# Gas Stoichiometry Worksheet

Directions: Use the gas laws we have learned to solve each of the following problems. ***Each of the chemical equations must first be balanced***. Show all your work for credit.

1. When calcium carbonate is heated strongly, carbon dioxide gas is released according to the following equation:

$$CaCO_3(s) \quad \rightarrow \quad CaO(s) \quad + \quad CO_2(g)$$

   What volume of $CO_2(g)$, measured at STP, is produced if 15.2 grams of $CaCO_3(s)$ is heated?

2. The synthesis of sodium chloride occurs according to the reaction:

$$Na(s) \quad + \quad Cl_2(g) \quad \rightarrow \quad NaCl(s)$$
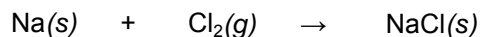
   What volume of chlorine at STP is necessary for the complete reaction of 4.81 grams of sodium metal?

3. Potassium permanganate is produced commercially by the this reaction:

$$K_2MnO_4(aq) \quad + \quad Cl_2(g) \quad \rightarrow \quad KMnO_4(s) \quad + \quad KCl(aq)$$
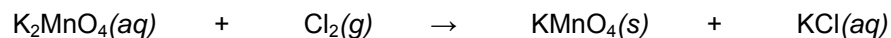
   What volume of chlorine gas at STP would be required to produce 10.0 grams of $KMnO_4$?

4. Consider the following *unbalanced* chemical equation for the combustion of propane:

$$C_3H_8(g) \quad + \quad O_2(g) \quad \rightarrow \quad CO_2(g) \quad + \quad H_2O(g)$$
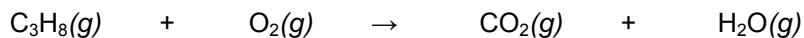
What volume of oxygen at 25°C and 1.04 atm is needed for the complete combustion of 5.53 grams of propane?

5. If water is added to magnesium nitride, ammonia gas is produced when the mixture is heated.

$$Mg_3N_2(s) \quad + \quad H_2O(l) \quad \rightarrow \quad MgO(s) \quad + \quad NH_3(g)$$
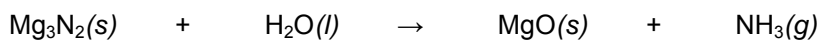
When excess water is added to 10.3 grams of magnesium nitride, what volume of ammonia gas would be collected at 24°C and 752 mmHg?

6. Ammonia and gaseous hydrogen chloride combine to form ammonium chloride according to this equation:

$$NH_3(g) \quad + \quad HCl(g) \quad \rightarrow \quad NH_4Cl(s)$$
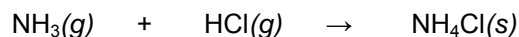
If 4.21 L of $NH_3(g)$ at 27°C and 1.02 atm is combined with 5.35 L of $HCl(g)$ at 26°C and 0.998 atm, what mass of $NH_4Cl(s)$ will be produced? Which gas is the limiting reactant? Which gas is the excess reactant?