YAKEEN NEET 2.0

2026

Solutions

Physical Chemistry | **Lecture -08**

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Topics to be covered

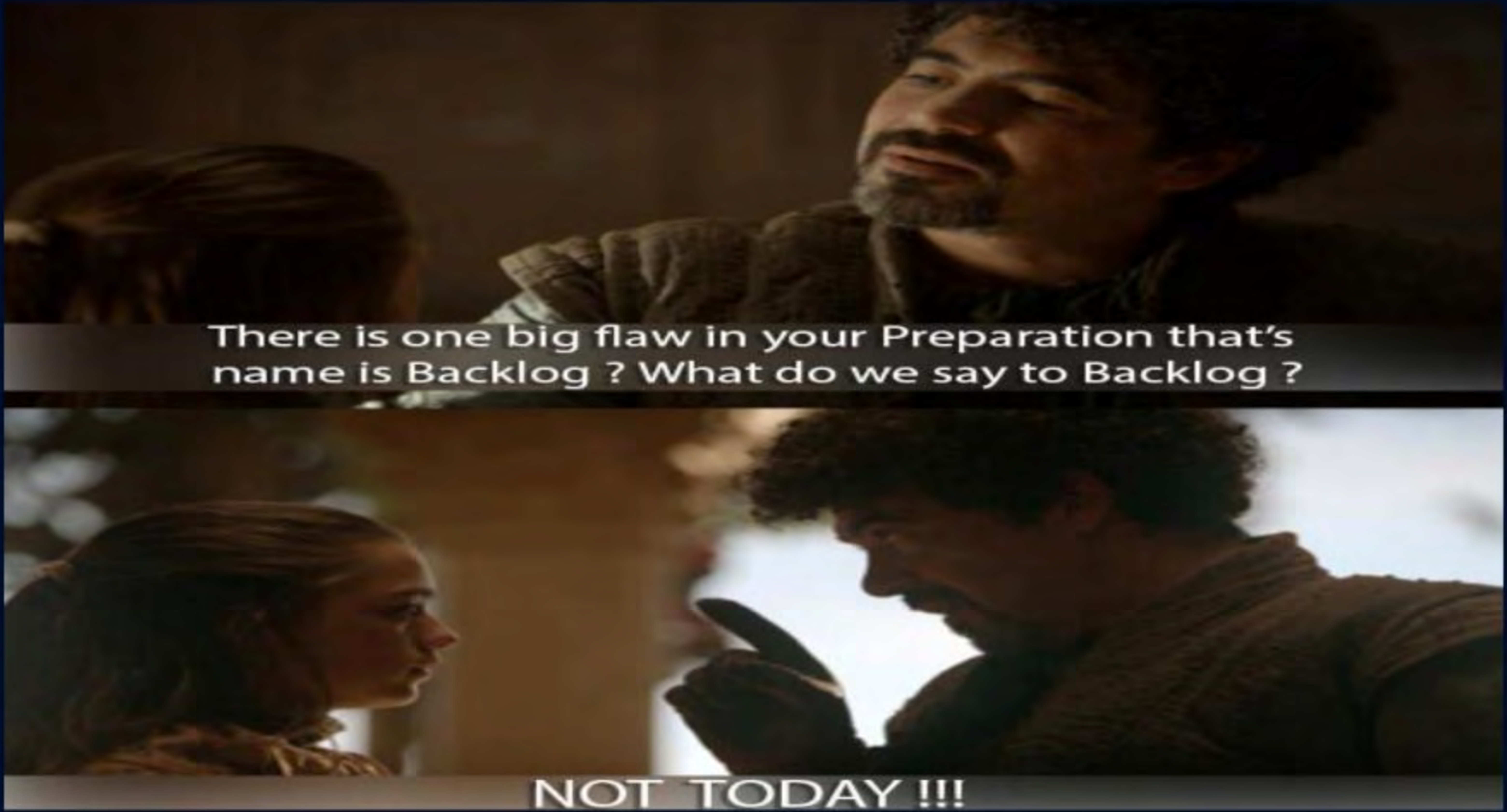
1. Revision of Last Class, Medics test no 10
2. Elevation In Boilin g Point
3. Depression in Freezing Point
4. Magarmach Practice Questions, Home work from modules

Rules to Attend Class

1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your Magarmach Practice Questions.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.

Rules to Attend Class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.


There is one big flaw in your Preparation that's
name is Backlog ? What do we say to Backlog ?
NOT TODAY !!!

MEDICS

Mastery
Checks your grasp over NEET-level concepts

Evaluation
Judging both knowledge and test-smartness

Decision Making
Testing your speed + accuracy under pressure

Intuition
Some answers need gut + logic – can you spot the trick?

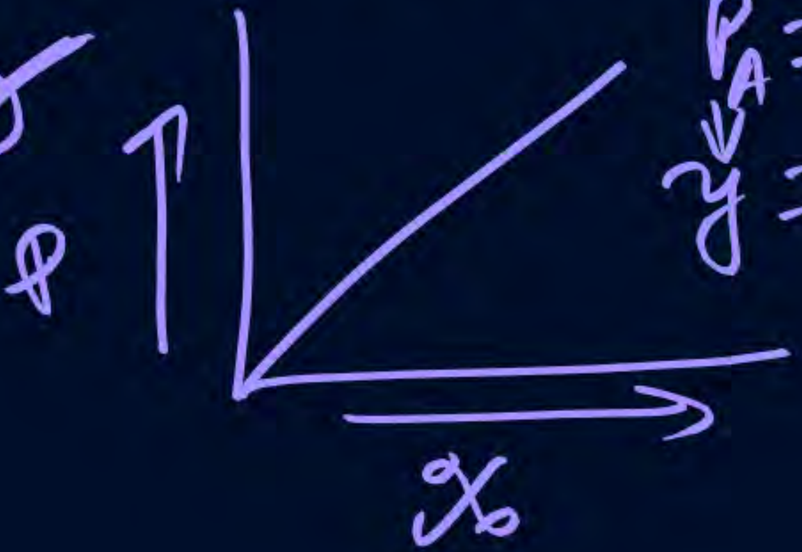
Concepts
It's all about strong basics – no shortcuts here

Strategy

The MEDICS test – built for those who heal, hustle, and hope.

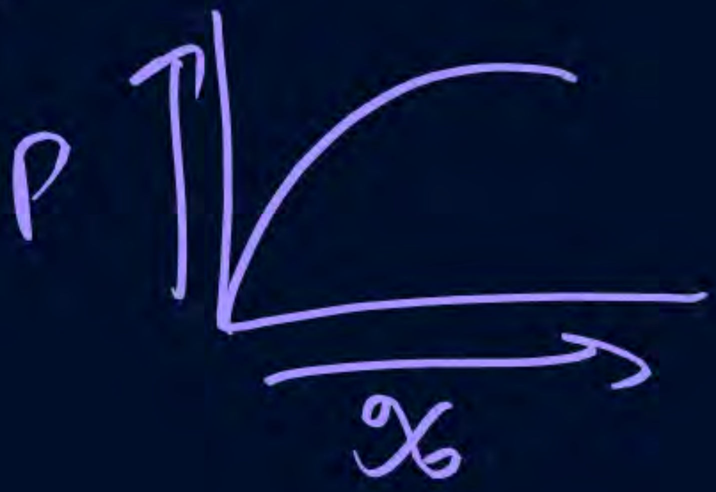
Q/ Henry law represented graphically

(a)



$$p_A = K_H x_A$$
$$y = m x$$

(c)



(b)

(d)

Q2 RLVP of aq. soln of urea is 0.1. find m

(a) 0.612

(b) 6.17

(c) 0.617

(d) 7.16

$$\frac{P^0 - P_s}{P^0} = 0.1 = X_B$$

$$m = \frac{X_B \times 1000}{X_A \times M_A}$$

$$= \frac{0.1 \times 1000}{0.9 \times 18} = \frac{55.55}{9}$$

Q.3 V.P. of CH_3OH is 96 torr find x_{CH_3OH} in solution if Partial P of CH_3OH is 24 torr.

