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° alcohols with PCC to form aldehydes

\[
\begin{align*}
R\text{-CH(OH)-H} & \xrightarrow{\text{PCC}} R\text{-CHO} \\
\text{1° Alcohol} & \xrightarrow{\text{CH}_2\text{Cl}_2}
\end{align*}
\]

### 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 tautomeration which subsequently forms a carbonyl.

\[
\begin{align*}
\text{Alkyne} & \xrightarrow{1}\text{Dissymmetry} \xrightarrow{2} \text{H}_2\text{O}_2 \text{NaOH} \\
\text{Addition} & \rightarrow \text{H}_2\text{C=O}
\end{align*}
\]

### Reduction of an ester, acid chloride or nitrile to form aldehydes

\[
\begin{align*}
\text{R'-COOR} & \xrightarrow{1 \text{DIBAL-H}} \text{R'-CHO} \\
\text{Ester} & \xrightarrow{2 \text{H}_2\text{O}} \\
\text{R'-C=O} & \xrightarrow{1 \text{LiAlH(O-t-Bu)}_3} \text{R'-CHO} \\
\text{Acid Chloride} & \xrightarrow{2 \text{H}_2\text{O}} \\
\text{R'-C≡N} & \xrightarrow{1 \text{DIBAL-H}} \text{R'-CHO} \\
\text{Nitrile} & \xrightarrow{2 \text{H}_2\text{O}}
\end{align*}
\]
Oxidation of \( \text{2}^\circ \) alcohols to form ketones

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

![Oxidation Reaction Diagram](image)

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.

![Hydration Reaction Diagram](image)

Friedel-Crafts acylation to form a ketone

Reaction of Grignard reagents with nitriles to form ketones

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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