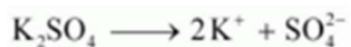**Q4.** Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 liter of water at 25° C, assuming that it is completely dissociated.

Answer :

When K_2SO_4 is dissolved in water, K^+ and SO_4^{2-} ions are produced.

$$K_2SO_4 \longrightarrow 2K^+ + SO_4^{2-}$$

Total number of ions produced = 3

$\therefore i = 3$

Given,

$w = 25$ mg $= 0.025$ g

$V = 2$ L

$T = 25°C = (25 + 273)$ K $= 298$ K

Also, we know that:

$R = 0.0821$ L atm $K^{-1}mol^{-1}$

$M = (2 \times 39) + (1 \times 32) + (4 \times 16) = 174$ g mol^{-1}

Appling the following relation,

$$\pi = i\frac{n}{v}RT$$

$$= i\frac{w}{M}\frac{1}{v}RT$$

$$= 3 \times \frac{0.025}{174} \times \frac{1}{2} \times 0.0821 \times 298$$

$$= 5.27 \times 10^{-3} atm$$