

KEY

Review: Gas Laws

$$P_1 V_1 = P_2 V_2$$

1. Use Boyle's law to solve for the missing value in each of the following

a. $P_1 = 800 \text{ mm Hg}$ $V_1 = 400 \text{ mL}$ $P_2 = 980 \text{ mm Hg}$ $V_2 = ? \text{ mL}$

$$800(400) = 980(V_2)$$

$$\boxed{326.53 \text{ mL}}$$

b. $P_1 = 4.4 \text{ atm}$ $V_1 = 350 \text{ mL}$ $P_2 = ? \text{ atm}$ $V_2 = 635 \text{ mL}$

$$4.4(350) = P_2(635)$$

$$\boxed{2.43 \text{ atm}}$$

2. A sample of air has a volume of 750.0 mL at 206°C. At what temperature will its volume be 900.0 mL at constant pressure?

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

$$\frac{750}{479} = \frac{900}{T_2}$$

$$750T_2 = 479(900)$$

$$\boxed{574.8 \text{ K}}$$

$$\boxed{301.8^\circ\text{C}}$$

3. A sample of gas at 184°C and 0.470 atm occupies a volume of 2.0L. What volume would this gas occupy at 40°C and 1.3 atm?

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{0.470(2)}{457} = \frac{(1.3)V_2}{313}$$

$$0.470(2)(313) = (1.3)V_2$$

$$294.22 = 1.3V_2$$

$$\boxed{.495 \text{ L}}$$

4. A mixture of three gases A, B and C is at a total pressure of 10.15 atm. The partial pressure of gas A is 1.70 atm; that of gas B is 3.09 atm. What is the partial pressure of gas C?

$$10.15 = 1.70 + 3.09 + P_C$$

$$10.15 = 4.79 + P_C$$

$$\boxed{5.36 \text{ atm}}$$

5. a. What is the volume of 1 mole of any gas at STP? 22.4 L

b. What is STP? What are the number associated with it?

Standard Temperature + Pressure
273 K 1 atm

6. a. How many moles are contained in 4.5L of CO₂ at STP?

$$\frac{4.5 \text{ L CO}_2}{22.4 \text{ L CO}_2} \times 1 \text{ mol CO}_2 = \boxed{.201 \text{ mol CO}_2}$$

b. What is the volume in liters of 4.30 mol of N₂ at STP?

$$\frac{4.3 \text{ mol N}_2}{1 \text{ mol N}_2} \times \frac{22.4 \text{ L N}_2}{1 \text{ mol N}_2} = 96.32 \text{ L N}_2$$

d. Find the mass in grams of 5.2 L of O₂. → mm = 31.998

$$\frac{5.2 \text{ L O}_2}{22.4 \text{ L O}_2} \times \frac{1 \text{ mol O}_2}{1 \text{ mol O}_2} \times \frac{31.998 \text{ g O}_2}{1 \text{ mol O}_2} = 7.428 \text{ g O}_2$$

6. Use the ideal gas law to calculate the following problems. R = 0.0821 L · atm / mol · K

a. What is the volume in liters of 4.00 mol of F₂ at 300 K and 350 atm?

$$PV = nRT$$

$$(350)V = (4)(0.0821)(300)$$

$$(350)V = 98.52$$

$$V = 0.281 \text{ L F}_2$$

b. Calculate the number of moles of gas contained in 2.0L at 273K and 3.5 atm.

$$PV = nRT$$

$$(3.5)(2) = n(0.0821)(273)$$

$$7 = n(22.41)$$

$$n = 0.312 \text{ mol}$$

7. Find the molar mass of a gas measured under the conditions specified.

0.550g occupies 3.01L at 51°C and 3.44 atm

$$PV = nRT$$

$$(3.44)(3.01) = n(0.0821)(324)$$

$$n = 0.389 \text{ mol}$$

$$\frac{0.55 \text{ g}}{0.389 \text{ mol}} = 1.41 \text{ g/mol}$$

$$1.41 \text{ g/mol}$$

8. In Charles' Law, if the volume is increased by half, the temperature will increase by half.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad \text{directly} \quad \uparrow \uparrow$$

9. In Boyle' Law, if the volume is increased by half, the pressure will decrease by 2.

$$P_1 V_1 = P_2 V_2 \quad \text{indirectly} \quad \uparrow \downarrow$$

10. If I have 368 torrs, then how many atm do I have?

$$\frac{368}{760} = 0.484 \text{ atm}$$

DON'T FORGET ABOUT LAB!!