(a) 0.25

(b) 0.75

(c) 0.55

(d) 0.45

$P^0_{CH_3OH} = 96$ torr

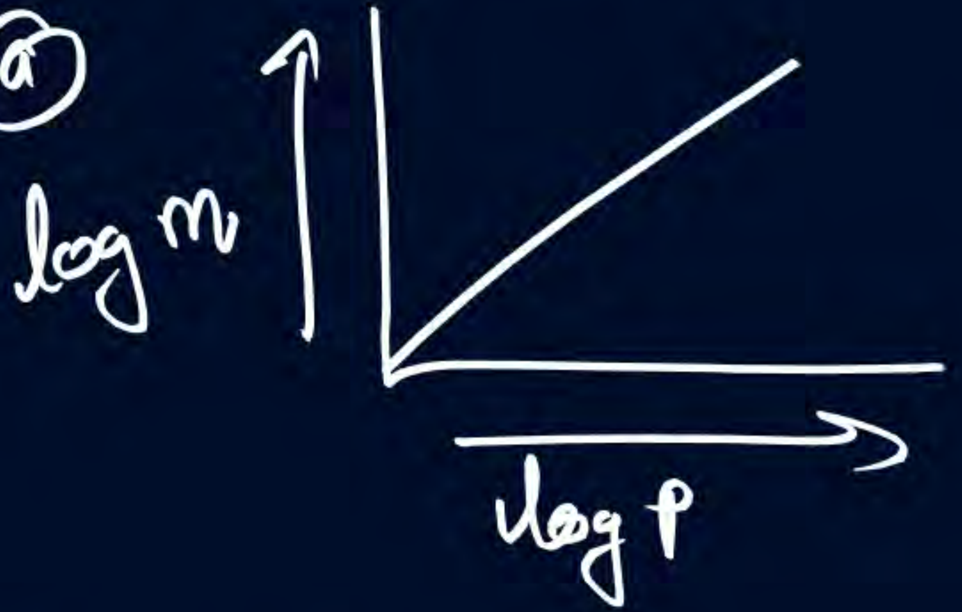
$x_{CH_3OH} = ?$

$P_{CH_3OH} = 24 \text{ torr} = P^0_{CH_3OH} \times x_{CH_3OH} = 96 \times x$

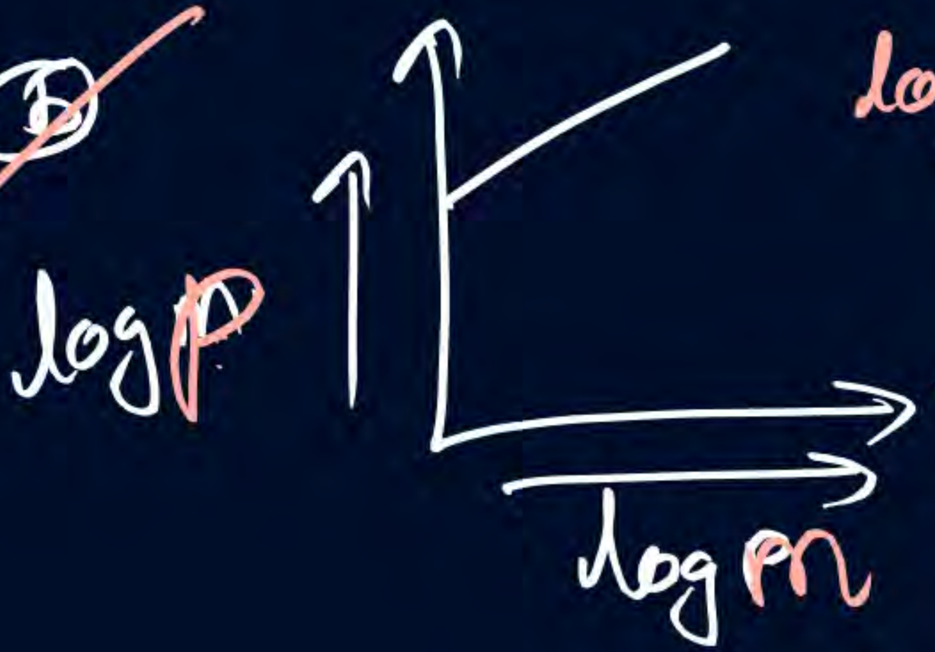
$x = \frac{24}{96} = \frac{1}{4} = 0.25$

Q4 which graph is correct?

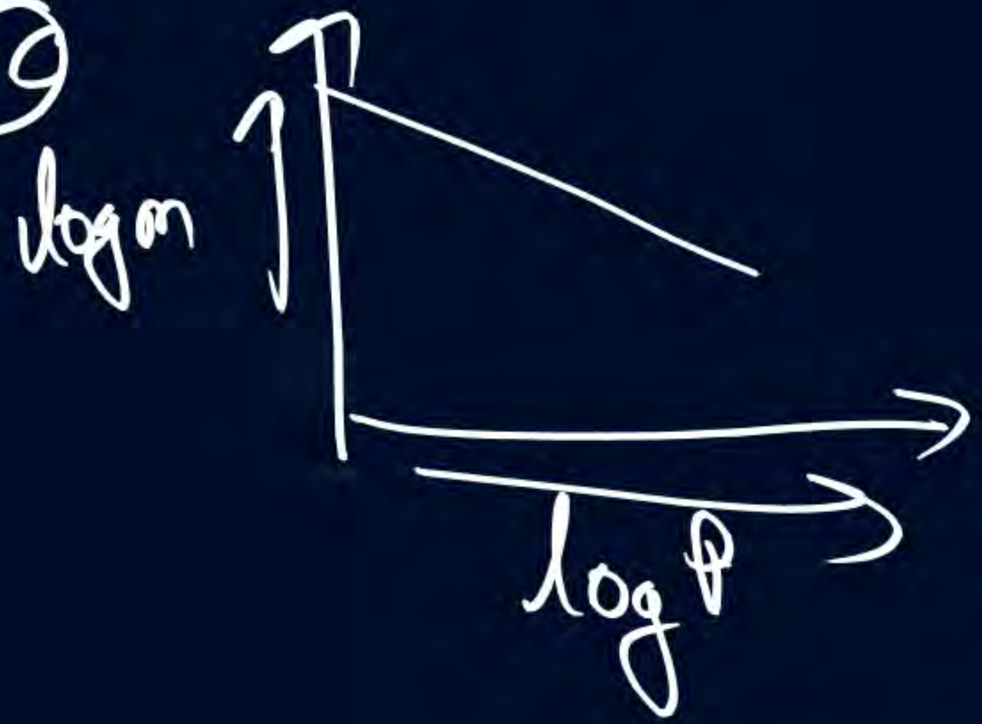
(a)



(b)



(c)



