

8 • Why Do Hot Air Balloons Float?**THE COMBINED GAS LAW**

In practical terms, it is often difficult to hold any of the variables constant. When there is a change in pressure, volume and temperature, the combined gas law is used. *Show work on another sheet of paper for credit.*

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \text{or} \quad P_1 \times V_1 \times T_2 = P_2 \times V_2 \times T_1$$

$$K = ^\circ C + 273$$

Complete the following chart.

	P_1	V_1	T_1	P_2	V_2	T_2
1	1.50 atm	3.00 L	20.0 °C	2.50 atm		30.0 °C
2	720. torr	256. mL	25.0 °C		250. mL	50.0 °C
3	600. mmHg	2.50 L	22.0 °C	760. mmHg	1.80 L	
4		750. mL	0.00 °C	2.00 atm	500. mL	25.0 °C
5	95.0 kPa	4.00 L		101. kPa	6.00 L	471. K or 198. °C
6	650. torr		100. °C	900. torr	225. mL	150. °C
7	850. mmHg	1.50 L	15.0 °C		2.50 L	30.0 °C
8	125. kPa	125. mL		100. kPa	100 mL	75.0 °C

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THE IDEAL GAS LAW

$$PV = nRT \text{ where}$$

P = pressure in atmosphere

V = volume in liters

n = number of moles of gas

R = Universal Gas Constant = 0.0821 L·atm/mol·K

T = Kelvin temperature

1. How many moles of oxygen will occupy a volume of 2.50 liters at 1.20 atm and 25 °C?

2. What volume will 2.00 moles of nitrogen occupy at 720. mmHg and 20.°C?

3. What pressure will be exerted by 25.0 g of CO₂ at temperature of 25 °C and a volume of 500. mL?

4. At what temperature will 5.00 g of Cl₂ exert a pressure of 900. mmHg at a volume of 750. mL?

5. What is the density of NH₃ at 800. mmHg and 25 °C? _____
6. If the density of a gas is 1.2 g/L at 745 mmHg and 20.°C, what is its molar mass?

7. How many moles of nitrogen gas will occupy a volume of 347 mL at 6680 mmHg and 27 °C?

8. What volume will 454 grams (1 lb) of hydrogen occupy at 1.05 atm and 25 °C?

9. Find the number of grams of CO₂ that exert a pressure of 785 mmHg at a volume of 32.5 L and a temperature of 32 °C. _____
10. An elemental gas has a mass of 10.3 g. If the volume is 58.4 L and the pressure is 758 mmHg at a temperature of 2.5 °C, what is the gas? _____