Gas Stoichiometry Practice #1

Name: _____

Answer the following questions using proper units and showing all work. Note that these problems require a balanced chemical equation.

GAS STOICHIOMETRY & VOLUME RATIO:

1. What volume of oxygen is needed to react with sulfur to produce 3.50 Liters of sulfur dioxide at STP?

   ____ $S_{(s)}$ + ____ $O_{2\,(g)}$ → ____ $SO_{2\,(g)}$

2. Determine the volume of hydrogen gas needed to react completely with 5.00 liters of oxygen gas to produce water at STP.

   ____ $H_{2\,(g)}$ + ____ $O_{2\,(g)}$ → ____ $H_2O_{(l)}$

VOLUME & MASS: @ STP AND Non-STP Conditions

1. Calcium carbonate forms limestone, one of the most common rocks on Earth. When solid calcium carbonate is heated, it decomposes to form solid calcium oxide and carbon dioxide gas. How many liters of carbon dioxide will be produced at STP if 2.38 kg of calcium carbonate reacts completely?

   ____ $CaCO_{3\,(s)}$ → ____ $CaO_{(s)}$ + ____ $CO_{2\,(g)}$

2. Determine how many moles of water vapor, $H_2O_{(g)}$, will be produced at 1.00 atm and 200.°C by the complete combustion of 10.5 L of methane gas, CH_4.

   ____ $CH_{4\,(g)}$ + ____ $O_{2\,(g)}$ → ____ $CO_{2\,(g)}$ + ____ $H_2O_{(g)}$

3. When iron rusts, it undergoes a synthesis reaction with oxygen to form iron (III) oxide. Calculate the volume of oxygen gas at STP that is required to completely react with 52.0 grams of iron.

____ $Fe_{(s)}$ + ____ $O_{2\,(g)}$ → ____ $Fe_2O_{3\,(s)}$

MIXED PRACTICE: @ STP AND Non-STP Conditions

1. Assume that copper (II) oxide reacts with 5.60 L of hydrogen gas at STP to produce solid copper and water vapor.

BALANCE EQUATION: ____ $CuO_{(s)}$ + ____ $H_{2\,(g)}$ → ____ $Cu_{(s)}$ + ____ $H_2O_{(g)}$

a. How many moles of $H_{2\,(g)}$ react?

b. How many moles of copper are produced?

c. How many grams of copper are produced?

2. If 45.0 L of natural gas, which is essentially methane gas (CH_4), undergoes a complete combustion reaction at 730. mmHg and 20.0°C, how many grams of carbon dioxide are produced?

____ $CH_{4\,(g)}$ + ____ $O_{2\,(g)}$ → ____ $CO_{2\,(g)}$ + ____ $H_2O_{(g)}$