

Question 13

Oxygen is present in 1 litre flask at a pressure of 7.6×10^{-10} mm of Hg. Calculate the number of oxygen molecules in the flask at 0°C .
(1983 - 2 Marks)

NOTE THIS STEP : First we should calculate the number of moles of the gas under the given conditions by the relation $PV = nRT$

Here $P = 7.6 \times 10^{-10}$ mm Hg

$$= \frac{7.6 \times 10^{-10}}{760} \text{ atm.} = 1 \times 10^{-12} \text{ atm.}$$

$V = 1$ litre, $T = 273 + 0 = 273\text{K}$, $R = 0.082$ litre atm./K/mol

Putting the values in equation

$$n = \frac{PV}{RT} = \frac{1 \times 10^{-12} \times 1}{0.082 \times 273} \text{ moles}$$

Now since 1 mole = 6.023×10^{23} molecules

$$\begin{aligned} \frac{10^{-12}}{0.082 \times 273} \text{ moles} &= \frac{6.023 \times 10^{23} \times 10^{-12}}{0.082 \times 273} \text{ molecules} \\ &= \mathbf{2.7 \times 10^{10} \text{ molecules}} \end{aligned}$$