

Gas Laws - 1. Boyle's & Charles Law.

B 1) Calculate the volume of a gas at 5.75 atm if it occupies 5.14 L at 2.49 atm.

$$P_1 V_1 = P_2 V_2 \leftarrow$$

$$V_2 = ?$$

$$P_2 = 5.75 \text{ atm}$$

$$V_1 = 5.14 \text{ L}$$

$$P_1 = 2.49 \text{ atm}$$

$$V_2 = \frac{P_1 V_1}{P_2} = \frac{2.49 \text{ atm} \times 5.14 \text{ L}}{5.75 \text{ atm}}$$

$$= \boxed{2.25 \text{ L}}$$

B 2) What will be the new pressure of a ^{6.00 L} balloon if it had a pressure of 748 Torr when the volume was 4.50 L?

$$P_1 V_1 = P_2 V_2$$

$$P_1 = 748 \text{ Torr}$$

$$V_1 = 4.50 \text{ L}$$

$$P_2 = ?$$

$$V_2 = 6.00 \text{ L}$$

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

$$= \frac{748 \text{ Torr} \times 4.50 \text{ L}}{6.00 \text{ L}} = \boxed{561 \text{ Torr}}$$

C 3) A sample of gas originally occupies 29.1 L at 0.0°C. What is the new volume at 15.0°C?

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

$$0.0 + 273 = 273 \text{ K}, 15.0 + 273 = 288 \text{ K}$$

$$V_1 = 29.1 \text{ L} \quad V_2 = ?$$

$$T_1 = 273 \quad T_2 = 288 \text{ K}$$

$$V_2 = \frac{V_1 \times T_2}{T_1} = \frac{29.1 \text{ L} \times 288 \text{ K}}{273 \text{ K}}$$

$$= \boxed{30.7 \text{ L}}$$

C 4) A sample of hydrogen gas occupies 692 L at 602°C. At what temp, in °C, will it occupy a volume of 300 L?

$$V_1 = 692 \text{ L}$$

$$T_1 = 602 + 273 = 875 \text{ K}$$

$$T_2 = ?$$

$$V_2 = 300 \text{ L}$$

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

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

$$= \frac{300 \text{ L} \times 875 \text{ K}}{692 \text{ L}}$$

$$= 379.3 \text{ K}$$

$$- 273 = \boxed{106.3^\circ \text{C}}$$