

CHEM 101B Solutions – Colligative Properties

1. Calculate the molarity and mole fraction of acetone in a 1.00-*m* solution of acetone (CH_3COCH_3) in ethanol ($\text{C}_2\text{H}_5\text{OH}$). (Density of acetone = 0.788 g/cm³; density of ethanol = 0.789 g/cm³; Assume that the volumes of acetone and ethanol add.)

2. What is the vapor pressure of a solution prepared by dissolving 27.2 g CaCl_2 in 25.0 mL water (density=0.997 g/mL) at 25°C, if pure water has a vapor pressure of 23.756 torr at this temperature? Assume $i=3.0$ for calcium chloride.

3. A salt/ice/water solution is made in the preparation of ice cream. If 4.0 oz rock salt is added to 0.50 gal ice water. To what temperature will the mixture be reduced? ($K_f = 1.86^\circ\text{C}\cdot\text{kg}/\text{mol}$, $i = 1.9$)

4. You combine 1.70 moles cyclohexane ($P_{cy}^{\circ}=97.6$ torr) with 2.85 moles acetone ($P_{ac}^{\circ}=229.5$) torr. Assume an ideal solution forms.
- What is the mole fraction of each solvent in solution?
 - What is the partial pressure of each solvent?
 - What is the solution vapor pressure?
 - What is the mole fraction of each solvent in the vapor?

5. A 1.00×10^{-3} g-sample of a protein was dissolved in water to make a 1.00 mL solution. The osmotic pressure of this solution was found to be 1.12 torr at 25°C. Calculate the molar mass of this protein.