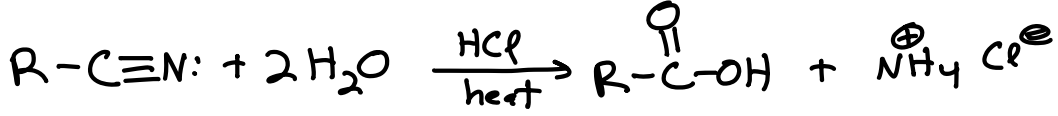
   c) In neutral solution → the intermediates could be positively-charged, negatively-charged or neutral

3) When in doubt transfer a proton → protons move very fast

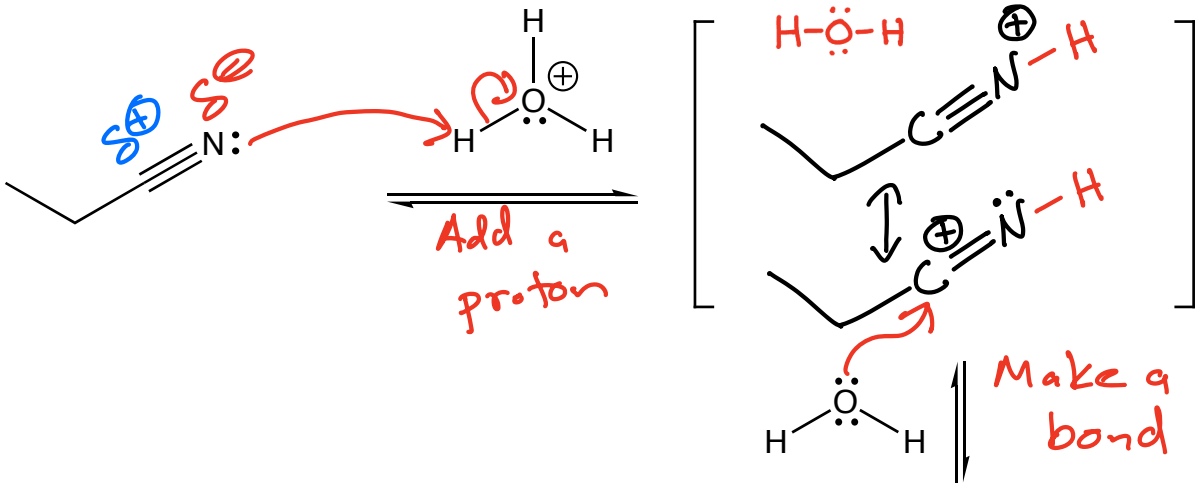
4) Analyze each intermediate carefully to predict the next step

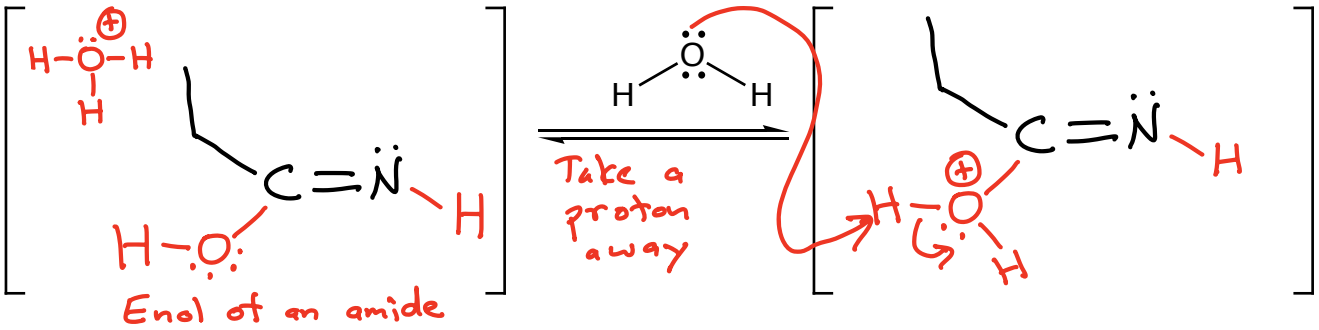
The following mechanism applies to which reaction we have seen? Trick Question → it applies to three reactions → Anhydride, ester and amide hydrolysis in acid! "Same song different verse!"





