6.4. Osmosis and Osmotic pressure -

Osmosis can also take place when the two solutions with different concentration of the same solute are placed in contact and are separated by a semi-permeable membrane. It will occur from the dilute solution into the concentrated solution from the solution with lesser solute concentration into the solution with higher concentration of the solute. Osmosis is the spontaneous movement of the solvent molecules either from pure solvent into the solution or from dilute solution into the concentrated solution through a semipermeable membrane (SPM) [Fig 2.9]

The movement or flow will continue till the equilibrium is attained. The flow of the solvent from its side to solution side across a semipermeable membrane can be stopped if some extra pressure is applied on the solution. The excess pressure that must be applied to prevent osmosis or to stop the flow of solvent molecules through a semipermeable membrane into the solution is called osmotic pressure [Fig 2.10].

For dilute solutions, experimentally ~~that~~ osmotic pressure is proportional to the molarity, C of the solution at a given temperature T.

$\pi = CRT$ ..... (XVII)

π = Osmotic pressure, R = Gas constant

$\pi = (n_2/V)RT$ ..... (XVIII)

V = volume of sol (l), n_2 = moles of solute

w_2 = solute (g)

$n_2 = w_2/M_2$

$\pi V = \frac{w_2 RT}{M_2}$ ..... (XIX) or, $\boxed{M_2 = \frac{w_2 RT}{\pi V}}$ ..... (XX)

Therefore, measurement of osmotic pressure ~~provides~~ determine molar masses of solute, which is widely used to determine molar masses of protein, polymers and other macromolecules.

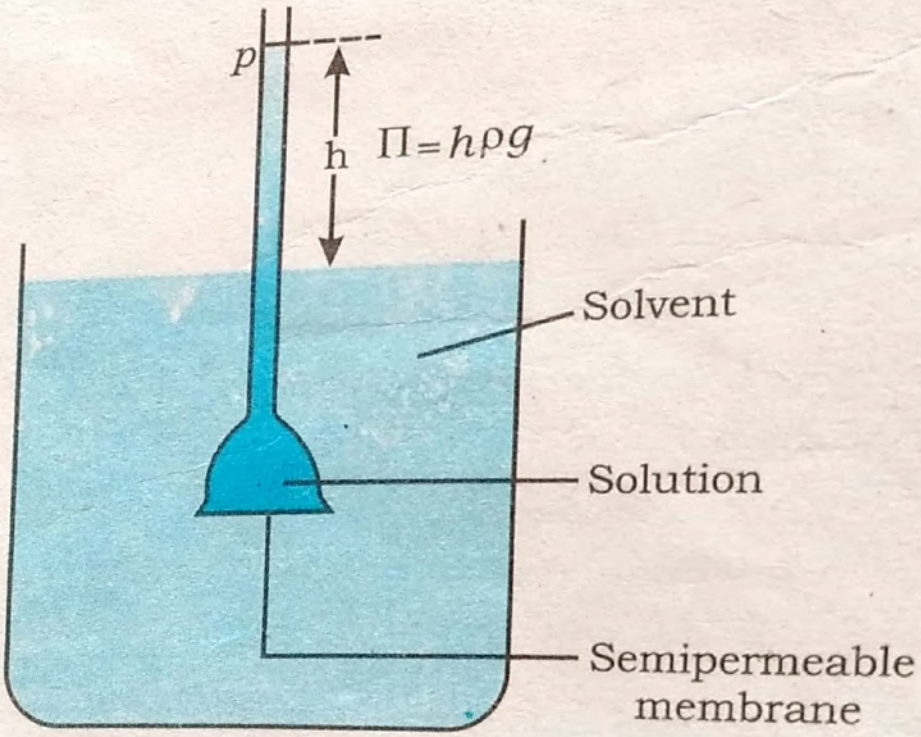

Fig. 2.9
Level of solution rises in the thistle funnel due to osmosis of solvent.

