1. A sample of air contains only nitrogen and oxygen gases whose partial pressures are 0.80 atm and 0.20 atm, respectively. Calculate the total pressure and mole fractions of the gases.

\[ P_T = 0.80 + 0.20 = 1.0 \text{ atm} \]

\[ 0.80 = (X_{N_2})(1.0) \]

\[ 0.20 = (X_{O_2})(1.0) \]

2. A mixture of gases contains 0.31 mol CH₄, 0.25 mol C₂H₆, and 0.29 mol C₃H₈. The total pressure is 1.50 atm. Calculate the partial pressures of the gases.

\[
\begin{align*}
P_{CH_4} &= X_{CH_4}(P_T) \\
 &= \frac{0.31}{1.50} \times 1.50 \\
&= 0.54 \text{ atm}
\end{align*}
\]

\[
\begin{align*}
P_{C_2H_6} &= \frac{0.25}{1.50} \times 1.50 \\
&= 0.25 \text{ atm}
\end{align*}
\]

\[
\begin{align*}
P_{C_3H_8} &= \frac{0.29}{1.50} \times 1.50 \\
&= 0.29 \text{ atm}
\end{align*}
\]

3. A sample of ammonia (NH₃) gas is completely decomposed into nitrogen and hydrogen gases over heated iron wool. If the total pressure is 866 mmHg, calculate the partial pressures of N₂ and H₂.

\[ 2 \text{NH}_3 \rightarrow \text{N}_2 + 3 \text{H}_2 \]

\[ P_{N_2} = \frac{1}{4} (866) = 216.5 \text{ mmHg} \]

\[ P_{H_2} = \frac{3}{4} (866) = 649.5 \text{ mmHg} \]

4. Each of the spheres represents a different gas molecule. Calculate the partial pressures of the gases if the total pressure is 2.6 atm.

\[ P_A = \frac{4}{12} (2.6) = 0.86 \text{ atm} \]

\[ P_B = \frac{6}{12} (2.6) = 1.3 \text{ atm} \]

\[ P_A_{\text{mix}} = \frac{2}{12} (2.6) = 0.43 \text{ atm} \]

5. Consider the three gas containers shown below. All of them have the same volume and are at the same temperature. (a) Which container has the smallest mole fraction of gas A? (b) Which container has the highest partial pressure of gas B?

\[ X_A = \frac{4}{9} \]

\[ X_A = \frac{5}{12} \]

\[ X_A = \frac{2}{15} \]

\[ P_B = \frac{n_BRT}{V} = 2 \]

\[ P_B = \frac{n_BRT}{V} = 3 \]

\[ P_B = \frac{n_BRT}{V} = 4 \]