Topics Covered:
- Acid catalyzed substitution of alcohols
- Conversion of alcohol to better leaving groups
- Reactions of Ethers under Acidic Environment
- Epoxide ring opening
- E and Z Conformations
- Alkene hydrohalogenation

1. (Klein 9.32) Predict the product and draw an arrow-pushing mechanism for the following reaction.

\[
\begin{array}{c}
\text{OH} \\
\text{HBr}
\end{array}
\]
2. Fill in the following boxes with appropriate reagents or products.

3. (Klein 14.14 - 14.16, 14.28) For each of the following compounds, draw the expected products when treated with (a) 1 equivalence of HBr; (b) excess HBr.

(1)
4. Klein (13.58) Identify the reagents you need to achieve each of the following transformations.

a) \[
\text{CH}_3\text{CH(OH)CH}_2\text{OH} \rightarrow \text{CH}_3\text{CH(OH)Br}
\]

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

c) \[
\text{CH}_3\text{CH(OH)CH}_2\text{OH} \rightarrow \text{CH}_3\text{CH(OH)}\text{CH(OH)}\text{CH}_2\text{CH}_2\text{Br}
\]

5. Write a stepwise mechanism for the reaction below to show the formation of the product.

\[
\begin{align*}
\text{O} \quad \text{NaOH} \quad \text{H}_2\text{O} & \quad \text{HO} \quad \text{HO} \\
\end{align*}
\]
6. Label each of the following alkenes as E or Z.

a)

b)

c)