YAKEEN NEET 2.0

2026

Solutions

Physical Chemistry Lecture -07

By- Amit Mahajan Sir

Topics to be covered

1. Revision of Last Class, Medics test
2. Azeotropes
3. Colligative Properties, RLVP
4. 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 Test Syllabus Tomorrow.

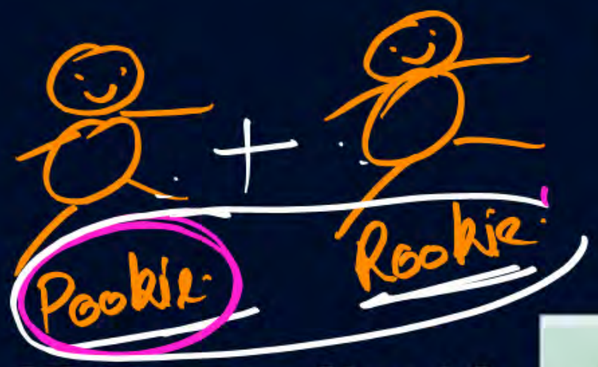
↓

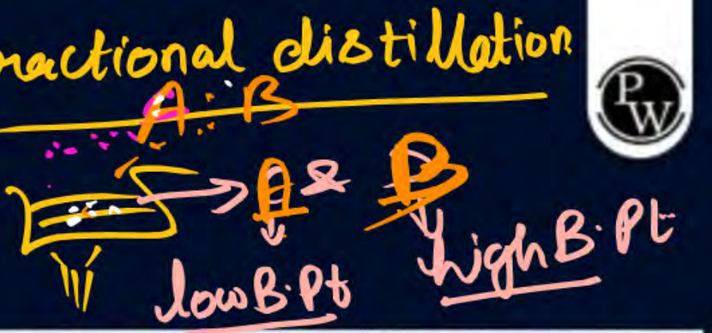
Lec-1 to Lec-7 Solutions → easy & moderate.

Revision of Last class

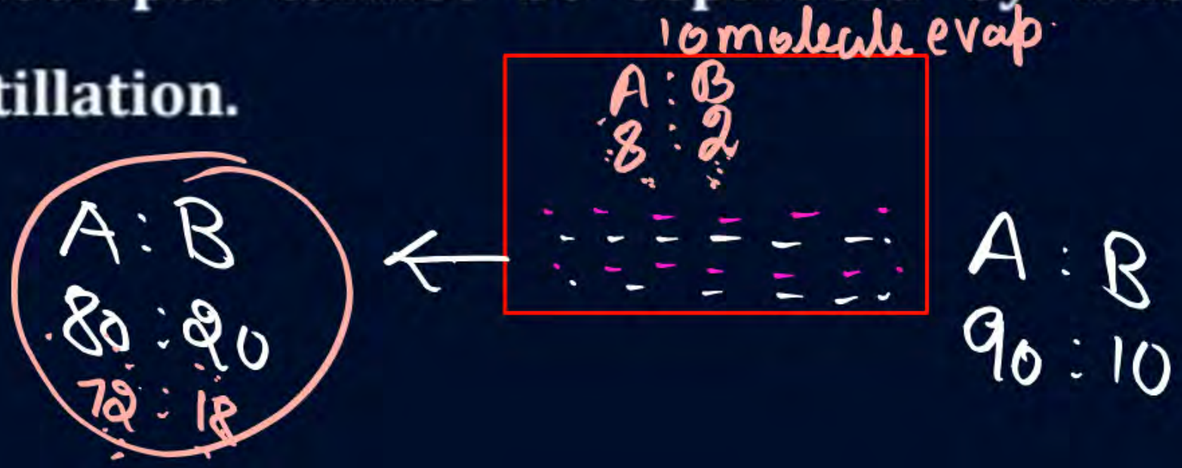
Non-ideal soln

Azeotropes





- Azeotropes mixture which boils like pure liquid i.e., it has one boiling pint.
- Ratio of Azeotropes in liquid phase & in vapor phase are equal
- Azeotropes cannot be separated by fractional distillation.



