Today

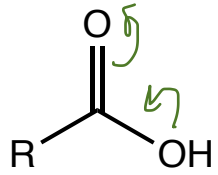
Electron Delocalization in and Reactions of Carboxylic Acids and Carboxylic Acid Derivatives
Section 15.3-15.9

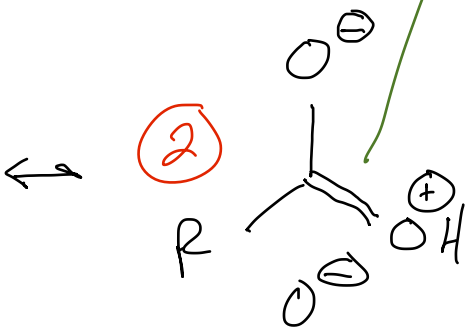
Next Class

Reaction of Amides , Nitriles, and Acid Anhydrides
Sections 15.10-15.16

how strong is the π bond

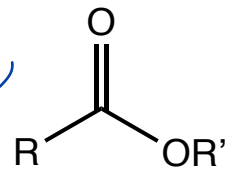
carboxylic acid

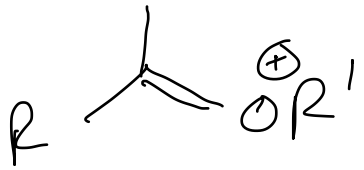




these two have the same π character because both have ⊕ charge on O

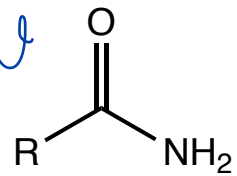
ester





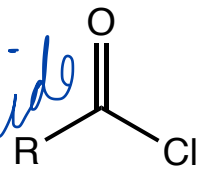
R' ≠ H

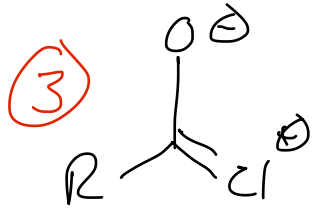
amide



more π character than acid + ester because the ⊕ is on an N and not an O

acid chloride





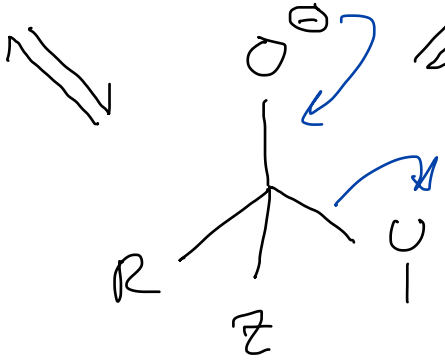
the least π character because a 3p orbital on Cl is interacting with a 2p orbital on C

Lone pair e-'s adjacent to a pi bond means there will be electron delocalization a.k.a. resonance.