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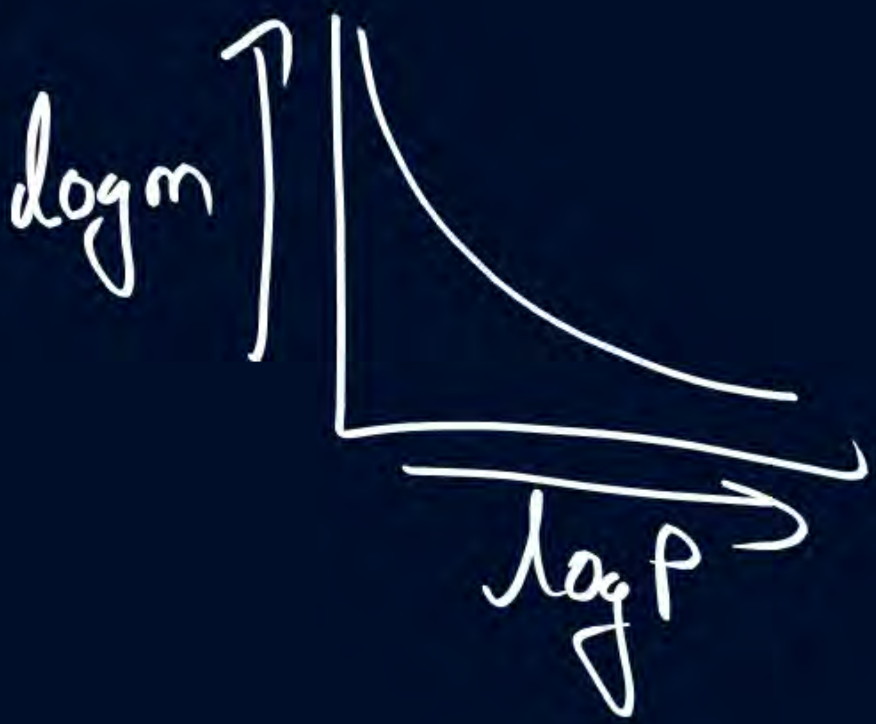


$$P_A = K_H\, m_A$$

$$\log P_A = \log K_H + \log m_A$$

$$y = C + mx$$

Q.5 equal masses of $\underline{CH_4}_{(g)}$ & $O_{2(g)}$ are mixed in an empty vessel. find fraction of total pressure exerted by O_2 is

(a) $\frac{1}{2}$

(b) $\frac{2}{3}$

(c) $\frac{1}{3} \times \frac{273}{298}$

(d) $\frac{1}{3}$ ✓

$w_{CH_4} = w_{O_2} = 32g$

$M_{CH_4} = 16g$

$M_{O_2} = 32g$

$n_{O_2} = \frac{32}{32} = 1$

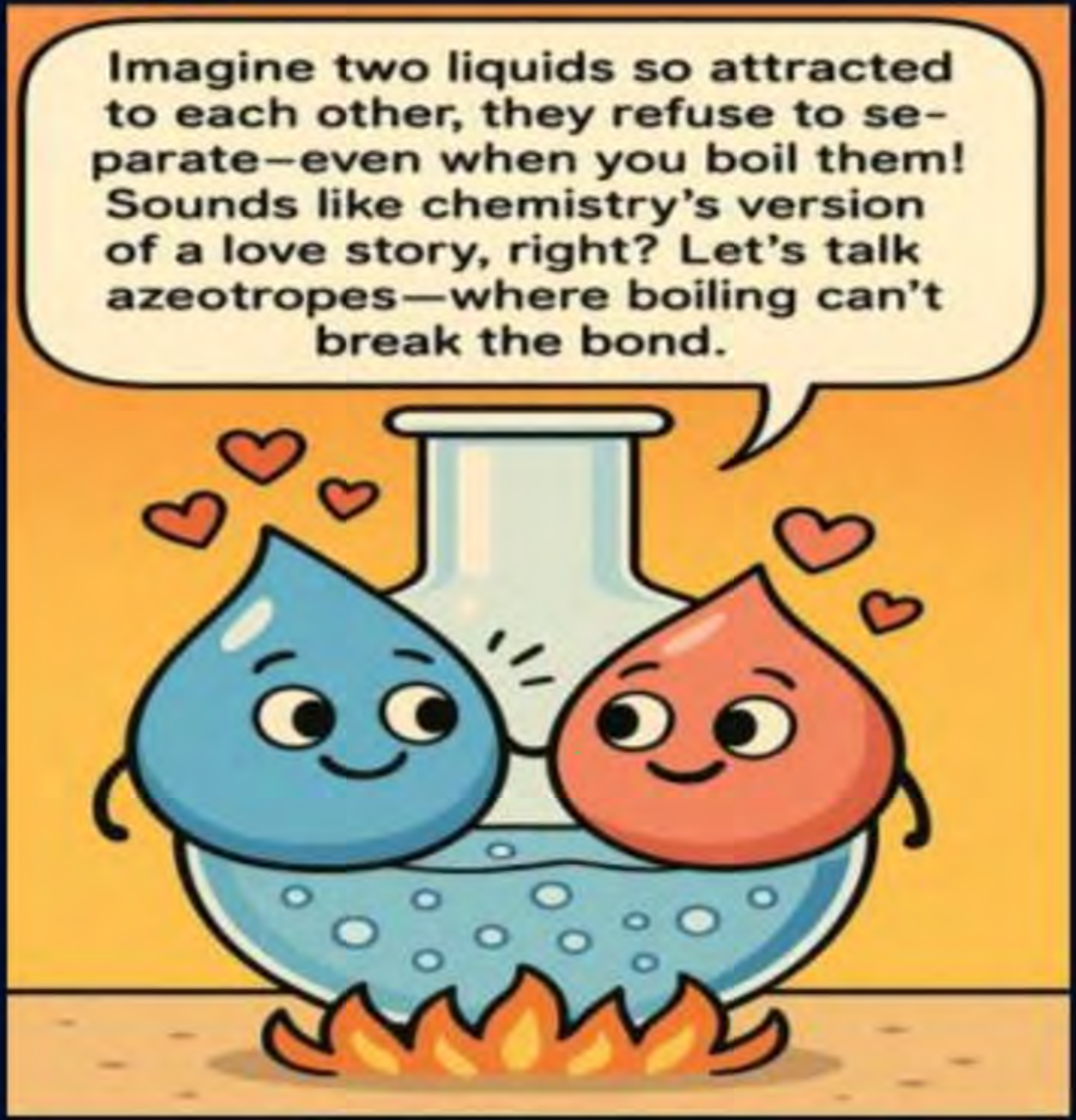
$n_{CH_4} = \frac{32}{16} = 2$

$\frac{P_{O_2}}{P_T} = \chi_{O_2} = \frac{n_{O_2}}{n_{O_2} + n_{CH_4}} = \frac{1}{3}$

