

Chapter Three

- 1) Which one of the following would you expect to have good solubility in water? Explain your answer?
(a) C_2H_6 (b) CaSO_4 (c) CH_4 (d) CCl_4
- 2) How much solvent must be added to 5.2 g of CaSO_4 to prepare 32.7% by mass solution?
- 3) Calculate the molality of following solutions
a- 2M sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) (density of solution = 1.12g/ml).
b- 48.2 % by mass KBr solution
- 4) How many grams of water are needed to dissolve 27.8 g of ammonium nitrate NH_4NO_3 in order to prepare a 0.452 m solution?
- 5) The vapor pressure of water at 20°C is 17.5 mmHg. What is the vapor pressure of a solution prepared from 2.00×10^2 g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) and 3.50×10^2 g water?
- 6) The vapor pressure of ethanol ($\text{C}_2\text{H}_5\text{OH}$) at 20 °C is 44 mmHg, and the vapor pressure of methanol (CH_3OH) at the same temperature is 94 mmHg. A mixture of 16 g of methanol and 31 g of ethanol is prepared (and can be assumed to behave as an ideal solution). calculate the vapor pressure of ethanol and methanol at 20 °C?
- 7) A solution is prepared by condensing 8.2 L of a gas, measured at 28 °C and 784-mmHg pressure, into 84 g of benzene. Calculate the freezing point of this solution? Freezing point of benzene is 5.5 °C and $K_f = 5.12$ °C/m.

- 8) When 24.0 g of a compound (a nonelectrolyte) are dissolved in 500 g of benzene, the solution has a freezing point of -0.47°C . What is the molar mass of the compound? Freezing point of benzene is 5.5°C and K_f of benzene is 5.12°C/m .
- 9) The vapor pressures of pure ethanol and 1-propanol are 108 and 40 mmHg at 36°C . The mole fraction of ethanol in a solution of the two is 0.73. Assuming the solution behaves ideally, what is the mole fraction of ethanol in the vapor phase?
- 10) 12.45 g of an organic compound ($\text{MW} = 324 \text{ g}$) was dissolved in water to make 283 mL of the solution at 32°C . what is the osmotic pressure of the solution ?
 $\pi = MRT$
- 11) The osmotic pressure of 0.050 M MgSO_4 at 25°C is 1.60 atm. what is the Van't Hoff factor?
- 12) What is the van't Hoff factor for calcium phosphate $\text{Ca}_3(\text{PO}_4)_2$ and ethylene glycol ($\text{C}_2\text{H}_4(\text{OH})_2$)?