A Few Relatively Challenging **Problems Designed** for **Fun** and **Intellectual Stimulation!**

1. 120.0 grams of Na2CO3 are mixed with 2.00 liters of 3.00 M H3PO4 at 780.0 mm Hg and 25.0 C, and the resulting gas is collected over water, answer the following questions.
     a. Which reactant is limiting?
     b. How many moles of gas are formed?
     c. What volume of dry gas could be collected?

a. sodium carbonate   b. 1.13 moles   c. 27.8 liters

2. What mass of zinc would need to react with hydrochloric acid in order to produce 25.0 ml of hydrogen gas collected over water at 25.0 C and 105 kPa?
     a. Solution technique using combined gas laws
     b. Solution technique using the ideal gas law   .067 grams

3. What volume of gas can be produced in a lab where P is 16.0 psi and T is 25.0 degrees Celcius if you collect it over water from the reaction of 50.0 g ammonium sulfate with 50.0 g Aluminum hydroxide.   17.5 liters

4. You want to make 40.0 ml of gas from some aluminum carbonate. The temperature of the lab is 23.0 degrees Celcius and the pressure is 760.0 torr. If you collect the gas over water, what mass of reactant is necessary?
         .1248 grams

5. How many liters of chlorine gas at 25° C and 0.950 atm can be produced by the reaction of 24.0 g of MnO2 with hydrochloric acid? The products include manganese (II) chloride water and chlorine.   7.1 liters

6. What volume of oxygen gas at 320 K and 680 torr will react with 5.00 L of NO gas at the same temperature and pressure? The product is nitrogen dioxide.
         2.5 liters

7. Calculate the density in g/L of SF6 gas at 27.0° C and 2.0 atm pressure.
         11.9 g/l

8. A gas occupies 2 liters at 25 C and 98 kPa. What will its volume be at 50 C and 50 kPa?
         4.25 liters

9. A gas which occupies 4 liters at 25 C and 50 kPa undergoes a volume change to 2 liters at 50 C. What is the new pressure?

108.4 kPa

10. A gas occupies 2 liters at 30 C and 14.7 psi. If the volume changes to 3 liters while the pressure moves to 16 psi, what will be the new temperature?

495 K

11. What is the volume of 4 moles of oxygen at 25 C and 750 mm Hg?

99.2 liters

12. Calculate the relative rate of diffusion of nitrogen(N2) to carbon dioxide.

1.25/1

13. 50.0 grams of ammonium chloride are mixed with 125 grams of barium hydroxide. What volume of gas would you expect to collect at 1.20 atm 40.0 C?   19.9 liters (ignoring water vapor)

14. If you want to collect 20.0 ml of oxygen over water at 25.0 C and 95.0 Kpa, what mass of 3% hydrogen peroxide would be necessary to decompose?

1.68 g