Type of Azeotropes

- **Minimum Boiling Azeotropes:**
- **Maximum Boiling Azeotropes:**

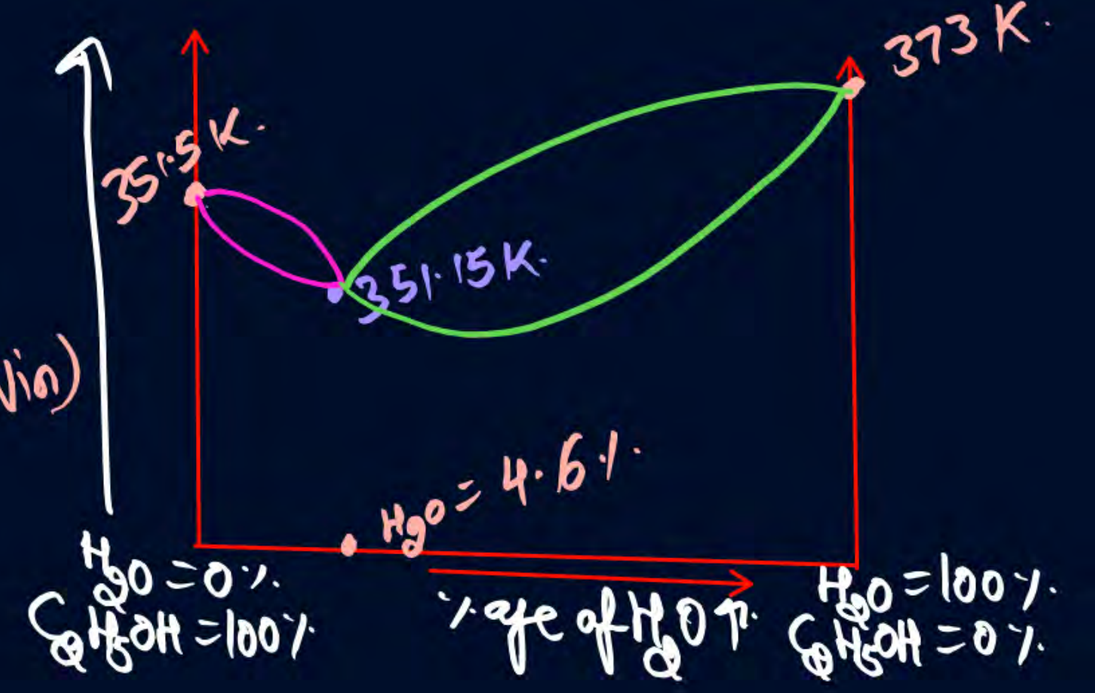
Minimum Boiling Azeotropes

Here boiling point of Azeotropes is less than the boiling point of either component i.e., They show positive deviation from Raoult's Law.

For Example: All examples of positive deviation from Raoult's law.

