Name: _____

Block: _____

Stoichiometry #3 (Limiting Reactant)

1. How many moles of H_2O would be produced if 3.5 mol H_2 react with 1.5 mol O_2 in the following reaction:

$$2\,H_2 + O_2 \longrightarrow 2\,H_2O$$

2. If 12.0 moles of S_8 reacted with 100. moles of O_2 in the *unbalanced* equation:

$$S_8 + \quad O_2 \longrightarrow \quad SO_3$$

Which reactant is limiting, and how much of the other reactant would be left over?

3. 325 g of H_2O is poured onto a 450 g block of sodium metal. What is the limiting reactant? How many liters of H_2 gas are produced at S.T.P.? The equation for this reaction is:

$$2\,Na + 2\,H_2O \longrightarrow 2\,NaOH + H_2$$

4. If 120 g of sand (SiO_2) is poured into 0.50 ℓ of 2.0 M hydrofluoric acid (HF), identify the limiting reactant and determine how much silicon tetrafluoride would be produced? The chemical equation for this reaction is:

$$SiO_2 + 4\,HF \longrightarrow SiF_4 + 2\,H_2O$$

5. If you add approximately 5.0 g of H_2O to approximately 5.0 g of calcium carbide (CaC_2), the reaction produces enough acetylene gas to make a satisfyingly loud explosion. Identify the limiting reactant and determine how many liters of acetylene (C_2H_2) gas would have been produced at S.T.P., assuming the *unbalanced* equation (which you will need to balance first) is:

$$CaC_2 + \quad H_2O \longrightarrow \quad C_2H_2 + \quad Ca(OH)_2$$

(Remember that H_2O is $H^+ + OH^-$ in a chemical reaction.)

6. 3.27 g of Zn are reacted with 100. mℓ of 1.00 M HCl in the reaction:

$$Zn + 2\,HCl \longrightarrow ZnCl_2 + H_2$$

   (a) Determine which reactant is limiting.

   (b) Determine the number of grams of $ZnCl_2$ that will be produced.

   (c) If the reaction conditions are 0°C and 1 atm pressure (S.T.P.), determine the number of liters of H_2 gas that will be produced.

   (d) If the non-limiting reactant is Zn, determine the mass in grams that will be left over.

   (e) If the non-limiting reactant is HCl, determine the concentration (molarity) of the HCl after the reaction is complete. (Assume the volume does not change.)