CH1020 Exercises (Worksheet 11)

1. What is the oxidation number of nitrogen in each of the following species:
    a. N_2
    b. N_2H_4
    c. NH_4^+
    d. NO_2
2. Determine the oxidation numbers for each element in the following substances:
    a. SO_2
    b. HBrO
    c. PF_3
    d. K_2O_2
    e. $LiCoO_2$
    f. $NaAlH_4$
    g. $HClO_2$
    h. $BaCrO_4$
    i. HSO_4^-

3. Which element is oxidized and which is reduced in the following reactions:

    a. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

    b. $3Fe(NO_3)_2(aq) + 2Al(s) \rightarrow 3Fe(s) + 2Al(NO_3)_3(aq)$

    c. $PbS(s) + 4H_2O_2(aq) \rightarrow PbSO_4(s) + 4H_2O(g)$

    d. $Cl_2(aq) + 2NaI(aq) \rightarrow I_2(aq) + 2NaCl(aq)$

4. Which of the following reactions are redox reactions? For those that are, indicate which element is the <u>oxidizing agent</u> and which is the <u>reducing agent</u>. For those that are not redox reactions, indicate whether they are precipitation or neutralization reactions.

    a. $P_4(s) + 10HClO(aq) + 6H_2O(l) \rightarrow 4H_3PO_4(aq) + 10HCl(aq)$

    b. $Br_2(l) + 2K(s) \rightarrow KBr(s)$

    c. $ZnCl_2(aq) + 2NaOH(aq) \rightarrow Zn(OH)_2(s) + 2NaCl(aq)$

    d. $Ba(s) + Cl_2(g) \rightarrow BaCl_2(s)$

    e. $HBr(aq) + KOH(aq) \rightarrow H_2O(l) + KBr(aq)$

    f. $2MnCO_3(s) + O_2(g) \rightarrow 2MnO_2(s) + 2CO_2(g)$

g. $Pb(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow PbSO_4(s) + NaNO_3(aq)$

5. Using the activity series, write balanced chemical equations for the following reactions. If no reaction occurs, write NR.

   a. Nickel metal is added to a solution of copper(II)nitrate

   b. Zinc metal is added to a solution of magnesium sulfate

   c. Hydrobromic acid solution is added to tin metal

   d. Hydrogen gas is bubbled through an aqueous solution of nickel(II)chloride

   e. Aluminum metal is added to a solution of cobalt(II)sulfate

   f. Hydrogen gas is bubbled through a solution of silver nitrate

   g. Hydrochloric acid is added to gold metal