for ex :- $C_2H_5OH + H_2O$

95.4% + 4.6%



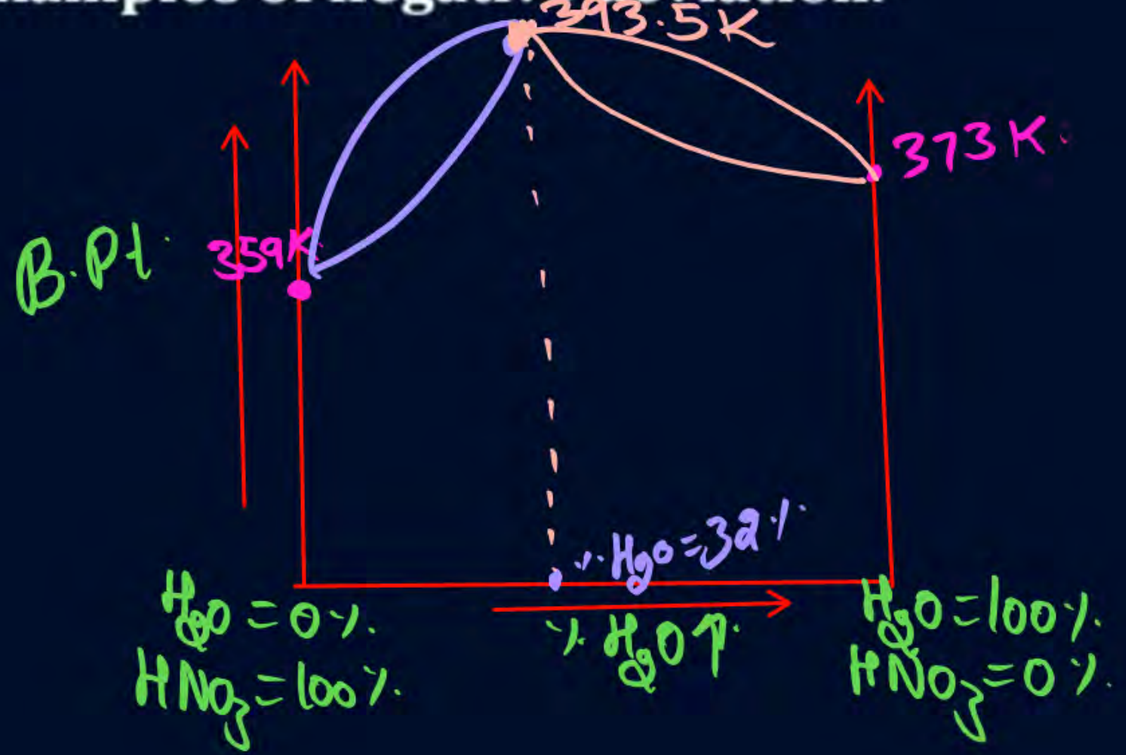
Maximum Boiling Azeotropes

Here boiling point of Azeotropes is greater than the boiling point of either component i.e., They show negative deviation from Raoult's Law.

For Example: All examples of negative deviation.

$H_2O + HNO_3$

32% 68%



QUESTION

Which of the following solutions can have boiling point less than that of both the individual components?

A. *n*-Hexane and *n*-Heptane

B. HNO_3 and H_2O

C. ~~HNO_3~~ and H_2O

D. C_2H_5OH and H_2O

QUESTION

Azeotropic mixture :

A are those which can be fractionally distilled

B have definite constant boiling point

C have same definite composition at any pressure

D are those which have different composition in liquid and vapour state

QUESTION

Which of the following liquid pairs shows a positive deviation from Raoult's law?

A. Acetone-chloroform

B. Benzene-methanol

C. Water-nitric acid

D. Water-hydrochloric acid

QUESTION

Select the mixture in which volume of solution is less than 2 V mL on mixing V mL each of the two miscible liquids:

A $CCl_4 + CS_2$

B Benzene + Toluene

C $CH_3COCH_3 + CHCl_3$

D Hexane + Pentane

V mL + V mL

2V mL

$\Delta V_{mix.} = (-)ve$

QUESTION

Some liquids on mixing, form azeotropes. Which of the following is only incorrect statement regarding azeotropic binary mixture of liquids?

A. The compositions in liquids and vapour phases are same.

B. The boiling point of azeotropic mixture does not depend on external pressure.

C. Solutions having large positive deviation form minimum boiling azeotrope at a specific composition.

D. Solutions having large negative deviation form maximum boiling azeotrope at a specific composition.

QUESTION

100 mL liquid chloroform is mixed with 100 mL liquid acetone at 25°C. Which of the following may be the final volume of resulting solution?

A 200 mL

B 203 mL

C 198 mL

D Any of these

Colligative Properties

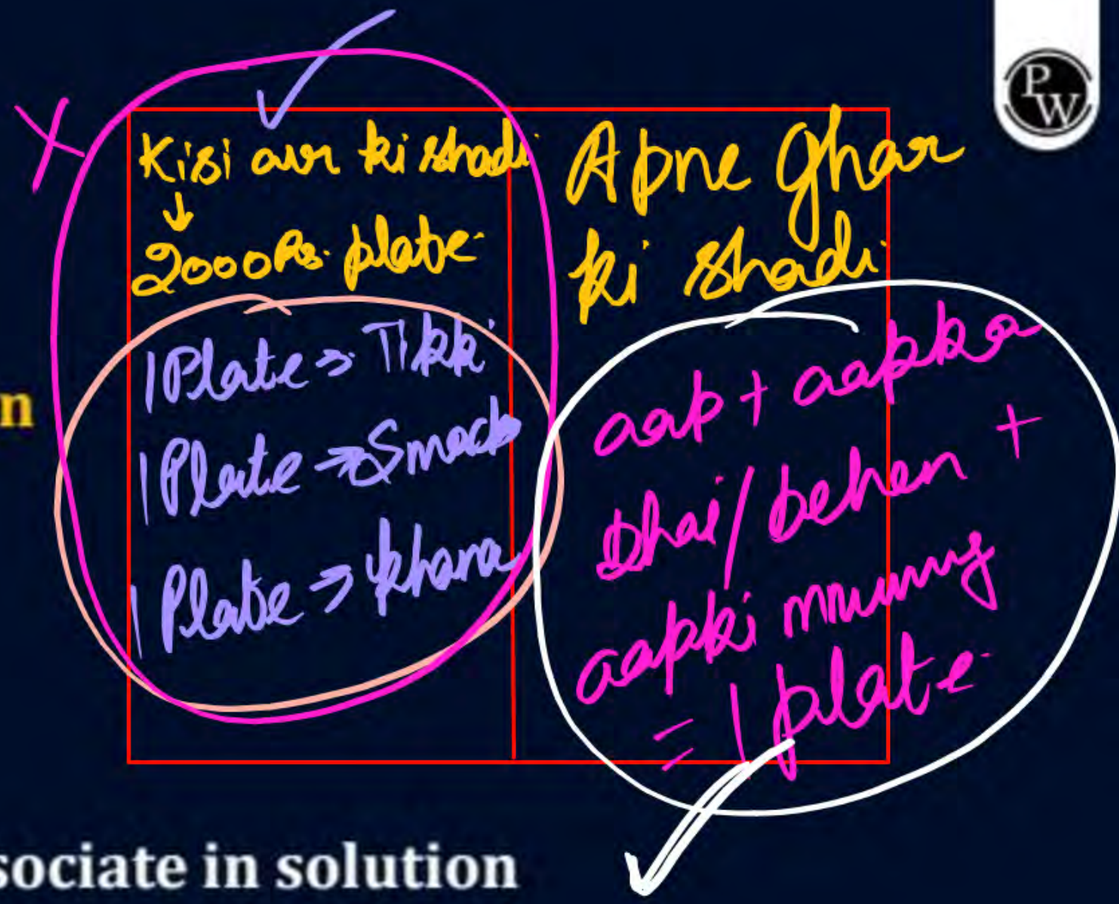
Properties of solution which depends upon number of particles of solute & not on nature of solute.

