1. A 250 mL sample of oxygen is collected over water at 25°C and 760.0 torr pressure. What is the pressure of the dry gas alone? (Vapor pressure of water at 25°C = 23.8 torr)

\[ P_{\text{gas}} = P_{\text{atm}} - P_{\text{water}} \]
\[ P_{\text{gas}} = 760.0 \text{ torr} - 23.8 \text{ torr} \]
\[ P_{\text{gas}} = 736.2 \text{ torr} \approx 740 \text{ torr} \]

2. A 32.0 mL sample of hydrogen is collected over water at 20.°C and 750.0 torr pressure. What is the volume of the dry gas at STP? (Vapor pressure of water at 20.°C = 17.5 torr)

\[ P_{\text{gas}} = P_{\text{atm}} - P_{\text{water}} \]
\[ P_{\text{gas}} = 750.0 \text{ torr} - 17.5 \text{ torr} \]
\[ P_{\text{gas}} = 732.5 \text{ torr} \]
\[ V_2 = V_1 \times \frac{P_1 T_1}{P_2 T_2} \]
\[ V_2 = 32.0 \text{mL} \times \frac{732.5 \text{torr}}{293K} \times \frac{273K}{760.0 \text{torr}} \]
\[ V_2 = 28.7 \text{mL} \approx 29 \text{mL} \]

3. A 54.0 mL sample of oxygen is collected over water at 23°C and 770.0 torr pressure. What is the volume of the dry gas at STP? (Vapor pressure of water at 23°C = 21.1 torr)

\[ P_{\text{gas}} = P_{\text{atm}} - P_{\text{water}} \]
\[ P_{\text{gas}} = 770.0 \text{ torr} - 21.1 \text{ torr} \]
\[ P_{\text{gas}} = 748.9 \text{ torr} \]
\[ V_2 = V_1 \times \frac{P_1 T_1}{P_2 T_2} \]
\[ V_2 = 54.0 \text{mL} \times \frac{748.9 \text{torr}}{296K} \times \frac{273K}{760.0 \text{torr}} \]
\[ V_2 = 49.1 \text{mL} \approx 49 \text{mL} \]

4. A mixture of 2.00 moles of H₂, 3.00 moles of NH₃, 4.00 moles of CO₂ and 5.00 moles of N₂ exerts a total pressure of 800. torr. What is the partial pressure of each gas?

\[ P_{\text{H}_2} = \frac{2.00 \text{mol}}{14.00 \text{mol}} \times 800. \text{torr} = 114 \text{ torr} \]
\[ P_{\text{NH}_3} = \frac{3.00 \text{mol}}{14.00 \text{mol}} \times 800. \text{torr} = 171 \text{ torr} \]
\[ P_{\text{CO}_2} = \frac{4.00 \text{mol}}{14.00 \text{mol}} \times 800. \text{torr} = 229 \text{ torr} \]
\[ P_{\text{N}_2} = \frac{5.00 \text{mol}}{14.00 \text{mol}} \times 800. \text{torr} = 286 \text{ torr} \]

5. The partial pressure of F₂ is 300. torr in a mixture of gases where the total pressure is 1.00 atm. What is the mole fraction of F₂?

\[ \frac{\text{moles F}_2}{\text{total moles}} \times 760. \text{torr} = 300. \text{torr} \]
\[ \frac{\text{moles F}_2}{\text{total moles}} = 0.395 \]