

NEET/JEE • CHEMISTRY • SOLUTIONS • UNIT 1.4.3

Vapour Pressure of Solid-in-Liquid Solutions

Medium Weightage

The gateway concept behind all four colligative properties.

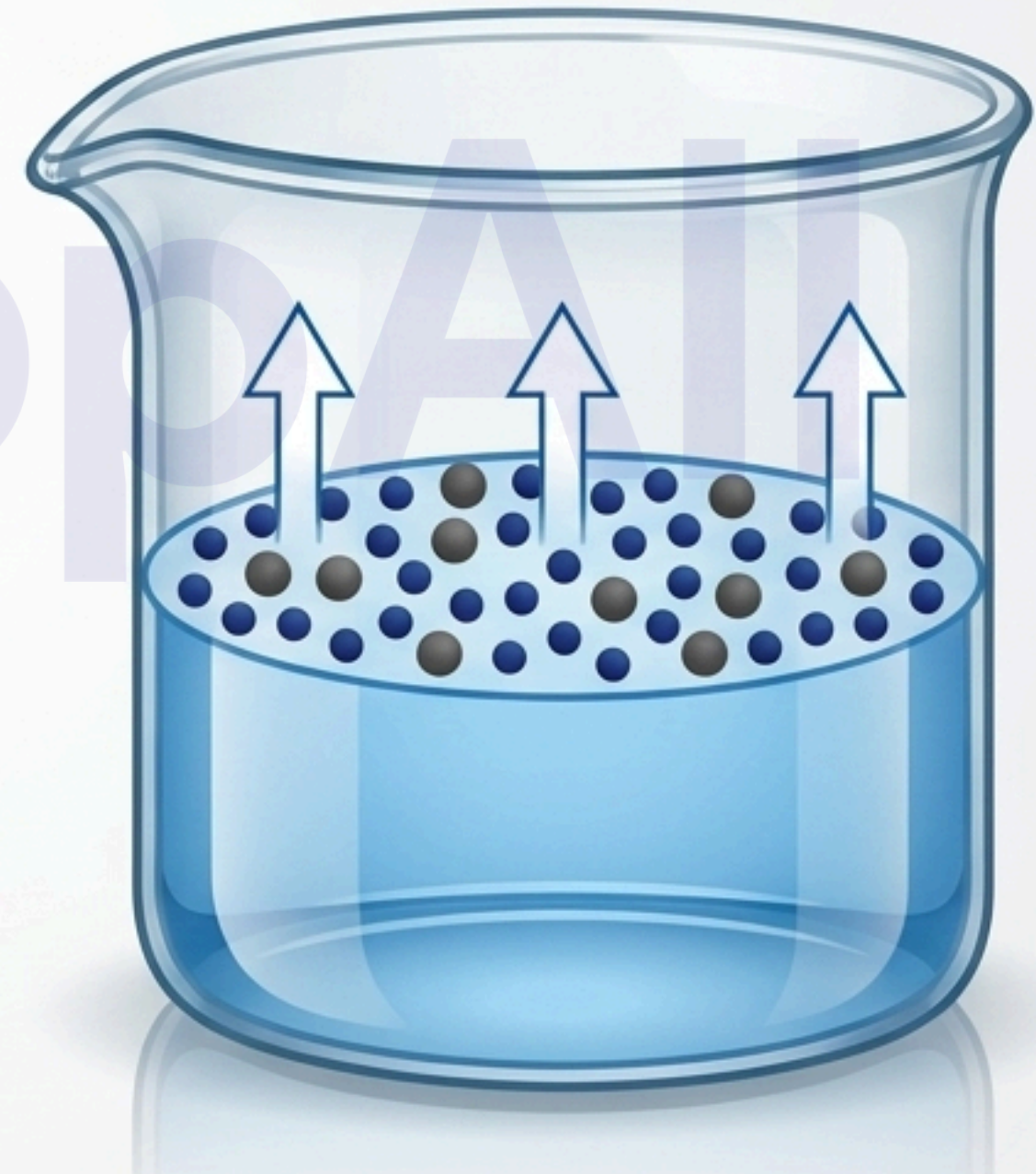
Pure Solvent

Entire surface area is available for volatile solvent molecules to escape.
Higher vapour pressure (p_1°).



Solution (with non-volatile solute)

Solute particles occupy surface area, reducing the fraction of solvent molecules that can escape. Lower vapour pressure (p_1).