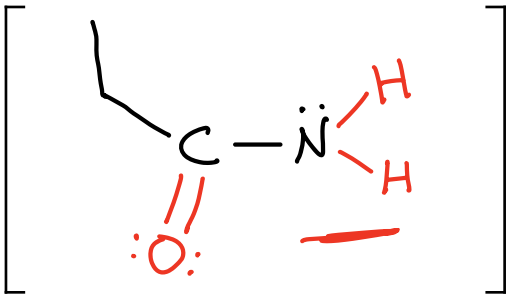
Acid Promoted Nitrile Hydrolysis





Enol of an amide

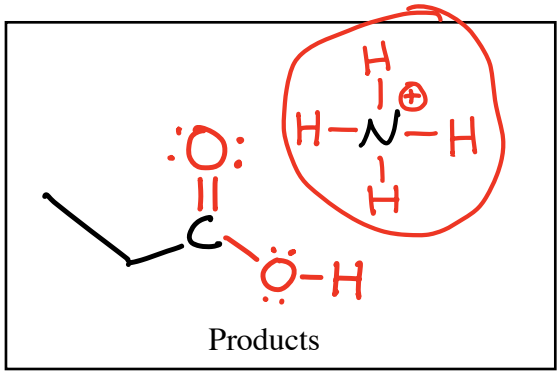
tautomerization



Much more stable keto form of an amide

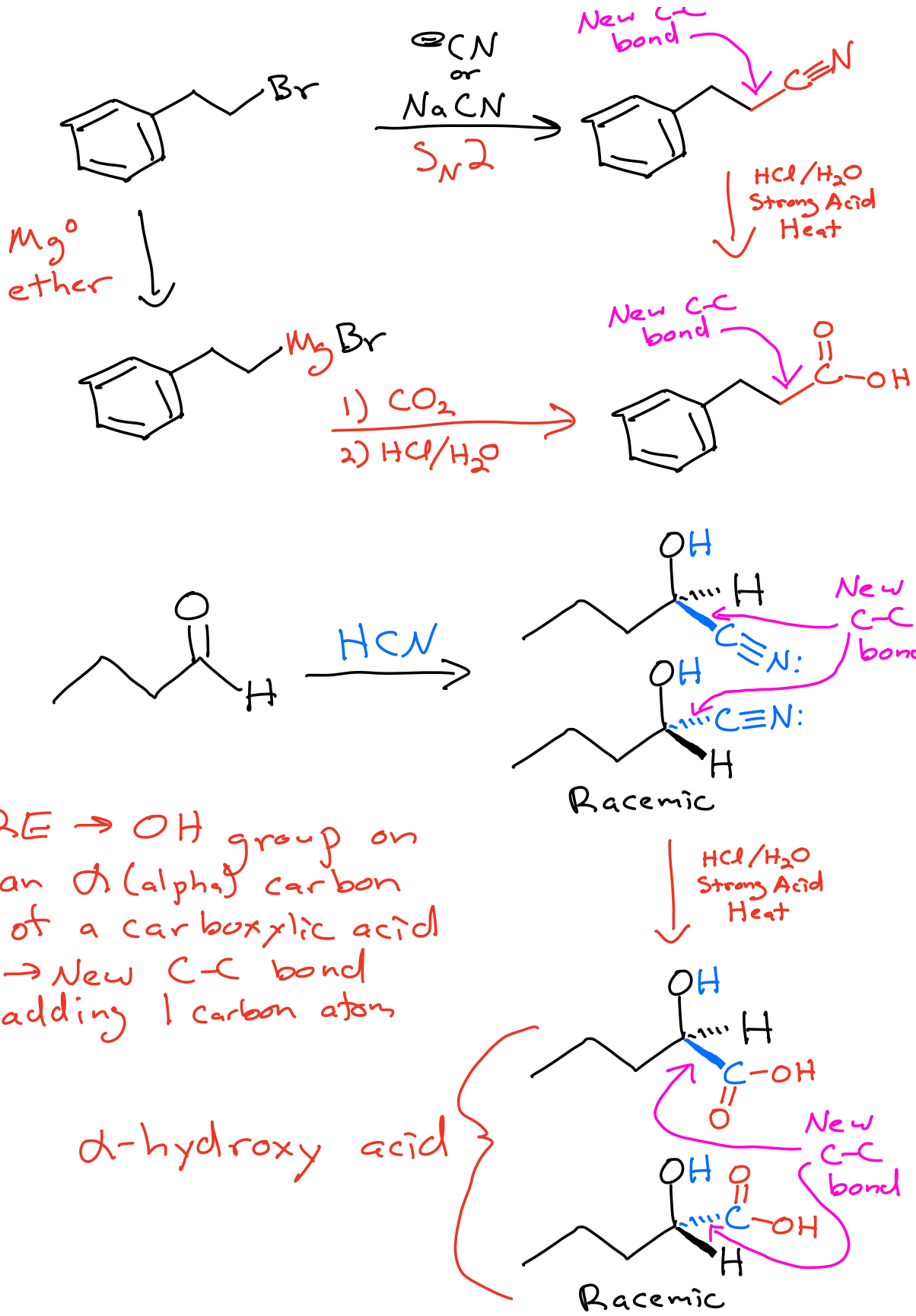
several steps

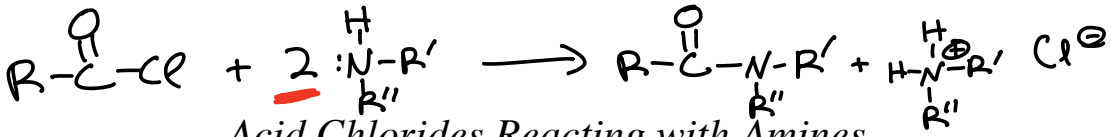
(see amide hydrolysis mechanism)



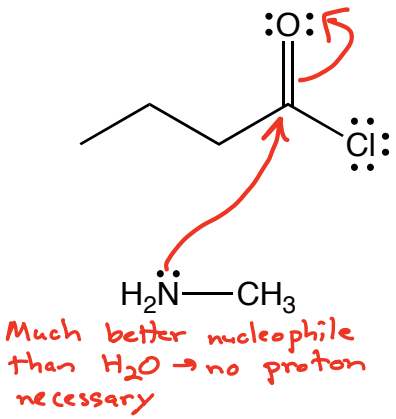
Products

These conditions are strong enough to hydrolyze amides according to the mechanism we saw as "Acid Promoted Hydrolysis of an Amide"

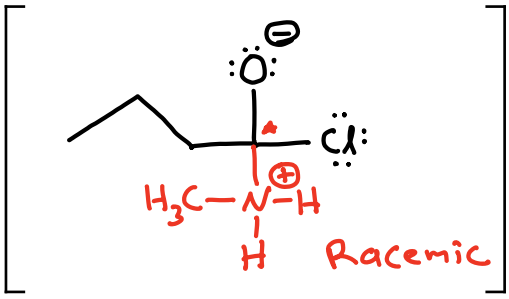

⊖CN
or
NaCN
SN2
New C-C bond
HCl/H2O
Strong Acid
Heat
Mg°
ether
MgBr
1) CO2
2) HCl/H2O
HCN
Racemic
KRE → OH group on an α (alpha) carbon of a carboxylic acid → New C-C bond adding 1 carbon atom
α-hydroxy acid