$P_{O_2} = \chi_{O_2} \times P_T$

$$P_S = P_A^0 x_A + P_B^0 x_B$$

Revision of Last class

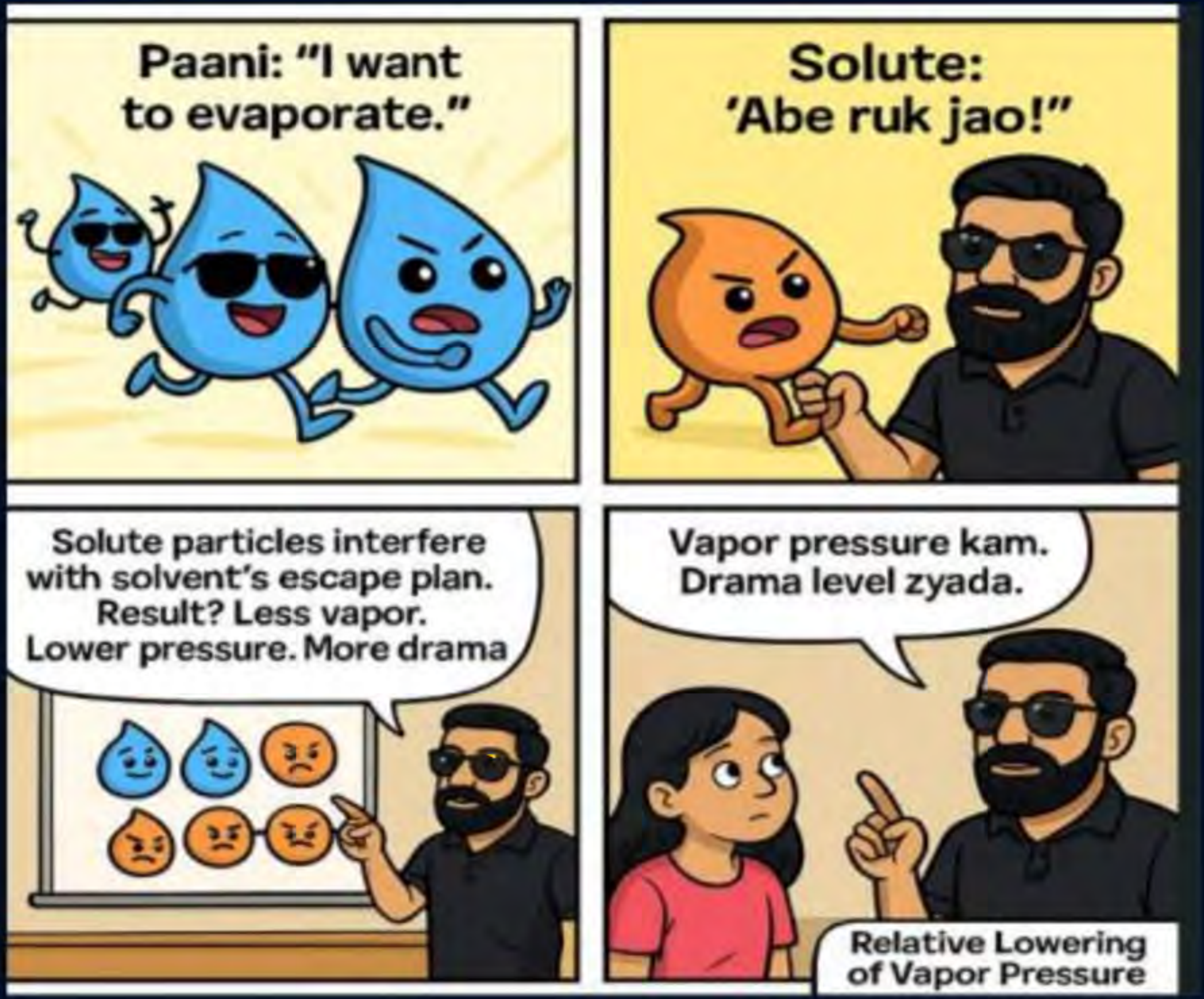


Relative Lowering of Vapor Pressure (RLVP)

$\frac{p^o - p_s}{p^o} = \chi_B$

if $n_A + n_B \approx n_A$

sol^n dilute or $\leq 5\%$



$$\frac{P^{0}-P_{S}}{P^{0}}=\frac{n_B}{n_A}$$

$$\frac{P^{0}-P_{S}}{P_{S}}=\frac{n_B}{n_A}=\frac{m\times M_A}{1000}$$

Elevation in Boiling Point (ΔT_b)

On addition of non-volatile solute to volatile solvent, vapor pressure decreases & Boiling point increases.