highest π character

the C=O
C is an
electrophile

tetrahedral
intermediate

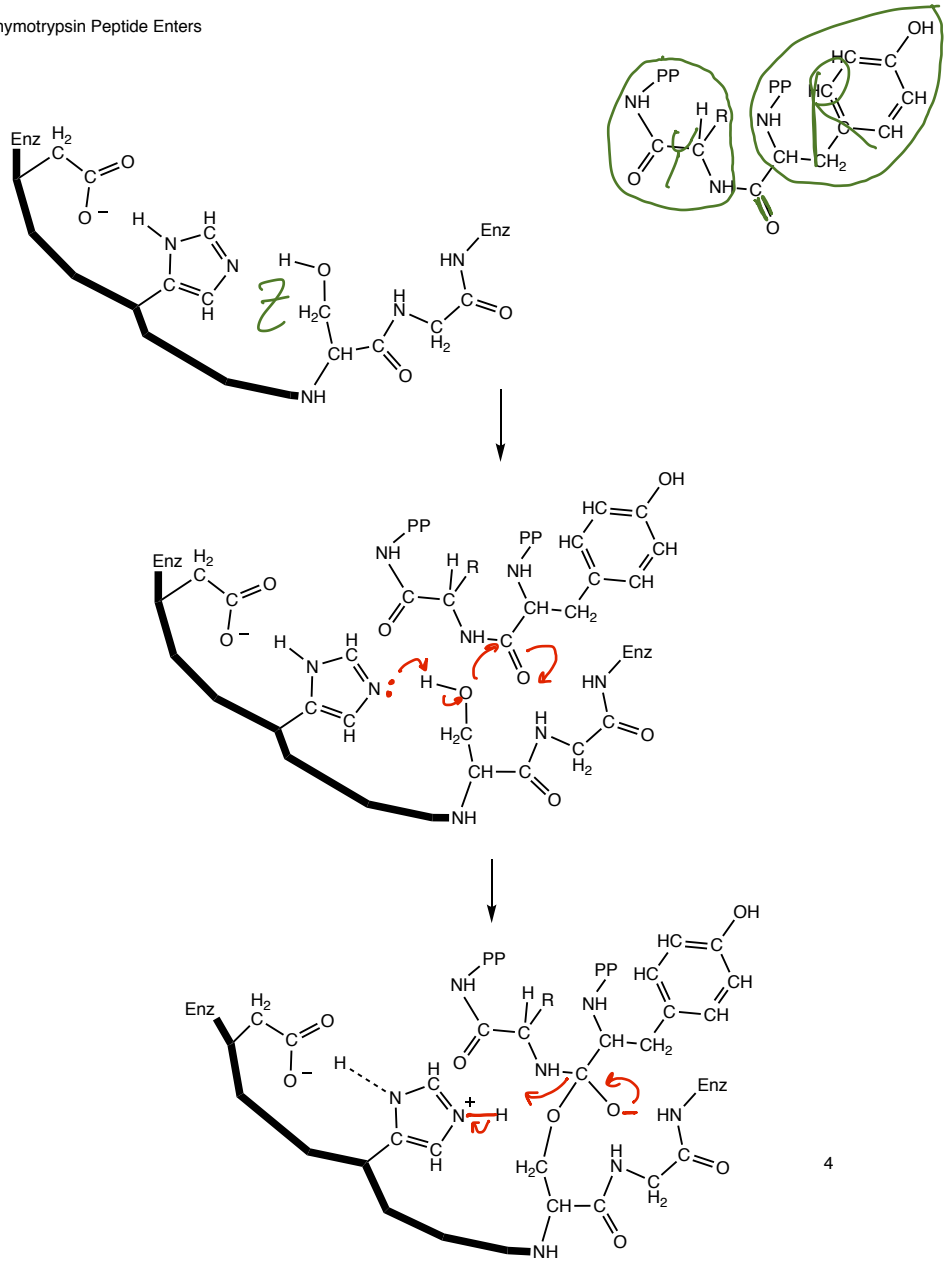


on the conditions
and the products
that form

whether the
reaction goes
to completion or
establishes a mix
of reactants +
products depends

