SECTION REVIEW

1. How are oxidation numbers assigned?
2. Label each of the following half-reactions as either an oxidation or a reduction half-reaction:

   a. $\overset{0}{Br_2} + 2e^- \longrightarrow 2\overset{-1}{Br^-}$

   b. $\overset{0}{Na} \longrightarrow \overset{+1}{Na^+} + e^-$

   c. $2\overset{-1}{Cl^-} \longrightarrow \overset{0}{Cl_2} + 2e^-$

   d. $\overset{0}{Cl_2} + 2e^- \longrightarrow 2\overset{-1}{Cl^-}$

   e. $\overset{+1}{Na^+} + e^- \longrightarrow \overset{0}{Na}$

   f. $\overset{0}{Fe} \longrightarrow \overset{+2}{Fe^{2+}} + 2e^-$

   g. $\overset{+2}{Cu^{2+}} + 2e^- \longrightarrow \overset{0}{Cu}$

   h. $\overset{+3}{Fe^{3+}} + e^- \longrightarrow \overset{+2}{Fe^{2+}}$

3. Which of the following equations represent redox reactions?

   a. $2KNO_3(s) \longrightarrow 2KNO_2(s) + O_2(g)$

   b. $H_2(g) + CuO(s) \longrightarrow Cu(s) + H_2O(l)$

   c. $NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

   d. $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

   e. $SO_3(g) + H_2O(l) \longrightarrow H_2SO_4(aq)$

4. For each redox equation identified in the previous question, determine which element is oxidized and which is reduced.

Critical Thinking

5. **ANALYZING INFORMATION** Use the following equations for the redox reaction between aluminum metal and sodium metal to answer the questions below.

$$\overset{0}{3\,Na} \longrightarrow \overset{+1}{3\,Na^+} + 3e^- \qquad \text{(oxidation)}$$

$$\overset{+3}{Al^{3+}} + 3e^- \longrightarrow \overset{0}{Al} \qquad \text{(reduction)}$$

$$\overset{0}{3\,Na} + \overset{+3}{Al^{3+}} \longrightarrow \overset{+1}{3\,Na^+} + \overset{0}{Al} \qquad \text{(redox reaction)}$$

   a. Explain how this reaction illustrates that charge is conserved in a redox reaction.

   b. Explain how this reaction illustrates that mass is conserved in a redox reaction.

   c. Explain why electrons do not appear as reactants or products in the combined equation.