Partial Pressures of Gas

Chem Worksheet 14-6

Name _____

Dalton's law of partial pressures states that the total pressure of a mixture of gases is equal to the sum of the individual pressures. In other words, mixtures of gases behave the same as a single gas would. In a mixture of gases each individual gas contributes its own pressure, known as the **partial pressure**, to the total pressure. The pressure of each gas is determined by the number of moles of gas, its volume and temperature. The sum of each gas pressure equals to the total pressure. The equation for this law is

$$P_{\text{total}} = P_1 + P_2 + P_3 + \ldots P_n$$

USEFUL EQUATIONS

1.00 atm = 760 torr	$PV = nRT$	$R = 0.0821 \frac{atm \cdot L}{mol \cdot K}$

Solve the following problems.

1. A canister contains 425 kPa of carbon dioxide, 750 kPa of nitrogen, and 525 kPa of oxygen. What is the total pressure of the container?
2. A tank containing ammonia and argon has a total pressure equal to 1.8 atm. The pressure of the ammonia is 1.2 atm. What is the pressure of the argon gas?
3. A sample of gas contains 3 moles of argon and 5 moles of krypton. If the argon exerts a pressure of 210 torr, what is the pressure of the krypton? What is the total pressure?

A 32.6 mL sample of hydrogen gas is collected over water using a technique known as water displacement. The temperature of the gas is 295 K. The total pressure of the mixture (hydrogen and water vapor) is 785.2 torr.

4. At 295 K the vapor pressure of water is 19.8 torr. Find the pressure of the hydrogen gas alone.
5. Using the volume and temperature given above, calculate the number of moles of hydrogen present.
6. Using the volume and temperature above, determine the number of moles of water vapor present.

The tank shown below contains helium, nitrogen, and oxygen gas and it has a volume of 425 L. Each marker in the container represents a mole of gas in the mixture. The container is at room temperature (20ºC).

7. Count the number of moles of helium in the sample. Repeat for nitrogen and oxygen.
8. Determine the fraction of each of the three gases.
9. Calculate the pressure of each gas. Use the volume and temperature listed above for each calculation.
10. Find the total pressure inside the container by adding the partial pressures for each gas.