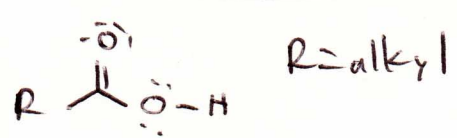
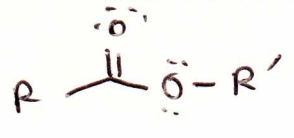


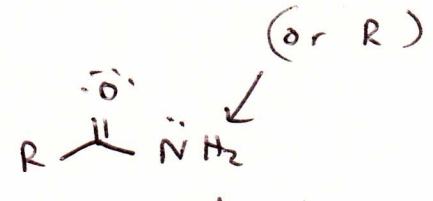
# Carboxylic Acids + Derivatives



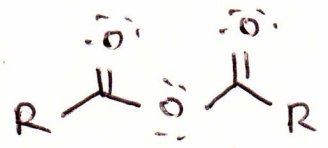
carboxylic acid



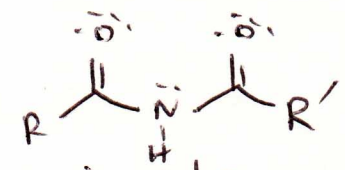
ester



amide



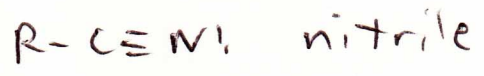
anhydride  
"without water"



imide

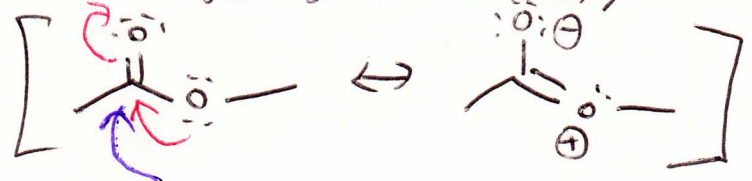


acyl halide



## Order of reactivity

- Charge stabilization / destabilization on C=O carbon



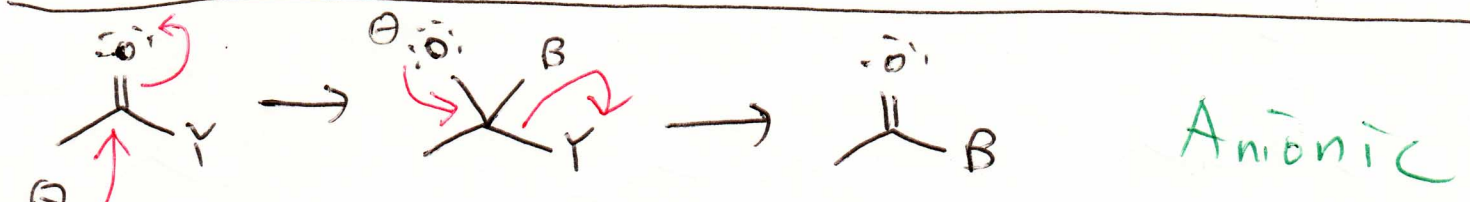
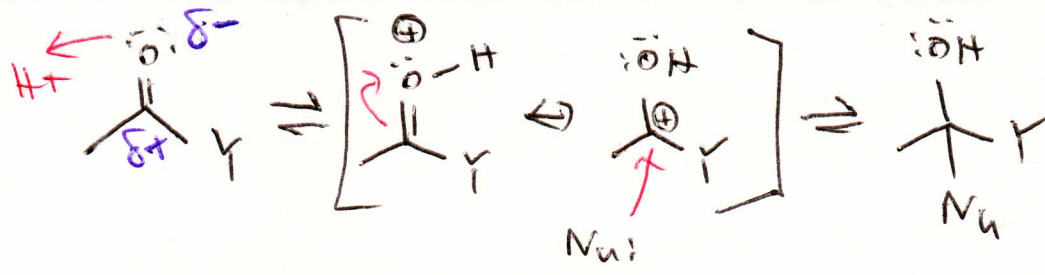
stabilizing C=O by delocalization

\* The more a C=O is stabilized, the less reactive it is.

