Aldehydes and ketones can be prepared using a wide variety of reactions. Although these reactions are discussed in greater detail in other sections, they are listed here as a summary and to help with planning multistep synthetic pathways. Please use the appropriate links to see more details about the reactions.

Oxidation of 1\(^0\) alcohols with PCC to form aldehydes

\[
\text{H}_2\text{C} = \text{CH} \quad \xrightarrow{\text{PCC}} \quad \text{CH}_2\text{Cl}_2 \quad \text{H}_2\text{C} = \text{O}
\]

Hydration of an alkyne to form aldehydes

Anti-Markovnikov addition of a hydroxyl group to an alkyne forms an aldehyde. The addition of a hydroxyl group to an alkyne causes tautomerization which subsequently forms a carbonyl.

Reduction of an ester, acid chloride or nitrile to form aldehydes
Oxidation of $2^\circ$ alcohols to form ketones

Typically uses Jones reagent (CrO$_3$ in H$_2$SO$_4$) but many other reagents can be used.

\[
\begin{array}{c}
\text{H} \\
\text{C} \\
\text{O} \\
\text{R} \\
\text{H}_2\text{SO}_4 \\
\text{R'} \end{array}
\begin{array}{c}
\text{CrO}_3 \\
\rightarrow \text{C} \\
\text{O} \\
\text{R} \\
\text{R'} \end{array}
\]

$2^\circ$ Alcohol

Hydration of an alkyne to form ketones

The addition of a hydroxyl group to an alkyne causes tautomerization which subsequently forms a carbonyl. Markovnikov addition of a hydroxyl group to an alkyne forms a ketone.

\[
\begin{array}{c}
\text{R} \\
\text{C} = \text{C} \\
\text{H} \end{array}
\begin{array}{c}
\rightarrow \text{H}_2\text{O} \\
\text{H}_2\text{SO}_4 \\
\text{R} \\
\text{C} = \text{C} \\
\text{H} \end{array}
\begin{array}{c}
\text{HO} \\
\text{R} \\
\text{C} = \text{C} \\
\text{H} \\
\text{R} \end{array}
\begin{array}{c}
\rightarrow \text{R} \\
\text{C} = \text{C} \\
\text{R} \end{array}
\]

Friedel-Crafts acylation to form a ketone

\[
\begin{array}{c}
\text{Acid Chloride} \\
\text{AlCl}_3 \end{array}
\begin{array}{c}
\text{R} \end{array}
\begin{array}{c}
\rightarrow \text{R} \end{array}
\]

Reaction of Grignard reagents with nitriles to form ketones

\[
\begin{array}{c}
\text{R} \\
\text{C} = \text{N} \end{array}
\begin{array}{c}
\rightarrow \text{R'} \text{MgBr} \\
\rightarrow \text{H}_2\text{O} \end{array}
\begin{array}{c}
\rightarrow \text{R} \\
\text{C} = \text{R'} \end{array}
\]

Alkenes can be cleaved using ozone (O$_3$) to form aldehydes and/or
ketones

This is an example of an Ozonolysis reaction.

Contributors

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