QUESTION:

an ideal gas occupies a volume of 1.0 cubic cm at 20 degrees and atmosphere.

(a) determine the number of molecules of gas in the container

(b) if the pressure of the 1.0-cm cubic volume is reduced to $1.0*10^{-11}$ Pa (while the temperature remains constant , how many moles of gas remain in the container ?

SOLUTION:

a) According to the ideal gas law

$$p_1 V_1 = n_1 RT$$

$$n_1 = \frac{N_1}{N_A}$$

$$p_1 V_1 = \frac{N_1}{N_A} RT$$

$$N = \frac{p_1 V_1 N_A}{RT} = \frac{1.01 \cdot 10^5 \cdot 10^{-6} \cdot 6.02 \cdot 10^{23}}{8.31 \cdot (20 + 273)} = 2.5 \cdot 10^{19}$$

b) Analogically:

$$p_2 V_1 = n_2 RT$$

$$n_2 = \frac{p_2 V_1}{RT} = \frac{10^{-11} \cdot 10^{-6}}{8.31 \cdot (20 + 273)} = 4.1 \cdot 10^{-21} \ mol$$

ANSWER

- **a)** $2.5*10^{19}$
- **b)** $4.1*10^{-21}$ mol