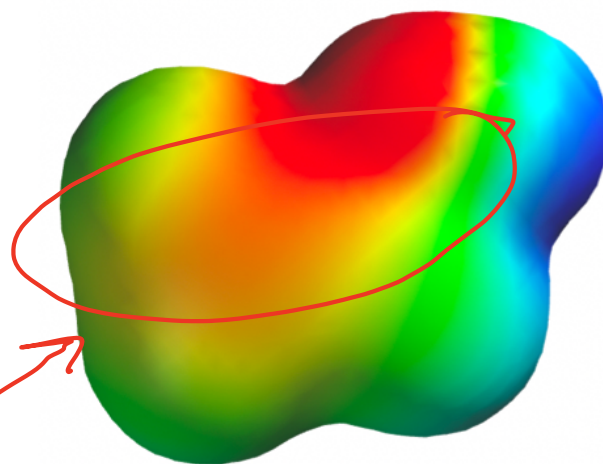
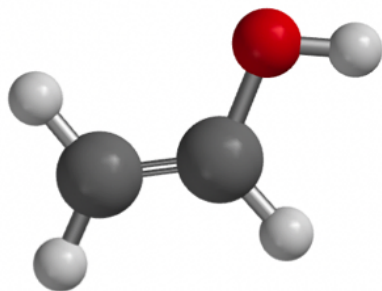
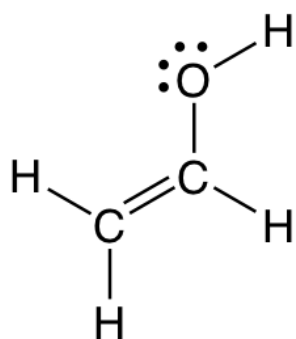
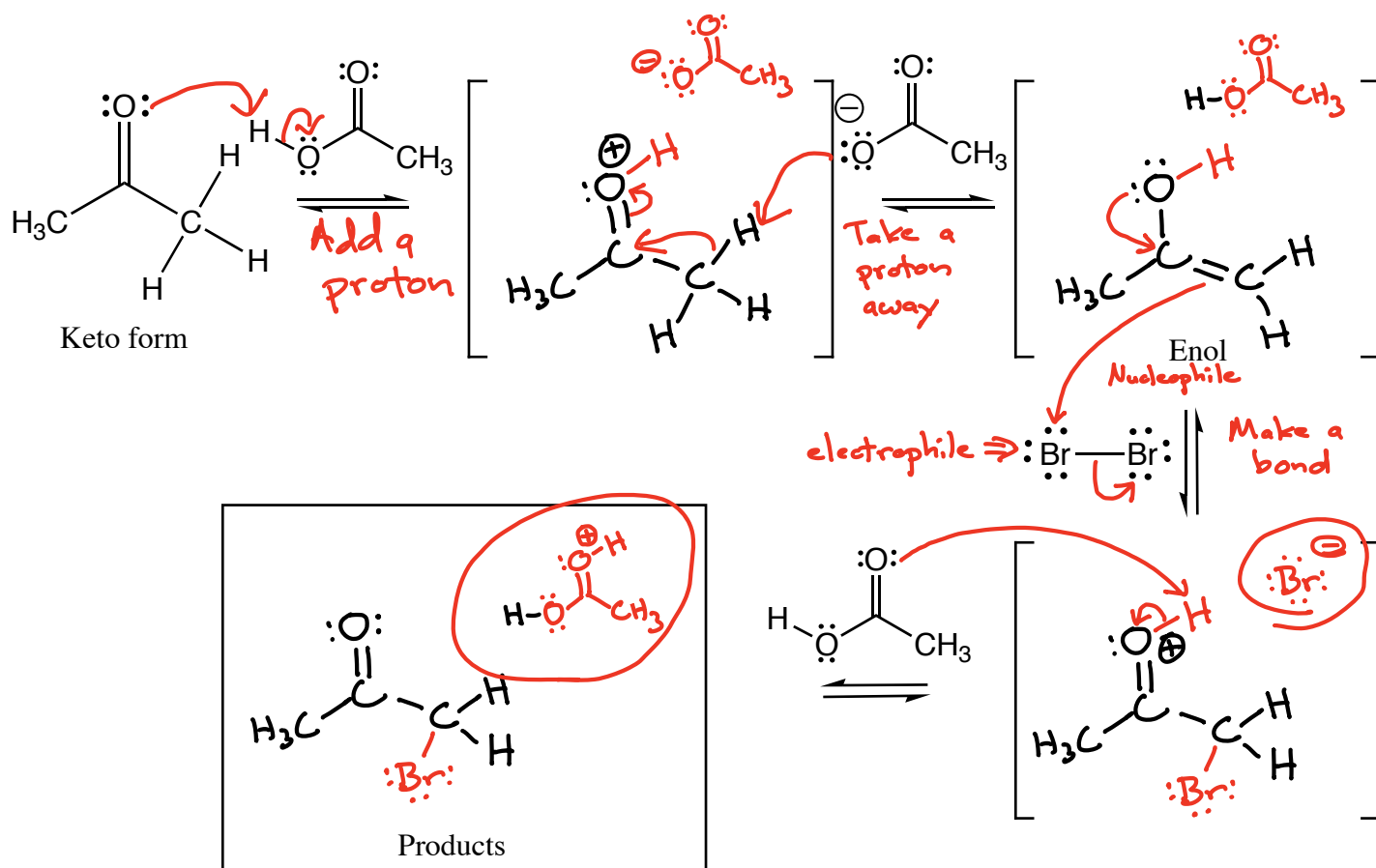
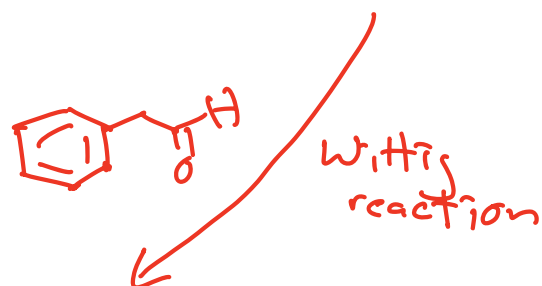
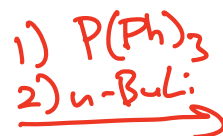
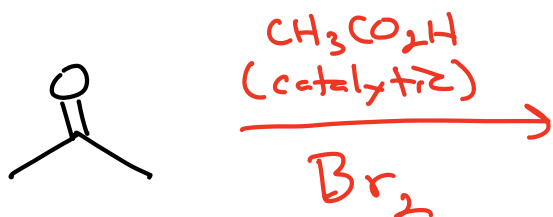


