Wkst 1.4: Reaction Mechanisms

1. a) Overall equation:

$$OCl^- + I^- \rightarrow OI^- + Cl^-$$

b) Intermediates: $HOCl$, OH^-, HOI. Catalyst: H_2O.

c) Since the I^- ion is involved in the rate-determining step, then we may expect the rate of the reaction to double when we double its concentration.

2. 2-Step mechanism:

$$O_{3(g)} \rightarrow O_{(g)} + O_{2(g)}$$
$$O_{(g)} + O_{3(g)} \rightarrow 2\,O_{2(g)}$$

3. 3-Step mechanism:

Step 1: $C_2H_6 \rightarrow 2\,CH_3$

Step 2: $CH_3 + Cl_2 \rightarrow CH_3Cl + Cl$

Step 3: $Cl + CH_3 \rightarrow CH_3Cl$

4. a) Overall equation:

$$H^+ + I^- + H_2O_2 \rightarrow HIO + H_2O$$

b) The rate-determining step is step 2.

c) To increase the rate of reaction, one would have to increase $[I^-]$ as it is the substance involved in the rate-determining step.

5. 4-Step mechanism:

$$H_2 + O_2 \rightarrow H_2O_2$$
$$N_2 + O_2 \rightarrow N_2O_2$$
$$N_2O_2 + H_2O_2 \rightarrow HNO_3 + HNO$$
$$HNO + O_2 \rightarrow HNO_3$$