Answer on Question #48664 - Chemistry – Inorganic Chemistry

Question

A sample of argon occupies a volume of 200 ml at STP. if the pressure is increased to 1520 torr and the temperature is decreased t 136.5 k, then the final volume is.

Answer:

The combined gas law or general gas equation shows the relationship between the pressure, volume, and temperature for a fixed mass of gas:

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

p_1 is the standard pressure, p_1 = 100.00 kPa;

V_1 is the initial volume, V_1 = 200 ml = 0.200 l = $2 \cdot 10^{-4}$ m^3;

T_1 is the standard temperature, T_1 = 0°C = 273.15 K;

p_2 = 1520 torr = 202.65 kPa;

T_2 = 136.5 K.

Then the final volume of argon is:

$$V_2 = \frac{p_1 V_1 T_2}{p_2 T_1} = \frac{100.00 \cdot 2 \cdot 10^{-4} \cdot 136.5}{202.65 \cdot 273.15} = 4.93 \cdot 10^{-5}\, m^3 = 4.93 \cdot 10^{-2} l = 49.3\, ml$$

Answer: The final volume of argon is 49.3 ml.