Hydrolysis of Acyl Derivatives

- Recognize hydrolysis as acyl substitution (by water)
- May occur under acid, base or neutral conditions

**Hydrolysis of amides under basic conditions:**

The final step is essentially irreversible

**Hydrolysis of amides under acidic conditions:**

Acid hydrolysis occurs under milder conditions since NH₃ is a better leaving group than amide ion, NH₂⁻

Notice the correspondence between amides and esters:

- Hydrolysis under basic conditions gives the carboxylate ion
- Hydrolysis under acid conditions gives the carboxylic acid
- Under basic conditions- strong nucleophile (hydroxide ion)
- Under basic conditions - weak nucleophile (water)

If you can hydrolyze esters, then you can draw mechanism for amide hydrolysis
Hydrolysis of nitriles

\[
\begin{align*}
R\text{–C}≡\text{N} & \xrightarrow{\text{OH}^-} R\text{–C}≡\text{N} - \text{H}_2\text{O} \\
& \xrightarrow{\text{H}_2\text{O}} R\text{–C}≡\text{N} - \text{H}_2\text{O}
\end{align*}
\]

Important to consider the CN triple bond as similar to C=O double bond

Nitrile Hydrolysis with acid:

\[
\begin{align*}
R\text{–C}≡\text{N} & \xrightarrow{\text{OH}^-} R\text{–C}≡\text{N} - \text{H}_2\text{O} \\
& \xrightarrow{\text{H}_2\text{O}} R\text{–C}≡\text{N} - \text{H}_2\text{O}
\end{align*}
\]

Nitrile Hydrolysis with base:

\[
\begin{align*}
R\text{–C}≡\text{N} & \xrightarrow{\text{OH}^-} R\text{–C}≡\text{N} - \text{H}_2\text{O} \\
& \xrightarrow{\text{H}_2\text{O}} R\text{–C}≡\text{N} - \text{H}_2\text{O}
\end{align*}
\]