

$$R = 62.4 \text{ L} \cdot \text{torr/mol} \cdot \text{K} \quad R = 0.0821 \text{ L} \cdot \text{atm/mol} \cdot \text{K} \quad PV = nRT \quad P_1 V_1 T_2 = P_2 V_2 T_1$$

SHOW ALL WORK TO RECEIVE CREDIT.

1. A sample of a gas occupies $1.40 \times 10^3 \text{ mL}$ at 25°C and 760 mmHg. What volume will it occupy at the same temperature and 380 mmHg?

$$\begin{aligned} P_1 &= 760 \text{ mm Hg} & P_2 &= 380 \text{ mm Hg} \\ V_1 &= 1.40 \times 10^3 \text{ mL} = 1.40 \text{ L} & V_2 &= ? \text{ L} \\ T_1 &= 298 \text{ K} & T_2 &= 298 \text{ K} \end{aligned}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$V_2 = \frac{P_1 V_1}{P_2} = \frac{(760 \text{ torr})(1.40 \text{ L})}{380 \text{ torr}}$$

$$V_2 = 2.8 \text{ L}$$

2. A sample of N_2 gas occupies 2.40 L at 20°C . If the gas is in a container that can contract or expand at constant pressure, at what temperature will the N_2 occupy 4.80 L?

$$\begin{aligned} P_1 &= P_2 \\ V_1 &= 2.40 \text{ L} & P_2 &= P_1 \\ V_2 &= 4.80 \text{ L} \end{aligned}$$

$$T_2 = \frac{P_2 V_2 T_1}{P_1 V_1} = \frac{(4.80 \Delta)(293 \text{ K})}{2.40 \text{ L}}$$

3. Calculate the volume occupied by 35.2 g of methane gas (CH_4) at 25°C and 1.0 atm.

$$\frac{35.2 \text{ g}}{16.04 \text{ g}} = 2.194 \text{ mol}$$

$$PV = nRT$$

$$V = \frac{nRT}{P} = \frac{(2.194 \text{ mol})(0.0821 \text{ L} \cdot \text{atm})}{(1.0 \text{ atm})(298 \text{ K})}$$

$$V = 53.7 \text{ L}$$

4. Calculate the density of $\text{CO}_2(\text{g})$ at 100°C and 10.0 atm pressure.

$$\text{Density} = \frac{\text{g}}{\text{L}}$$

$$\text{use } 1 \text{ mol } \text{CO}_2 (44.01 \text{ g}) \text{ in } PV = nRT \text{ to find } V$$

$$V = \frac{(1 \text{ mol})(0.0821 \text{ L} \cdot \text{atm})}{(10.0 \text{ atm})(1 \text{ mol} \cdot \text{K})} 373 \text{ K} = 3.062 \text{ L}$$

$$\text{Density} = \frac{44.01 \text{ g}}{3.062 \text{ L}} = 14.49 \text{ g/L}$$

5. Determine the molar mass of chloroform gas if a sample weighing 0.389 g is collected in a flask with a volume of 102 cm^3 at 97°C . The pressure of the chloroform is 728 mmHg.

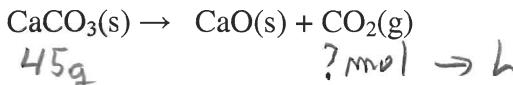
$$\text{molar mass} = \frac{\text{g}}{\text{mole}}$$

$$\text{use } PV = nRT \text{ to find moles (n)}$$

$$n = \frac{PV}{RT} = \frac{(728 \text{ torr})(0.102 \text{ L})}{(62.4 \text{ L} \cdot \text{torr})(370 \text{ K})}$$

$$n = 0.003216 \text{ moles} \text{ then } \frac{0.389 \text{ g}}{0.003216 \text{ mol}} = 121.9 \text{ g/mol}$$

6. What volume of CO_2 gas at 645 torr and 800 K could be produced by the reaction of 45 g of CaCO_3 according to the equation?



$$\frac{45 \text{ g CaCO}_3}{100.09 \text{ g}} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CaCO}_3} = 0.4496 \text{ mol}$$

$$PV = nRT$$

$$V = \frac{nRT}{P}$$

$$V = \frac{(0.4496 \text{ mol})(62.4 \text{ L} \cdot \text{torr})}{(645 \text{ torr})(1 \text{ mol} \cdot \text{K})} 800 \text{ K}$$

$$V = 34.8 \text{ L}$$