This page gives you the facts and a simple, uncluttered mechanism for the nucleophilic addition / elimination reaction between acyl chlorides (acid chlorides) and alcohols.

Ethanoyl chloride is taken as a typical acyl chloride. Any other acyl chloride will behave in the same way. Simply replace the \(\text{CH}_3\) group in what follows by anything else you want. Similarly, ethanol is taken as a typical alcohol. If you are interested in another alcohol, you can replace the \(\text{CH}_3\text{CH}_2\) group by any other alkyl group.

### The reaction between ethanoyl chloride and ethanol

Ethanoyl chloride reacts instantly with cold ethanol. There is a very exothermic reaction in which a steamy acidic gas is given off (hydrogen chloride). Ethyl ethanoate (an ester) is formed.

\[
\begin{array}{c}
\text{H}_3\text{C} & \text{Cl} \\
\text{O} & \text{H}\\
\end{array}
\quad +
\begin{array}{c}
\text{HO} \quad \rightarrow \\
\text{H}_3\text{C} & \text{O} \\
\end{array}
\begin{array}{c}
\text{O} \\
\text{H}\\
\end{array}
\quad +
\begin{array}{c}
\text{HCl} \\
\end{array}
\]

### The mechanism

The first stage (the addition stage of the reaction) involves a nucleophilic attack on the fairly positive carbon atom by one of the lone pairs on the oxygen of an ethanol molecule.

The second stage (the elimination stage) happens in two steps. In the first, the carbon-oxygen double bond reforms and a chloride ion is pushed off.

That is followed by removal of a hydrogen ion by the chloride ion to give ethyl ethanoate and hydrogen chloride.
Contributors

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