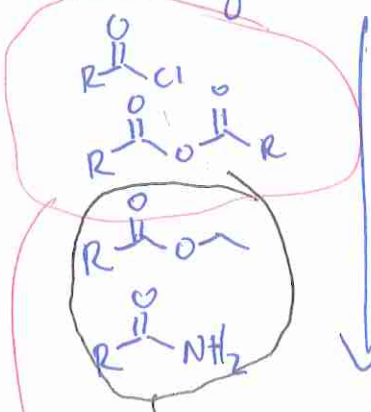
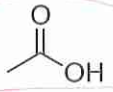
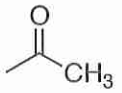
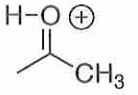
Mon 3/20/17

Reactivity of Carboxylic Acid Derivatives

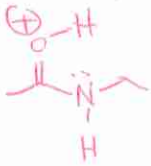


Decreasing Reactivity towards Nuc:

Protonated State	pK_a
$H_3N^{\oplus}$	~ 9
H_2N	~ 40
	4.8
HCl	- 7
H_2O	15.7
HO	15-19
$H_3O^{\oplus}$	- 1.7
$H_2O^{\oplus}$	-2
	18-20
	- 6

Equilibrium favors formation of the weaker acid.

Larger pka ⇒ Weaker acid

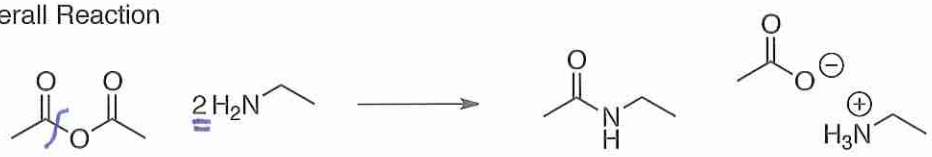
So H_2N^- picks up the proton from 

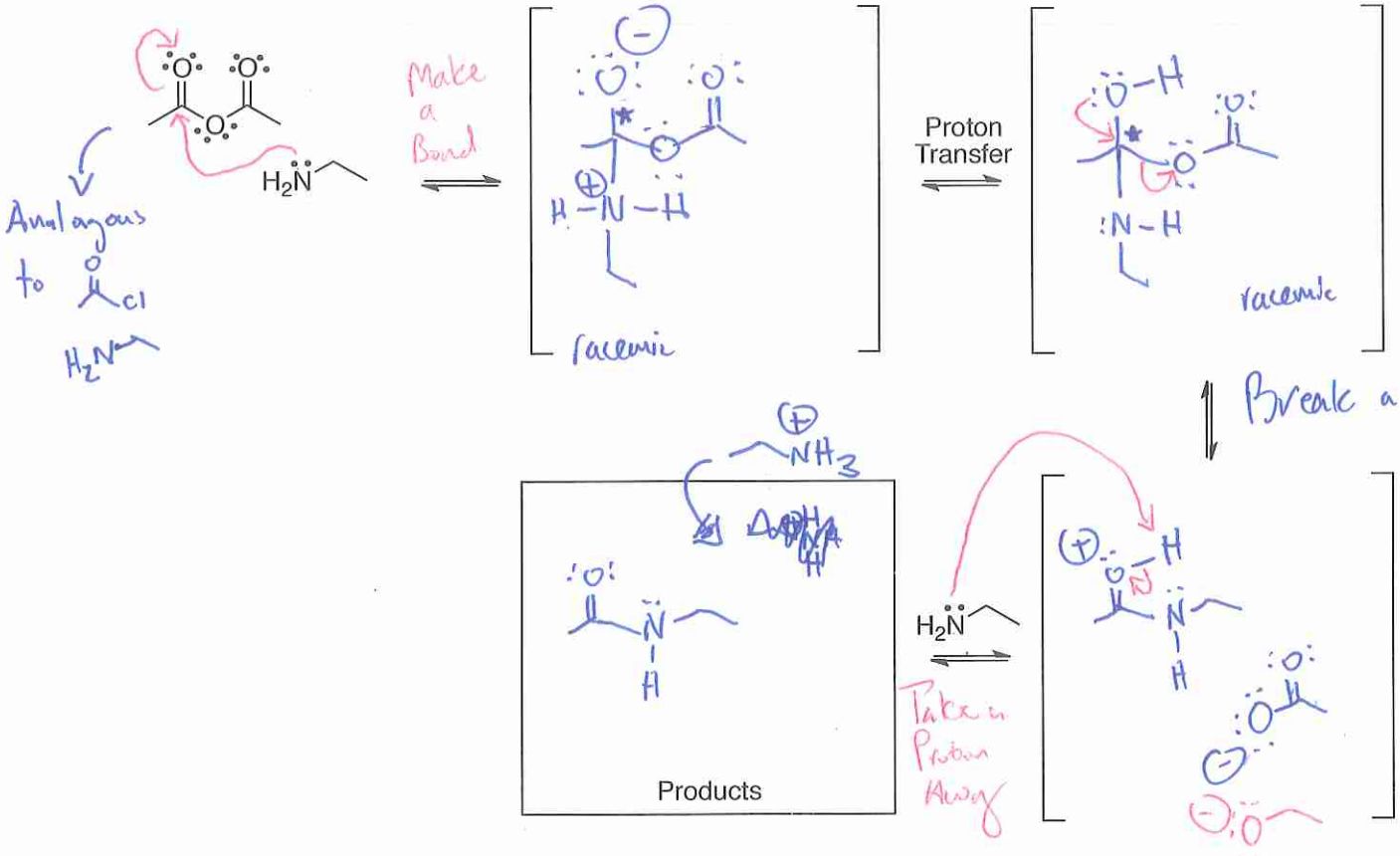
Need to protonate C=O before H_2O can attack!

