Name _____ Date _____ Grade _____

Work Session 3B: Oxidation Number and Redox Equations

Use the rules in the textbook to assign oxidation numbers to elements.

1. Give the oxidation number of chlorine in each of the following substances:

   NaCl $MgCl_2$ Cl_2 OCl_2 ClO_3^- ClF NaClO

2. Give the oxidation number of manganese in each of the following substances:

   MnO_4^{1-} Mn_2O_3 $KMnO_4$ MnO_2^{2-} $MnSO_4$ MnO_2 Mn

   $MnSO_4$ MnO_2 Mn

3. Show the oxidation number for each element in the following balanced equation:

   $2\ KMnO_4 + 10\ NaI + 8\ H_2SO_4 \rightarrow 5\ I_2 + 2\ MnSO_4 + 5\ Na_2SO_4 + K_2SO_4 + 8\ H_2O$

4. For the reaction in question 3, list those elements which have changed oxidation number during the reaction, showing the oxidation number before and after the reaction. Which element is oxidized? Which is reduced? Which is the oxidizing agent? Which is the reducing agent? How many electrons are transfered per manganese atom? How many totally in the reaction as shown?

5. Show the oxidation number for each element in the following balanced equation:

   $4\ Cl_2 + K_2S_2O_3 + 10\ KOH \rightarrow 8\ KCl + 2\ K_2SO_4 + 5\ H_2O$

6. For the reaction in question 5, list those elements which have changed oxidation number during the reaction, showing the oxidation number before and after the reaction. Which element is oxidized? Which is reduced? Which is the oxidizing agent? Which is the reducing agent? How many electrons are transfered per sulfur atom? How many totally in the reaction as shown?

7. It is important to notice if sulfur is in SO_4^{2-}, or in $S_2O_3^{2-}$, or in H_2S, or whatever, to calculate its oxidation number. It is not important if Na is in NaCl, or Na_2SO_4, or Na_3PO_4 to to calculate its oxidation number. Use the rules on page 148 to explain why.

8. Give the oxidation number for the element indicated in each compound. Going from the first to the second compound, has the element been oxidized, reduced, or stayed the same?

O in	H_2O	H_2O_2
S in	SO_4^{2-}	SF_6
H in	NaH	HCl

9. Balance the following equations using the oxidation number method. Identify the oxidizing and reducing agents.

$$\_\_\ MnO_4^-(aq) + \_\_\ ClO_2^-(aq) + \_\_\ H_2O \rightarrow \_\_\ MnO_2(s) + \_\_\ ClO_4^-(aq) + \_\_\ OH^-$$

$$\_\_K_2CrO_4\ (aq) + \_\_Fe(NO_3)_2\ (aq) + \_\_HNO_3\ (aq) \rightarrow \_\_Cr(NO_3)_3\ (aq) + \_\_Fe(NO_3)_3\ (aq) + \_\_KNO_3\ (aq) + \_\_H_2O(l)$$

$$\_\_KClO_3\ (aq) + \_\_HBr(aq) \rightarrow \_\_KCl\ (aq) + \_\_Br_2\ (aq) + \_\_H_2O(l)$$

As an extra treat, here are two titration problems.

10. For the following reaction: $2\ NaOH(aq) + H_2SO_4\ (aq) \rightarrow Na_2SO_4(aq) + 2\ H_2O(l)$
a) How many ml of 0.150 M NaOH will react with 55.5 ml of 0.200 M H_2SO_4?

b) A solution of 0.150 M NaOH is carefully added to a different solution of H_2SO_4. It takes 46.3 ml of the hydroxide to just react with 25.6 ml of the acid. What is the molarity of the acid?