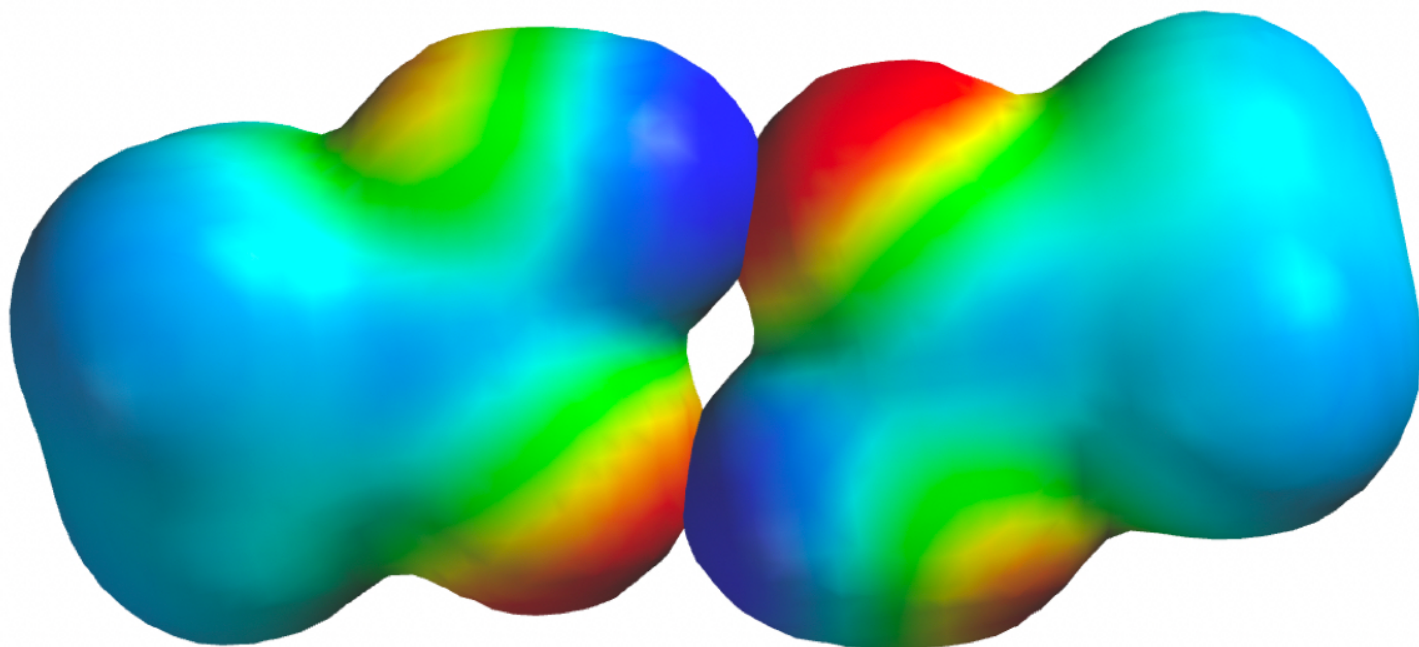
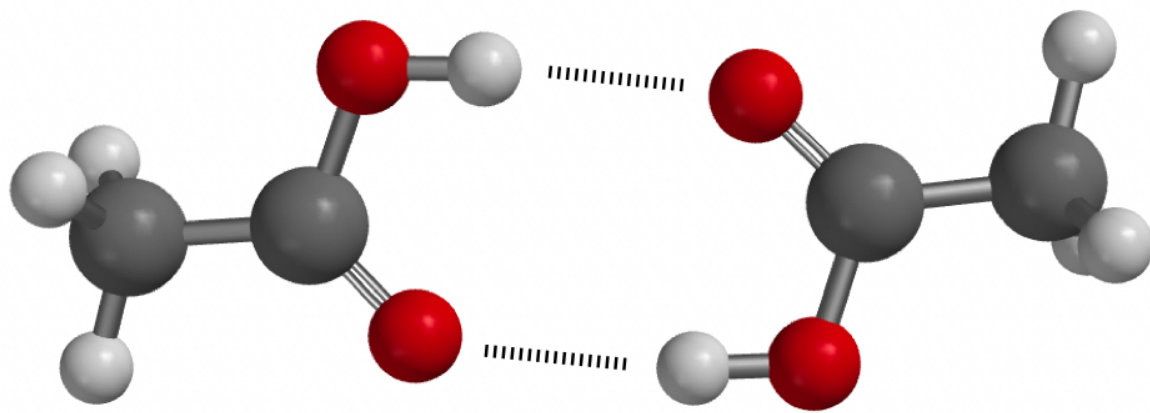
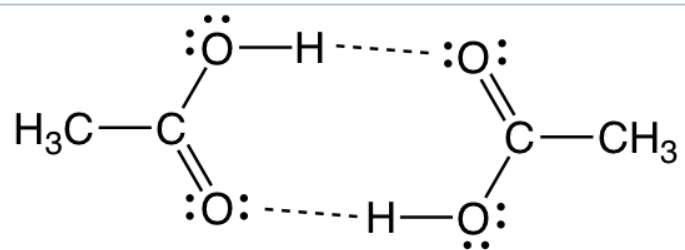
α -Halogenation of an Aldehyde or Ketone Catalyzed by Acid



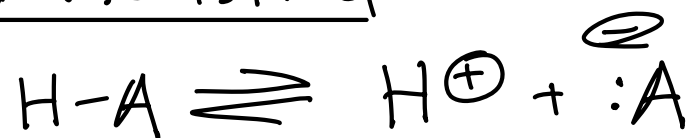
Nucleophile

Example





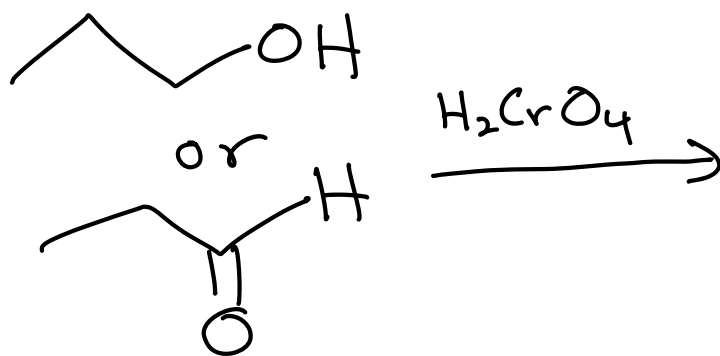
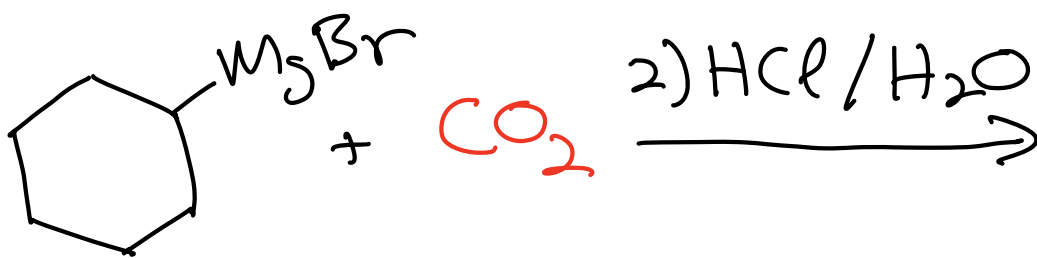
Acidity Revisited