Railway ticket → 5 mate ya 5 patle.
Bus ticket → yes.
movie ticket → yes.
Readymade shirt → Prices → yes.
Tailor made shirt → No C.P

Colligative Properties

Colligative Properties gives best results when

- Solute does not react with solvent.
- Solute should be non-volatile
- Solution should be dilute
- Solute should neither dissociation or associate in solution



Type of Colligative Properties

There are four Colligative Properties:

- Relative lowering of vapour pressure
- Elevation in boiling point
- Depression in freezing point
- Osmotic pressure

QUESTION – (AIPMT 1992)

Which one is a colligative property?

A. Boiling point

B. Vapour pressure

C. Osmotic pressure

D. Freezing point

QUESTION – (NCERT Exemplar)

Colligative properties depend on _____.

A. The nature of the solute particles dissolved in solution.

B. The number of solute particles in solution.

C. The physical properties of the solute particles dissolved in solution.

D. The nature of solvent particles.

Type of Colligative Properties

Colligative Properties

Colligative properties are characteristics of a solution that depend on the ratio of the number of solute particle to solvent particles.

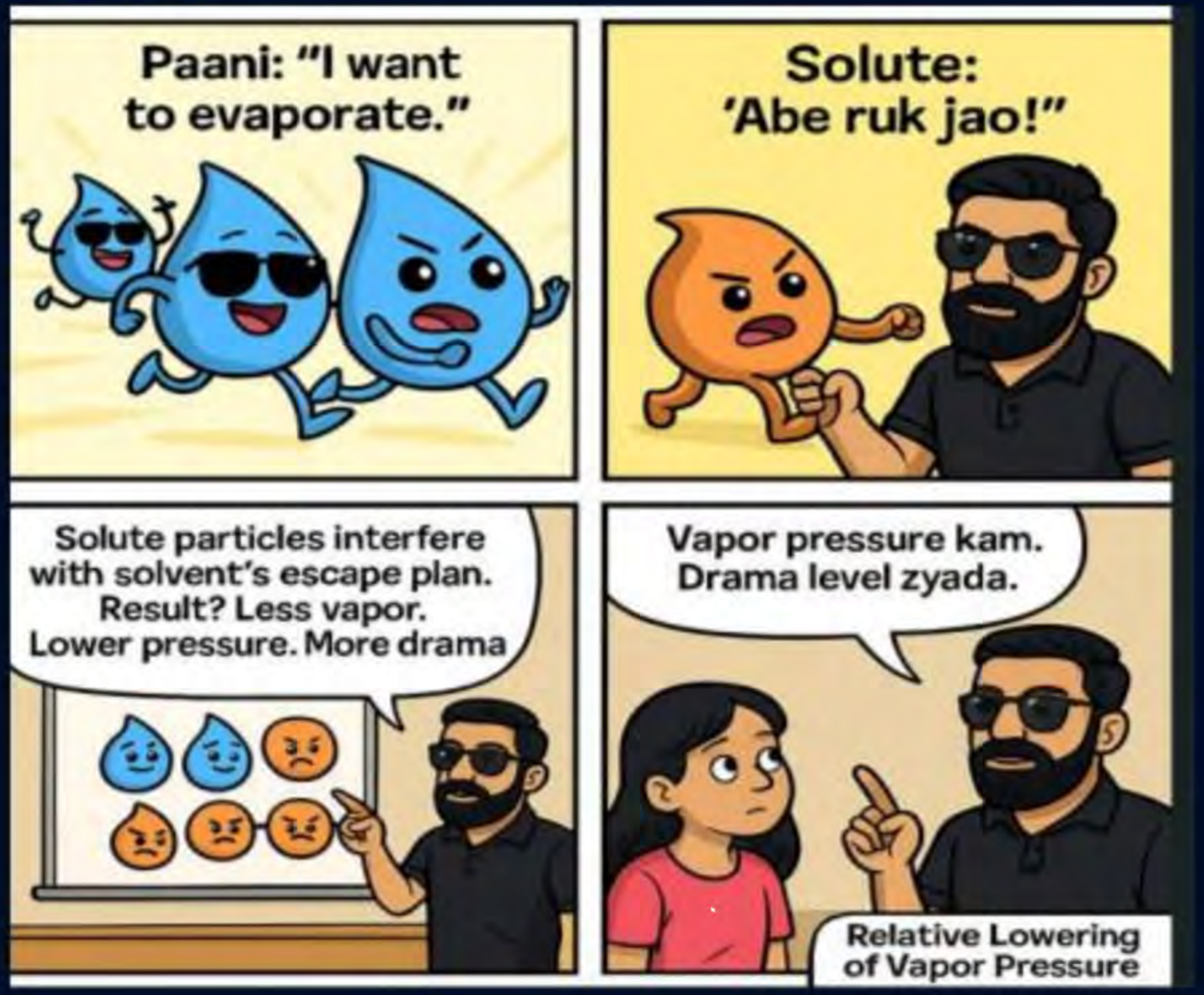
Freezing Point Depression

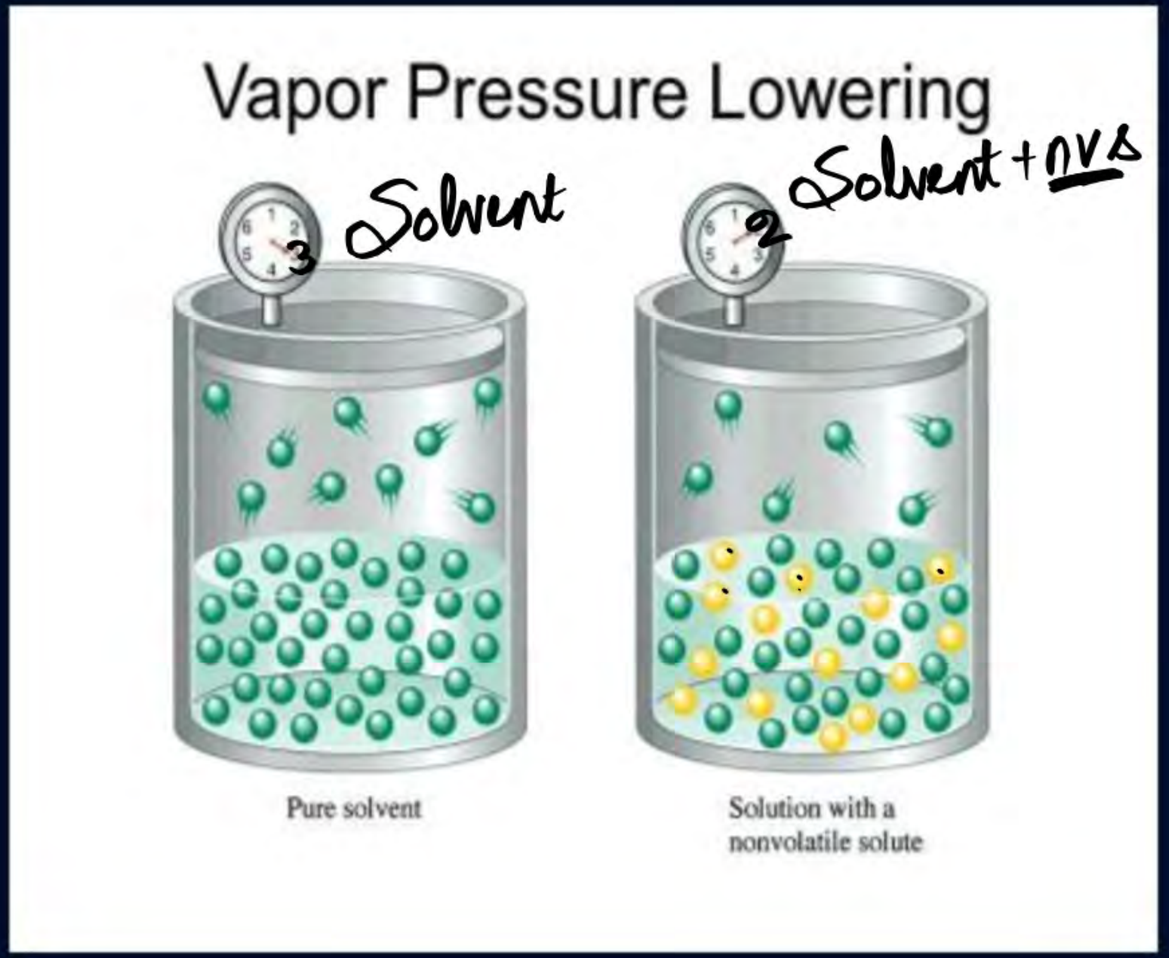
Boiling Point Elevation

Osmostic Pressure

Vapor Pressure Lowering

Relative Lowering of Vapor Pressure (RLVP)





① on addition of nVS, V.P. ↓

↓

$P_S = P_A^\circ \chi_A$

$P_A^\circ = P^\circ$ = V.P. solvent in pure form

$P_S = P^\circ \chi_A$

$\frac{P_S}{P^\circ} = \chi_A$

$1 - \frac{P_S}{P^\circ} = 1 - \chi_A$

P° = 100 mm of Hg

P_S = 60 mm of Hg

$P^\circ - P_S = 100 - 60 = 40$ mm of Hg

$\frac{P^\circ - P_S}{P^\circ} = \frac{40}{100} = \frac{4}{10}$

MIT

$\frac{P^\circ - P_S}{P^\circ} = \chi_B$

$\frac{P^\circ - P_S}{P^\circ} = \frac{n_B}{n_A + n_B}$

