

Pre-AP Chemistry/AP Chemistry

Unit #17—Gas Laws

Density of a Gas

What is the density of carbon tetrachloride vapor at 714 torr and 125 °C?

$$\begin{array}{l} \text{C} = 12.011 \text{ g/mol} \times 1 = 12.011 \text{ g/mol} \\ \text{Cl} = 35.453 \text{ g/mol} \times 4 = \frac{141.812 \text{ g/mol}}{153.823 \text{ g/mol}} \end{array}$$

$$\frac{714 \text{ torr}}{760 \text{ torr}} \left| \frac{1 \text{ atm}}{760 \text{ torr}} \right. = 0.939 \text{ atm}$$

$$125 \text{ }^\circ\text{C} + 273.15 \text{ K} = 398.15 \text{ K}$$

$$\begin{array}{l} (0.939 \text{ atm})(153.823 \text{ g/mol}) \\ (0.08206 \text{ Latm/Kmol})(398.15 \text{ K}) \end{array} = 4.421 \text{ g/L}$$

Calculate the density of sulfur hexafluoride gas at 678 torr and 28°C.

$$\begin{array}{l} \text{S} = 32.066 \text{ g/mol} \times 1 = 32.066 \text{ g/mol} \\ \text{F} = 18.988 \text{ g/mol} \times 6 = \frac{113.928 \text{ g/mol}}{145.994 \text{ g/mol}} \end{array}$$

$$\frac{678 \text{ torr}}{760 \text{ torr}} \left| \frac{1 \text{ atm}}{760 \text{ torr}} \right. = 0.892 \text{ atm}$$

$$28 \text{ }^\circ\text{C} + 273.15 \text{ K} = 301.15 \text{ K}$$

$$\begin{array}{l} (0.892 \text{ atm})(145.994 \text{ g/mol}) \\ (0.08206 \text{ Latm/Kmol})(301.15 \text{ K}) \end{array} = 5.270 \text{ g/L}$$