Q1. 21 January Shift 1

Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ_2. When 1 g of PQ is dissolved in 50 g of solvent 'A', ΔT_b was 1.176 K while when 1 g of PQ_2 is dissolved in 50 g of solvent 'A', ΔT_b was 0.689 K. (K_b of ' A' $= 5$ K kg mol^{-1}). The molar masses of elements P and Q (in gmol^{-1}) respectively, are :

(1) $70, 110$ (2) $65, 145$ (3) $25, 60$ (4) $60, 25$

Q2. 21 January Shift 2

A substance ' X ' (1.5 g) dissolved in 150 g of a solvent ' Y ' (molar mass $= 300$ g mol^{-1}) led to an elevation of the boiling point by 0.5 K. The relative lowering in the vapour pressure of the solvent ' Y ' is ____ $\times 10^{-2}$. (nearest integer)

[Given : K_b of the solvent $= 5.0$ K kg mol^{-1}]

Assume the solution to be dilute and no association or dissociation of X takes place in solution.

Q3. 21 January Shift 2

The osmotic pressure of a living cell is 12 atm at 300 K. The strength of sodium chloride solution that is isotonic with the living cell at this temperature is ____ gL^{-1}. (Nearest integer)

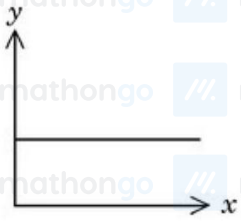
Given : R $= 0.08$ L atm K^{-1} mol^{-1}

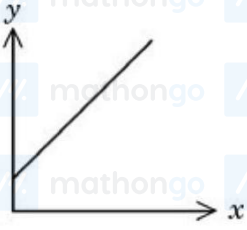
Assume complete dissociation of NaCl

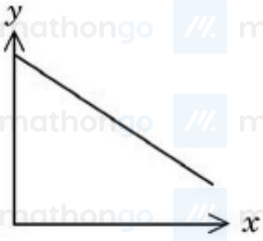
(Given : Molar mass of Na and Cl are 23 and 35.5 g mol^{-1} respectively.)

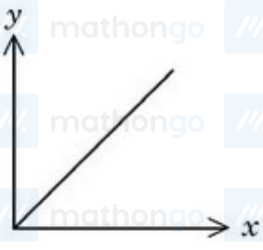
Q4. 22 January Shift 1

Consider a solution of CO_2(g) dissolved in water in a closed container. Which one of the following plots correctly represents variation of log (partial pressure of CO_2 in vapour phase above water) [y-axis] with log (mole fraction of CO_2 in water) [x-axis] at 25°C ?

(1) 

(2) 

(3) 

(4) 

Q5. 22 January Shift 1

Given below are two statements:

Statement I: The Henry's law constant K_H is constant with respect to variations in solution's concentration over the range for which the solution is ideally dilute.

Statement II: K_H does not differ for the same solute in different solvents.

In the light of the above statements, choose the correct answer from the options given below

(1) Statement I is false but Statement II is true (2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false (4) Both Statement I and Statement II are true

Q6. 22 January Shift 2

At $T(K)$, 100 g of $98\% H_2SO_4(w/w)$ aqueous solution is mixed with 100 g of $49\% H_2SO_4(w/w)$ aqueous solution. What is the mole fraction of H_2SO_4 in the resultant solution?

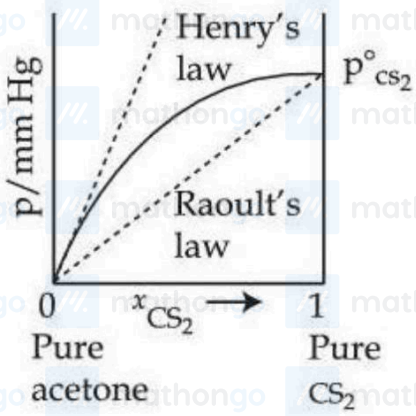
(Given : Atomic mass $H = 1u; S = 32u; O = 16u$).

(Assume that temperature after mixing remains constant)

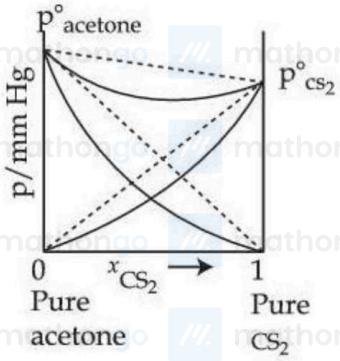
(1) 0.663 (2) 0.9 (3) 0.337 (4) 0.1

Q7. 23 January Shift 1

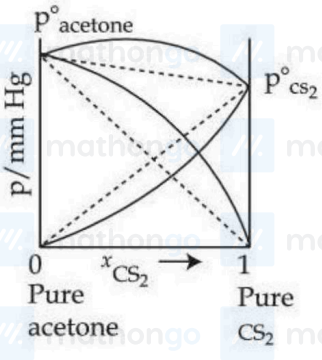
Which one of the following graphs accurately represents the plot of partial pressure of CS_2 vs its mole fraction in a mixture of acetone and CS_2 at constant temperature?