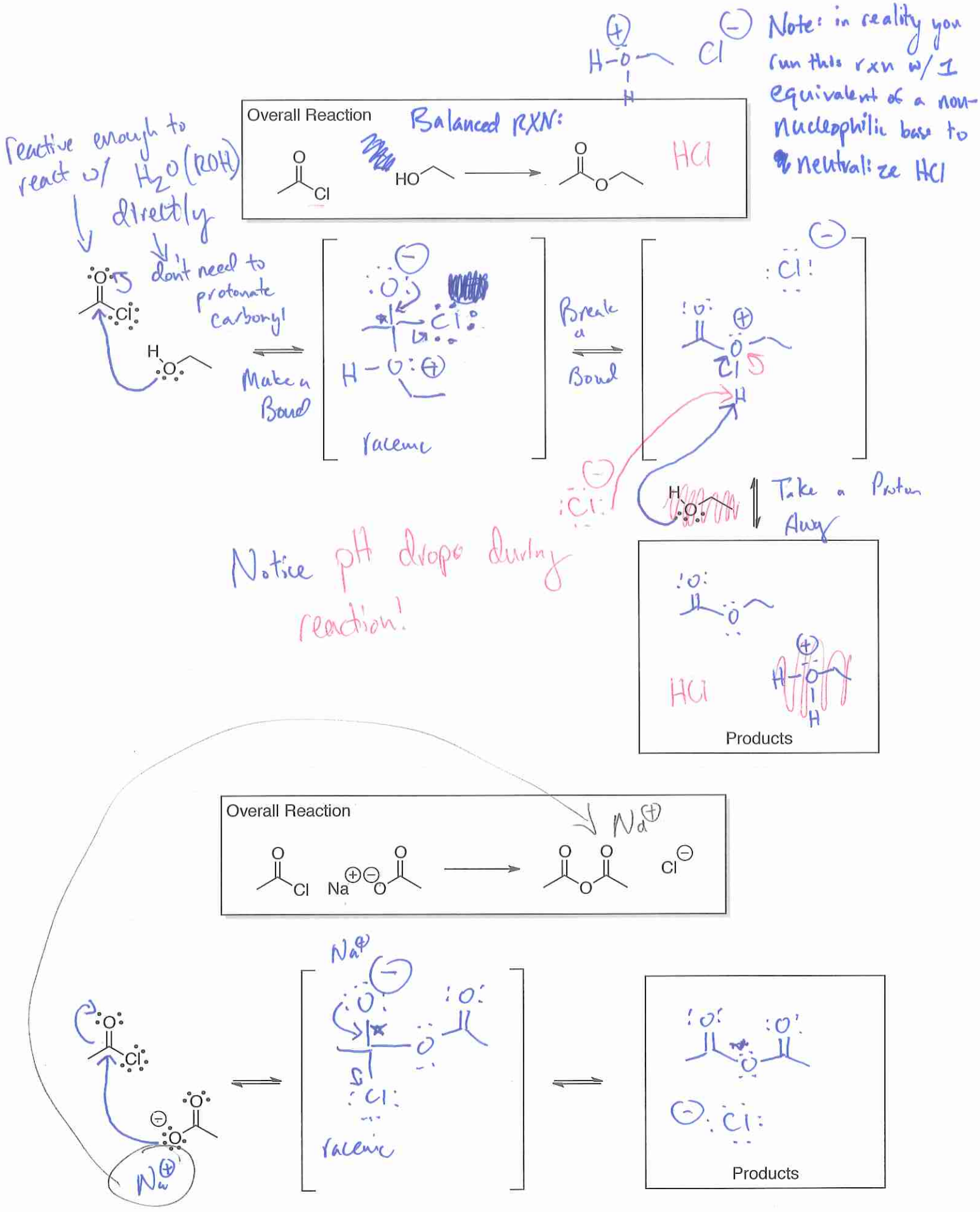
So we need Acid!

