3. ***Write the half-reaction for oxidation.*** In this example, the sulfur is being oxidized.

$$\overset{-2}{H_2S} \longrightarrow \overset{+6}{SO_4^{2-}}$$

- ***Balance the atoms.*** To balance the oxygen in this half-reaction, H_2O must be added to the left side. This gives 10 extra hydrogen atoms on that side of the equation. Therefore, 10 hydrogen ions are added to the right side. In basic solution, OH^- ions and water may be used to balance atoms.

$$\overset{-2}{H_2S} + 4H_2O \longrightarrow \overset{+6}{SO_4^{2-}} + 10H^+$$

- ***Balance the charge.*** Electrons are added to the side having the greater positive net charge. The left side of the equation has no net charge; the right side has a net charge of 8+. For the charges to balance, each side must have the same net charge. Therefore, 8 electrons are added to the product side so that it has no charge and balances with the reactant side of the equation. Notice that the oxidation of sulfur from a state of –2 to +6 indicates a loss of 8 electrons.

$$\overset{-2}{H_2S} + 4H_2O \longrightarrow \overset{+6}{SO_4^{2-}} + 10H^+ + 8e^-$$

The oxidation half-reaction is now balanced.

4. ***Write the half-reaction for reduction.*** In this example, nitrogen is being reduced from a +5 state to a +4 state.

$$\overset{+5}{NO_3^-} \longrightarrow \overset{+4}{NO_2}$$

- ***Balance the atoms.*** H_2O must be added to the product side of the reaction to balance the oxygen atoms. Therefore, two hydrogen ions must be added to the reactant side to balance the hydrogen atoms.

$$\overset{+5}{NO_3^-} + 2H^+ \longrightarrow \overset{+4}{NO_2} + H_2O$$

- ***Balance the charge.*** Electrons are added to the side having the greater positive net charge. The left side of the equation has a net charge of 1+. Therefore, 1 electron must be added to this side to balance the charge.

$$\overset{+5}{NO_3^-} + 2H^+ + e^- \longrightarrow \overset{+4}{NO_2} + H_2O$$

The reduction half-reaction is now balanced.

5. ***Conserve charge by adjusting the coefficients in front of the electrons so that the number lost in oxidation equals the number gained in reduction.*** Write the ratio of the number of electrons lost to the number of electrons gained.

$$\frac{e^- \text{ lost in oxidation}}{e^- \text{ gained in reduction}} = \frac{8}{1}$$