$$K_a = \frac{[\text{A}^{\ominus}][\text{H}^{\oplus}]}{[\text{HA}]}$$

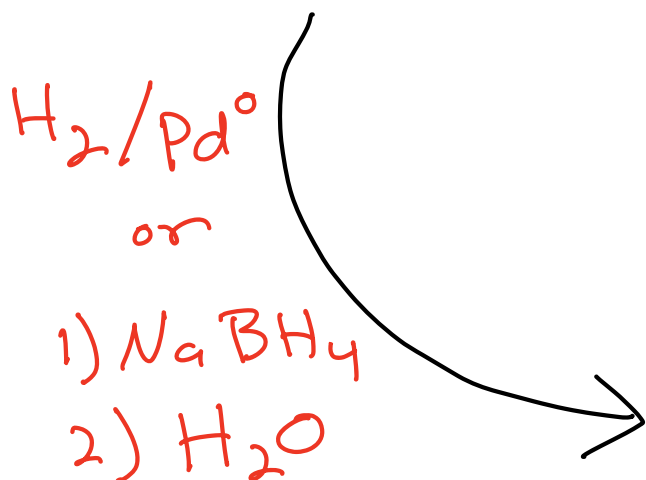
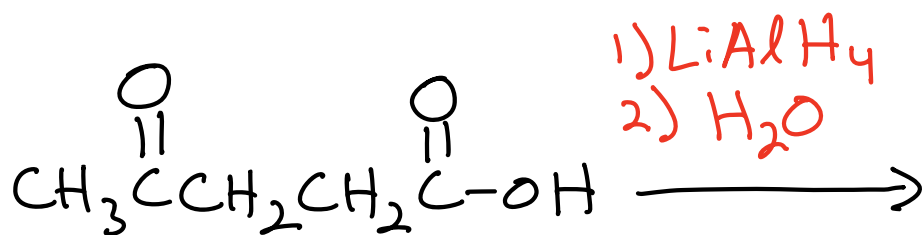
$$\text{p}K_a = -\log_{10} K_a$$

Making Carboxylic Acids



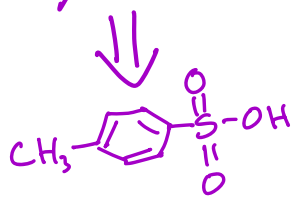
Reactions of Carboxylic Acids

Reduction $\rightarrow$

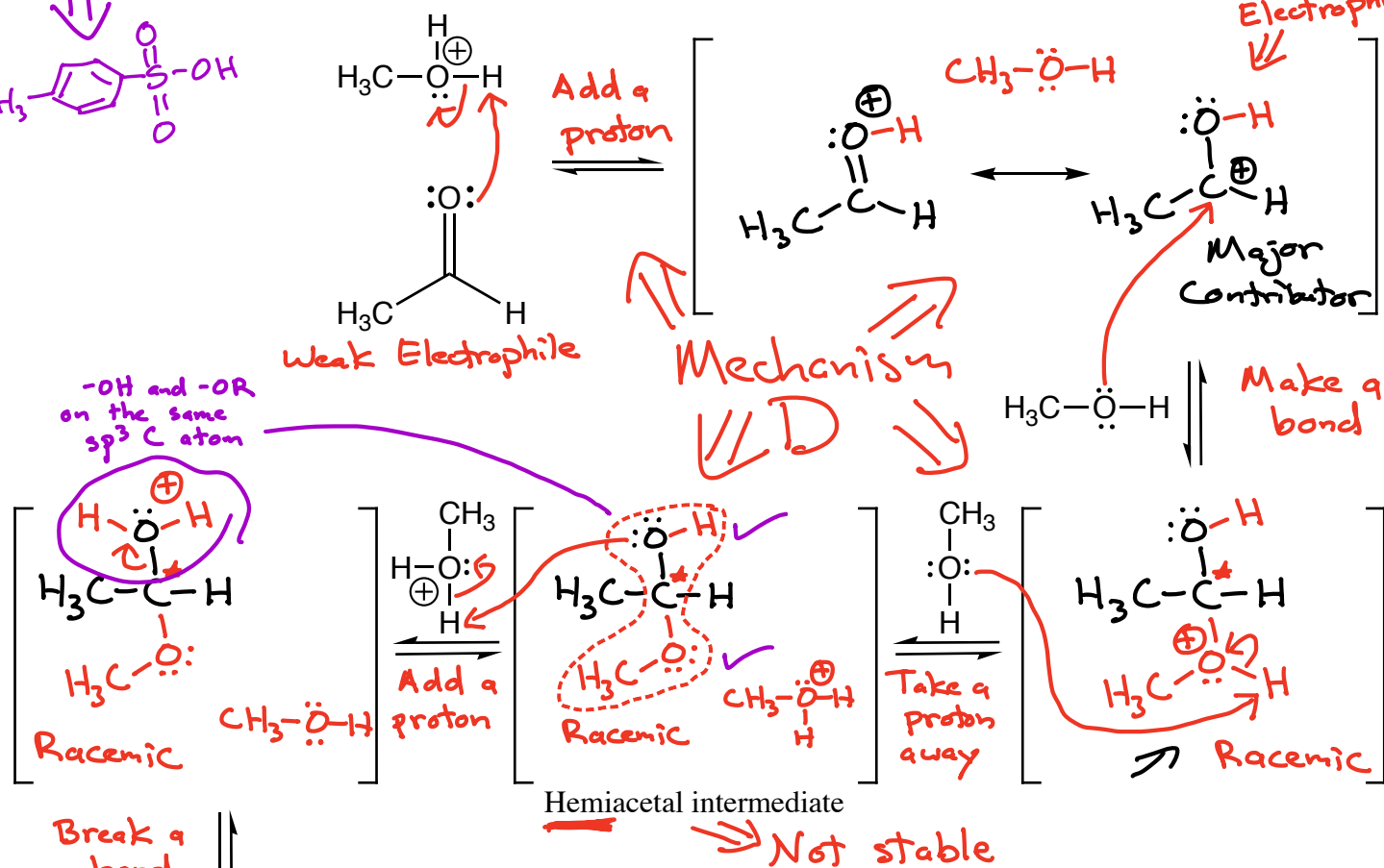


Time Capsule →
This is
Reversible

TsOH or H₂SO₄
Tosylic Acid
Acid Catalyzed Hemiacetal and Acetal Formation From an Aldehyde or Ketone

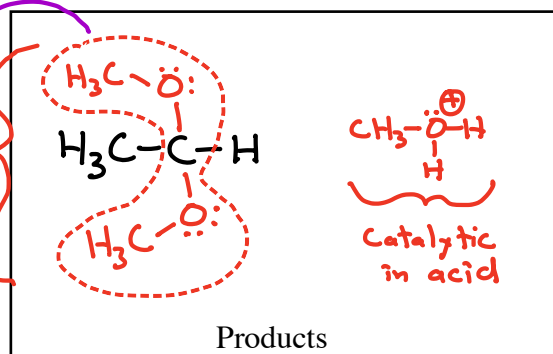


"Hex, does that thing have a hemi in it?" "SWEET!"