Chymotrypsin Hydrolyzes Proteins

Chymotrypsin Peptide Enters



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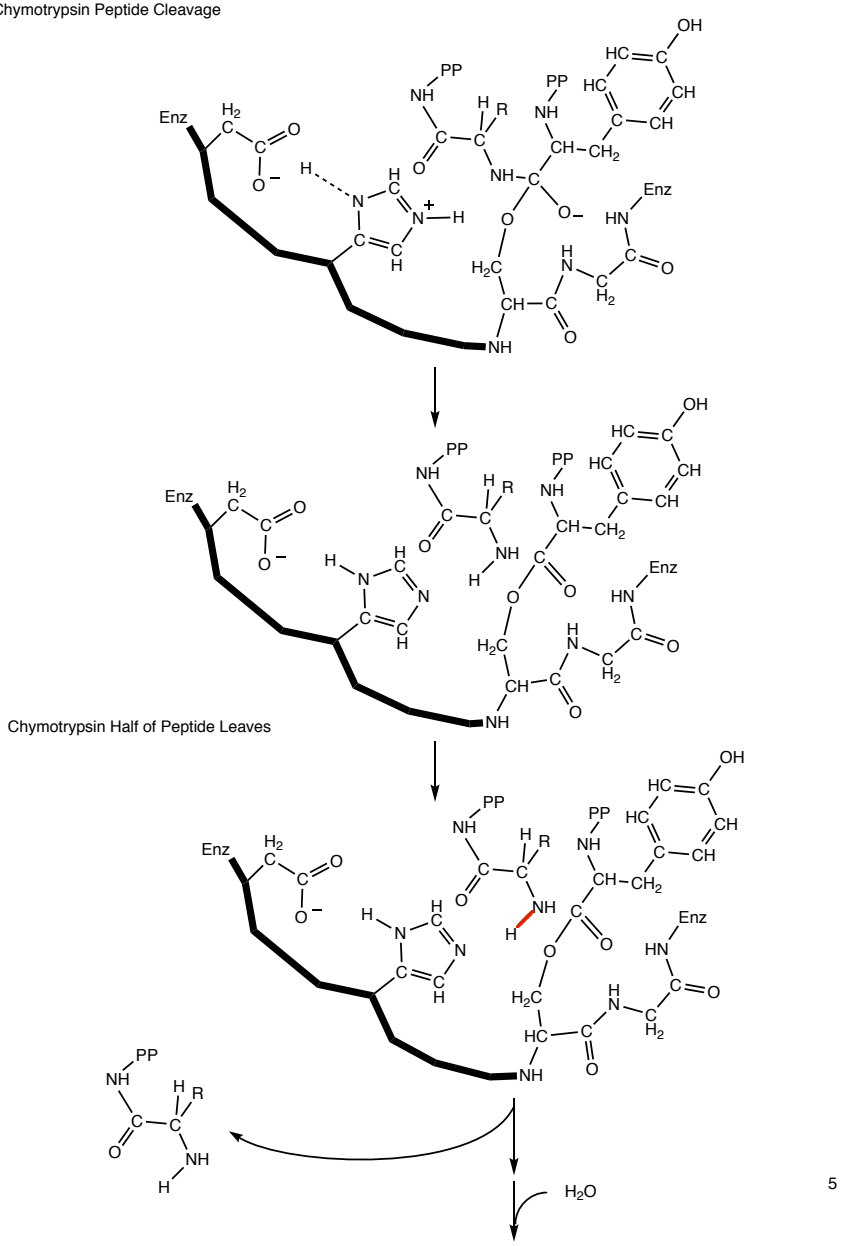
Chymotrypsin Peptide Cleavage



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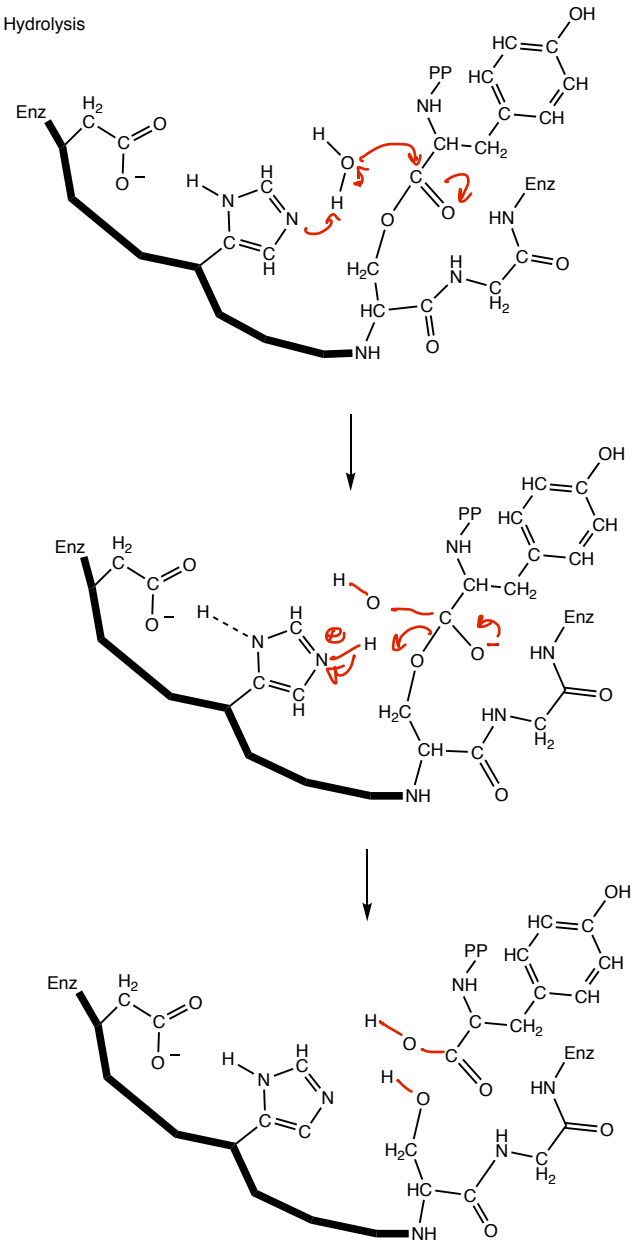
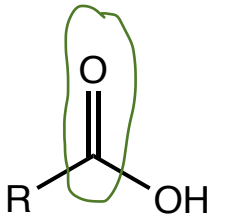
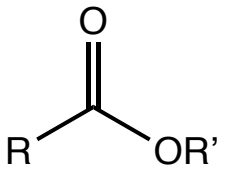
Chymotrypsin Hydrolyzes Proteins

Chymotrypsin Ester Hydrolysis

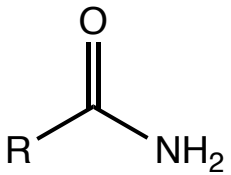




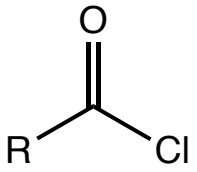


tied for 2nd place
intermediate strength π bond
and the LG would be $^{\ominus}OR$...
not great (2)

R' ≠ H

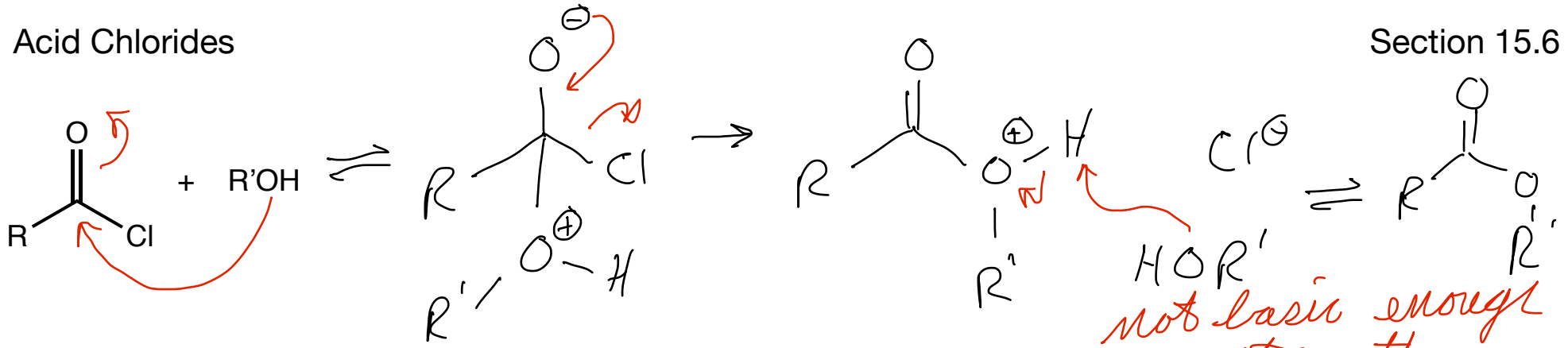


strongest π bond
$NH_2^{\ominus}$ would be the most basic LG (3)