$\Delta T_b = T_b - T^{\circ}$

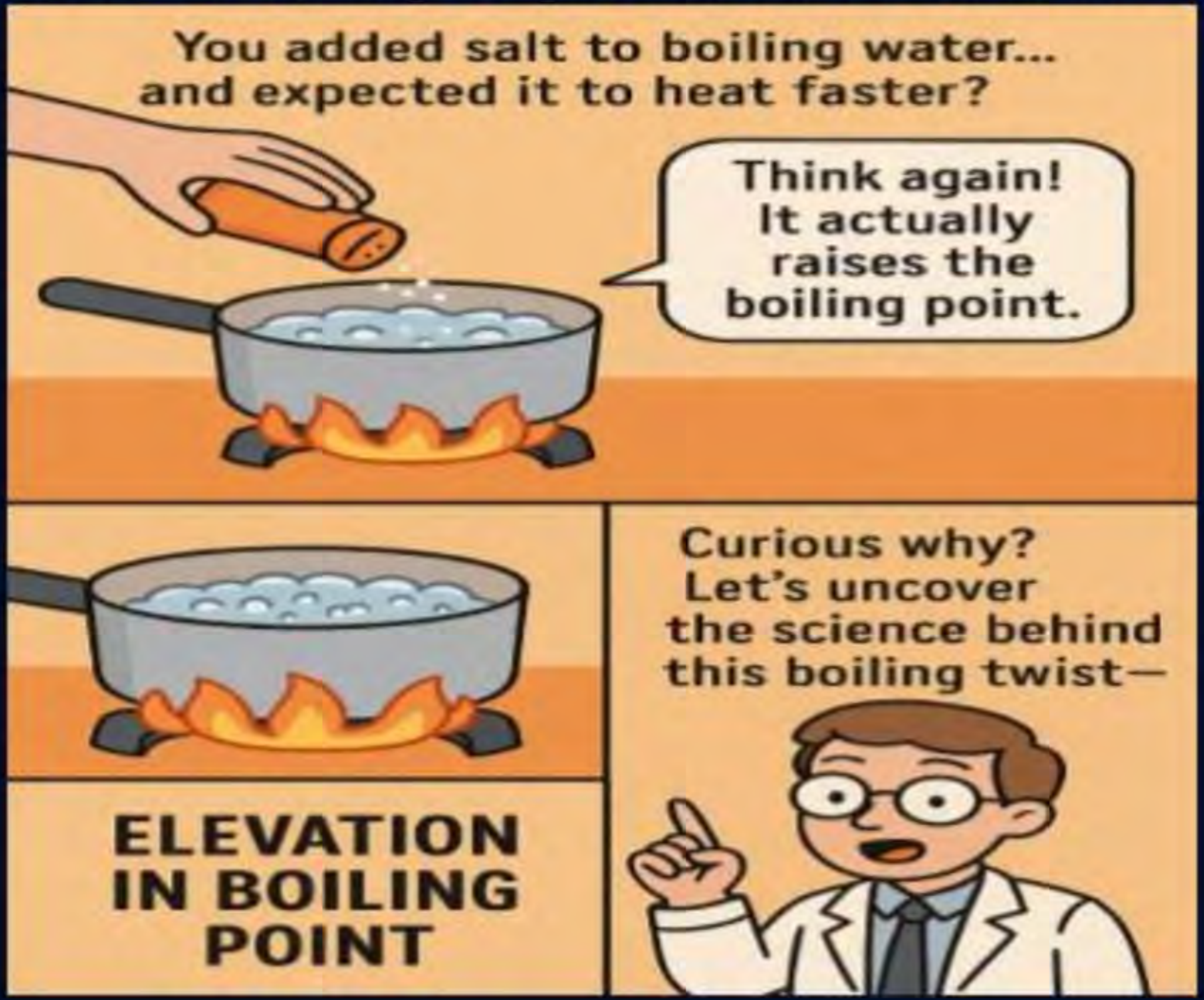
B.Pt. sol^n — B.Pt. solvent

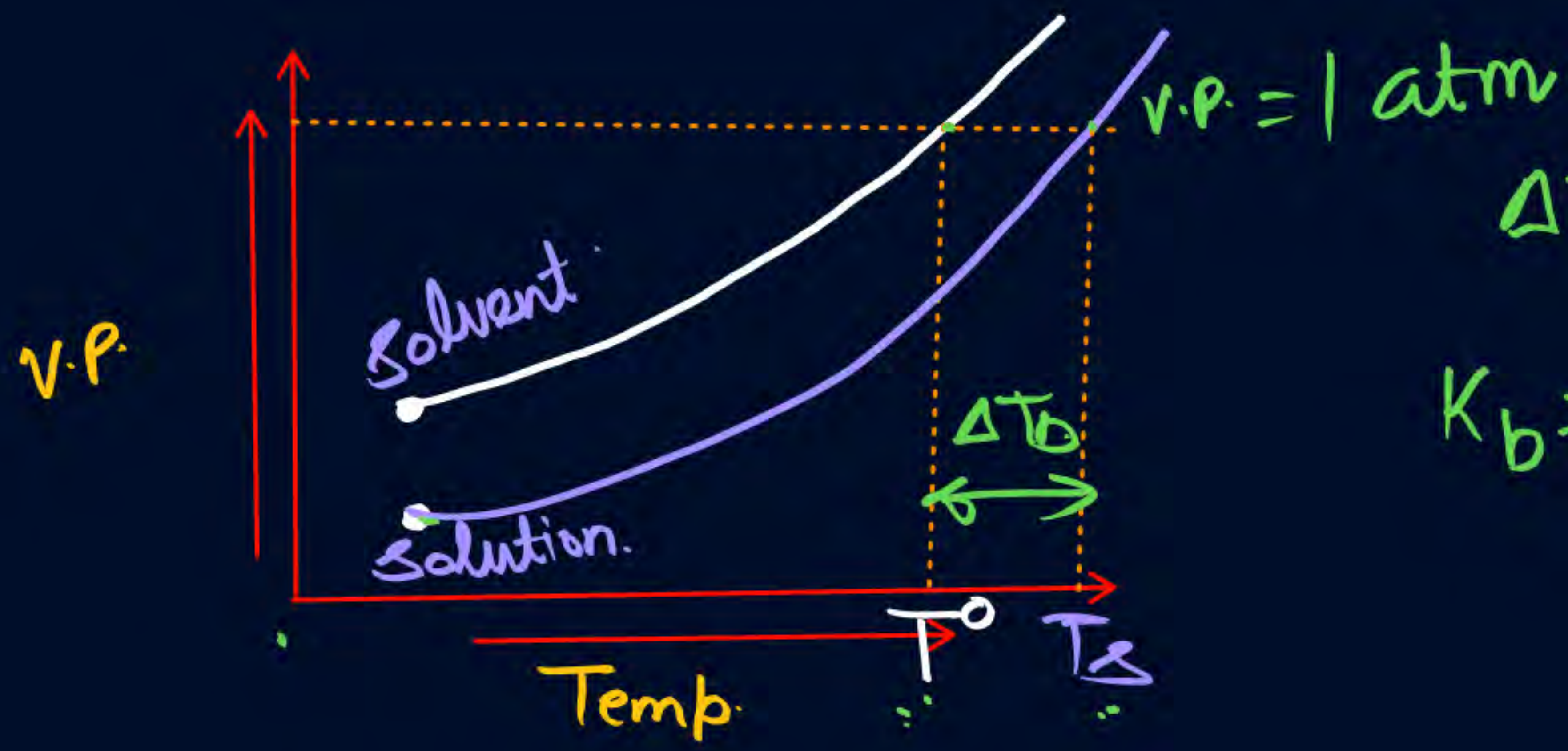
diff. in Temp ⇒ °C = K both same.

27°C 300 K

30°C 303 K

$\Delta T = 3°C = 3K$





$\Delta T_b = K_b\, m$

K_b = molal elevation Constt. or ebulliscopic Constt. → depend on solvent.

ΔT_b = elevation in B.Pt. $= T_s - T^0$

$\Delta T_b \propto \underline{m}$

Define K_b & it's Units

$\Delta T_b = K_b\, m \Rightarrow$ unit of $K_b = K\,Kg/mol$

for $m = 1$ molal

$\Delta T_b = K_b$

$$K_b = \frac{R\,T^{o2}}{1000\, l_{vap}}$$

$R = 8.314\ J K^{-1} mol^{-1} \approx \frac{25}{3} J K^{-1} mol^{-1}$

T^o = B.Pt. of solvent.

l_{vap} = latent heat of Vaporisation.

Enthalpy of Vaporisation ($\Delta H_{vap.}$)

$\Delta H_{vap.}$ = Heat req. to convert 1 mole of liquid to vapour.

$\hookrightarrow$ J/mol

$l_{vap.}$ = ~~~~~~~~~~ 1 g ~~~~~~~~~~

$\hookrightarrow$ J/g

$\Delta H_{vap} = l_{vap.} \times M_A \Rightarrow l_{vap.} = \frac{\Delta H_{vap.}}{M_A}$

$l_{vap.} = \frac{\Delta H_{vap.}}{M_A}$

$K_b = \frac{R T^{o2} M_A}{1000\, \Delta H_{vap}}$

QUESTION

On mixing 3 g of non-volatile solute in 200 mL of water, its boiling point becomes 100.52°C. If K_b for water is 0.6 K kg/mol then molecular weight of solute is

(A) $105\ g\ mol^{-1}$

(B) $12.6\ g\ mol^{-1}$

(C) $15.7\ g\ mol^{-1}$

(D) $17.3\ g\ mol^{-1}$

$w_B = 3g$

$M_B = ?$

$V_{H_2O} = 200 ml$

$d_{H_2O} = 1 g/ml$

$w_A = 200 g$

$T_s = 100.52°C$

$K_b = 0.6\ K\ Kg/mol$

$\Delta T_b = T_b - T^0$

$= 100.52 - 100$

$= 0.52\ K$

$$\Delta T_b = \frac{K_b\ w_B \times 1000}{M_B \times w_A}$$

$$M_B = \frac{0.6 \times 3 \times 1000}{0.52 \times 200} = \frac{900}{52} = 17.3\ g/mol$$

QUESTION

$\uparrow \Delta T_b$

Which has maximum elevation in boiling point out of 1% aqueous solution of each (molar mass given in bracketts)

I. Urea (60)

II. Glucose (180)

III. Sucrose (342)

IV. Pentose (150)

(A) I

$\uparrow \Delta T_b = \dfrac{K_b\, w_B \times 1000}{\downarrow M_B \times w_A}$

(B) II

(C) III

(D) IV

QUESTION

Which of the following is a constant quantity ?

(A) $\frac{\Delta T_b}{K_b}$ ✗

(B) $m\Delta T_b$

(C) $\frac{\Delta T_b}{m}$ ✓

(D) $K_b m$

$\Delta T_b = K_b m$

$\frac{\Delta T_b}{K_b} = m$

$\frac{\Delta T_b}{m} = \underline{K_b}$

QUESTION

B ↑ (sulphur) A ↑ (Benzene)

On dissolving 3.24 g of sulphur in 40 g of Benzene, Boiling point of solution was higher than that of Benzene by 0.81 K. K_b value for Benzene = 2.53 K kg/mol. Calculate molecular formula of Sulphur.

