Key

Review: Gas Laws

$P_1V_1 = P_2V_2$

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

a. P_1 = 800mm Hg V_1 = 400mL P_2 = 980mmHg V_2=?

$$V_2 = \frac{P_1V_1}{P_2} = \frac{(800\text{mmHg})(400\text{mL})}{(980\text{mmHg})} = \boxed{327\text{mL}}$$

b. P_1 = 4.4 atm V_1 = 350 mL P_2= ? V_2= 635mL

$$P_2 = \frac{P_1V_1}{V_2} = \frac{(4.4\text{atm})(350\text{mL})}{(635\text{mL})} = \boxed{2.43\text{atm}}$$

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? V_1 T_1 T_2?

V_1	750mL
T_1	479 K
V_2	900mL
T_2	?

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

$$T_2 = \frac{T_1V_2}{V_1} = \frac{(479\text{K})(900\text{mL})}{(750\text{mL})}$$

206°C + 273 = 479K

575K

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? T_1 P_1 V_1 V_2=? T_2 P_2

P_1	.470atm	P_2	1.3atm
V_1	2L	V_2	?
T_1	184+273 = 457K	T_2	40+273 = 313K

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$$V_2 = \frac{P_1V_1T_2}{T_1P_2}$$

$$V_2 = \frac{(.470\text{atm})(2\text{L})(313\text{K})}{(457\text{K})(1.3\text{atm})} = \boxed{.50\text{L}}$$

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 3.09atm. What is the partial pressure of gas C?

$P_T = P_A + P_B + P_C$

$10.15\text{atm} = 1.70\text{atm} + 3.09\text{atm} + P_C$

$-4.79 \quad -(1.70+3.09)$

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

omit 5 a. What is the volume of 1 mole of any gas at STP? _____

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

6. a. How many moles are contained in 4.5L of CO_2 at STP? Standard conditions!

$PV = nRT$

P	1atm
V	4.5L
n	?
R	.0821
T	273K

$$n = \frac{PV}{RT} = \frac{(1\text{atm})(4.5\text{L})}{(.0821\frac{\text{L·atm}}{\text{mol·K}})(273\text{K})} = \boxed{.201\text{mol}}$$

$PV = nRT$

b. What is the volume in liters of 4.30 mol of N_2 at (STP?) Standard conditions!

P	1.0 atm	R	.0821
V	?		
n	4.30 mol	T	273K

$V = \frac{nRT}{P} = \frac{(4.30\text{mol})(.0821)(273\text{K})}{(1.0\text{ atm})} = \boxed{96.4\text{L}}$

omit ~~c. Find the mass in grams of 5.2 L of O_2.~~

$PV = nRT$

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 F_2 at 300 K and 350 atm?

P	350 atm	R	.0821
V	?		
n	4.00 mol	T	300K

$V = \frac{nRT}{P} = \frac{(4\text{mol})(.0821)(300\text{K})}{(350\text{ atm})} = \boxed{.28\text{L}}$

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

P	3.5 atm	R	.0821
V	2L		
n	?	T	273K

$n = \frac{PV}{RT} = \frac{(3.5\text{atm})(2\text{L})}{(.0821)(273\text{K})} = \boxed{.31\text{mol}}$

omit ~~c. Find the molar mass of a gas measured under the conditions specified.~~
0.550g occupies 3.01L at 51°C and 3.44 atm

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

V↑ T?

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

9. In Boyle' Law, if the volume is increased by half, the pressure will ___decrease___ by ___2___.

$P_1V_1 = P_2V_2$

↓ ↑ ×2

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

$\frac{368\text{torr}}{1} \times \frac{1\text{atm}}{760\text{torr}} = \boxed{.48\text{atm}}$

Ex: P ↓ by 2/1 V ↑ by 1/2