1) Aldol condensation

Mixed aldol

**Example of a poor mixed aldol**

\[
\text{CH}_3\text{CH}_2\text{CH}==\text{CH}_2 + \text{CH}_3\text{CH}==\text{CH}_2 \xrightarrow{\text{NaOH}} \text{CH}_3\text{CH}==\text{C}==\text{CH}_2 + \text{CH}_3\text{CH}=\text{CH}_2
\]

**Example of an ideal crossed-aldol condensation**

- Only one reagent is able to form an enolate
- Aldehyde much more reactive than ketone

p-anisaldehyde

\[
\text{CH}_3\text{O} + \text{CH}_3\text{C}==\text{CH}_2 \xrightarrow{\text{NaOH}} \text{CH}_3\text{C}==\text{C}==\text{CH}_2 \quad \text{acetoephone}
\]

Spectroscopic confirmation

- The product contains a conjugate \(\text{C}==\text{O}\) that would have a noticeably different frequency than either starting material,
- The product contains a conjugate alkene not present in either reagent.
2) Robinson annulation

\[
\begin{align*}
\text{Mechanism } & \quad \text{H}^+ \\
\rightarrow & \quad \text{H}^+ \\
\text{Dean-Stark} & \quad \text{toluene} \\
\text{water} & \quad \text{water-soluble}
\end{align*}
\]

3) Benzocaine

\[
\begin{align*}
\text{H}_2\text{N} & + \text{CO}_3^{2-} \\
\rightarrow & \quad \text{H}_2\text{N} + \text{H}_2\text{O}
\end{align*}
\]

Azeotrope - a gaseous mixture that phase separates upon condensation.

If benzocaine has hydrolyzed before being subjected to the carbonate wash, it would have reformed a carboxylic acid, which would be neutralized by carbonate and form a water-soluble salt.
D-sugar

D-glucose

D-erythrose  D-threose

D-ribose  D-arabinose  D-xylose  D-lyxose

D-glyceraldehyde

aldose - aldehyde  ketose - ketone

hexose - 6 carbons  aldohexose
pentose - 5 carbons  tetraose - 4 carbons  triose - 3 carbons

D-glucose

D-fructose

# of carbons (hexose)
functional group (aldose)
enuantiomer (D)
anomer (α, β)
ring size (5 vs 6)
D/L determined by last stereo center

β-L-galactopyranose

POAD → cis

Haworth