Ans $w_B = 3.24g$ S_x $x = \frac{M_B}{G.A.M.} = \frac{253}{32} \approx 8$ G.A.M of S = 32 g/mol

$w_A = 40g$ ∴ formula Sulphur = S_8

$\Delta T_b = 0.81K$ $\Delta T_b = K_b\, m$

$K_b = 2.53\ K/m$ $0.81 = \frac{2.53 \times 3.24 \times 1000}{M_B \times 40}$

$M_B = 253\ g/mol$

QUESTION

The latent heat of vaporization of a liquid of molar mass, 80 g/mol and boiling point, 127°C is 8 kcal/mol. The ebullioscopic constant of the liquid is:

(A) 3.2

(B) 0.04

(C) 0.32

(D) 0.52

$\Delta H_{vap} = l_{vap} = 8\ K\ Cal/mol$

$= 8000\ Cal/mol$

$M_A = 80g$

$T^0 = 127°C$

$R \approx 2\ Cal\ K^{-1} mol^{-1}$

$$K_b = \frac{RT^{0^2}}{1000\, l_{vap}} = \frac{RT^{0^2} M_A}{1000\, \Delta H_{vap}}$$

$$K_b = \frac{2 \times (127)^2 \times 80}{1000 \times 8000}$$

QUESTION-(JEE main 27th July 1st Shift-2022)

Boiling point of a 2% aqueous solution of a non-volatile solute A is equal to the boiling point of 8% aqueous solution of a non-volatile solute B. The relation between molecular weights of A and B is:

(A) $M_A = 4M_B$

(B) $M_B = 4M_A$

(C) $M_A = 8M_B$

(D) $M_B = 8M_A$

solute

solute

2%

2g solute

100g soln

$M_A = ?$

$T_s = T_s'$

$T^0 = T^0$

$\Delta T_b = \Delta T_b'$

$\cancel{K_b} m = \cancel{K_b} m'$

$\frac{\cancel{2} \times \cancel{1000}}{M_A \times 98} = \frac{\cancel{8}\,4 \times \cancel{1000}}{M_B \times 92}$

$\frac{M_B}{M_A} = \frac{4 \times 98}{92}$

$\Delta T_b = T_s - T^0$

8%

8g solute 100g soln

$M_B = ?$

$\Rightarrow M_B \approx 4 M_A$

QUESTION-(JEE main 10th April 2nd Shift-2019)

1 g of a non-volatile non-electrolyte solute is dissolved in 100 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 5. The ratio of the elevation in their boiling points, $\frac{\Delta T_b(A)}{\Delta T_b(B)}$ is

(A) 5 : 1

(B) 1 : 0.2

(C) 10 : 1

(D) 1 : 5

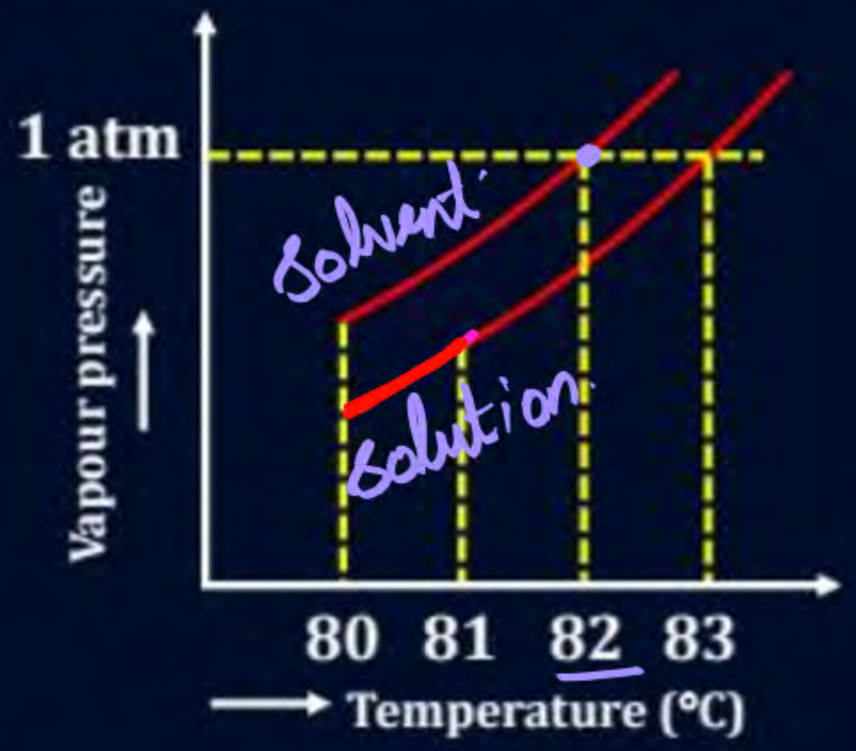
$$\frac{(\Delta T_b)_A}{(\Delta T_b)_B} = \frac{(K_b)_A \cancel{m_A}}{(K_b)_B \cancel{m_B}}$$

$m_A = m_B$

$$= \frac{1}{5}$$

QUESTION-(JEE Mains 8th April 1st Shift 2023)

The vapour pressure *vs* temperature curve for a solution solvent system is shown below:



The boiling point of the solvent is 82 °C.

Normal Freezing Point

$T = 0^\circ C$

& $P = 1\,atm$

Ice $H_2O(s)$

$H_2O(l)$

Solid $\rightleftharpoons$ Liquid

Temperature at which rate of melting of solid is equal to rate of freezing of liquid are same.

Depression in Freezing Point (ΔT_f)

#MFT

① On addition of n.v.s. ⇒ V.P. ↓ ∴ f.Pt. ↓

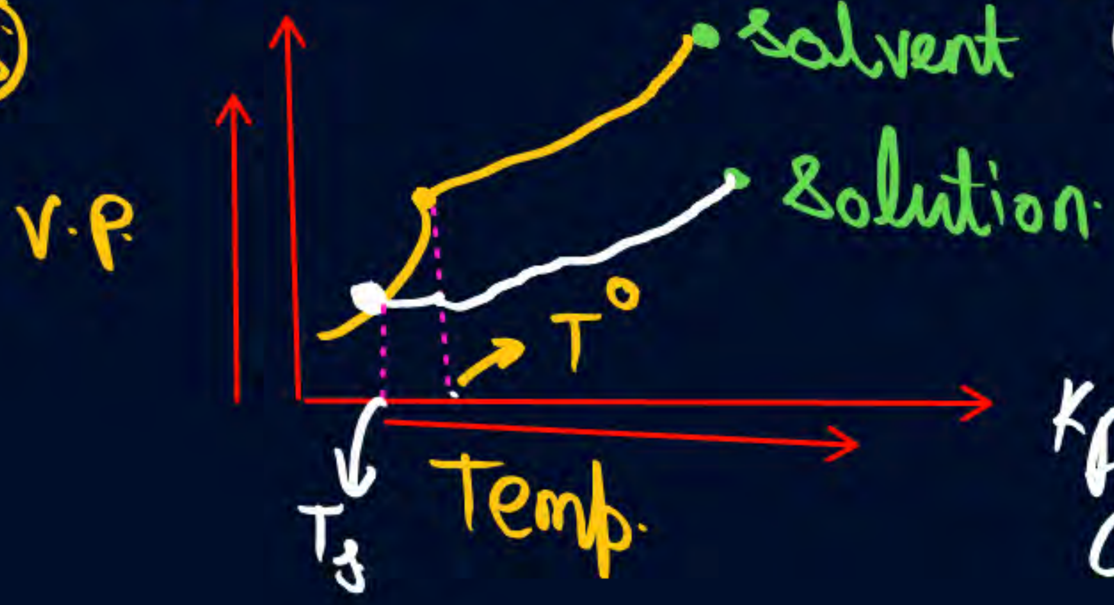
T° ↑ — Solvent f.Pt.

T_s ↓ — Solution f.Pt.