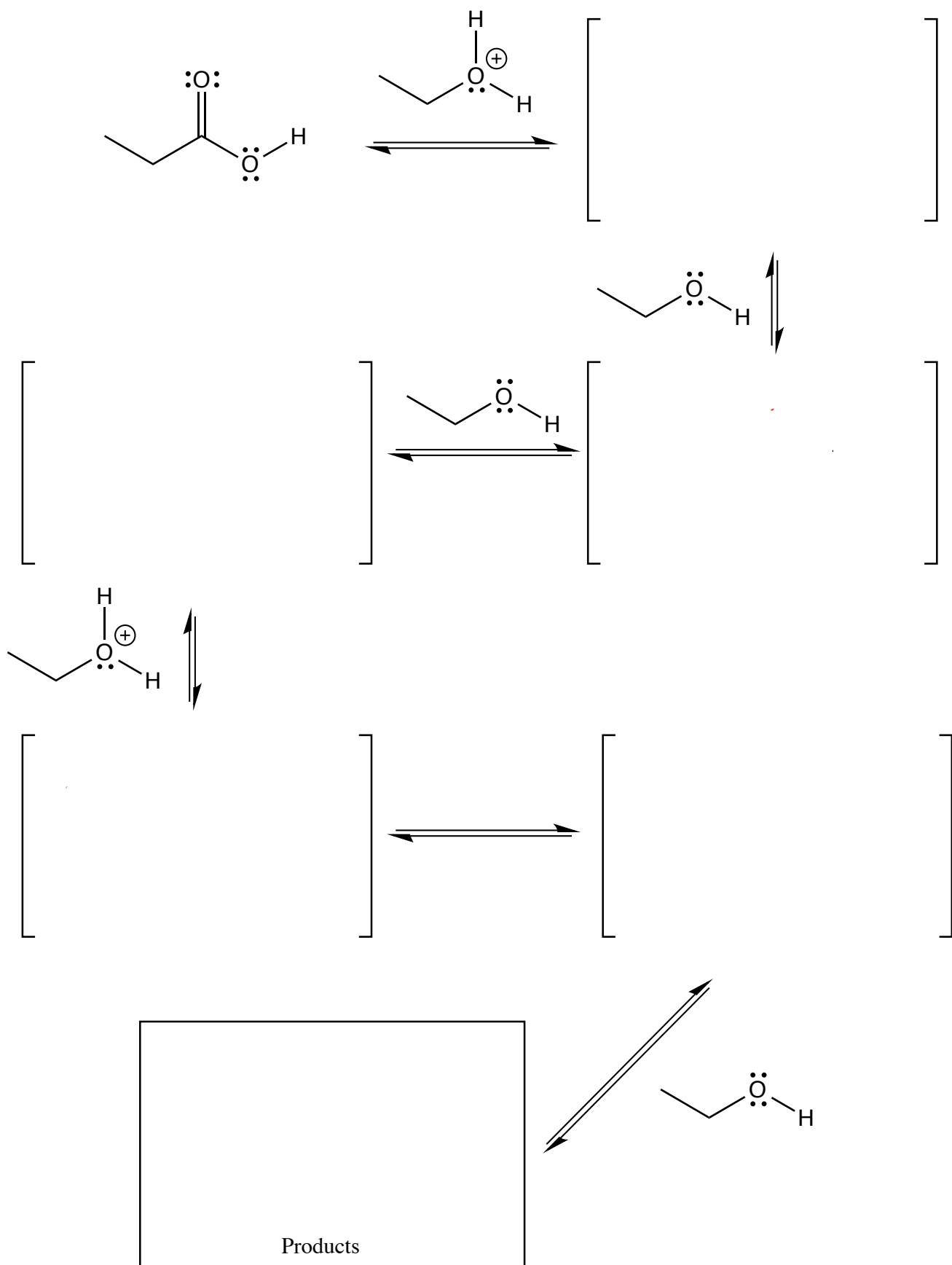


Key Recognition Element (KRE):
 Two bonds to ether O atoms to an sp³ C atom

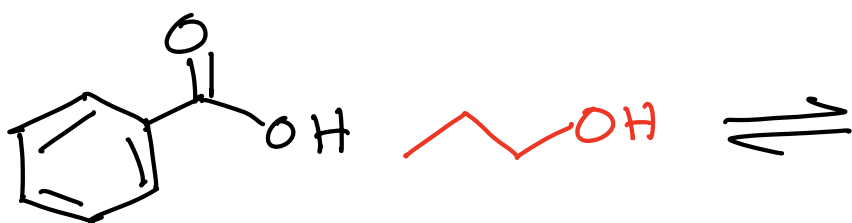
An acetal



Fischer Esterification



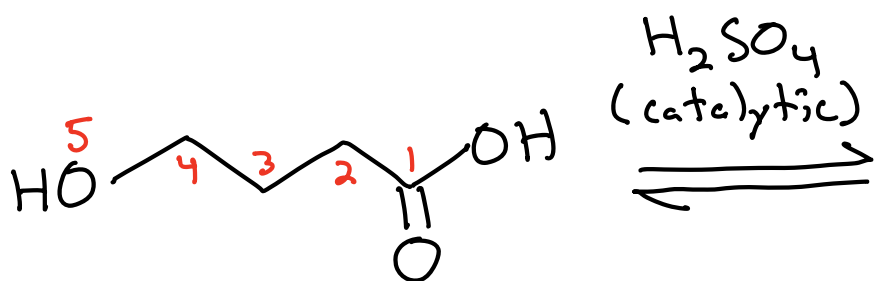
KRE $\rightarrow$



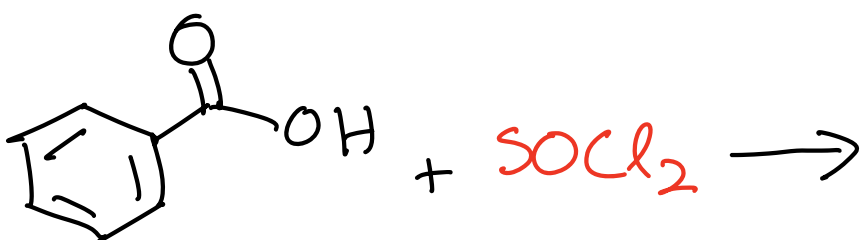
Time Capsule $\rightarrow$
This is reversible



