

Questions from an old test (Summer 00)

1. (16 pts.) Determine (a) the molarity and (b) the molality of an aqueous 50.0% by mass NaOH solution. The density of the NaOH solution is 1.515 g/cm^3 . The density of pure water is 1.000 g/cm^3 .

2. (13 pts.) At $25.0 \text{ }^\circ\text{C}$, 0.1354 g of an unknown nonelectrolyte are dissolved in enough water to make 10.0 mL of solution. The osmotic pressure of the solution was 13.2 torr . Determine the molar mass of the unknown.

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3. (14 pts.) A solution is made from 0.375 mol of benzene (C_6H_6) and 0.425 mol of pentane ($CH_3CH_2CH_2CH_2CH_3$). Determine the mole fraction of benzene in (a) the liquid phase of the solution. The vapor pressures of benzene and pentane are 95 and 511 torr respectively. (b) Which has the higher boiling point, benzene or pentane.

6. (12 pts.) You are asked to use freezing point depression to determine the molar mass of an unknown substance. The unknown substance dissolves in both benzene, $K_f = 5.10 \text{ } ^\circ\text{C} \cdot m^{-1}$, and water, $K_f = 1.86 \text{ } ^\circ\text{C} \cdot m^{-1}$. Which solvent should you use. Support your choice with calculations.