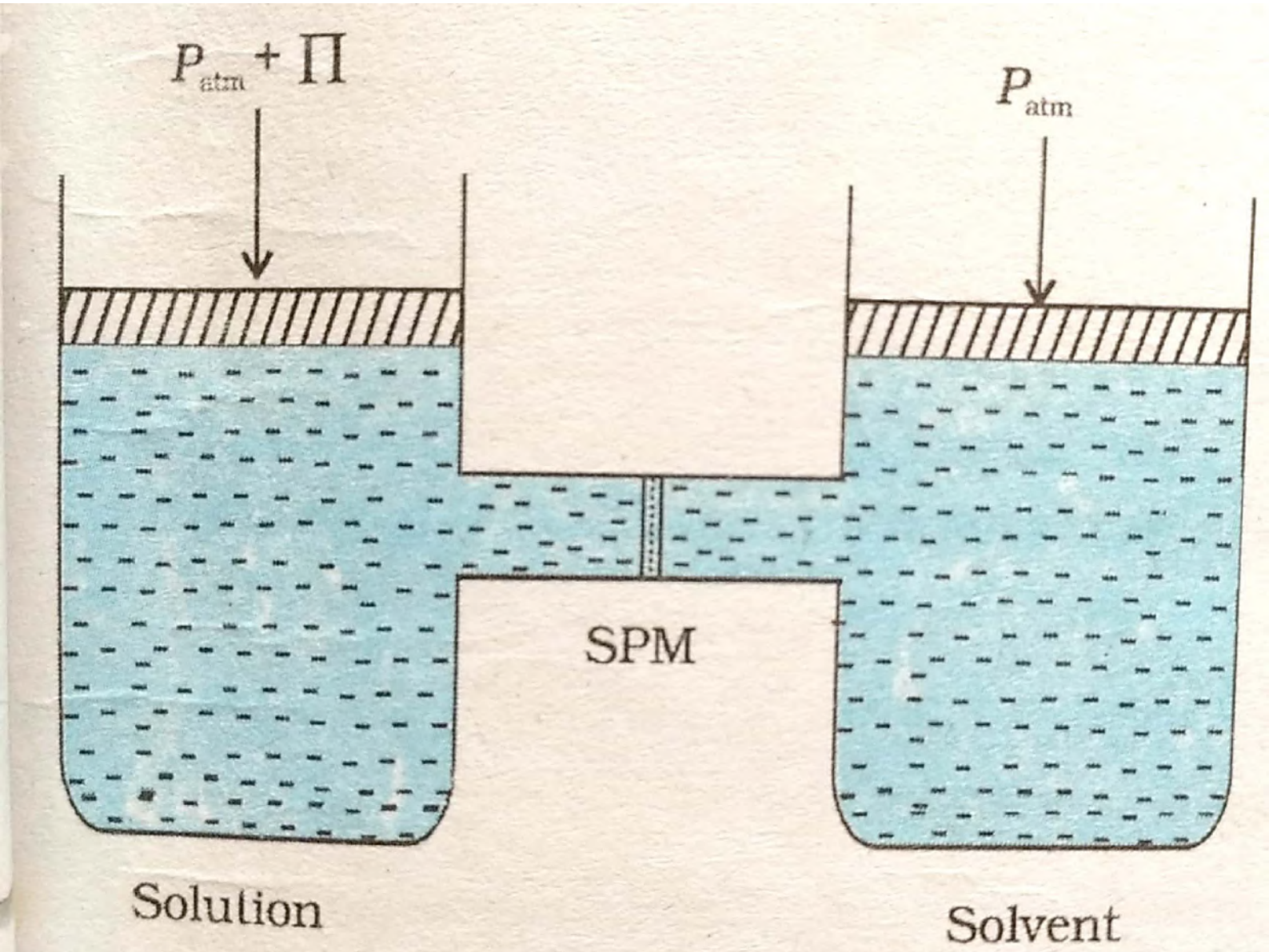

Fig. 2.10: *The excess pressure equal to the osmotic pressure must be applied on the solution side to prevent osmosis.*