1. (Klein 14.12) Show two different ways to make the following compound via a Williamson ether synthesis starting from an alcohol.

![Diagram of the compound and reactions]

Answers:

1. Using NaH and phenol followed by the formation of the sodium salt with the alkyl bromide.

2. Using NaH and the alkyl bromide followed by the formation of the sodium salt with the phenol.

2. Predict the product of the following reaction and draw an arrow-pushing mechanism.
3. Draw an arrow pushing mechanism for the following reaction.

Answer:
4. (Klein 13.51)

a) Using any reagents of your choice to make each of the following alcohols:

a) 
\[\text{CH}_3\text{CHCH}_2\text{CH}_2\text{OH}\]

b) 
\[\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}\]

c) 
\[\text{H}_3\text{C}\text{CH(OH)}\text{CH}_3\]

Answer:
b) Determine whether each of the alcohols from part A will undergo an E1 or E2 reaction when reacted with sulfuric acid.

Answer:

a) E1
b) E2
c) E1

5. (Klein 13.60) Fill in the blank with the missing starting material, reagent, or major product.
a) \[
\begin{array}{c}
\text{CH}_3\text{CH}_2\text{OH} \\
\text{H}_{2}\text{SO}_4 \text{ or } \text{TsOH}
\end{array}
\] \[\rightarrow \]
\[
\begin{array}{c}
\text{CH}_3\text{CH}==\text{CH}_2
\end{array}
\]

b) \[
\begin{array}{c}
\text{NaH}
\end{array}
\] \[\rightarrow \]
\[
\begin{array}{c}
\text{CH}_3\text{CH}==\text{CH}_2
\end{array}
\]

c) \[
\begin{array}{c}
\text{KOEt}
\end{array}
\] \[\rightarrow \]
\[
\begin{array}{c}
\text{CH}_3\text{CH}==\text{CH}_2
\end{array}
\]

Answer:
6. Draw a stepwise mechanism that shows the formation of the product from the starting materials.

Answer: