YAKEEN 2.0

FOR NEET 2023

Qsd⇒

Lecture - 07

Solutions

Sarvesh Sir

TOPICS TO BE COVERED

- Solution
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-
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Qsd:-1 Osmotic pressure of solution is π_1 when 50% solute (CuCl) dissociate. Suppose solute (CuCl) 100% dissociate than osmotic pressure is

55 Sec

A $2\pi_1$

B $\frac{3}{4}\pi_1$

(e) $\frac{4}{3}\pi_1$

C $3\pi_1$

(X) D $\frac{\pi_1}{2}$

$CuCl \rightarrow Cu^{+1} + Cl^{-}$

$\pi = iCRT$

Constant

$\pi \propto i$

$\frac{\pi_1}{\pi_2} = \frac{i_1}{i_2}$

$\pi_2 = \frac{i_2}{i_1} \times \pi_1 = \frac{2}{1.5} \times \pi_1$

$= \frac{4}{3}\pi_1$

$i_1 = 1 + (n-1)\alpha$

$i_1 = 1 + (2-1) \times 0.5$

$i_1 = 1 + 0.5 = 1.5$

$i_2 = 1 + (n-1)\alpha$

$= 1 + (2-1) \times 1$

$= 1 + 1 = 2$

Qsd.-2 1 mole NaCl dissolve in 0.2m KCl solution than select incorrect statements

50sec

A. ΔT_b increases ✗

B. ΔT_f decreases

C. ✗ T_f of sol^n decreases

D. ✗ T_b of sol^n increases

$\Delta T_b = i K_b m$

$\rightarrow \Delta T_b \propto im$

$\rightarrow (T_b)_{sol^n} \propto im$

$\Delta T_f = i K_f m$

$|\Delta T_f| \propto im$

$(T_f)_{sol^n} \propto \frac{1}{im}$

?

Ideal and Non-ideal solution

Binary solution

Ideal solution

- Follows Raoult's law
- $P_T = P_A^0 X_A + P_B^0 X_B$
- $P_A = P_A^0 X_A$
- $P_B = P_B^0 X_B$

Non-ideal solution

- Does not follows Raoult's law
- $P_T \neq P_A^0 X_A + P_B^0 X_B$
- $P_A \neq P_A^0 X_A$
- $P_B \neq P_B^0 X_B$

Non-ideal solution → $P_I \neq P_A + P_B \neq P_A^0 X_A + P_B^0 X_B$

Exp. value, R.L.

Positive deviation

Negative deviation

→ $P_T > P_A + P_B$

→ $P_T < P_A + P_B$

Q Experimental value of total v.p. of solution is 540 mm of Hg $(P_T)_{Exp}$
If partial v.p. of liquid-A and B respectively 200 mm and 300 mm of Hg. Select correct statements

$\Rightarrow 200+300=500$
$P_T \Rightarrow R.L.$

(a) Non-ideal soln form

(b) ideal soln form

(c) solution shows positive deviation

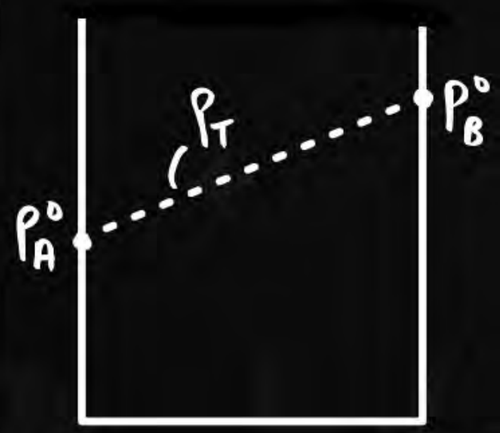
(d) 'A' & 'C' are correct

$$(P_T)_{Exp.} = \frac{P_A+P_B}{R.L} - \text{ideal}$$

$(P_T)_{Exp} \neq P_A+P_B \rightarrow$ Non ideal

$(P_T)_{Exp} > P_A+P_B$ positive

$(P_T)_{Exp} < P_A+P_B$ negative

Properties	Ideal solution	Non-ideal soln: positive deviation	Non-ideal soln: Negative deviation
① Vapour pressure of soln.	$(P_T)_{Exp} = P_A + P_B$ (R.L.)	$(P_T)_{Exp} > P_A + P_B$ (R.L.) $\Delta P = (P_T)_{Exp} - (P_T)_{R.L}$	$(P_T)_{Exp} < P_A + P_B$ (R.L.)
② Graphical Representation	 $X_A=1$, $X_B=0$; $X_A=0$, $X_B=1$	 $X_A=1$, $X_B=0$; $X_A=0$, $X_B=1$	 $X_A=1$, $X_B=0$; $X_A=0$, $X_B=1$

Properties	Ideal solution	Non-ideal soln: positive deviation	Non-ideal soln: Negative deviation
(3) Intraction (Force) ($V.P. \propto \frac{1}{Force}$)	A-A = B-B = A-B	A-A = B-B > A-B	A-A = B-B < A-B
(4) Volume change (ΔV) on mixing	$\rightarrow \Delta V = 0$	ΔV = +ve, $\Delta V > 0$	ΔV = -ve, $\Delta V < 0$
(5) Enthalpy change of soln. (ΔH)	$\rightarrow \Delta H = 0$	$(\Delta H)_{soln}$ = +ve	$(\Delta H)_{soln}$ = -ve, $(\Delta H)_{soln} < 0$

Properties	Ideal solution	Non-ideal soln: positive deviation	Non-ideal soln: Negative deviation
(6) Entropy change of soln ($\Delta S_{soln.}$)	$(\Delta S)_{soln} = +ve$	$(\Delta S)_{soln} = +ve$	$(\Delta S)_{soln} = +ve$
Note → Entropy always increases when No. of liq. or gas or solid mixed			
(7) Gibbs free Energy change (ΔG)	→ $\Delta G = -ve$	$\Delta G = -ve$	$\Delta G = -ve$

$C_{SD} = 18$

(a) ΔU, ΔH, ΔP $\left((P_T)_{Exp} - (P_T)_{R.L}\right)$ = Jaisa naam ⇒ sign

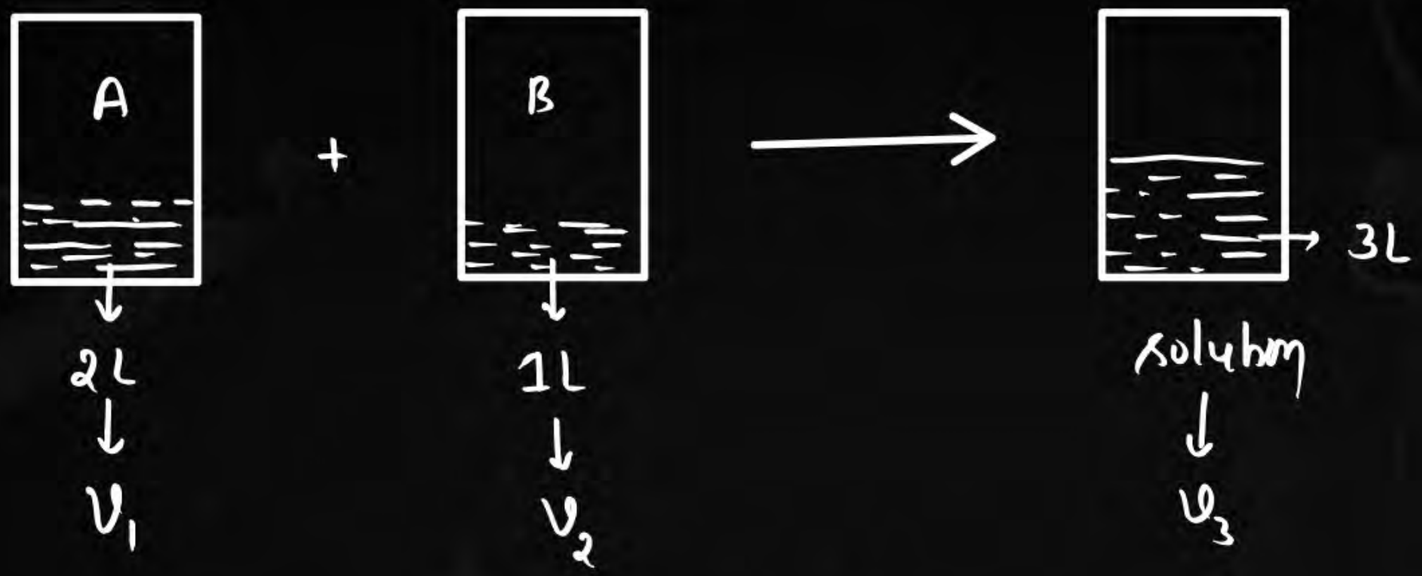
(b) ΔG, ΔS ⇒ same sign hai sabhi sol^{n} ke liye

Q-1 → Intraction (force) → jada ↑ → V.P. ⇒ (a) kam ✓
(b) jada

A–A = B–B A–B

ideal soln ① 5f = 5f = 5F

Non ideal soln { (+ve) { ② 5f = 5f > 4f → force → kam → V.P → (a) kam, (b) jada ✓
(-ve) { ③ 5f = 5f < 7f → force-jada → V.P → (a) kam ✓, (b) jada



ideal → ΔV = change in Vol. = $V_f - V_i$

$= 3 - (2+1) = 3 - 3 = 0$

Negative → A = 2L B = 1L, (A-B) = 2.9L

$\Delta V = 2.9 - (3) = -0.1$

$A - A$ ↓ $H_1 = +ve$

$B - B$ ↓ $H_2 = +ve$

$A - B$ ↓ $H_3 = -ve$

$\Rightarrow \Delta H_{sol^n} = \text{deni} - \text{release}$

$\Delta H_{sol^n} = (H_1 + H_2) - H_3$

bond break = Energy deni hogi

bond form = Energy release hoti hai

ideal sol^n = $A - A + B - B = 2A - B$

$A - A$ ↑ $+10$

$B - B$ ↑ $+10$

$+10 + 10 = +20$

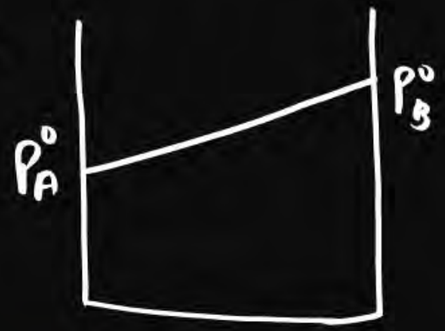
$2A - B$ ↓ $-10 \times 2 = -20$

$+20 - 20 = 0$

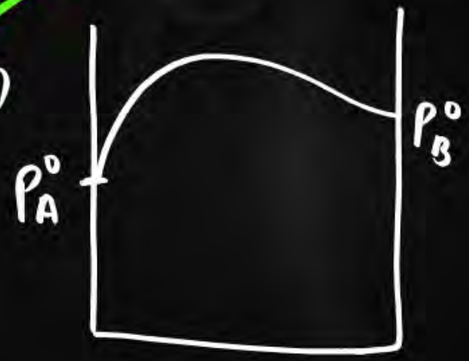
Q Experimental value of total v.p. of solution is 540 mm of Hg. If partial v.p. of liquid-A and B respectively 200 mm and 300 mm of Hg. Select correct graphical Represent of above sol^{n}.

(a)

(B)



(C) ✓



(d) None of these

$(P_T)_{Exp} = 540\,mm$

$P_A + P_B = 200 + 300 = 500\,mm$

$(P_T) > P_A + P_B$

Q. Which one of the following is incorrect for ideal solution?

[NEET 2016, PHASE-II]

(A) $\Delta H_{max} = 0$

(B) $\Delta U_{mix} = 0$

(C) $\Delta P = P_{obs} - P_{calculated\ by\ Raoult's\ law} = 0$

(D) $\Delta G_{mix} = 0$

Q. Formation of a solution from two components can be considered as:

[CBSE AIPMT 2003]

I. Pure solvent → separated solvent molecules, ΔH_1 = +ve

II. Pure solute → separated solute molecules, ΔH_2 = +ve

III. Separated solvent and solute molecules → solution, ΔH_3 → -ve

Solution so formed will be ideal, if

A. $\Delta H_{sol.} = \Delta H_1 - \Delta H_2 - \Delta H_3$

B. $\Delta H_{sol} = \Delta H_3 - \Delta H_1 - \Delta H_2$

C. $\Delta H_{sol} = \Delta H_1 + \Delta H_2 + \Delta H_3$

D. $\Delta H_{sol} = \Delta H_1 + \Delta H_2 - \Delta H_3$ ✓

with sign

Q. Which one is not equal to zero for an ideal solution?

(CBSE AIPMt 2015)

A. $\Delta H_{mix} = 0$

B. $\Delta S_{mix} = +ve$

C. $\Delta V_{mix} = 0$

D. $\Delta P = P_{observed} - P_{Raoult} = 0$

Q. An ideal solution is formed when its compounds [CBSE AIPMT 1998]

A. have no volume change on mixing → $\Delta V = 0$

B. have no enthalpy change on mixing → $\Delta H = 0$

C. have both the above characteristics ✓✓

D. have high solubility

C_{SD} =

ideal sol^{n}. ⇒ Solution of intraction (force) aure solute and solvent Ke Intraction yadi ek jaise hai to ideal sol^{n}. hoga (yadi ek jaise molecule milte ho)

positive deviation = yadi solute aur solvent Ko milne se intraction (force) kam ho raha hai

N·C·E·R·T →

Note → H_2O me kuchh Bhi milne pr non-ideal sol^{n} hota

Note → yadi wo H_2O me ionise ho raha hai → negative deviat^{n} hoga

yadi ionise nahi ho raha hai = positive deviat^{n}

Negative deviation

yadi solute aur solvent ko milne se intrachon jada ho raha hai → Negative deviation

$H_2O + C_2H_5OH \rightarrow +ve$

$H_2O + HNO_3 \rightarrow -ve$

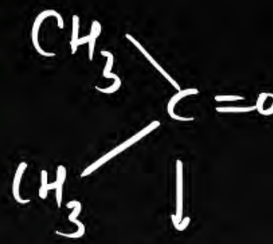
$H_2O + HCl \rightarrow -ve$

$H_2O + NaCl \rightarrow -ve$

$H_2O + CCl_4 \rightarrow +ve$

$H_2O + C_6H_6 \rightarrow +ve$

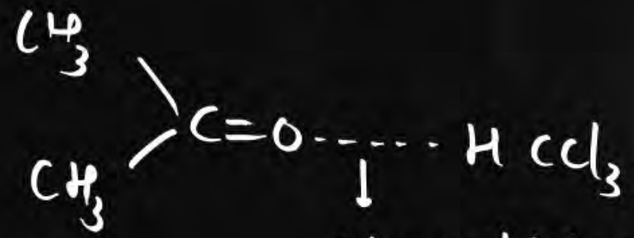
$H_2O + CH_3COOH \rightarrow -ve$



+ $CHCl_3$ ⇒ Negative deviat^n.

polar - polar

polar - polar



Strong H-bon > p-p bond

Ex → Hexane → C_6H_{14} → Hydro - Hydro

Heptane → C_7H_{16} → Hydro - Hydro

$C_6H_{14} + C_7H_{16}$ → Hydro - Hydro

Ex → $\underline{CH_3}-Cl + \underline{CH_3}-Br$

Ex → 

Ex → $\underline{CCl_4} + \underline{CBr_4}$

Q. All form ideal solution except [CBSE AIPMT 1998]

A. C_6H_6 and $C_6H_5CH_3$ – ideal

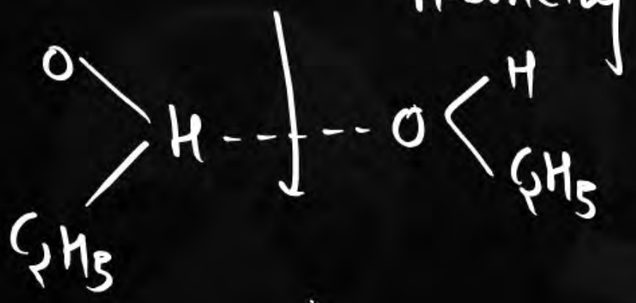
B. C_2H_5Cl and C_2H_5I – ideal

C. C_6H_5Cl and C_6H_5Br – ideal

D. ~~C_2H_5I~~ and C_2H_5OH → Non-ideal

↓

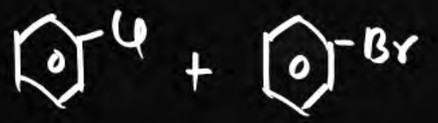
H-bonding



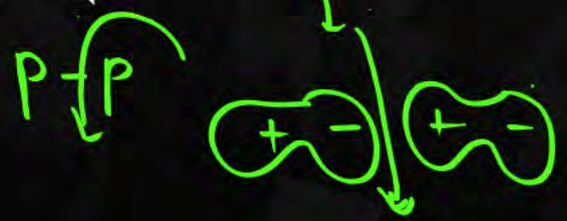
List-1

(a) $H_2O + H_2SO_4$

(b) $H_2O + C_2H_5OH$

(c) 

(d) $CH_3-CH_2-Br + CH_3-CH_3$



List-2

(P) ideal

(q) +ve deviation

(r) -ve deviation

P → c,
q → b, d
r → a

HOME WORK

THANK YOU