J-Adv

21, 20, 18, 17, 11, 6-8

O-I 30-34

S-I 21-28

O-I 35-52

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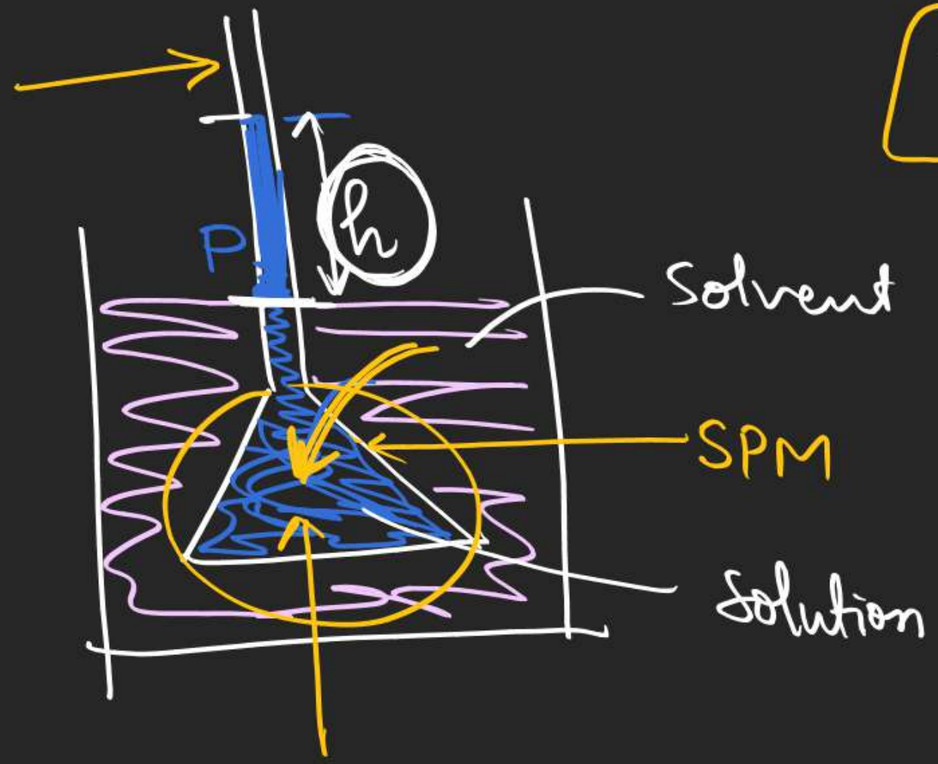
Osmotic pressure :- Minimum pressure required to stop the flow of solvent molecules from solvent to solution side is called osmotic pressure.



density of soln

$$\pi = h d g$$

osmotic pressure

$$h_1 d_1 = h_2 d_2$$

$$d_{Hg} = 13.6 \text{ gm/ml}$$

Acc to Van't Hoff

$$\pi \propto CT$$

$$\pi = CRT$$

Isotonic
hypertonic
hypotonic

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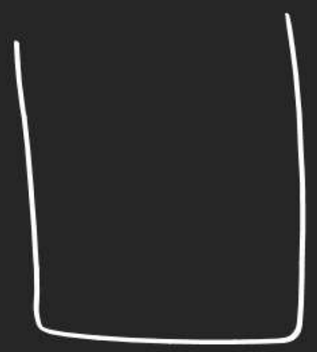
Abnormal colligative properties :→



1000 gm H_2O

1 mol NaCl

$K_b = 2$ K. kg/mol

100% → Na^+ 1 mol, Cl^- 1 mol

50% → Na^+, Cl^-

$\Delta T_b = K_b \times m$

$= 2 \times 2$

$= 4$

$\Delta T_b = 2 \times 1.5$

$= 3$

$CH_3COOH \rightarrow CH_3COO^- + H^+$

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Van't Hoff factor (i) = $\frac{\text{(actual no. of moles)}}{\text{moles added}}$