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$$E=mc^2$$



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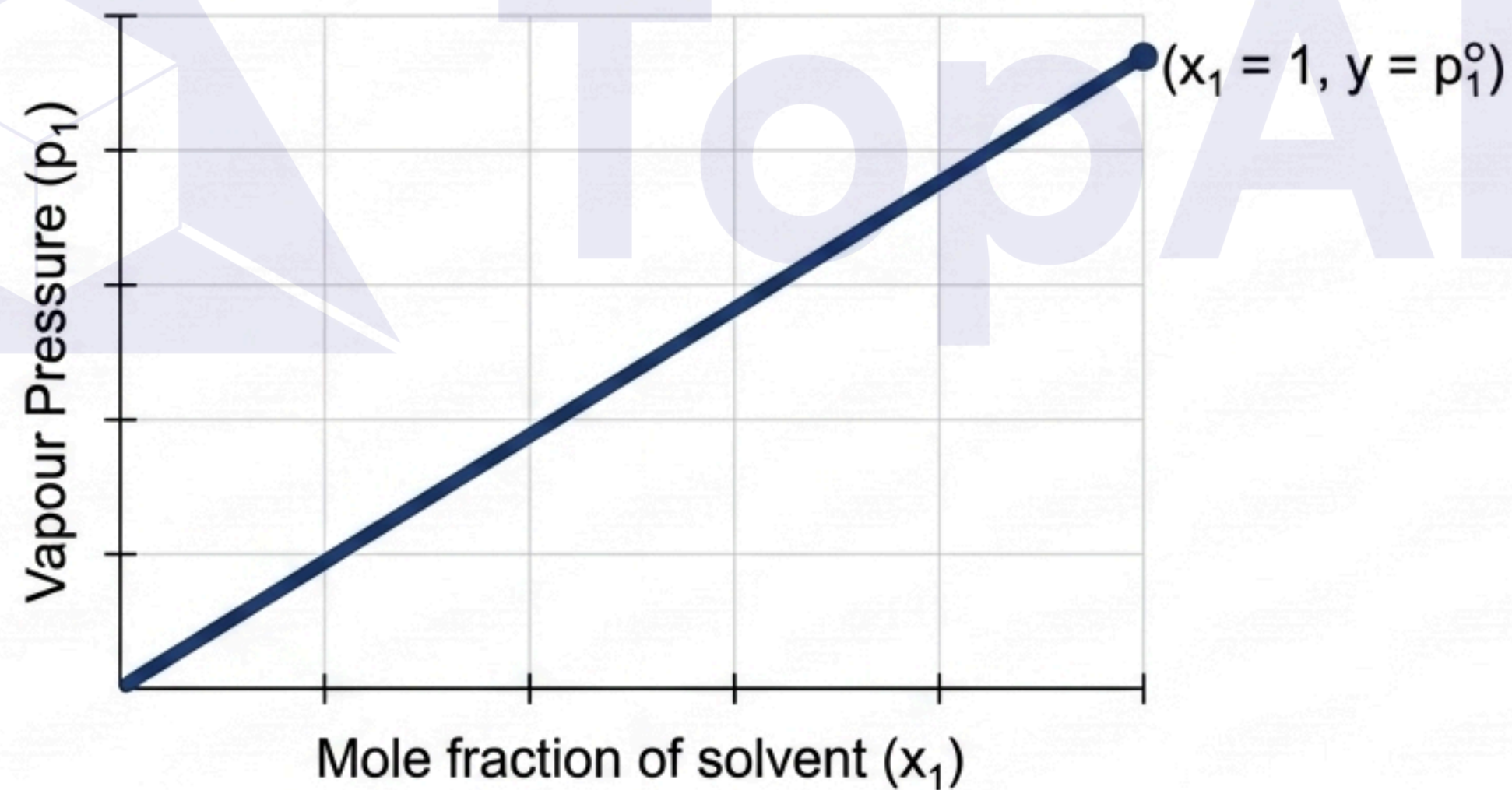
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$$p_1 = x_1 p_1^{\circ}$$

Where p_1 is solution vapour pressure, x_1 is solvent mole fraction, and p_1° is pure solvent vapour pressure.



Why This Matters

The lowering of vapour pressure depends **only on the AMOUNT** of solute added (its mole fraction), and **never on its identity**.

Because it is independent of chemical nature, it is the literal definition of a **colligative property**.

**1 mol sucrose
in 1 kg water**

**1 mol urea
in 1 kg water**



Nearly identical vapour pressure drop.

Proof that chemical identity (sucrose vs. urea)
does not alter the colligative effect.

Key Takeaways

- **Apply** $p_1 = x_1 p_1^\circ$ whenever a calculation involves a non-volatile solute in a volatile solvent.
- **Remember** only solvent molecules exist in the vapour phase and contribute to the measured pressure over these solutions.
- **Connect** this pressure-lowering mechanism directly to the four colligative properties you will calculate next.



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