Honors Chemistry: Gases and Their Properties: Reinforcement

Answer the following questions; Be sure to show all work and all units. Also, be sure to re-arrange the variables before solving the problem.

1. A gas system has an initial pressure of 2680 torr with the volume unknown. When the pressure changes to 2240 torr the volume is found to be 6.62 L **What was the initial volume in mL**?

2. A gas system has an initial number of moles of 0.0983 moles with the volume unknown. When the number of moles changes to 0.00296 moles, under conditions of constant P (pressure) and T (temperature), the volume is found to be 0.298 L **What was the initial volume in mL**?

n_1 = 0.0983 mole

V_1 = ? mL

n_2 = 0.00296 mole

V_2 = 0.298 liter

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

$$V_1 = \frac{V_2 n_1}{n_2} = \frac{(0.298\ L)(0.0983\ mol)}{(0.00296\ mol)} = 9.90\ L$$

$$\frac{9.90\ L}{} \times \frac{1000\ mL}{1\ L} = 9900\ mL$$

3. A gas system has initial volume and temperature of 8330 mL and 335.3 K If the volume changes to 5080 mL, **what will the resultant temperature be in ^{o}C**?

4. A sample containing three gases are within a ten-liter container (at the same temperature). **Calculate the partial pressure of each gas** - if the total pressure within the container has a pressure of 476 kPa. Within the container there is: 45.3 grams of nitrogen gas, 187 grams of argon gas, and 34.1 grams of chlorine gas.

$$P_T = P_1 + P_2 + P_3$$

$$\frac{45.3\ g\ N_2}{} \times \frac{1\ mol\ N_2}{2(14.01\ g)} = 1.6167\ mol\ N_2$$

$$\frac{187\ g\ Ar}{} \times \frac{1\ mol\ Ar}{39.95\ g} = 4.6809\ mol\ Ar$$

$$\frac{34.1\ g\ Cl_2}{} \times \frac{1\ mol\ Cl_2}{2(35.45\ g)} = 0.48096\ mol\ Cl_2$$

$$P_{N_2} : \frac{1.6167\ mol}{6.77856\ mol}(476\ kPa) = 114\ kPa$$

$$P_{Ar} : \frac{4.6809\ mol}{6.77856\ mol}(476\ kPa) = 328\ kPa$$

$$P_{Cl_2} : \frac{0.48096\ mol}{6.77856\ mol}(476\ kPa) = 34\ kPa$$

$$1.6167\ mol\ N_2 + 4.6809\ mol\ Ar + 0.48096\ mol\ Cl_2 = 6.77856\ moles\ GAS$$

5. A gas system has initial pressure and volume of 58.70 kPa and 2070 mL If the volume changes to 2.23 L, **what will the resultant pressure be in torr**?

6. A gas system has initial volume and temperature of 6.63 L and 26.4 ^{o}C If the temperature changes to 260.0 K, **what will the resultant volume be in L**?

$V_1 = 6.63$ L
$T_1 = 26.4\ ^{0}$C
$V_2 = ?$ L
$T_2 = 260.0$ K

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Use Kelvin the scale while working with temperature, convert at the end of the problem.

$$26.4^{0}C + 273 = 299.4\ K$$

$$V_2 = \frac{V_1T_2}{T_1} = \frac{(6.63\ L)(260.0\ K)}{(299.4\ K)} = 5.76\ L$$

7. A gas system has an initial volume of 4.15 L with the number of moles unknown. When the volume changes to 4790 mL, under conditions of constant P and T, the number of moles is found to be 0.222 moles **What was the initial number of moles**?

8. A gas system has initial pressure and volume of 8.14 atm and 0.609 L If the volume changes to 0.837 L, **what will the resultant pressure be in torr**?

$P_1 = 8.14$ atm
$V_1 = 0.609$ L
$P_2 = ?$ torr
$V_2 = 0.837$ L

$$P_1V_1 = P_2V_2$$

$$P_2 = \frac{P_1V_1}{V_2} = \frac{(8.14\ atm)(0.609\ L)}{(0.837\ L)} = 5.92\ atm$$

$$\frac{5.92\ atm}{} \times \frac{101.325\ kPa}{1\ atm} \times \frac{7.501\ torr}{1\ kPa} = 4501\ torr$$

9. A sample containing two gases are within a 6.50 liter container (at the same temperature). **Calculate the partial pressure of each gas** - if the total pressure within the container has a pressure of 3.44 atm. Within the container there is: 42.3% oxygen gas and 57.7 % helium gas.