$A \longrightarrow nB$

a

$a(1-\alpha) = an\alpha$

$$i = \frac{a[1-\alpha+n\alpha]}{a}$$

$$\boxed{i = 1+(n-1)\alpha}$$

$N_2O_4 \rightarrow 2NO_2$

$n = 2$

$A \longrightarrow n_1B + n_2C$

$n = n_1 + n_2$

$n_1A \longrightarrow n_2B$

$n = \frac{n_2}{n_1}$

$BaCl_2 \rightarrow Ba^{2+} + 2Cl^-$

$n = 3$

$2NH_3 \rightarrow N_2 + 3H_2$

$NH_3 \rightarrow \frac{1}{2}N_2 + \frac{3}{2}H_2$

$n = \frac{1}{2} + \frac{3}{2} = 2$

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$$m = \frac{n}{\text{mass of solvent}} \times 1000$$

MA_x

0.1M CH_3COOH

K_a

ΔT_b

molarity → molality → mole fraction

if density is not given

$M = m$

$$\Delta T_b = K_b \times m \times [1 + (n-1)\alpha]$$

$$\Delta T_f = K_b \times m \times [1 + (n-1)\alpha]$$

$$\pi = CRT \times [1 + (n-1)\alpha]$$

$$\left(\frac{P_0 - P_s}{P_0}\right) = \frac{n}{n+N} = \frac{nxi}{nxi+N}$$

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Q. find K_a of a weak acid (HA) having conc 0.1M and elevation in boiling point 0.75 K.

Given $K_b = 5$ K.kg/mol

$$\Delta T_b = K_b \times m [1 + (2-1)\alpha]$$

$$0.75 = 5 \times 0.1 [1 + \alpha]$$

$$0.5 = \alpha$$

$$K_b = \frac{C\alpha^2}{1-\alpha} = \frac{0.1 \times (0.5)^2}{0.5} = 0.1 \times 0.5$$

$$= 5 \times 10^{-2}$$

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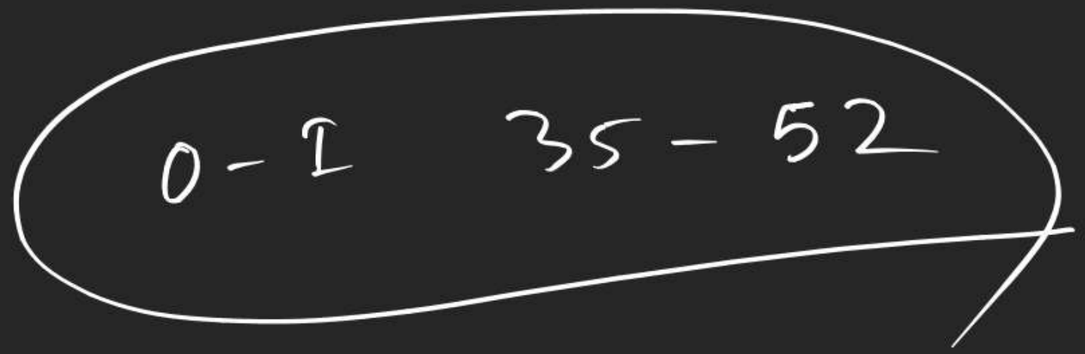

2. EMF of the cell: $Cd(s) \mid CdCl_2 \cdot 5H_2O$ (sat.) $|AgCl(s)|Ag(s)$ is $+0.70\ V$ at $0°C$ and $+0.60\ V$ at $50°C$. If $\Delta H°$ and $\Delta S°$ are temperature independent, then the correct information(s) regarding the cell reaction is/are

ABCD

AC

(a) $\Delta G° = -115.8\ kJ$ at $50°C$

(b) $\Delta G° = 135.1\ kJ$ at $0°C$

(c) $\Delta S° = -\frac{386\ J}{K}$

(d) $\Delta H° = -221.178\ kJ$

4. For the reversible reaction: $A \rightleftharpoons B$; $\Delta H = -2\text{kcal}$, the pre-exponential factors are same for the forward and backward reactions. If the activation energy of backward reaction is 8kcal/mol, then the correct information(s) about the reaction is/are

(A) The activation energy of forward reaction is 6kcal/mol.

(B) At $500\ \text{K}$, the fraction of 'A' molecules crossing the energy barrier for forward reaction is e^{-6}.

(C) At $500\ \text{K}$, the fraction of 'B' molecules crossing the energy barrier for forward reaction is e^{-8}.

(D) Equilibrium constant for the reaction is e^{-2} at $500\ \text{K}$.

5. If $[Fe^{3+}]$ at equilibrium, when potassium iodide is added to a solution of Fe^{3+} initially at $0.50M$ until $[I^-] = 1.0M$, is $x \times 10^{-5}M$, the value of x is (Given $E^\circ_{Fe^{3+}|Fe^{2+}} = 0.77\ V,\ E^\circ_{I_2|I^-} = 0.53\ V, 2.303RT/F = 0.06$)

$I_2(s) = 5$

$I_2(aq) = 2.5$

$2Fe^{3+} + 2I^- \longrightarrow I_2 + 2Fe^{2+} \quad K = 10^8$

$x \qquad 1 \qquad 0.25 \qquad 0.5$

$$\frac{(0.25)(0.5)^2}{x^2 \times 1} = 10^8$$

$$x^2 = \frac{1}{4} \times \left(\frac{1}{2}\right)^2 \times 10^{-8}$$

$$x = \frac{1}{2} \times \frac{1}{2} \times 10^{-4}$$

7. Enthalpy of the reaction: $Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$ is $-84.54\ kJ$. Magnitude of enthalpies of formation of $Ag^+(aq)$ and $Br^-(aq)$ is in 8:9 ratio but their signs are opposite. Enthalpy of formation of $AgBr$ is $-99.54\ kJ/mol$. The magnitude of enthalpy of formation of $Ag^+(aq)$(in kJ/mol) is

$$\Delta H_r = \Delta H_f(Pr) - \Delta H_f(R)$$

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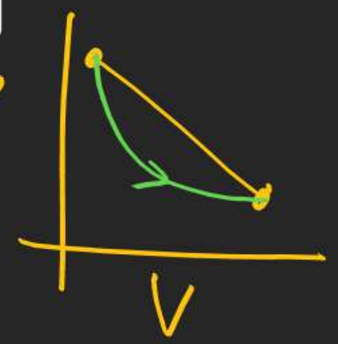
Class 12th JEE Advanced Final Paper-2

1. An ideal gas is taken reversibly from state $A(P, V)$ to the state $B(0.5P, 2\ V)$ along a straight line in PV diagram. Which of the following statement(s) is/are correct regarding the process?

(A) The work done by gas in the process A to B exceeds the work that would be done by it if the same change in state were performed isothermally.



(B) In the $T - V$ diagram, the path AB becomes a part of parabola.

(C) In the $P - T$ diagram, the path AB becomes a part of hyperbola.

(D) On going from A to B, the temperature of the gas first increases to a maximum value and then decreases.

4. A metal ' M ' (atomic mass $= 31.25$) crystallizes in CCP but it has some vacancy defect. If the edge length of the unit cell is $500\mathrm{pm}$ and the density of the metal is $1.6075\ \mathrm{g/cm^3}$, then the number of moles of metal atoms missing per litre of the crystal is $(1\mathrm{amu} = 1.67 \times 10^{-24}\ \mathrm{g})$

$$1.6075 = \frac{(Z) \times 31.25 \times 1.67 \times 10^{-24}}{(500 \times 10^{-10})^3}$$

$$Z = 3$$

$$\left(\frac{1000}{a^3}\right) \times$$

Paragraph (Match list):

5. An aqueous solution of 'X' is added slowly to an aqueous solution of 'Y' as shown in List I. The variation in conductivity of these reactions is given in List II. Match List I with List II.

List I X Y		List II	
(A)	$(C_2H_5)_3N + CH_3COOH$	(P)	Conductivity decreases and then increases
(B)	$KI(0.1M) + AgNO_3(0.01M)$	(Q)	Conductivity decreases and then does not change much
(C)	$CH_3COOH + KOH$	(R)	Conductivity increases and then does not change much
(D)	$NaOH + HI$	(S)	Conductivity does not change much and then increases