Most Repeated Questions in JEE Main Chemistry from Colligative Properties

Q: When a non-volatile solute is added to the solvent, the vapour pressure of the solvent decreases by 10 mm of Hg . The mole fraction of the solute in the solution is 0.2. What would be the mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg ?

Q: A solution containing 10 g of an electrolyte AB_2 in 100 g of water boils at 100.52°C. The degree of ionization of the electrolyte (a) is _____× 10^{-1} . (nearest integer)

[Given: Molar mass of AB_2 = 200 g mol^{-1} , Kb (molal boiling point elevation constant of water) = 0.52 K kg mol^{-1} , boiling point of water = 100°C; AB2 ionises as $AB_2 \rightarrow A^{2+} + 2B^-$]

Q: Considering acetic acid dissociates in water, its dissociation constant is 6.25 x 10^5. If 5 mL of acetic acid is dissolved in 1 litre water, the solution will freeze at-x × 10-2 ºC, provided pure water freezes at 0 °C. x = _____(Nearest integer)

Given: $(K_f)_{water}$ = 1.86 K kg mol^{-1}

Q: When 'x' x 10-2 mL methanol (molar mass = 32 g' density = 0.792 g/cm³) is added to 100 mL. water (density = 1 g/cm³), the following diagram is obtained. x = _____(nearest integer).

[Given: Molal freezing point depression constant of water at 273.15 K is 1.86 K kg mol^{-1}]

Q: An artificial cell is made by encapsulating 0.2 M glucose solution within a semipermeable membrane. The osmotic pressure developed when the artificial cell is placed within a 0.05 M solution of NaCl at 300 K is _____ × 10^{-1} bar. (nearest integer). [Given: R0.083 L bar mol^{-1} K^{-1}]

Q: 2.7 kg of each of water and acetic acid are mixed. The freezing point of the solution will be -x °C. Consider the acetic acid does not dimerise in water, nor dissociates in water. x = _____(nearest integer)

[Given: Molar mass of water 18 g mol^{-1} , acetic acid 60 g mol^{-1}
KH_2O: 1.86 K kg mol^{-1}
K_f acetic acid: 3.90 K kg mol^{-1}
freezing point: H2O = 273 K, acetic acid 290 K]

Q: The vapour pressure of 30% (w/v) aqueous solution of glucose is _____ mm Hg at 25°C. [Given: The density of 30% (w/v), aqueous solution of glucose is 1.2 g cm^{-3} and vapour pressure of pure water is 24 mm Hg.] (Molar mass of glucose is 180 g mol^{-1})

Q: If the degree of dissociation of aqueous solution of weak monobasic acid is determined to be 0.3, then the observed freezing point will be _____ % higher than the expected/ theoretical freezing point. (Nearest integer)

Q: Sea water contains 29.25% NaCl and 19% $MgCl_2$ by weight of solution. The normal boiling point of the sea water is _____ ^oC (Nearest integer) Assume 100% ionization for both NaCl and $MgCl_2$

Given: Kb (H2O) = 0.52 K kg mol^{-1} Molar mass of NaCl and $MgCl_2$ is 58.5 and 95 g mol^{-1} respectively.

Q: In the depression of freezing point experiment

A. Vapour pressure of the solution is less than that of pure solvent.
B. Vapour pressure of the solution is more than that of pure solvent.
C. Only solute molecules solidify at the freezing point.
D. Only solvent molecules solidify at the freezing point.

(A) A and D only
(B) B and C only
(C) A and C only
(D) A only

Q: . A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K. The molecular mass of the solute is _____ g mol^{-1} . (Nearest integer) Given, water boils at 373 K, Kb for water = 0.52 K kg mol^{-1}