Stoichiometry with Gases

STP = "Standard Temperature and Pressure"
Standard Temperature = 273 K
Standard Pressure = 1.00 atm = 101.325 kPa = 760 mm Hg = 760 torr
1 mL = 1 cm^3 = 1 cc
Kelvin = Celsius + 273
The Universal Gas Constant R = 8.314 L·kPa/mol·K = 0.0821 L·atm/mol·K = 62.4 L·Torr/moleK

1. Consider the following reaction:

$$\_\_\_HgO \rightarrow \_\_\_Hg + \_\_\_O_2$$

What volume of O_2 can be formed from 100.0 g of HgO at STP?

2. Consider the following reaction:

$$\_\_\_KClO_3 \rightarrow \_\_\_KCl + \_\_\_O_2$$

What mass of $KClO_3$ is needed to make 5.00L of O_2 at STP?

3. Methane is burned according to the following equation:

$$\_\_\_CH_4 + \_\_\_O_2 \rightarrow \_\_\_CO_2 + \_\_\_H_2O$$

What volume of CO_2 at 745 torr and 24°C is collected by burning 25.00 g of CH_4?

4. If 90.0 g of water are decomposed into hydrogen gas and oxygen gas at 25.0°C and standard pressure…
   A) What volume of hydrogen will be produced?
   B) What volume of oxygen will be produced?

5. Ethane gas, C_2H_6, burns in air and produces carbon dioxide gas and water vapor. Assume all measurements are made at STP.
   A) What volume of carbon dioxide are formed if 12.0 L of ethane are burned?
   B) How many moles of water vapor are formed?
   C) How many grams of oxygen gas will be needed?

6. Ammonia gas is formed by the decomposition of NH_4Cl. HCl is the other product.
   A) Write the equation for the chemical reaction.
   B) What volume of NH_3 forms from 25.0 g of NH_4Cl at STP?
   C) What volume of HCl forms from 25.0 g of NH_4Cl at STP?
   D) Why are the answers to B and C are what they are?
   E) How many grams of NH_4Cl are needed to make 15.0L of NH_3 at 27°C and 0.950 atm?