

Useful information:

$$R = 0.0821 \text{ L atm/mol K} \quad 1 \text{ atm} = 760 \text{ mmHg} = 101 \text{ kPa} = 14.97 \text{ Psi}$$

1. A sample of nitrogen, N_2 , and helium, He , has a volume of 25 mL at 30°C and a total pressure of 745 mmHg. If the partial pressure of He is 32 mmHg, what is the partial pressure of nitrogen? (3 pts)

Dalton's Law of Partial Pressures

$$P_{\text{Total}} = P_{\text{N}_2} + P_{\text{He}}$$

$$745 \text{ mmHg} = P_{\text{N}_2} + 32 \text{ mmHg}$$

$$P_{\text{N}_2} = 745 \text{ mmHg} - 32 \text{ mmHg} = \mathbf{713 \text{ mmHg}}$$

2. When heated, calcium carbonate decomposes to give calcium oxide and carbon dioxide.



If 2 moles of CaCO_3 react, how many liters of CO_2 gas are produced at STP? (4 pts)
STP = 273 K and 1 atm

$$2 \text{ mol CaCO}_3 \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CaCO}_3} = 2 \text{ mol CO}_2$$

Ideal Gas Law

$$PV = nRT$$

$$V = \frac{nRT}{P} = \frac{(2 \text{ mol}) \left(0.0821 \frac{\text{Latm}}{\text{molK}}\right) (273 \text{ K})}{1 \text{ atm}} = \mathbf{44.8 \text{ L}}$$

3. Cyclopropane, C_3H_6 , is a general anesthetic. A 5.0 L sample has a pressure of 5.0 atm. What is the volume of the anesthetic given to a patient at a pressure of 1.0 atm? (3 pts)

Boyle's Law

$$P_1V_1 = P_2V_2$$

$$V_2 = \frac{P_1V_1}{P_2} = \frac{(5.0 \text{ atm})(5.0 \text{ L})}{(1.0 \text{ atm})} = \mathbf{25 \text{ L}}$$