1. Write an equation showing the acid-base reaction between hydrochloric acid and sodium hydroxide.

2. Write an equation showing the substitution reaction between 2-chloro-2-methylpropane (tert-butyl chloride) and hydroxide ion.

3. If the separation of halide ion from carbon is the rate-determining step in the $S_N1$ reaction, one would want a solvent which stabilizes the resulting cation and anion to speed up the reaction. Which solvent would you choose for this role, acetone, $n$-propanol, or water? Presume the alkyl halide is soluble in all three possible solvents.

4. Which would you expect to react faster with hydroxide ion in an $S_N1$ reaction: 2-bromo-2-methylpropane (tert-butyl bromide) or 2-chloro-2-methylpropane (tert-butyl chloride)?