

Organic Chemistry Revision Sheets Acyl Chlorides | Nucleophilic Addition-Elimination (with amines)

Reaction

REACTANTS: Acyl Chloride and Amine (primary)

PRODUCT: (Secondary) Amide and Alkyl Ammonium Chloride

REACTION TYPE: Nucleophilic Addition-Elimination

REACTION: $R \subset C$ $R^1 NH_2$ $R \subset C$ Acyl Chloride $R^1 NH_2$ $R \subset C$ $R^1 NH_2$ $R^1 NH_2$

Mechanism

The amine acts as a **nucleophile** due to the lone pair of electrons on the nitrogen atom attacking the carbon (with a partial positive charge) in the acyl chloride. A new carbon-nitrogen bond forms between the acyl group and the ammonia. The carbon-oxygen double bond breaks to a single bond, giving the oxygen a negative charge. The carbon-oxygen double bond reforms, carbon-chlorine bond breaks and a chloride ion is removed. Amine present removes H⁺ ion from -RCON⁺HR¹ group. **Addition-elimination reaction.**

$$R \xrightarrow{\delta_{+}} C \xrightarrow{0} : NH_{2}R^{1} \longrightarrow R \xrightarrow{-C} - N \xrightarrow{R} H \longrightarrow R \xrightarrow{-C} - N \xrightarrow{-R} H \xrightarrow{-R}$$

Notes:

- Ammonia produces a primary amide and ammonium chloride salt when reacted with acyl chlorides.
- Primary amines produce a secondary amide and an alkyl ammonium chloride salt when reacted with acyl chlorides.
- Secondary amines produce a tertiary amide and an alkyl ammonium chloride salt when reacted with acyl chlorides.