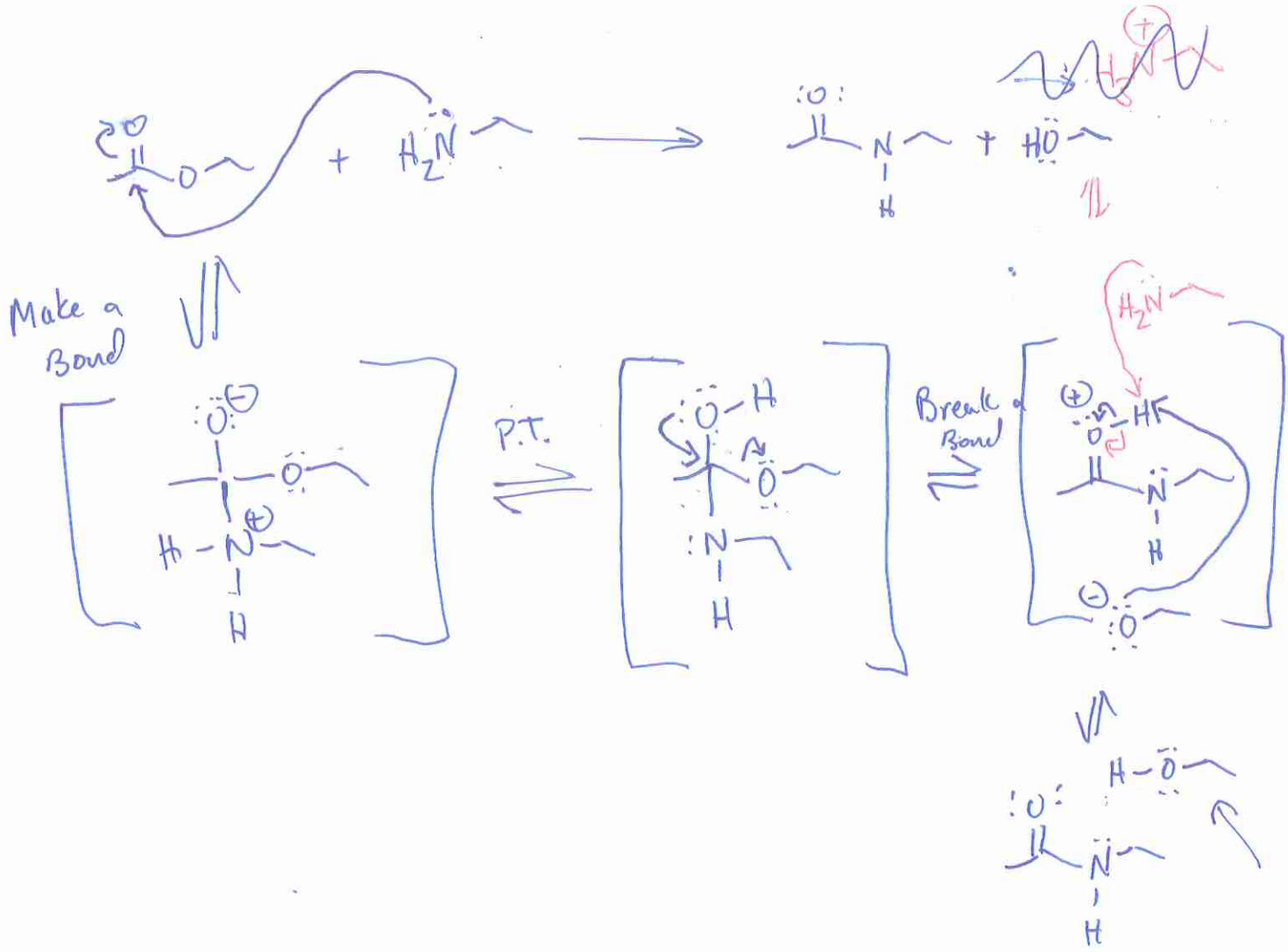
Reactive enough for H_2O to attack directly