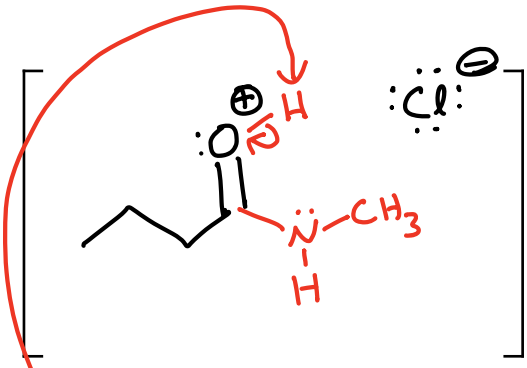
Acid Chlorides Reacting with Amines



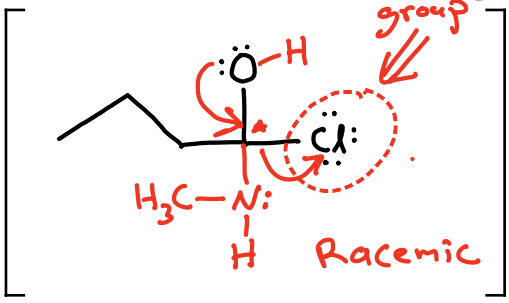
Make a bond

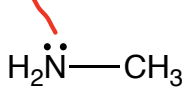


Proton transfer

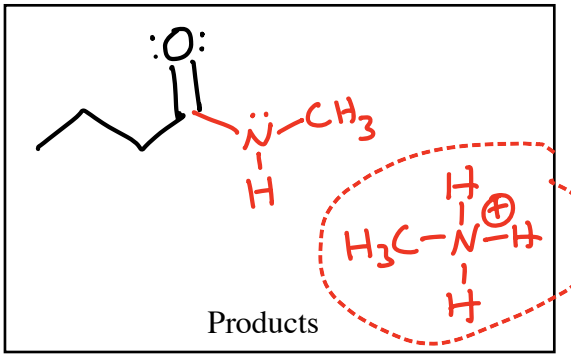


Break a bond



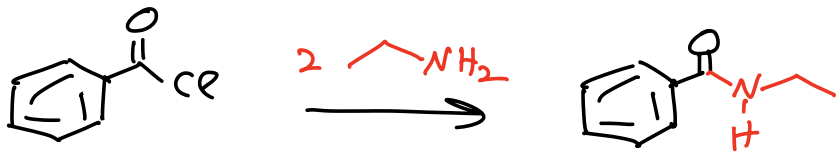


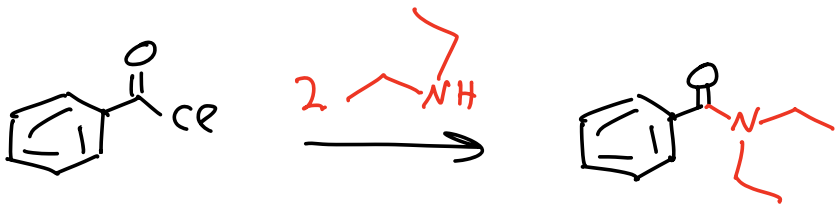
Take a proton away

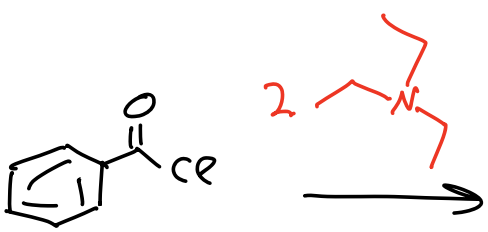


NOT a nucleophile so we need 2 equivalents of amine for this reaction

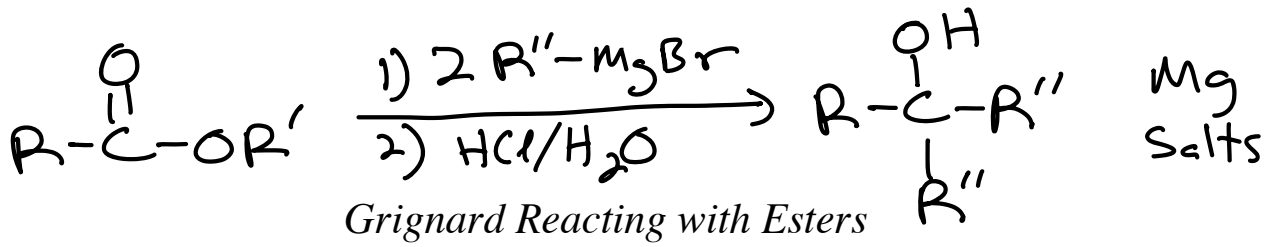
You need at least one H atom on the amine N atom to have a reaction