You can make
cyclic esters
called Lactones



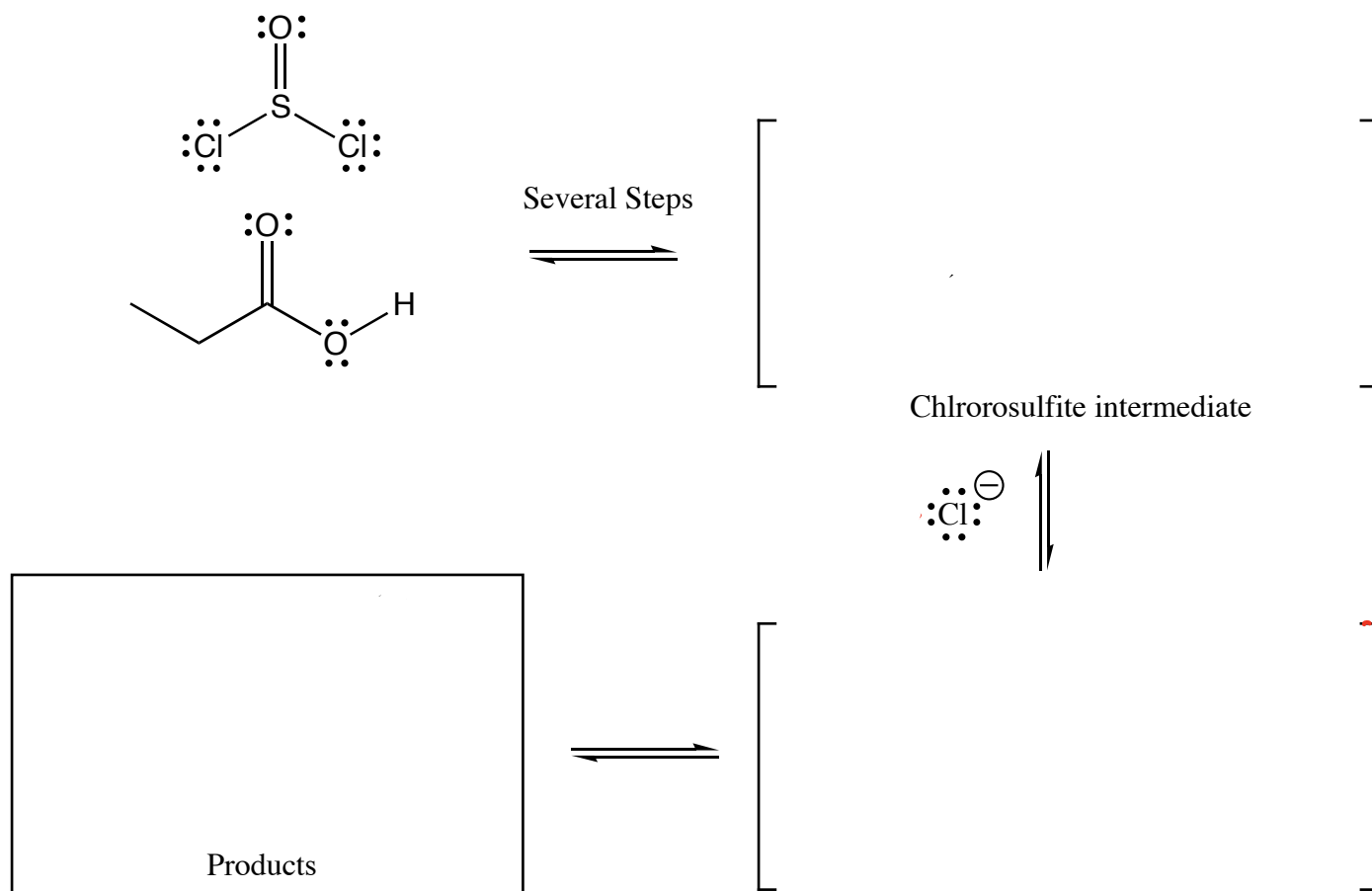
Carboxylic Acid and SOCl_2



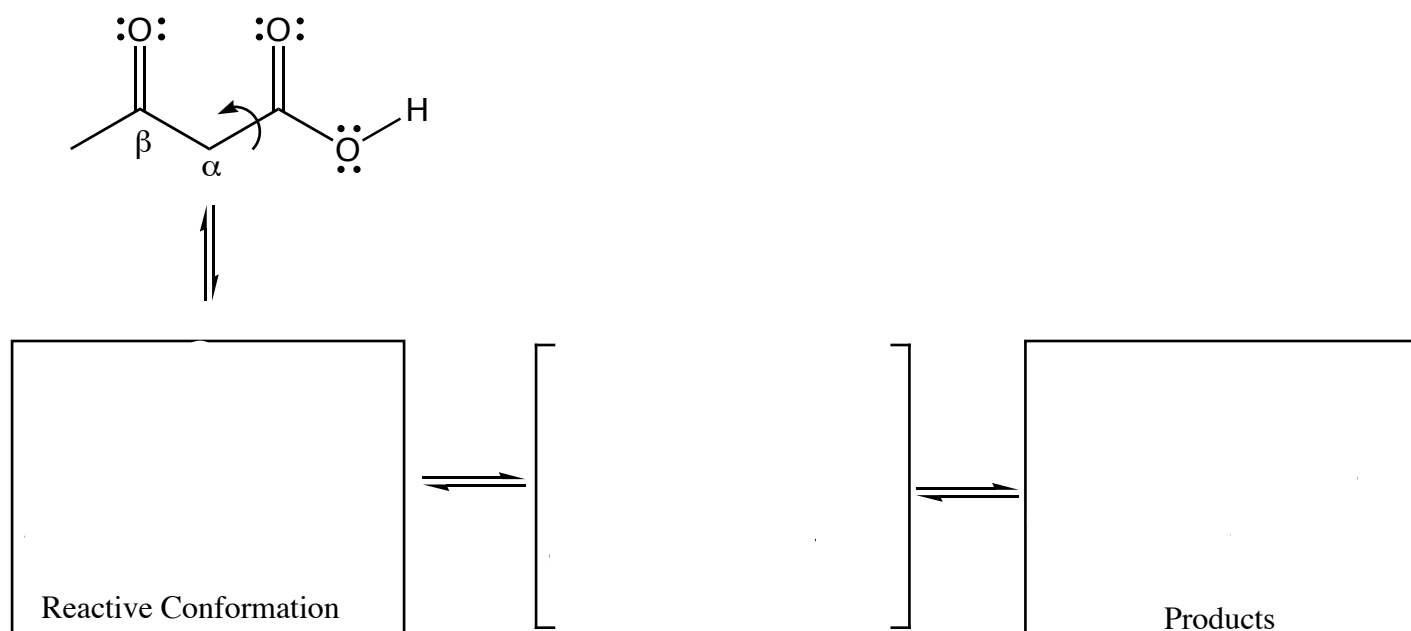
Time capsule $\rightarrow$



Reaction with Thionyl Chloride



Decarboxylation of a β -Keto Acid

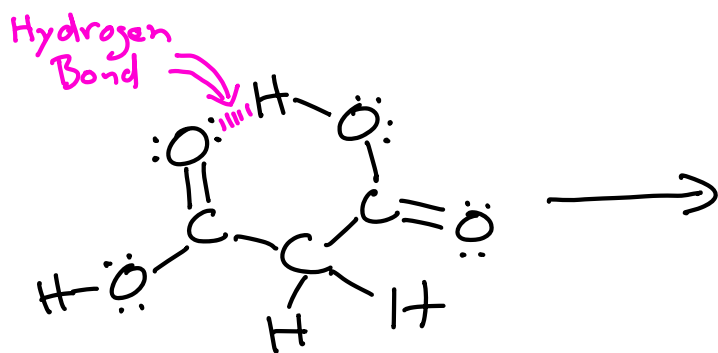


KRE $\rightarrow$ Ketone and CO_2

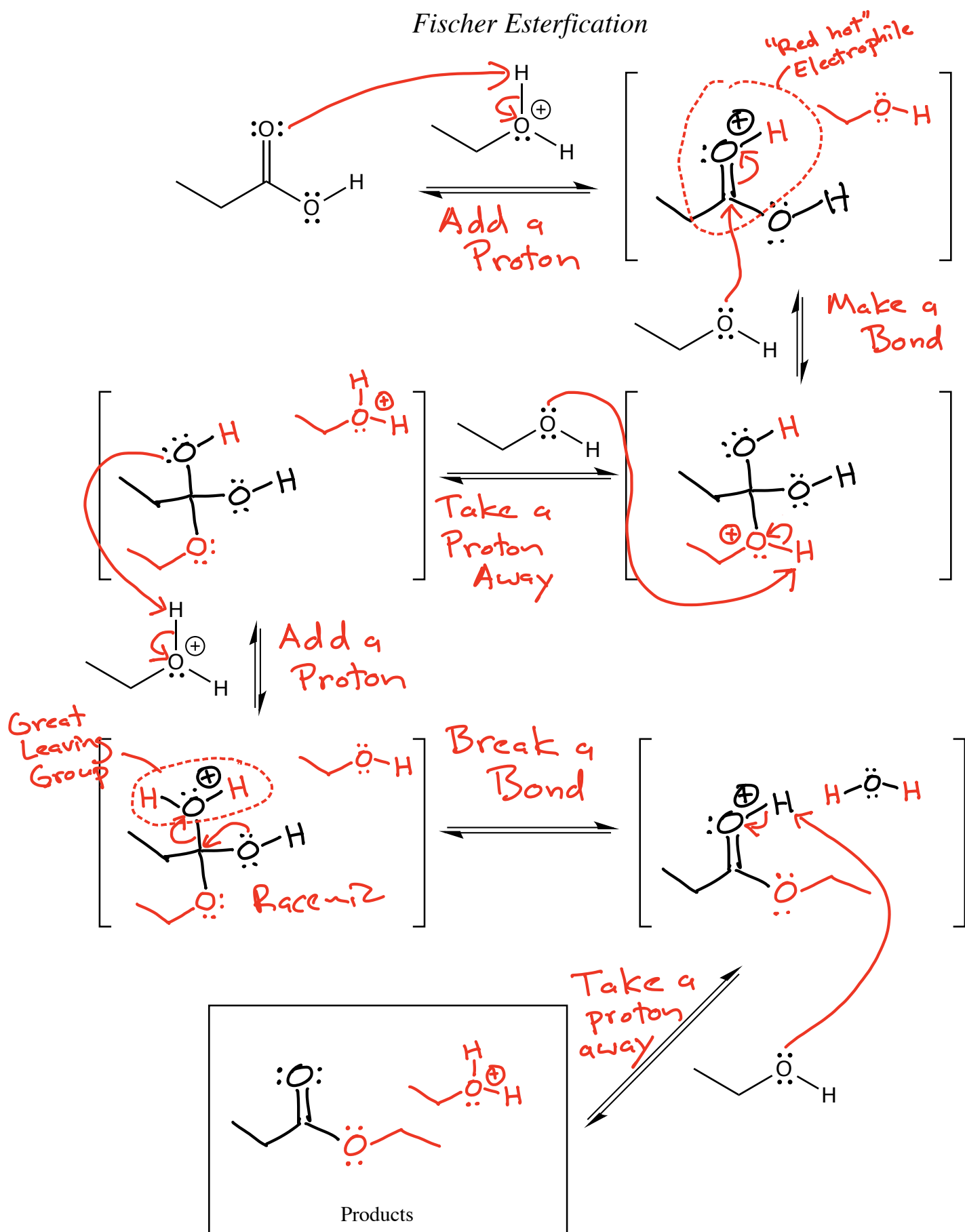


Time capsule $\rightarrow$

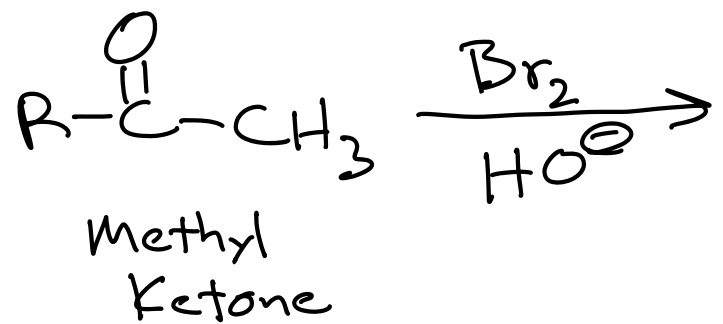
This also works with β -diacids



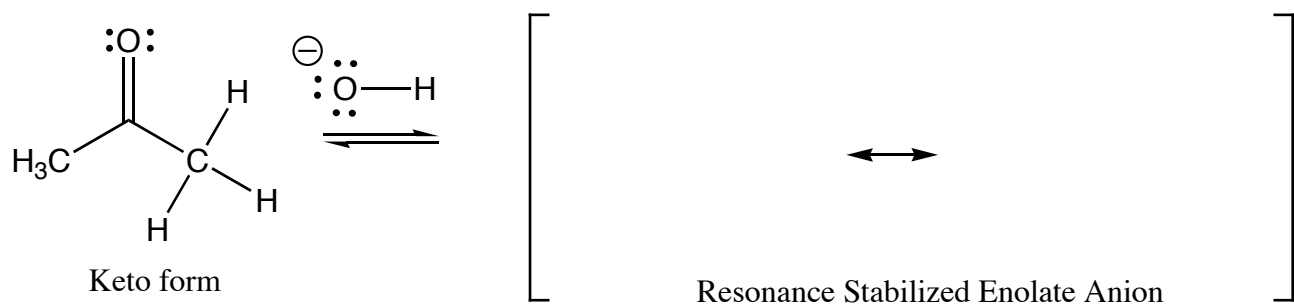
Fischer Esterification



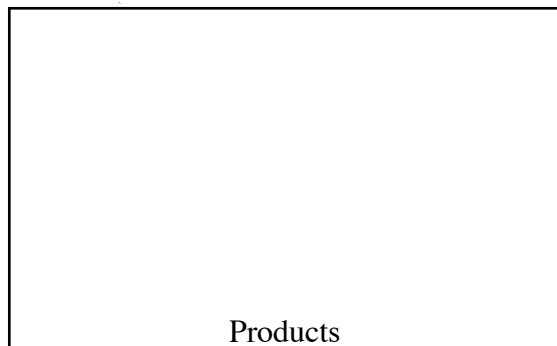
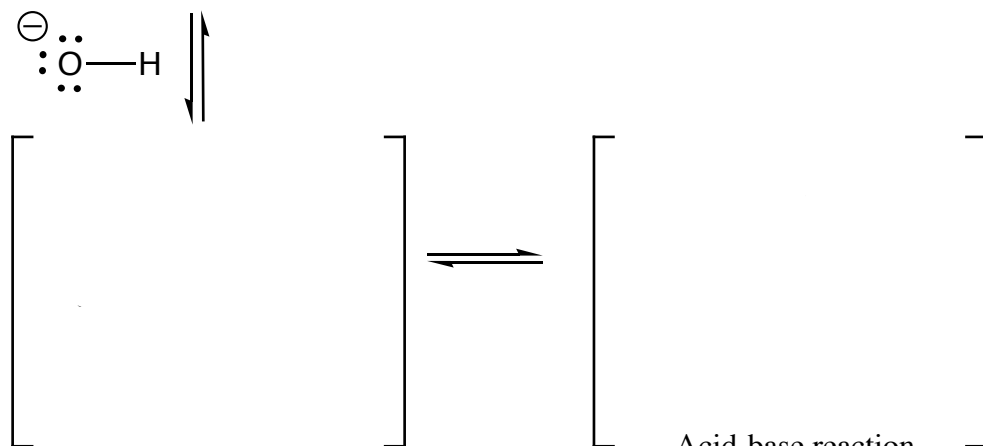
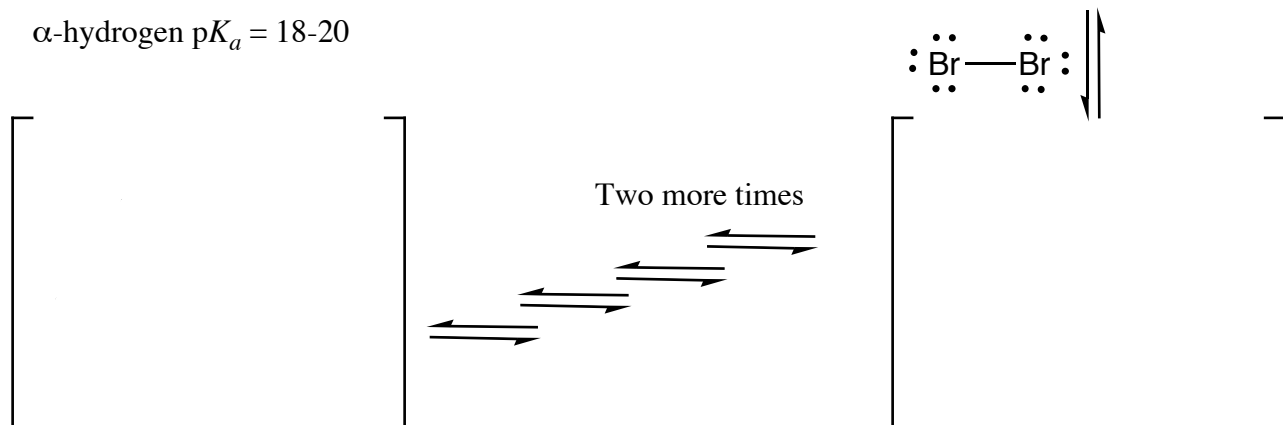
The haloform reaction $\rightarrow$



The Haloform Reaction



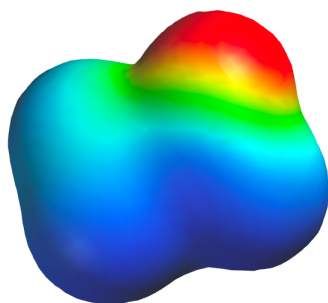
