Substitution 1

1. Predict the major product(s) for the following reaction. Show the transition state for the slow-step in the reaction.

\[
\text{Br} \quad \xrightarrow{\text{KCN}} \quad \text{H}_2\text{O} / \text{acetone}
\]

2. Predict the product(s) of the following reaction.

\[
\text{I} \quad \xrightarrow{\text{ONa}} \quad \text{H}_2\text{O} / \text{MeOH}
\]

\[
\text{Br} \quad \xrightarrow{\text{Nal (excess)}} \quad \text{acetone}
\]

\[
\text{OH} \quad \xrightarrow{\quad} \quad \text{+}
\]

3. Why are S_N2 reactions slower in polar, protic solvents than in polar, aprotic solvents?

4. Predict the major product(s) for the following reaction. Provide a complete arrow-pushing mechanism for the reaction.

\[
\text{Cl} \quad \xrightarrow{\text{EtOH}} \quad 50^\circ\text{C}
\]