Limiting Reagent and Percent Yield Review Worksheet

Limiting Reagent Problems

1. Use the folowing equation for the oxidation of aluminum in the following problems. **$4Al + 3O_2 \rightarrow 2Al_2O_3$**
   a.) Which reactant is limiting if 0.32 mol Al and 0.26 mol O_2 are available?

   b.) How many moles of Al_2O_3 are formed from the reaction of 6.38×10^{-3} mol of O_2 and 9.15×10^{-3} mol of Al?

   c.) If 3.17g of Al and 2.55g of O_2 are available, which reactant is limiting?

2. A reaction such as the one shown here is often used to demonstrate a single replacement reaction.

   $3CuSO_4(aq) + 2Fe(s) \longrightarrow 3Cu(s) + Fe_2(SO_4)_3(aq)$

   a. If you place 0.092 mol of iron filings in a solution containing 0.158 mol of $CuSO_4$, what is the limiting reactant?

   b. How many moles of Cu will be formed?

3. Nickel replaces silver from silver nitrate in solution according to the following equation:

   $2AgNO_3 + Ni \longrightarrow 2Ag + Ni(NO_3)_2$

   a.) If you have 22.9g of Ni and 112g of $AgNO_3$, which reactant is in excess?

   b.) What mass of nickel (II) nitrate would be produced given the quantities above?

Percent Yield Problems

1. Assume the following hypothetical reaction takes place.

   $2A + 7B \rightarrow 4C + 3D$

   Calculate the percentage yield in each of the cases:

   a. The reaction of 0.0251 mol of A produces 0.0349 mol of C

   b. The reaction of 1.19 mol of A produces 1.41 mol of D

   c. The reaction of 189 mol of B produces 39 mol of D

   d. The reaction of 3500 mol of B produces 1700 mol of C

2. Elemental Phosphorous can be produced by heating calcium phosphate from rocks with silica from sand and carbon in the form of coke. The following reaction takes place:

   $Ca_3(PO_4)_2 + 3SiO_2 + 5C \rightarrow 3CaSiO_3 + 2P + 5CO$

   a. If 57 mol of $Ca_3(PO_4)_2$ is used and 101 mol of $CaSiO_3$ is obtained what is the percentage yield?

   b. Determine the percentage yield obtained if 1280 mol of carbon is consumed and 622 mol of $CaSiO_3$ is produced.