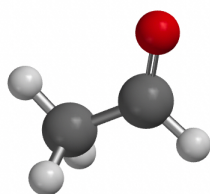
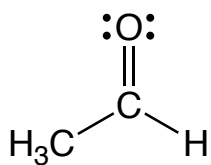
α -hydrogen $pK_a = 18-20$



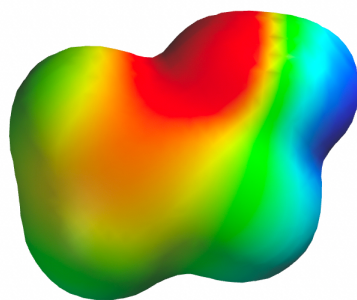
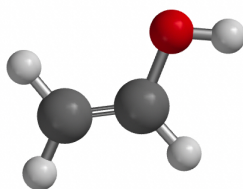
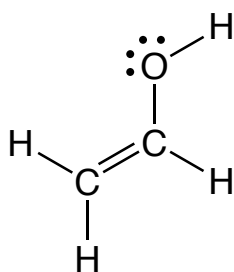


Be Careful:

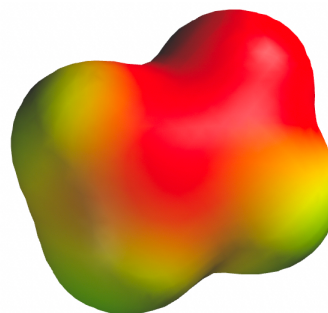
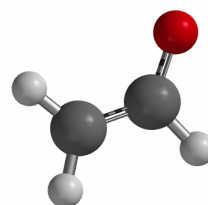
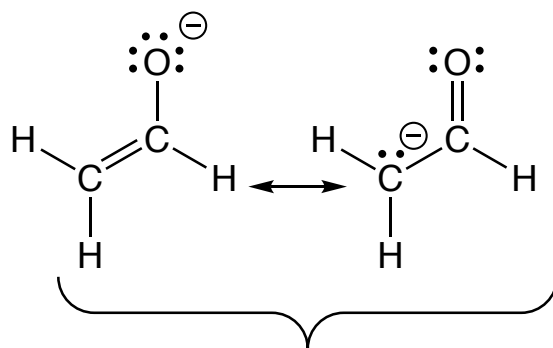