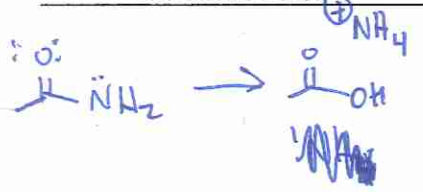
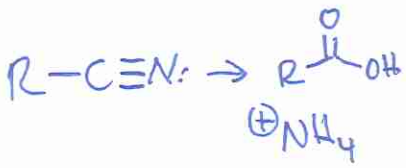
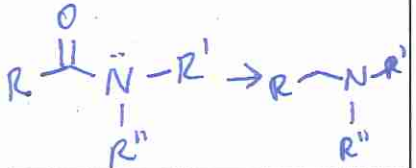
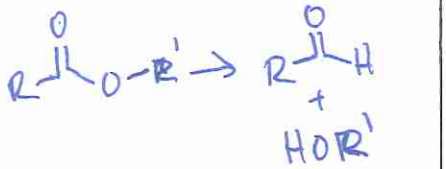
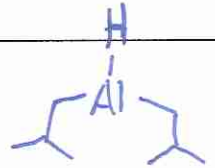
Overall Reaction



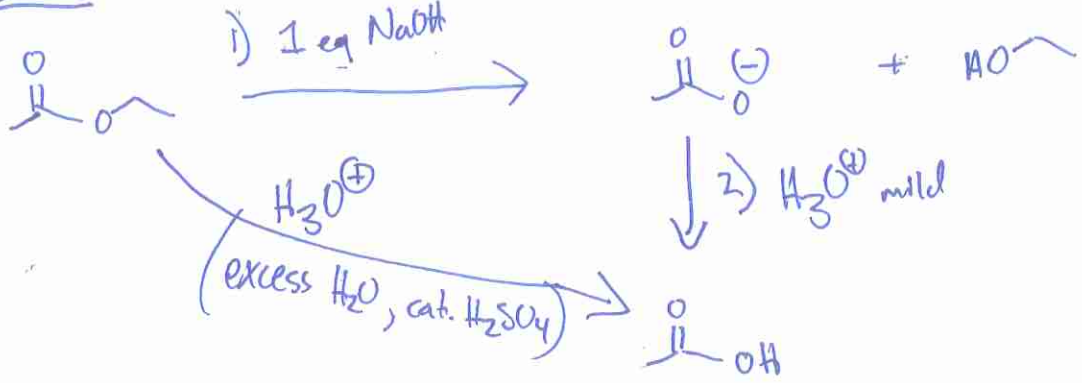


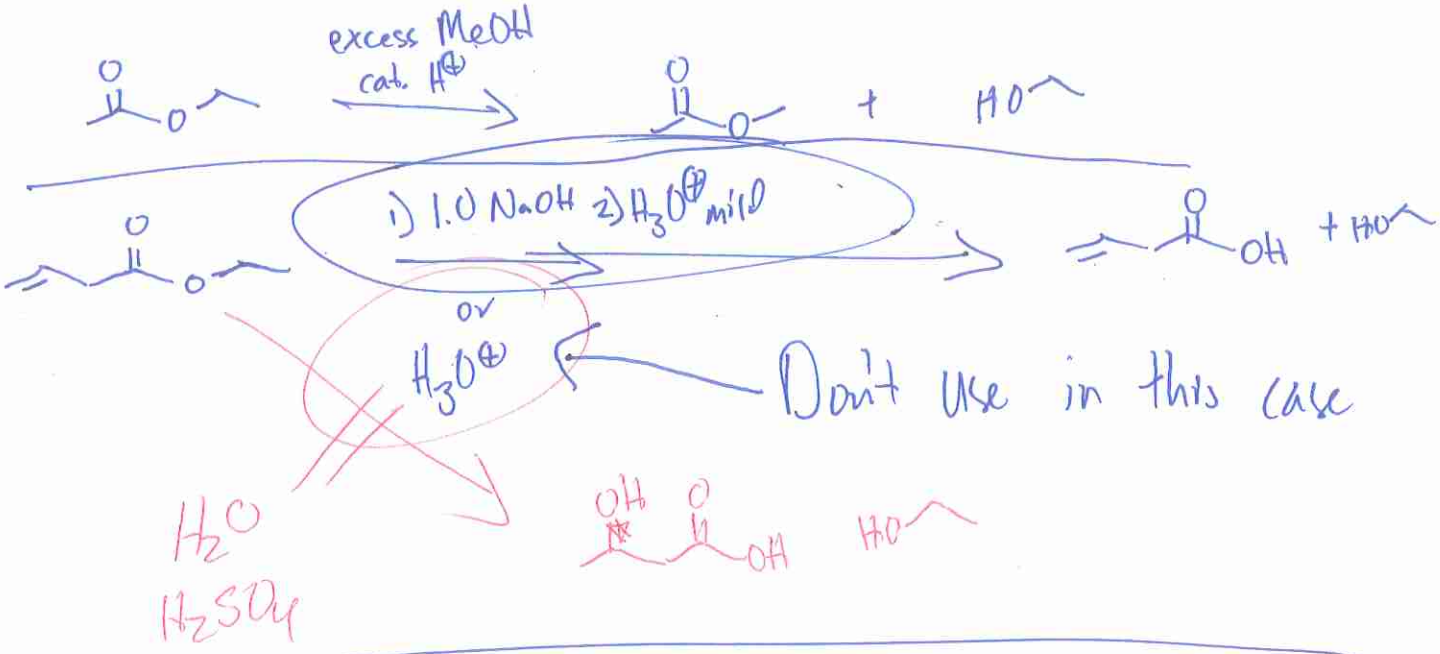

Note: in reality you run this rxn w/ 1 equivalent of a non-nucleophilic base to neutralize HCl
Overall Reaction
Balanced RXN:
HCl
Reactive enough to react w/ H2O (ROH) directly
don't need to protonate carbonyl
Make a Bond
Break a Bond
Take a Proton Away
Notice pH drops during reaction!
Products
