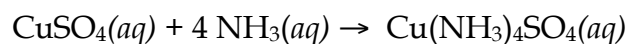# Stoichiometry-Activity 3, Limiting Reagents

1. Solid iron (III) oxide reacts with carbon monoxide gas to form iron solid and carbon dioxide gas. If 187 g of iron (III) oxide is allowed to react with 105.8 grams of carbon monoxide, how many grams of iron can be generated?

2. If only 99.0 g of iron is generated, what is the percent yield of iron?

3. The deep blue $Cu(NH_3)_4SO_4$ is made by the reaction of copper (II) sulfate with ammonia, as described by the following reaction:

$$CuSO_4(aq) + 4\ NH_3(aq) \rightarrow Cu(NH_3)_4SO_4(aq)$$

a) If you use 10.0g of ammonia and 20.0g of copper(II) sulfate, what is the theoretical yield for the reaction?

b) If 18.6 g of $Cu(NH_3)_4SO_4$ is isolated at the end of the reaction, what is the percent yield for the reaction?

Stoichiometry-Activity 3, Limiting Reagents

4. Nitrogen gas can be prepared by passing gaseous ammonia over solid copper (II) oxide at high temperatures, as described by the following *balanced* equation.

$$2 \, NH_3 \, (g) \; + \; 3 \, CuO \, (s) \rightarrow \; N_2 \, (g) \; + \; 3 \, Cu \, (s) \; + \; 3 \, H_2O \, (g)$$
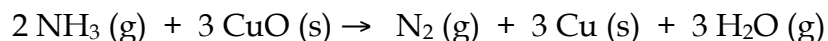
a) How many grams of N_2 are formed when 18.1 g of NH_3 are reacted with 90.4 g of CuO?

b) What starting material, if any is left over? How many grams of that material are left over?

5. Chlorine dioxide is used as a disinfectant and bleaching agent. In water, it reacts to form chloric acid ($HClO_3$), according to the following *balanced* equation:

$$6 \, ClO_2 \; + \; 3 \, H_2O \rightarrow \; 5 \, HClO_3 \; + \; HCl$$
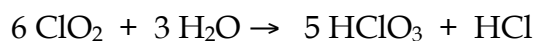
a) If 142.0 g of ClO_2 are mixed with 38.0 g of H_2O, how many grams of chloric acid are formed?

b) What is the percent yield for the reaction if 120.2 g of chloric acid is actually produced?