Electrophile



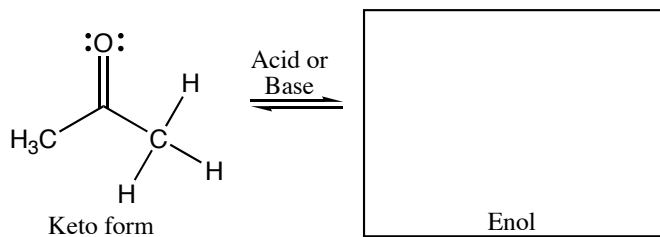
Nucleophile



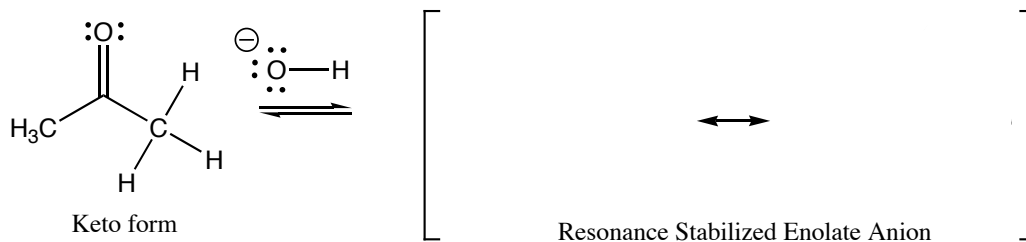
Strong
Nucleophile

Keto-Enol Tautomerization vs. Enolate Resonance

Keto-Enol Tautomerization

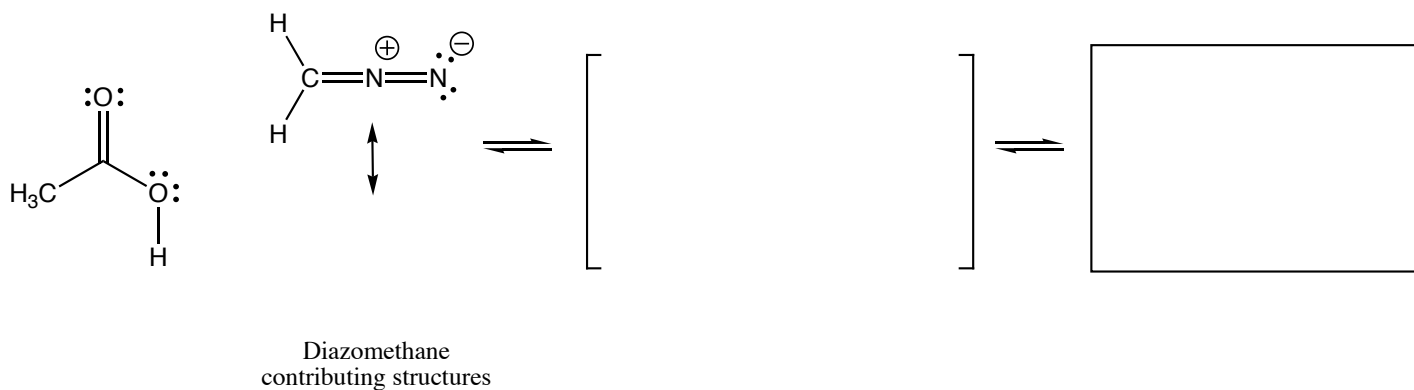


Enolate Resonance

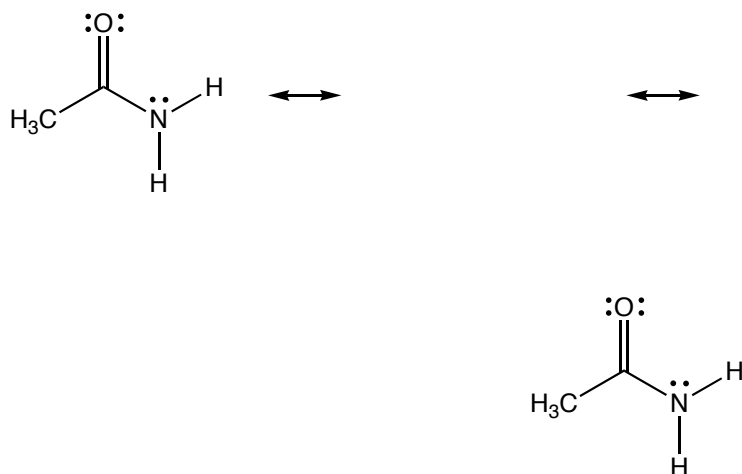


α -hydrogen $pK_a = 18-20$

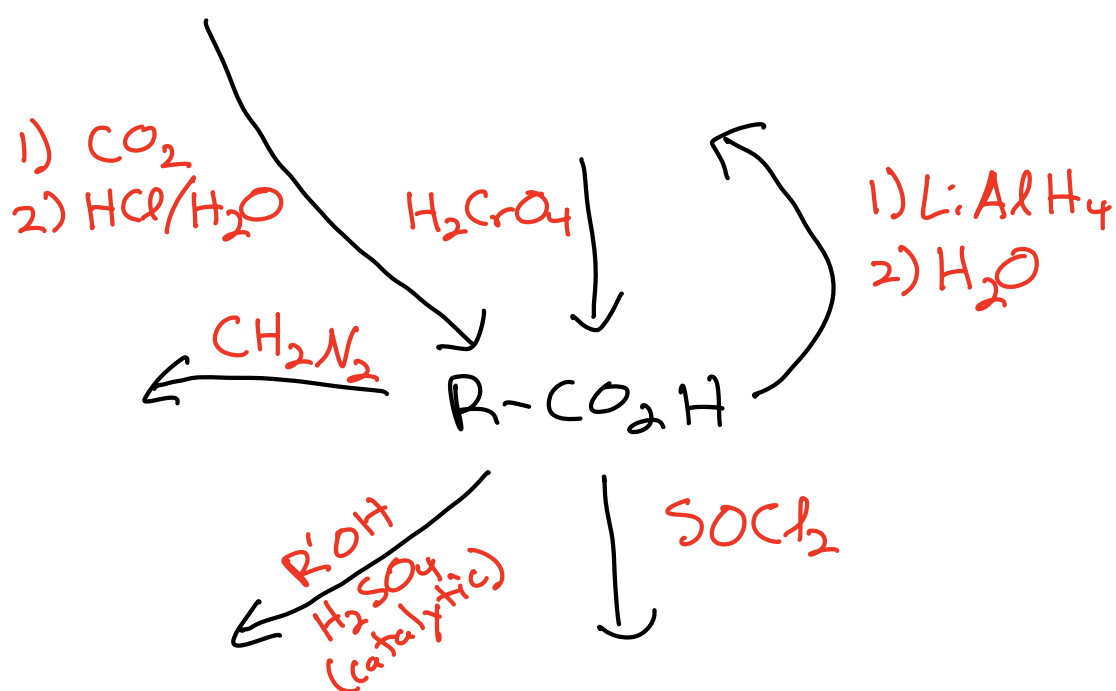
Diazomethane reaction



Amide Resonance VERY IMPORTANT!!!!



Summary of Carboxylic Acid Reactions →



Carboxylic Acid Derivatives

Interconversion of Carboxylic Acid Derivatives