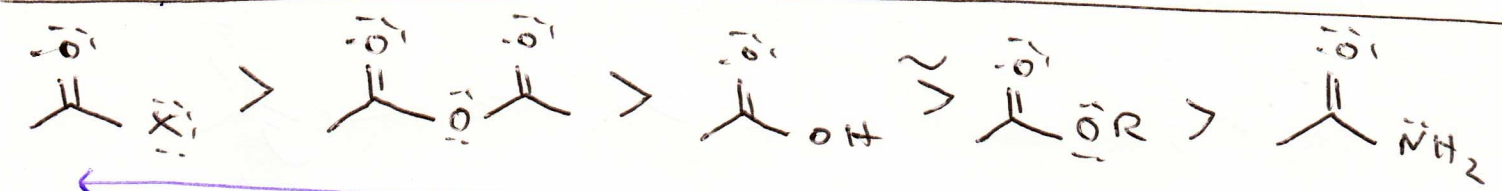
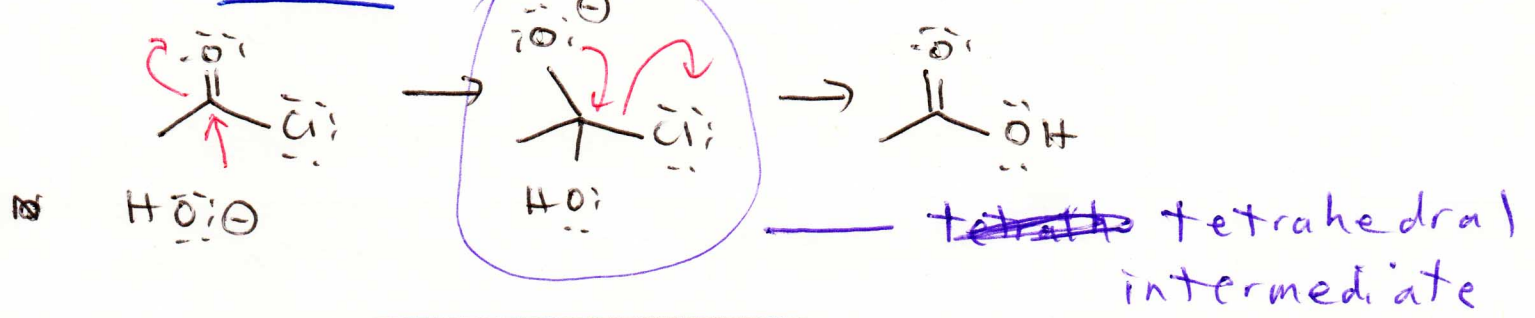
Halogens - Can undergo resonance (delocalization) since they have available lone pairs. Overall, however, more e<sup>-</sup> is withdrawn than donated

- Fluorine - Although F is similar in size to C and it has good orbital overlap, it is the most EN element on the periodic table.

- Chlorine, Bromine, Iodine - Less EN, but larger than C so they have poorer orbital overlap so they do not contribute as much by resonance.

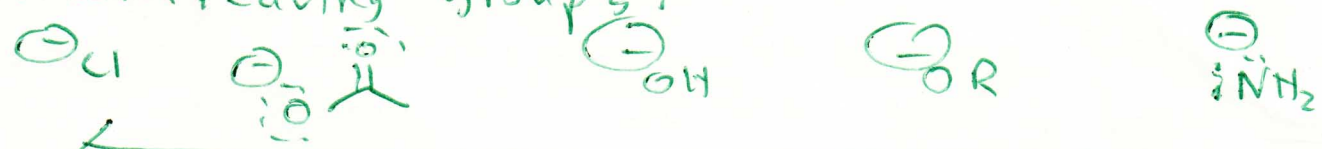


Example



← Increasing reactivity

Effective leaving groups:



← Increase in leaving group ability

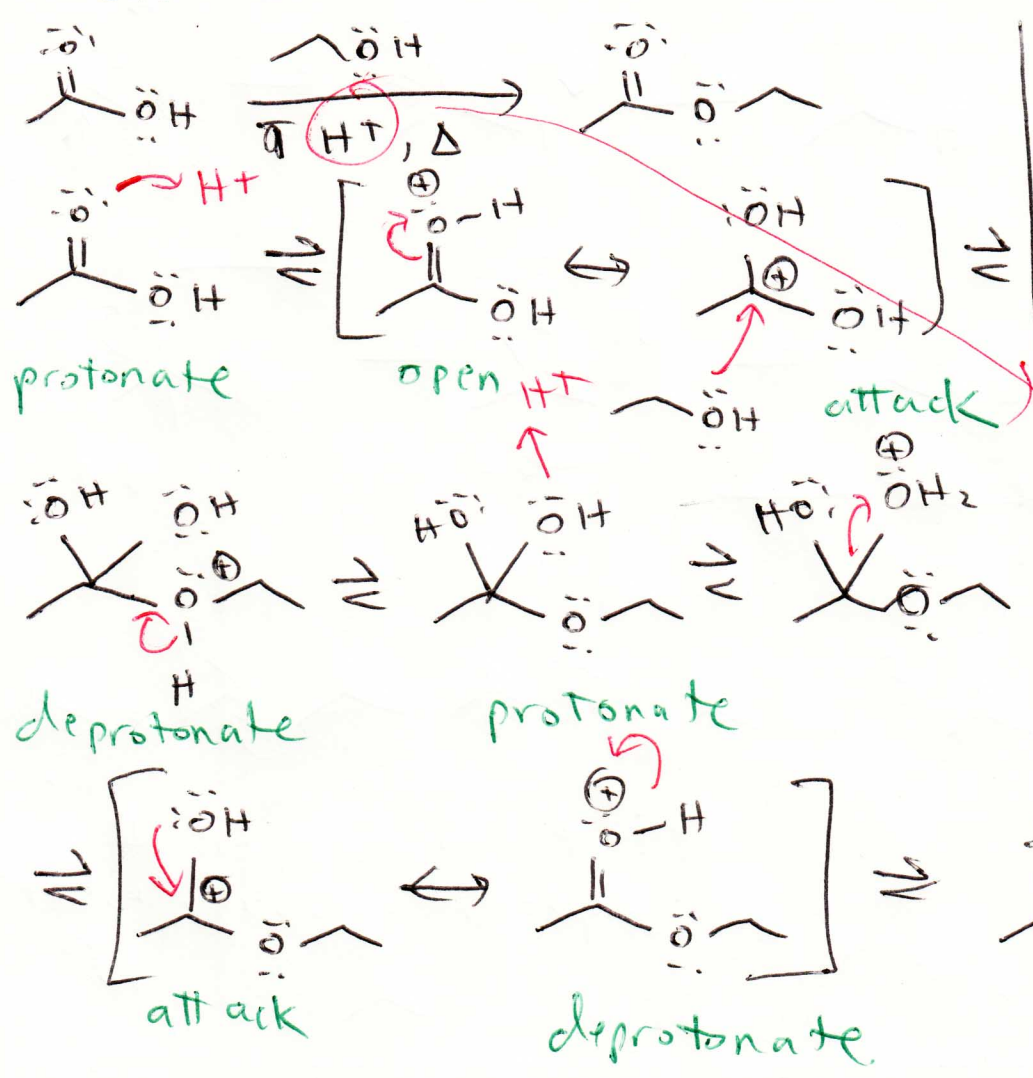
← Leaving group basicity

← Strength of conjugate acid of leaving group

- Carboxylic acids and ~~car~~ derivatives are carbonyl-containing compounds, which means they normally react due to the  $\delta^+$  on the carbonyl carbon (anionic) or due to the  $\delta^-$  on the carbonyl oxygen (cationic).

- Cationic rxns: normally stepwise, often acid catalyzed.
- Anionic rxns: normally concerted, base-promoted

### Fischer esterification / deesterification



Flashcards

- 1) Synthetic utility
- 2) reagents
- 3) conditions
- 4) mechanism
- 5) stereochemistry
- 6) regiochemistry

p-toluene sulfonic acid  
 Tosic acid

Cc1ccc(cc1)S(=O)(=O)O