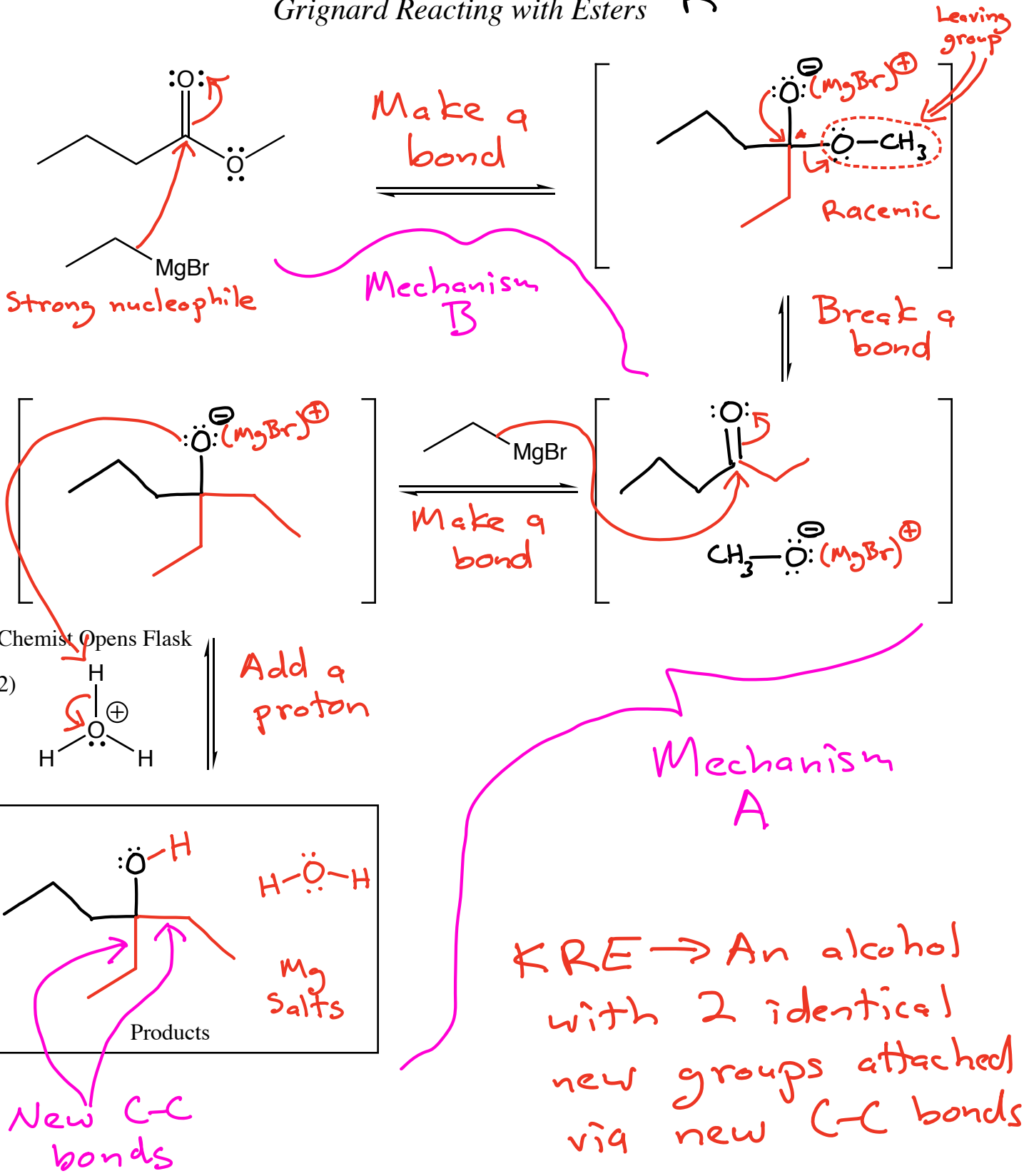


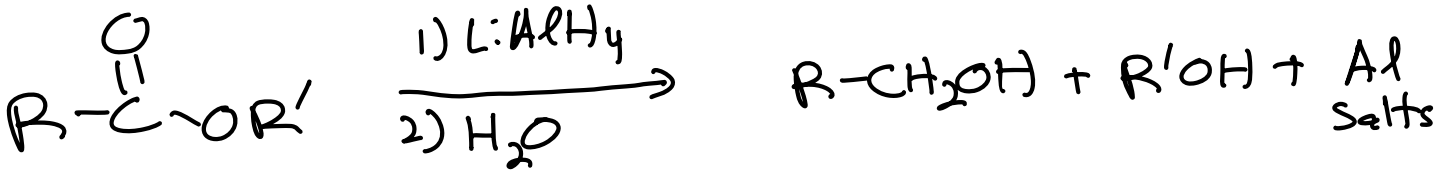


No Reaction

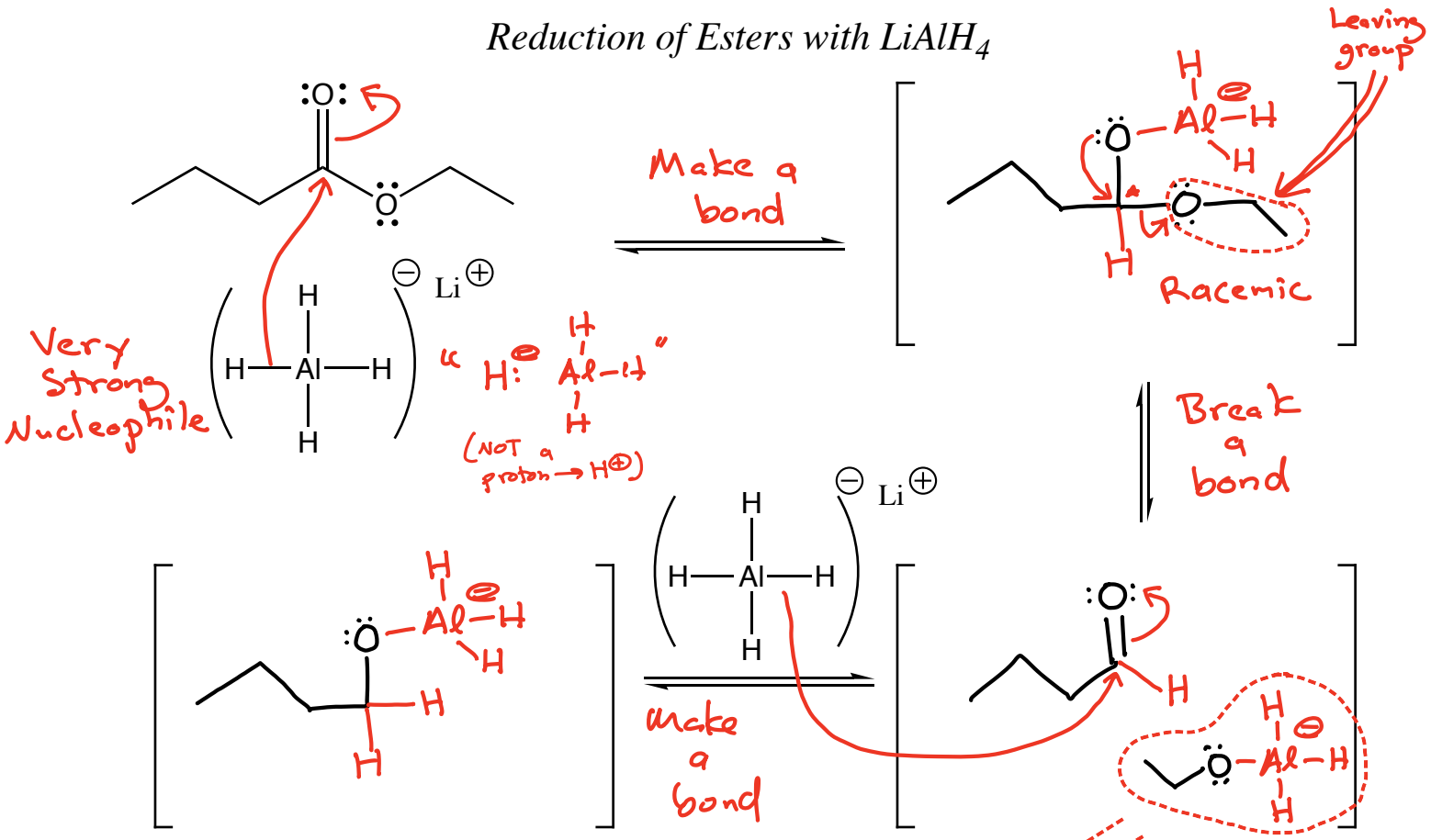


Grignard Reacting with Esters



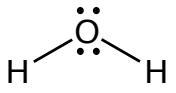


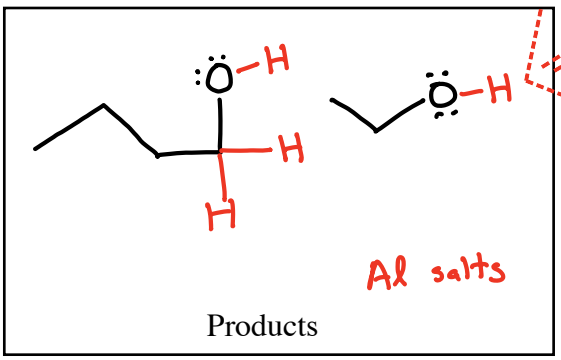
Reduction of Esters with $LiAlH_4$



Chemist Opens Flask

2)





Just keeping track of this product

KRE → converts an ester into two alcohols → breaks C-O bond

Note the extreme similarities between these last two mechanisms!