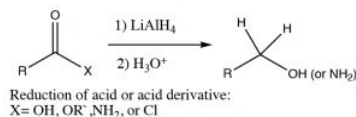
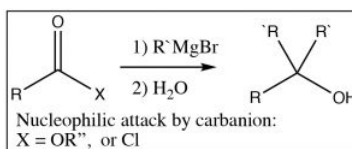


7.13: Reactions at the Carbonyl Group of Acid Derivatives with Irreversible Nucleophiles



Just as we saw with aldehydes and ketones, we can reduce a carbonyl group by the addition of a hydride ion. Typically, Lithium Aluminum Hydride (rather than sodium borohydride) is used in such a reaction because acid derivatives (amides, esters, anhydrides, chlorides) are usually not reactive enough to react with sodium borohydride. With LiAlH₄, the acid or acid derivative is reduced all the way down to the primary alcohol or amine. With acids or esters, the reaction does not stop at the aldehyde step since aldehydes are generally more reactive and the reducing reagent will preferentially reduce any aldehyde as it is formed.



The situation is different when acid derivatives are reacted with highly reactive carbanions such as Grignard reagents or alkyl lithium reagents. In this case, any derivative that has acidic protons (the carboxylic acid itself or most amides) will simply deprotonate and the reaction will go no further. With esters or acid chlorides, however, two equivalents of the carbanion add to the carbonyl. The reaction goes through the intermediate step of forming a ketone, but just like the LiAlH₄ reduction, since ketones are more reactive than acid derivatives, the ketone will undergo nucleophilic attack as they are formed, resulting in the alcohol.

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