Overall Reaction
Na
Cl
Products


Make a Bond
P.T.
Break Bond

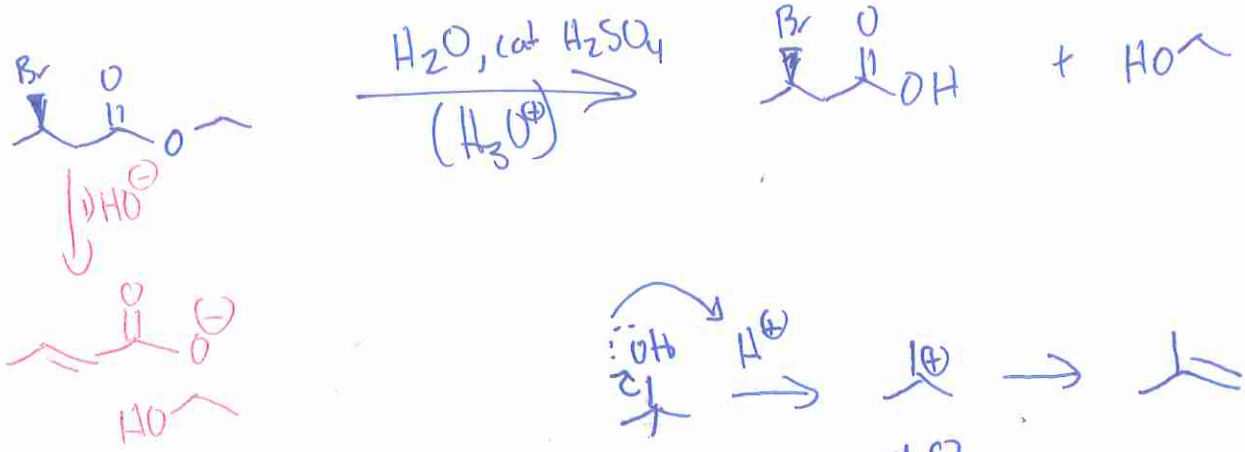
Transformation	Reagent	Mechanism
	H_3O^+ heat (1 eq HCl + H_2O) ← Balanced	Packet! Amides are the least reactive carboxylic acid derivatives → need Acid & Heat KRE
	H_3O^+ heat (1 eq HCl + 2 H_2O)	Packet KRE
	1) $LiAlH_4$ 2) H_2O	Weird → O atom leaves with Aluminum! KRE
	1) DIBALH 2) H_2O	No mech!  KRE Aldehyde from ester
		KRE
		KRE
		KRE

Esters





What conditions for hydrolyzing this ester?



3° ROH eliminate in acid!

Anything bound to an sp^2 (or sp) hybridized atom is in the same plane as that atom

sp^2