Q3. Determine the amount of CaCl2 (*i* = 2.47) dissolved in 2.5 litre of water such that its osmotic pressure is 0.75 atm at 27°C.

Answer :

We know that,

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

$$\Rightarrow \pi = i\frac{w}{MV}RT$$

$$\Rightarrow w = \frac{\pi MV}{iRT}$$

$\pi = 0.75\,\text{atm}$

$V = 2.5\,\text{L}$

$i = 2.47$

$T = (27 + 273)\,\text{K} = 300\,\text{K}$

Here,

R = 0.0821 L atm K⁻¹mol⁻¹

M = 1 × 40 + 2 × 35.5

= 111g mol⁻¹

Therefore, w $= \dfrac{0.75 \times 111 \times 2.5}{2.47 \times 0.0821 \times 300}$

= 3.42 g

Hence, the required amount of $CaCl_2$ is 3.42 g.