if sol^n dilute or $\leq$ 5% solute
$n_B \ll n_A \Rightarrow n_A + n_B \approx n_A$

$P^\circ - P_S$ = Lowering of V.P.

$\frac{P^\circ - P_S}{P^\circ} = R.L\ V.P.$

approx.

$\frac{P^\circ - P_S}{P^\circ} = \frac{n_B}{n_A}$

$\frac{P^\circ - P_S}{P^\circ} = \frac{m \times M_A}{1000}$

$$m = \frac{x_B}{x_A \times M_A} \times 1000$$

$$m = \frac{n_B \times 1000}{n_A \times M_A}$$

$$\frac{n_B}{n_A} = \frac{m \times M_A}{1000}$$

$$\frac{P^\circ - P_S}{P^\circ} = \frac{n_B}{n_A + n_B}$$

$$\frac{P^\circ}{P^\circ - P_S} = \frac{n_A + n_B}{n_B}$$

$$\frac{P^\circ}{P^\circ - P_S} = \frac{n_A}{n_B} + 1$$

$$\frac{-1}{1} + \frac{P^\circ}{P^\circ - P_S} = \frac{n_A}{n_B}$$

$$\frac{-P^\circ + P_S + P^\circ}{P^\circ - P_S} = \frac{n_A}{n_B}$$

$$\frac{P_S}{P^\circ - P_S} = \frac{n_A}{n_B}$$

#MI

$$\frac{P^\circ - P_S}{P_S} = \frac{n_B}{n_A}$$

$$\frac{P^\circ - P_S}{P_S} = \frac{m \times M_A}{1000}$$

always 100% Correct ans

don't use to find RLVP.

QUESTION

The ratio between lowering of vapor pressure of solution and mole fraction of solute is equal to

A. Relative lowering of vapour pressure

B. Vapour pressure of pure solvent

C. Vapour pressure of solution

D. Molar mass of solvent

$$\frac{P^\circ - P_S}{x_B} = P^\circ$$

$$\frac{P^\circ - P_S}{P^\circ} = x_B$$

QUESTION – (AIPMT 1995)

According to Raoult's law, relative lowering of vapour pressure for a solution is equal to

$$\frac{p^\circ - p_s}{p^\circ} = x_B$$

A moles of solute

B moles of solvent

C mole fraction of solute

D mole fraction of solvent

QUESTION – (AIPMT 1998)

The vapour pressure of a solvent decreased by 10 mm of mercury when a non-volatile solute was added to the solvent. The mole fraction of the solute in the solution is 0.2. What should be the mole fraction of the solvent if the decrease in the vapour pressure is to be 20 mm of mercury?

