Writing Half Reactions

During a redox reaction electrons are both lost and gained. The metal loses and the non metal gains. An equation showing either the gain or the loss of electrons but not both is called a half reaction. Consider the reaction below:

$$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

Magnesium loses electrons while oxygen gains. The reaction can be split into two half reactions showing each. The oxidation half reaction shows the loss of electrons. Electrons are shown on the product side of the equation. The reduction half reaction shows the electron gain. Electrons are shown on the reactant side of the equation.

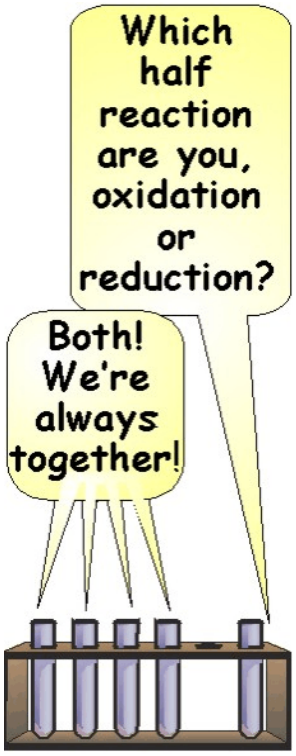
Oxidation Half: $2[Mg^0 \rightarrow Mg^{2+} + 2e^-]$

Reduction Half: $2[O^0 + 2e^- \rightarrow O^{2-}]$

The net equation, the redox reaction, is a combination of the half reactions such that the number of electrons lost equals the number of electrons gained. The electrons are not shown in the net equation because the electrons that were lost are the same ones that were gained.

Net Reaction: $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

To write the half reactions, it is first necessary to determine the oxidation states of the elements on both sides of the equation so you know what was oxidized and what was reduced. Then write the oxidation and reduction halves as shown above, making sure the equation is balanced so the number of electrons lost equals the number gained.



Write the half reactions for each of the redox reactions below:

1. $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + NO_2 + H_2O$

2. $CdS + I_2 + HCl \rightarrow CdCl_2 + HI + S$

3. $NaClO + H_2S \rightarrow NaCl + H_2SO_4$

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4. $Sn + HNO_3 + H_2O \rightarrow H_2SnO_3 + NO$

5. $KMnO_4 + HCl \rightarrow KCl + MnCl_2 + H_2O + Cl_2$

6. $Fe(OH)_2 + H_2O_2 \rightarrow Fe(OH)_3$

7. $Na + H_2O \rightarrow NaOH + H_2$

8. $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + NO_2 + H_2O$

9. $H_2O_2 \rightarrow H_2O + O_2$

10. $K_2Cr_2O_7 + H_2O + S \rightarrow SO_2 + KOH + Cr_2O_3$