② $\Delta T_f = T^{\circ} - T_s$

ΔT_f — Depression in f.Pt. same as °C & K

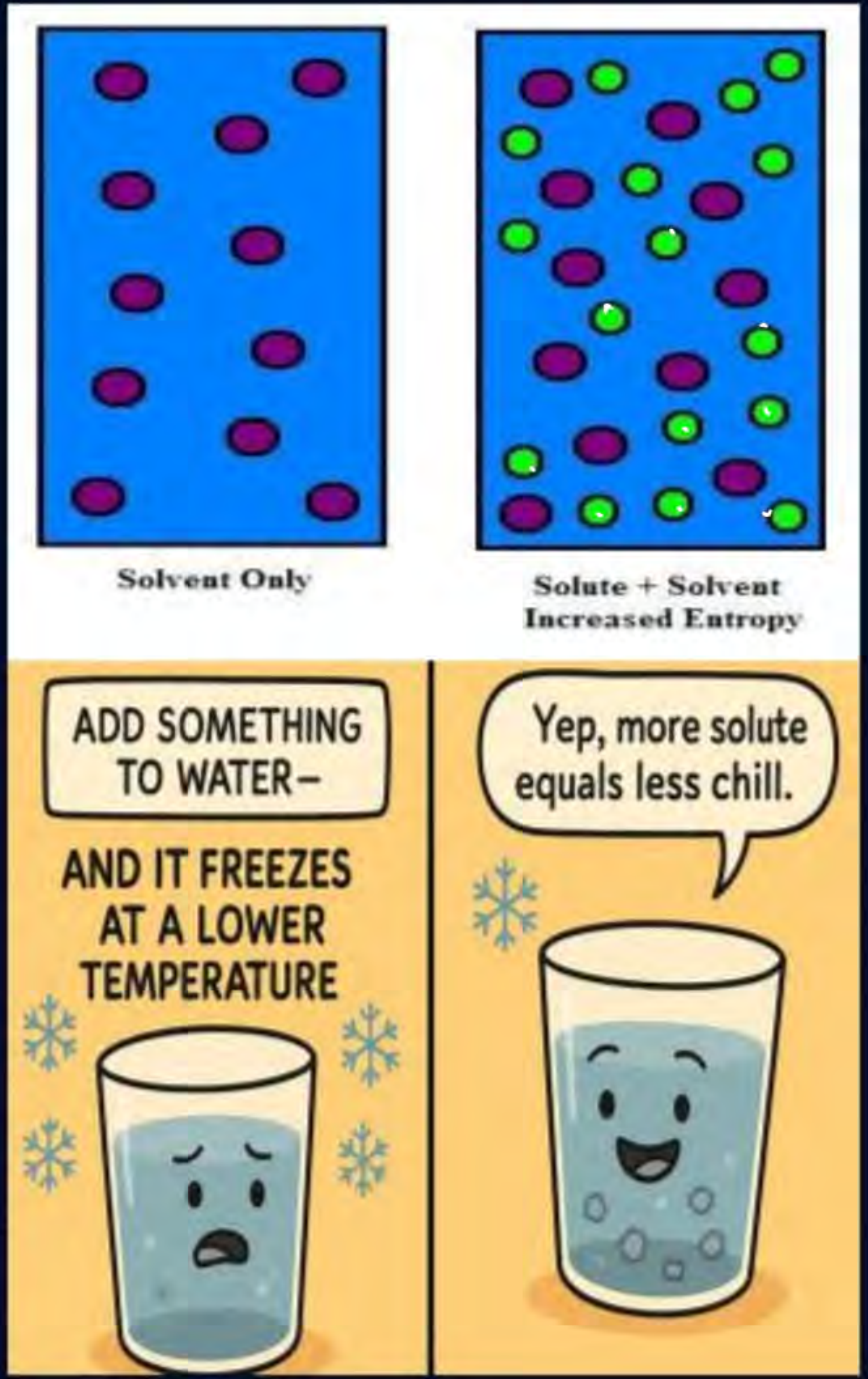
③



④ $\Delta T_f \propto m$ ✓

$\Delta T_f = K_f\, m$

K_f = molal depression Constt. or Cryoscopic Constt.



Define K_f

for 1 molal solution.

$$\Delta T_f = K_f$$

unit of $K_f = K\ Kg\ mol^{-1}$

K_f depend on solvent.

$$K_f = \frac{RT^{o2}}{1000\, l_{fusion}} = \frac{RT^{o2} M_A}{1000\, \Delta H_{fusion}}$$

$$\Delta H_{fusion} = l_{fusion} \times M_A$$

$$l_{fusion} = \frac{\Delta H_{fusion}}{M_A}$$

l_{fusion} = latent heat of fusion $\rightarrow$ Heat to convert 1g solid to liquid

ΔH_{fusion} = enthalpy of fusion $\rightarrow$ ~~~~~ 1mole ~~~~


Nobody:-
Literally Nobody:-
*Le Boiling and Freezing Points when You add any Solute in a Solvent
Maaf karna.. gusse me idhar udhar nikal jaata hu

QUESTION

Question Explain rast Method.

Applications of Depression in Freezing Point

2 Page

QUESTION – (AIIMS 2018, 27 May)

Assertion (A): A non volatile solute is added in liquid solvent then freezing point of mixture decreases.

Reason (R): Vapour pressure decreases by addition of non volatile solute, so equilibrium point where V.P. of solid and V.P. of liquid are equal can reach at lower temperature.

(A) If both assertion and reason are correct and reason is correct explanation of assertion.

(B) If both assertion and reason are correct but reason is not correct explanation of assertion.

(C) If Assertion is correct but reason is incorrect.

(D) If both the assertion and reason are incorrect.

QUESTION (NEET 2017)

If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be

(A) halved

(B) tripled

(C) Unchanged

(D) doubled

QUESTION – (NEET 2020)

The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is: (rounded off upto two decimal places)

(A) 0.80 K

(B) 0.40 K

(C) 0.60 K

(D) 0.20 K

QUESTION – (AIIMS 2018, 27 May)

Ethylene glycol is used as an antifreeze to reduce freezing point of water to –2.4°C. What mass of antifreeze is required for 2 L water? (K_f water = 1.86 K kg/mol)

(A) 16 kg

(B) 160 g

(C) 1.60 kg

(D) 16 g

QUESTION

Pure benzene freezes at 5.45°C. A 0.374 m solution of tetrachloroethane in benzene freezes at 3.55°C. The K_f (°C/ m) for benzene is

(A) 0.508

(B) 5.08

(C) 50.8

(D) 508

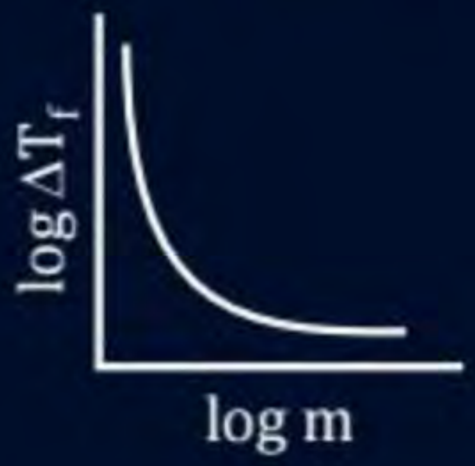
QUESTION

Graphical variation of $\log(\Delta T_f)$ with $\log(m)$ for a dilute solution is (ΔT_f is depression in freezing point and mis the molality)

(A)


(B)


(C)


(D)


QUESTION

If in previous Question, straight line is inclined at 45° and intercept on log ΔT_f axis is 0.27, then depression in freezing point of 1.10 molal solution is

(A) 0.27°

(B) 2.0°

(C) 0.2°

(D) 3.0°

QUESTION – (AIIMS 2018, 26 May)