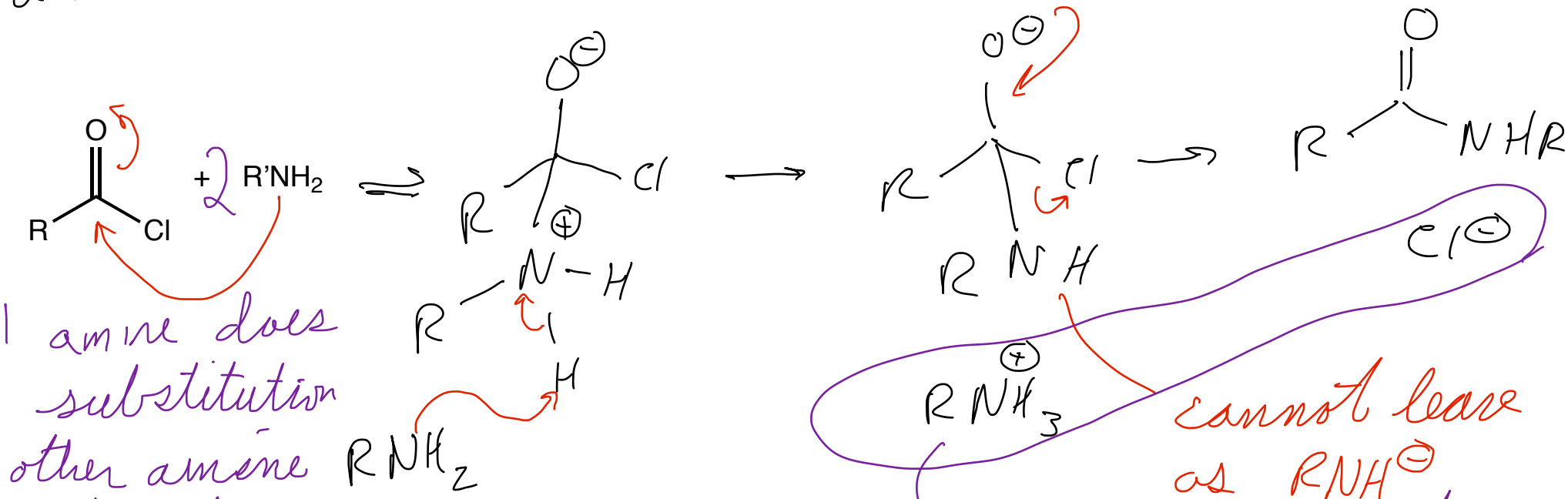


weakest π bond
Cl^- LG is a very weak base (1)

