

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

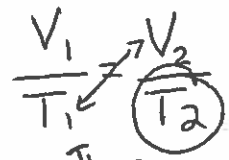
$$V_2 = \frac{P_1 V_1}{P_2} = \frac{(800 \text{ mm Hg})(400 \text{ mL})}{(980 \text{ mm Hg})} = \boxed{327 \text{ mL}}$$

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

$$P_2 = \frac{P_1 V_1}{V_2} = \frac{(4.4 \text{ atm})(350 \text{ mL})}{(635 \text{ mL})} = \boxed{2.43 \text{ atm}}$$

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	750 mL	V_2	
T_1	479 K		
V_2	900 mL		
T_2	?		

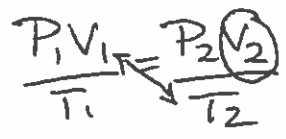


$$T_2 = \frac{T_1 V_2}{V_1} = \frac{(479 \text{ K})(900 \text{ mL})}{(750 \text{ mL})}$$

206°C
+ 273
479 K

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

P_1	0.470 atm	P_2	1.3 atm
V_1	2 L	V_2	?
T_1	184 + 273 = 457 K	T_2	40 + 273 = 313 K



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

$$V_2 = \frac{(0.470 \text{ atm})(2 \text{ L})(313 \text{ K})}{(457 \text{ K})(1.3 \text{ atm})} = \boxed{0.50 \text{ L}}$$

575 K

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?

$$P_T = P_A + P_B + P_C$$

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

$$\underline{-4.79} \qquad \underline{-(1.70 + 3.09)}$$

$P_C = 5.36 \text{ atm}$

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 CO₂ at STP?

$$PV = nRT$$

Standard conditions!

P	1 atm
V	4.5 L
n	?
R	0.0821
T	273 K

$$n = \frac{PV}{RT} = \frac{(1 \text{ atm})(4.5 \text{ L})}{(0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}})(273 \text{ K})} = \boxed{0.201 \text{ mol}}$$

$$PV = nRT$$

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	?	T	273K
n	4.30 mol		

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

~~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. $R = 0.0821 \text{ L} \cdot \text{atm} / \text{mol} \cdot \text{K}$

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	?	T	300K
n	4.00 mol		

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

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	T	273K
n	?		

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

~~omit~~ 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 ^{V↑} increased by half, the temperature will ^{T?} increase by half. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

9. In Boyle' Law, if the volume is increased by half, the pressure will decrease by 2. $P_1 V_1 = P_2 V_2$

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: $P \cdot V$
 $\downarrow \quad \uparrow$
 $\frac{2}{1} \text{ by } \frac{1}{2}$