

8 • Why Do Hot Air Balloons Float?

BOYLE'S LAW

Boyle's Law states that the volume of a gas varies inversely with its pressure if temperature is held constant.

(If one goes up, the other goes down.) We use the formula:

$$P_1 \times V_1 = P_2 \times V_2$$

Solve the following problems (assuming constant temperature). Assume all number are 3 significant figures.

1. A sample of oxygen gas occupies a volume of 250 mL at 740 torr pressure. What volume will it occupy at 800 torr pressure?
2. A sample of carbon dioxide occupies a volume of 3.50 Liters at 125 kPa pressure. What pressure would the gas exert if the volume was decreased to 2.00 liters?
3. A 2.00-Liter container of nitrogen had a pressure of 3.20 atm. What volume would be necessary to decrease the pressure to 1.00 atm?
4. Ammonia gas occupies a volume of 450 mL as a pressure of 720 mmHg. What volume will it occupy at standard pressure (760 mmHg)?
5. A 175 mL sample of neon had its pressure changed from 75.0 kPa to 150 kPa. What is its new volume?
6. A sample of hydrogen at 1.50 atm had its pressure decreased to 0.50 atm producing a new volume of 750 mL. What was the sample's original volume?
7. Chlorine gas occupies a volume of 1.20 liters at 720 torr pressure. What volume will it occupy at 1 atm pressure?
8. Fluorine gas exerts a pressure of 900 torr. When the pressure is changed to 1.50 atm, its volume is 250 mL. What was the original volume?