## Supplemental Limiting Reactant and Percent Yield Problems

1. According to the balanced chemical equation, how many grams of silver will be produced from combining 100.g of copper with 200.g of silver nitrate?
   $Cu\ (s) + 2\ AgNO_3\ (aq) \rightarrow Cu(NO_3)_2\ (aq) + 2\ Ag\ (s)$

2. At STP, what volume of "laughing gas" (dinitrogen monoxide) will be produced from a reaction of 50.g of nitrogen gas and 75 g of oxygen gas according to the equation:
   $2\ N_2\ (g) + O_2(g) \rightarrow 2\ N_2O\ (g)$

3. The theoretical yield of ammonia in an industrial synthesis was 550 tons, but only 480 tons was obtained. What was the percent yield of the reaction?

4. Some underwater welding is done via the thermite reaction, in which rust reacts with aluminum to produce iron and aluminum oxide according to the equation:

   $Fe_2O_3 + Al \rightarrow Fe + Al_2O_3$

   In one such reaction, 258 g of aluminum and excess rust produced 464 g of iron. What was the percent yield for the reaction?

**Supplemental Limiting Reactant and Percent Yield Problems**

1. According to the balanced chemical equation, how many grams of silver will be produced from combining 100.g of copper with 200.g of silver nitrate?

   $Cu\ (s) + 2\ AgNO_3\ (aq) \rightarrow Cu(NO_3)_2\ (aq) + 2\ Ag\ (s)$

g Cu → mol Cu → mol Ag → g Ag

$$100.g\ Cu\left(\frac{1\ mol\ Cu}{63.55g\ Cu}\right)\left(\frac{2\ mol\ Ag}{1\ mol\ Cu}\right)\left(\frac{107.87g}{1\ mol\ Ag}\right) = 339.4807238$$

339g Ag

Ag 1×107.87 = 107.87
N 1×14.01 = 14.01
O 3×16.00 = 48.00
169.88g

g $AgNO_3$ → mol $AgNO_3$ → mol Ag → g Ag

$$200.g\ AgNO_3\left(\frac{1\ mol\ AgNO_3}{169.88g\ AgNO_3}\right)\left(\frac{2\ mol\ Ag}{2\ mol\ AgNO_3}\right)\left(\frac{107.87g}{1\ mol\ Ag}\right) = 126.995526$$

limiting reactant.

127g Ag

max product formed.

2. At STP, what volume of "laughing gas" (dinitrogen monoxide) will be produced from a reaction of 50.g of nitrogen gas and 75 g of oxygen gas according to the equation:

   $2\ N_2\ (g) + O_2(g) \rightarrow 2\ N_2O\ (g)$

g $N_2$ → mol $N_2$ → mol $N_2O$ → L $N_2O$

$$50.g\ N_2\left(\frac{1\ mol\ N_2}{28.02g\ N_2}\right)\left(\frac{2\ mol\ N_2O}{2\ mol\ N_2}\right)\left(\frac{22.4L}{1\ mol\ N_2O}\right) = 39.9714$$

limiting reactant.

max product 40.L

g $O_2$ → mol $O_2$ → mol $N_2O$ → L $N_2O$

$$75g\ O_2\left(\frac{1\ mol\ O_2}{32.00g\ O_2}\right)\left(\frac{2\ mol\ N_2O}{1\ mol\ O_2}\right)\left(\frac{22.4L}{1\ mol\ N_2O}\right) = 105.L$$

3. The theoretical yield of ammonia in an industrial synthesis was 550 tons, but only 480 tons was obtained. What was the percent yield of the reaction?

$$\frac{480 \text{ tons recovered}}{550 \text{ tons}} \times 100$$

**87.3% yield**

4. Some underwater welding is done via the thermite reaction, in which rust reacts with aluminum to produce iron and aluminum oxide according to the equation:

$$Fe_2O_3 + 2\,Al \rightarrow Al_2O_3 + 2\,Fe$$

In one such reaction, 258 g of aluminum and excess rust produced 464 g of iron. What was the percent yield for the reaction?

g Al → mol Al → mol Fe → g Fe

$$258\text{g Al}\left(\frac{1\text{ mol Al}}{26.98\text{g Al}}\right)\left(\frac{2\text{ mol Fe}}{2\text{ mol Al}}\right)\left(\frac{55.85\text{g}}{1\text{ mol Fe}}\right) = 534.07\text{g}$$

534 g

$$\frac{464\text{g Fe}}{534\text{g}} \times 100 = 86.89138577$$

**86.9%**