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**

\[
\text{H}_2\text{C-OH} \xrightarrow{\text{PCC}} \text{H}_2\text{C=O}
\]

**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**

1. Oxidation of 1° alcohols with PCC to form aldehydes
2. Hydration of an alkyne to form aldehydes
3. Reduction of an ester, acid chloride or nitrile to form aldehydes
Oxidation of 2° alcohols to form ketones

Typically uses Jones reagent (CrO₃ in H₂SO₄) but many other reagents can be used.

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.

Friedel-Crafts acylation to form a ketone
Reaction of Grignard reagents with nitriles to form ketones

\[
\begin{align*}
\text{R} \quad & \text{C} = \text{N} \\
\text{Nitrile} \\
\text{R} \quad & \text{C} = \text{O} \\
\text{Ketone}
\end{align*}
\]

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

\[
\begin{align*}
\text{R} \quad & \text{C} = \text{C} \quad \text{H} \\
\text{Alkene} \\
\text{R} \quad & \text{C} = \text{O} \\
\text{R} \quad & \text{C} = \text{O}
\end{align*}
\]

This is an example of a Ozonolysis reaction.

Contributors

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