When 45 g solute is dissolved in 600 g water, freezing point is lowered by 2.2 K, calculate molar mass of solute (K_f = 1.86 K kg mol^{-1})

(A) 63.4 g/mol

(B) 80 g/mol

(C) 90 g/mol

(D) 21 g/mol

QUESTION-(JEE main 25th July 2nd Shift-2022)

Two solution A and B are prepared by dissolving 1 g of non-volatile solutes X and Y, respectively in 1 kg of water. The ratio of depression in freezing points for A and B is found to be 1 : 4. The ratio of molar masses of X and Y is:

(A) 1 : 4

(B) 1 : 0.25

(C) 1 : 0.20

(D) 1 : 5

QUESTION – (AIIMS 2016)

A solution containing 1.8 g of a compound (empirical formula CH_2O) in 40 g of water is observed to freeze at –0.465°C. The molecular formula of the compound is: [K_f of water = 1.86 kg K mol^{-1}]

(A) $C_2H_4O_2$

(B) $C_3H_6O_3$

(C) $C_4H_8O_4$

(D) $C_6H_{12}O_6$

QUESTION – (AIPMT 2004)

Camphor is often used in molecular mass determination because

A) it is readily available

B) it has a very high cryoscopic constant

C) it is volatile

D) it is solvent for organic substances

QUESTION

A motor vehicle radiator was filled with 8 L of water to which 2 L of methyl alcohol (density 0.8 g/ml) were added. What is lowest temperature at which vehicle can be parked outdoors without a danger that water in radiator will freeze? (K_f for H_2O = 1.86 K kg mal^{-1})

QUESTION-(JEE main 9th Jan 2nd Shift-2019)

A solution containing 62 g ethylene glycol in 250 g water is cooled to –10°C. If K_f for water is 1.86 K kg mol^{-1}, the amount of water (in g) separated as ice is:

(A) 64

(B) 32

(C) 16

(D) 48

QUESTION-(JEE main 10th Jan 2nd Shift-2019)

Elevation in the boiling point for 1 molal solution of glucose is 2 K. The depression in the freezing point for 2 molal solution of glucose in the same solvent is 2 K. The relation between K_b and K_f is:

(A) $K_b = 1.5\ K_f$

(B) $K_b = 0.5\ K_f$

(C) $K_b = 2\ K_f$

(D) $K_b = K_f$

QUESTION-(JEE main 12th Jan 1st Shift-2019)

freezing point of a 4% aqueous solution of X is equal to freezing point of 12% aqueous solution of Y. If molecular weight of X is A, then molecular weight of Y is:

(A) 2A

(B) 3A

(C) A

(D) 4A

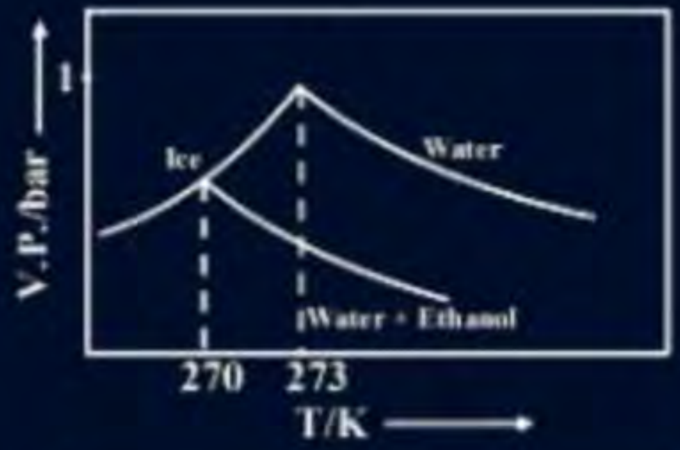
QUESTION-(JEE Advance 2017)

Pure water freezes at 273 K and 1 bar. The addition of 34.5 g of ethanol to 500 g of water changes the freezing point of the solution. Use the freezing point depression constant of water at 2 K kg mol^{-1}. The figures shown below represent plots of vapour pressure (V.P.) versus temperature (T).

[Molecular weight of ethanol is 46 g mol^{-1}]

Among the following, the option representing change in freezing point is

(A)



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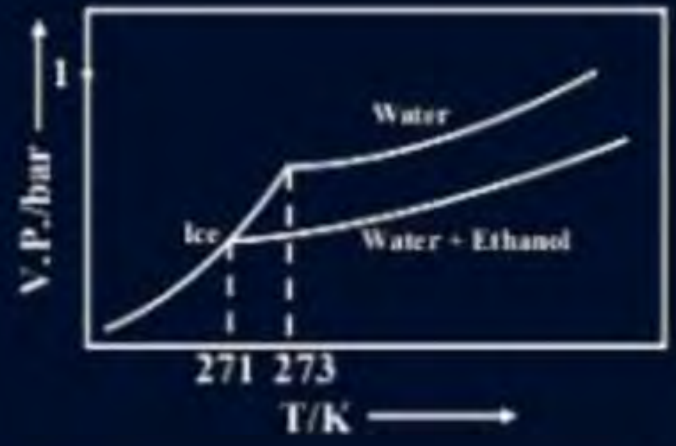

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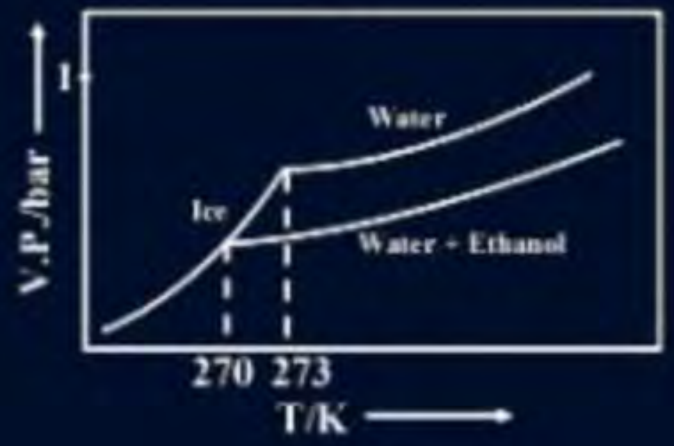
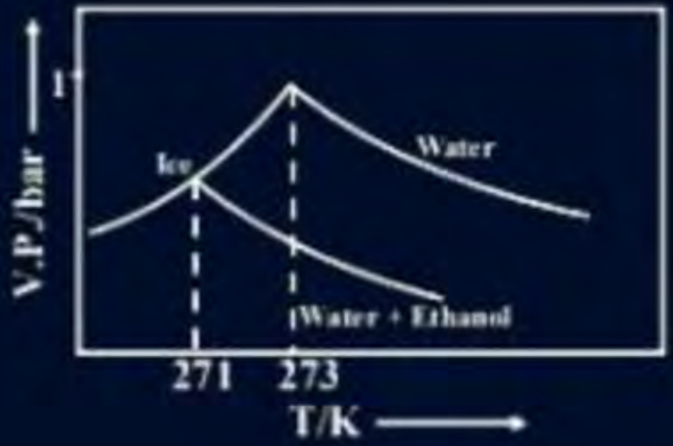


(D)



QUESTION

Two elements A & B form compounds having molecular formula AB_2 & AB_4. When dissolved in 20g of benzene 1g of AB_2 lowers the freezing point by 2.3 K. Whereas 1g of AB_4 lowers the freezing point by 1.3 K. Determine atomic masses of A & B. The molal depression Constant for benzene is 5.1 K Kg mol^{-1}.

Home work from modules

Solve all questions of depression in freezing point.

THANK

YOU