(1) most reactive



acid chloride + alcohol → ester



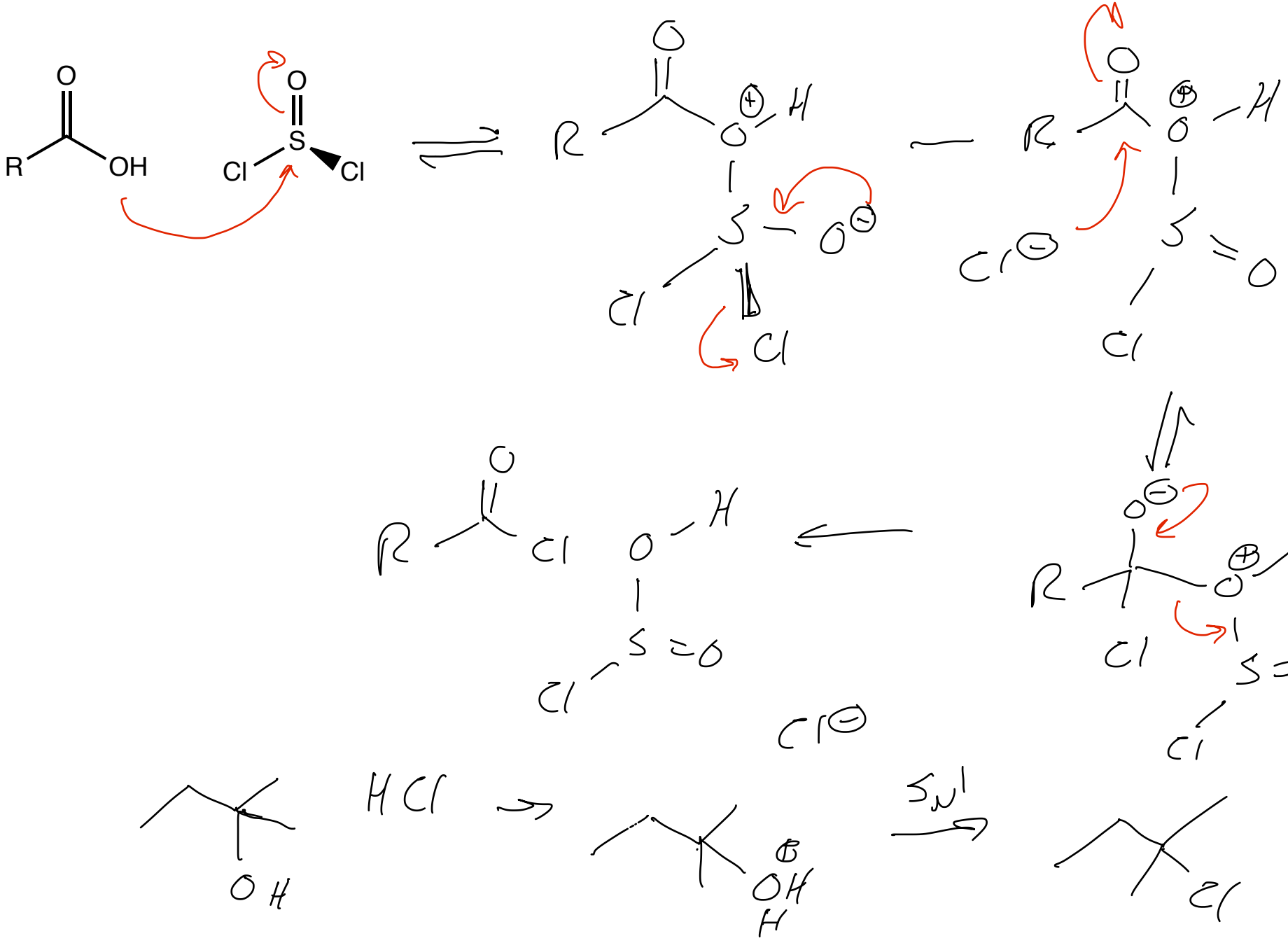
1 amine does substitution

other amine gets H^+

cannot leave as $RNH^\ominus$

will likely precipitate

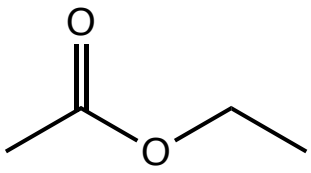
amine + acid chloride → amide


R
OH
Cl
Cl
HCl
SN1

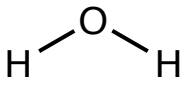
Hydrolysis

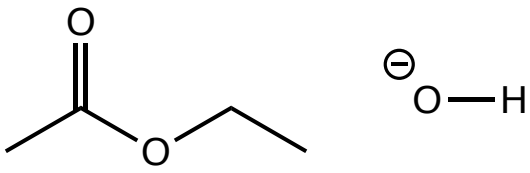
Transesterification

Aminolysis


O
O


H
Cl


O
H
H


O
O

O
H