

0.30 mol of argon gas at 25°C is admitted into an evacuated 75 cm<sup>3</sup> chamber. The gas undergoes isothermal expansion to a volume of 300 cm<sup>3</sup>. What is the final pressure of the gas?

Given:

Number of moles of argon gas:  $n = 0.30 \text{ mol}$

Initial temperature of gas:  $T_i = 25^\circ\text{C} = 298 \text{ K}$

Initial volume of gas:  $V_i = 75 \text{ cm}^3 = 75 \times 10^{-6} \text{ m}^3$

Final volume of gas:  $V_f = 300 \text{ cm}^3 = 300 \times 10^{-6} \text{ m}^3$

Determine: Final pressure of gas:  $P_f$

$$P_f V_f = nRT_f \text{ -----(1)}$$

**R is the gas constant and has a value of 8.314 J / mol**

Since this is an isothermal expansion,  $T_i = T_f$ .

Rearranging (1) and substituting for  $V_f$ ,  $n$ ,  $R$ , and  $T_f$  in (1):

$$P_f = nRT_f / V_f = (0.3 \times 8.314 \times 298) / (300 \times 10^{-6}) = 2.5 \times 10^6 \text{ pa}$$