Due to the acidic nature of α hydrogens they can be exchanged with deuterium by reaction with D$_2$O (heavy water). The process is accelerated by the addition of an acid or base; an excess of D$_2$O is required. The end result is the complete exchange of all α hydrogens with deuterium.

**General reaction**

\[
\begin{array}{c}
\text{O} & \text{C} & \text{H} \\
\text{C} & \text{C} & \text{D} \\
\end{array}
\]

\[
\begin{array}{c}
\text{D}_2\text{O} \\
\text{D}_3\text{O}^- \text{ or } \text{DO}^- \\
\end{array}
\]

**Example 1: Deuterium Exchange**

\[
\begin{array}{c}
\text{O} & \text{C} & \text{CH}_3 \\
\text{H}_2 & \text{C} & \text{H}_2 \\
\end{array}
\]

\[
\begin{array}{c}
\text{D}_2\text{O} \\
\text{DO}^- \\
\end{array}
\]

\[
\begin{array}{c}
\text{O} & \text{C} & \text{CH}_3 \\
\text{D}_2 & \text{C} & \text{D}_2 \\
\end{array}
\]

**Mechanism in basic conditions**

1) Enolate Formation

\[
\begin{array}{c}
\text{C} & \text{H} & \text{D} \\
\end{array}
\]

\[
\text{HOD}
\]

2) Deuteration

\[
\begin{array}{c}
\text{C} & \text{D} & \text{DO}^- \\
\end{array}
\]

\[
\begin{array}{c}
\text{D}_2\text{O} \\
\end{array}
\]

**Problems**

1) Please draw the product for the following reactions.
2) Answers

Contributors

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