- (A) 0.8
- (B) 0.6
- (C) 0.4
- (D) 0.2

$P^\circ - P_S = 10$ mm of Hg.

$\chi_B = 0.2$

$\frac{P^\circ - P_S}{P^\circ} = \chi_B$

$\frac{P^\circ - P_S'}{P^\circ} = \chi_B'$

$\frac{10}{20} = \frac{0.2}{\chi_B'}$ $\Rightarrow \chi_B' = 0.2 \times 2 = 0.4$

$\chi_A' = 1 - \chi_B'$

$= 1 - 0.4 = 0.6$

$P^\circ - P_S' = 20$ mm of Hg

QUESTION-(JEE main 11th April 2nd Shift-2023)

What weight of glucose must be dissolved in 100 g of water to lower the vapour pressure by 0.20 mm Hg? (Assume dilute solution is being formed)

[Given: Vapour pressure of pure water is 54.2 mm Hg at room temperature. Molar mass of glucose is 180 g mol^{-1}]

A. 4.69 g

B. 3.69 g

C. 2.59 g

D. 3.59 g

$w_B = ?$

$w_A = 100\,g$

$P^\circ - P_S = 0.2\ mm\ of\ Hg$

$P^\circ = 54.2\ mm\ of\ Hg$

$M_B = 180\ g/mol$

$M_A = 18\ g/mol$

$\frac{P^\circ - P_S}{P^\circ} = \frac{n_B}{n_A}$

$\frac{0.2}{54.2} = \frac{w_B \times 18}{180 \times 100}$

$3.69\,g = \frac{2000}{542} = w_B$

542) 2000 (3.6
1626
3740

QUESTION* – (NCERT Exemplar)

Relative lowering of vapor pressure is a colligative property because ____.

A. It depends on the concentration of a non electrolyte solute in solution and does not depend on the nature of the solute molecules.

B. It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles.

C. It depends on the concentration of a non electrolyte solute in solution as well as on the nature of the solute molecules.

D. It depends on the concentration of an electrolyte or non electrolyte solute in solution as well as on the nature of solute molecules.

QUESTION-(JEE main 6th Sept 2nd Shift-2020)

A set of solutions is prepared using 180g of water as a solvent and 10 g of different non-volatile solutes A, B and C. The relative lowering of vapour pressure in the presence of these solutes are in the order: [Given, molar mass of A = 100 g mol^{-1}; B = 200 g mol^{-1}; C = 10,000 g mol^{-1}]

$w_A = 180g$.

$w_B = 10g \rightarrow A, B, C$.

$\uparrow n_B = \frac{w_B}{M_B} \downarrow$

(A) B > C > A

(B) C > B > A

(C) A > B > C ✓

(D) A > C > B

$\frac{p^\circ - p_s}{p^\circ} \uparrow = \chi_B = \frac{n_B}{n_A + n_B} \uparrow$

QUESTION – (NEET 2020-Covid)

If 8 g of a non-electrolyte solute is dissolved in 114 g of n-octane to reduce its vapour pressure to 80%, the molar mass (in g mol^{-1}) of the solute is:
[Given that molar mass of n-octane is 114 g mol^{-1}]

(A) 60
(B) 80
(C) 20
(D) 40 ✓

C_8H_{18}

$w_B = 8g \quad M_B = ?$

$w_A = 114g \quad M_A = 114 g/mol$

Let $P^\circ = 100$ mm of Hg.

$P_S = 80$ mm of Hg.

$$\frac{P^\circ - P_S}{P^\circ} = \frac{n_B}{n_A}$$

$$\frac{20}{100} = \frac{8}{M_B \times 1}$$

$$M_B = 40$$

$$\frac{20}{100} = \frac{8}{M_B \times 1}$$

$$M_B = 40\,g$$

QUESTION

How much urea (molar mass = 60 g mol^{-1}) should be dissolved in 50g of water, so that its vapour pressure at room temperature is reduced by 25%. Calculate molality of the solution obtained.

$w_B = ?$, $M_B = 60g$

$w_A = 50g$

$P^0 = 100$ mm of Hg

$P_S = 75$ mm of Hg.

