Limiting Reagent Worksheet #2

1. Consider the reaction

$$I_2O_5(g) + 5\ CO(g) \text{-------} > 5\ CO_2(g) + I_2(g)$$
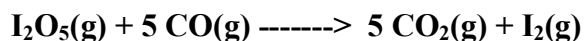
a) 80.0 grams of iodine(V) oxide, I_2O_5, reacts with 28.0 grams of carbon monoxide, CO. CO is limiting
Determine the mass of iodine I_2, which could be produced? **50.7 g**

b) If, in the above situation, only 0.160 moles, of iodine, I_2 was produced.
i) what mass of iodine was produced? 40.6 g
ii) what percentage yield of iodine was produced. **80.1%**

2. Zinc and sulphur react to form zinc sulphide according to the equation.

$$Zn\ +\ S\ \text{---------} >\ ZnS\ \text{Zn=0.3803 mol}\ \ \text{S=0.9356 mol}$$

If 25.0 g of zinc and 30.0 g of sulphur are mixed,
a) Which chemical is the limiting reactant? Zn
b) How many grams of ZnS will be formed? **0.3803 mol = 37.1 g**
c) How many grams of the excess reactant will remain after the reaction is over?
17.7 g

3. Which element is in excess when 3.00 grams of Mg is ignited in 2.20 grams of pure oxygen? O_2
What mass is in excess? **0.226 g O_2** What mass of MgO is formed? **4.97 g MgO**

4. How many grams of Al_2S_3 are formed when 5.00 grams of Al is heated with 10.0 grams S? **Al is limiting, 13.9 g Al_2S_3**

5. When MoO_3 and Zn are heated together they react

$$3\ Zn(s) + 2\ MoO_3(s) \text{----------} > Mo_2O_3(s) + 3\ ZnO(s)$$

What mass of ZnO is formed when 20.0 grams of MoO_3 is reacted with 10.0 grams of Zn? **Zn is limiting, 12.4 g of ZnO will be produced**

6. Silver nitrate, $AgNO_3$, reacts with ferric chloride, $FeCl_3$, to give silver chloride, AgCl, and ferric nitrate, $Fe(NO_3)_3$. In a particular experiment, it was planned to mix a solution containing 25.0 g of $AgNO_3$ with another solution containing 45.0 grams of $FeCl_3$.

a) Write the chemical equation for the reaction. **$3AgNO_3 + FeCl_3 \rightarrow 3AgCl + Fe(NO_3)_3$**

b) Which reactant is the limiting reactant? **$AgNO_3$**

c) What is the maximum number of moles of AgCl that could be obtained from this mixture? **0.147 mol**

d) What is the maximum number of grams of AgCl that could be obtained? **21.1 g**

e) How many grams of the reactant in excess will remain after the reaction is over? **37.1 g ferric chloride**

7. Solid calcium carbonate, $CaCO_3$, is able to remove sulphur dioxide from waste gases by the reaction:

$$CaCO_3\ +\ SO_2\ + \text{other reactants} \text{------} > CaSO_3 + \text{other products}$$

In a particular experiment, 255 g of $CaCO_3$ was exposed to 135 g of **SO_2 (limiting)** in the presence of an excess amount of the other chemicals required for the reaction.

a) What is the theoretical yield of $CaSO_3$? **253 g $CaSO_3$**

b) If only 198 g of CaSO₃ was isolated from the products, what was the percentage yield of CaSO₃ in this experiment? 78.3%