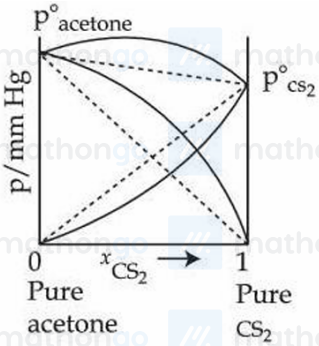
(1)



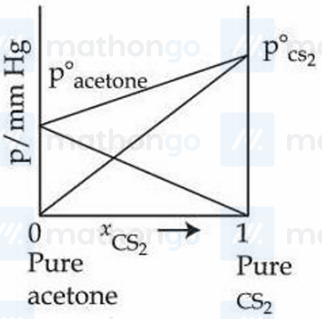
(2)



(3)



(4)



Q8. 23 January Shift 2

Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is ____. (Nearest integer)

Q9. 24 January Shift 1

A solution is prepared by dissolving 0.3 g of a non-volatile non-electrolyte solute 'A' of molar mass 60 g mol^{-1} and 0.9 g of a non-volatile non-electrolyte solute ' B ' of molar mass 180 g mol^{-1} in 100 mLH_2O at 27°C. Osmotic pressure of the solution will be

[Given: R = 0.082 L atm K^{-1} mol^{-1}]

(1) 0.82 atm (2) 2.46 atm (3) 1.23 atm (4) 1.47 atm

Q10. 24 January Shift 1

' W ' g of a non-volatile electrolyte solid solute of molar mass ' M ' $gmol^{-1}$ when dissolved in 100 mL water, decreases vapour pressure of water from 640 mm Hg to 600 mm Hg. If aqueous solution of the electrolyte boils at 375 K and K_b for water is 0.52 K kg mol^{-1}, then the mole fraction of the electrolyte solute (x_2) in the solution can be expressed as

(Given : density of water = 1 g/mL and boiling point of water = 373 K)

(1) $\frac{2\cdot6}{16} \times \frac{M}{W}$ (2) $\frac{16}{2\cdot6} \times \frac{W}{M}$ (3) $\frac{1.3}{8} \times \frac{M}{W}$ (4) $\frac{1\cdot3}{8} \times \frac{W}{M}$

Q11. 24 January Shift 2

At 298 K, the mole percentage of N_2(g) in air is 80%. Water is in equilibrium with air at a pressure of 10 atm. What is the mole fraction of N_2(g) in water at 298 K ? (K_H for N_2 is 6.5×10^7 mmHg)

(1) 1.23×10^{-7} (2) 1.17×10^{-4} (3) 9.35×10^{5} (4) 9.35×10^{-5}

Q12. 24 January Shift 2

Two liquids A and B form an ideal solution at temperature T K. At T K, the vapour pressures of pure A and B are 55 and 15kNm^{-2} respectively. What is the mole fraction of A in solution of A and B in equilibrium with a vapour in which the mole fraction of A is 0.8 ?

(1) 0.340 (2) 0.663 (3) 0.5217 (4) 0.480

Q13. 28 January Shift 1

At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

(1) 400, 300 (2) 600,400 (3) 300,200 (4) 500, 200

Q14. 28 January Shift 2

Consider the following aqueous solutions.

I. 2.2 g Glucose in 125 mL of solution.

II. 1.9 g Calcium chloride in 250 mL of solution.

III. 9.0 g Urea in 500 mL of solution.

IV. 20.5 g Aluminium sulphate in 750 mL of solution. The correct increasing order of boiling point of these solutions will be :

[Given : Molar mass in $gmol^{-1}$: $H = 1, C = 12, N = 14, O = 16, Cl = 35.5, Ca = 40, Al = 27$ and $S = 32$]

(1) III < I < II < IV (2) I < II < III < IV

(3) II < III < I < IV (4) II < III < IV < I

ANSWER KEYS

1. (3)	**2.** 3	**3.** 15	**4.** (2)	**5.** (3)	**6.** (3)	**7.** (4)	**8.** 200
9. (2)	**10.** (4)	**11.** (4)	**12.** (3)	**13.** (4)	**14.** (2)		