$m = ?$

$$\frac{P^0 - P_S}{P_S} = \frac{m \times M_A}{1000}$$

$$\frac{100 - 75}{75} = \frac{m \times 18}{1000}$$

$$\frac{25}{75} = \frac{1}{3} = \frac{m \times 18}{1000}$$

$$m = \frac{1000}{54}$$

QUESTION

Vapour pressure of an aqueous solution of glucose is 750 mm of Hg at 373 K. Calculate the molality and mole fraction of solute.

Ans $P_S = 750\ mm\ of\ Hg$ $\quad m = ?$ $\quad \chi_B = ?$

$T = 373\ K \rightarrow$ B.Pt of solution

$\rightarrow P^\circ = 1\ atm = 760\ mm\ of\ Hg$

$$\frac{P^\circ - P_S}{P^\circ} = \chi_B$$

$$\frac{760 - 750}{760} = \chi_B = \frac{1}{76}$$

$$\frac{P^\circ - P_S}{P_S} = \frac{m \times M_A}{1000}$$

$$\frac{1\phi}{75\phi} = \frac{m \times 18}{1000}$$

$$\frac{100\phi}{135\phi} = m$$

$$m = \frac{20}{27}$$

QUESTION-(JEE main 7th Jan 2nd Shift-2020)

Two open beakers one containing a solvent and the other containing a mixture of that solvent with a non-volatile solute are together sealed in a container. Over time

(A) The volume of the solution increases and the volume of the solvent decreases

(B) The volume of solution and the solvent does not change

(C) The volume of the solution does not change and the volume of the solvent decreases

(D) The volume of the solution decreases and the volume of the solvent increases


500Rs
900Rs
450Rs
50Rs
Rookie
100Rs
Pookie

Home work from modules

Solve all questions of Redative Lowering of V.P.

Magarmach Practice questions

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

At room temperature, a dilute solution of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mm Hg, lowering of vapour pressure will be (Molar mass of urea = 60 g mol^{-1})

A 0.031 mm Hg

B 0.028 mm Hg

C 0.017 mm Hg

D 0.027 mm Hg

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

At room temperature, a dilute solution of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mm Hg, lowering of vapour pressure will be (Molar mass of urea = 60 g mol^{-1})

A 0.031 mm Hg

B 0.028 mm Hg

C 0.017 mm Hg

D 0.027 mm Hg

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

At room temperature, a dilute solution of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mm Hg, lowering of vapour pressure will be (Molar mass of urea = 60 g mol^{-1})

(A) 0.031 mm Hg

(B) 0.028 mm Hg

(C) 0.017 mm Hg

(D) 0.027 mm Hg

QUESTION

The vapor pressure of benzene at 30°C is 121.8 mm of Hg. By adding 15g of non-volatile solute in 250g of benzene, its vapour pressure is decreased to 120.2 mm of Hg. The molecular weight of solute is:

A $156.6\ g\ mol^{-1}$

B $267.4\ g\ mol^{-1}$

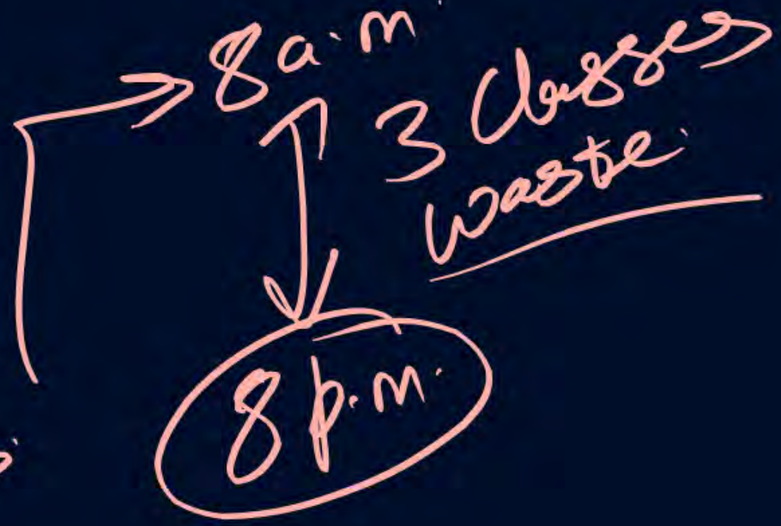
C $351.5\ g\ mol^{-1}$

D $467.4\ g\ mol^{-1}$

★ ★ ★ ★ ★ tricks:

Selfish

Minimize the losses:



2 a.m.

THANK YOU