## Gas Laws: Part 2

1. Helium gas has a pressure of 8.25 atm in a 4.65 L vessel. If the volume is decreased to 2.65 L, what is the pressure? The temperature is held constant.

$P_1V_1 = P_2V_2$ $P_1$ = 8.25 atm, $V_1$ = 4.65 L, $V_2$ = 2.65 L, $P_2$ = ?

$$P_2 = \frac{8.25\ atm \times 4.65\ L}{2.65\ L} = \mathbf{14.5\ atm}$$

2. Neon gas exerts a pressure of 125 kPa at 395 K. What is the pressure, in atm, if the temperature is increased to 500 K?

101.3 kPa = 1 atm, $124\ kPa \times \frac{1\ atm}{101.3\ kPa} = 1.22\ atm$, $P_1$ = 1.22 atm, $T_1$ = 395K, $T_2$ = 500 K

$$P_2 = \frac{1.22\ atm \times 500\ K}{395\ K} = \mathbf{1.55\ atm}$$

3. A sample of chlorine gas occupies a volume of 785 mL at 1.00 atm at a temperature of -9.00 °C. What volume will the gas occupy if the pressure is tripled and the temperature is increased to 167 °C?

$P_1$ = 1.00 atm, $P_2$ = 3.00 atm, $V_1$ = 0.785 L, $V_2$ = ?, $T_1$ = -9.00 °C + 273.15 = 264.15 K, $T_2$ = 167 °C + 273.15 = 440 K

$$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{1.00\ atm \times 0.785\ L \times 440\ K}{264.15\ K \times 3.00\ atm} = \mathbf{0.436\ L}$$

4. A 0.595 L sample of krypton gas is held under STP. What volume does the gas occupy if the pressure is tripled and the temperature is doubled?

$P_1$ = 1.00 atm, $P_2$ = 3.00 atm, $T_1$ = 273.15 K, $T_2$ = 546.30 K, $V_1$ = 0.594 L, $V_2$ = ?

$$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{1.00\ atm \times 0.594\ L \times 546.30\ K}{273.15\ K \times 3.00\ atm} = \mathbf{0.396\ L}$$

5. A 45.0 L sample of $N_2$ gas is under a pressure of 8.6 atm at a temperature of 89.2 °C. If the volume is decreased to 20.0 L, the temperature is decreased to 25.5 °C, what is the new pressure?

$P_1$ = 8.6 atm, $V_1$ = 45.0 L, $V_2$ = 20.0 L, $T_1$ = 362.35 K, $T_2$ = 298.65 K

$$P_2 = \frac{P_1V_1T_2}{V_2} = \frac{8.6\ atm \times 45.0\ L \times 298.65\ K}{20.0\ L \times 362.35\ K} = \mathbf{15.9\ atm}$$

6. How many grams of $CO_2$ are contained in a 44.8 L vessel at STP?

There are 2 mol $CO_2$ which is 88.0 g

$$n = \frac{1.00\ atm \times 44.8\ L}{0.0821 \frac{L \cdot atm}{mol \cdot K} \times 273\ K} = 2.00\ mol = \mathbf{88.0\ g\ CO_2}$$