Colligative Property Practice

1. If the molarity of an aqueous solution is known, what other property of the substance must be known in order to determine the molality of the solution? How does the magnitude of the value of molality compare to the value of the molarity of the same substance?
2. Why does a 2.00-molal aqueous solution of glucose (C6H12O6) have the same freezing point as a 2.00-molal solution of sucrose (C12H22O11), even though the M.Wt. of sucrose is much greater?
3. The freezing point of a solution prepared by dissolving 1.00 mol of hydrogen fluoride, HF, in 500 g water is -3.8oC, but the freezing point of a solution prepared by dissolving 1.00 mol of hydrogen chloride, HCl, in 500g water is -7.4oC. Explain.
4. The Henry’s law constant (kH) for O2 in water at 20oC is 1.28 x 10-3 mol/Latm. How many grams of O2 will dissolve in 2.00 L of H2O when the partial pressure of O2 above the water is 1.00 atm? How many grams of O2 will dissolve in 2.00 L of water when the partial pressure of O2 above the water is 0.502 atm?
5. A 3.179 M solution of glucose (C6H12O6) has a density of 1.381 g/mL at 25oC. Calculate
   1. the mass percent of glucose
   2. the mole fraction of glucose
   3. The molality of glucose
6. A solution of glucose in water has a vapor pressure of 15.9 torr at 25oC. The vapor pressure of pure water is 23.8 torr at 25oC and 71.9 torr at 45oC.
   1. What is the mole fraction of glucose in this solution?
   2. What would be the vapor pressure of this solution at 45oC?
7. If 30.0 grams of magnesium chloride (a strong electrolyte) is dissolved in 500.0 ml of water, what is the freezing point of this solution?
8. The stevia plant produces a variety of glycosides which is a natural non-caloric sweeteners. The empirical formula of one of these glycosides is C5H8O. To find its molecular formula, you dissolve 1.65 g in 25.0 g of chloroform, CH3Cl. The boiling point of the solution is 62.41oC. What is the molecular formula of this glycoside? (Normal boiling point chloroform is 61.70oC and Kb is +3.63oC/m)
9. What is the osmotic pressure (**in mm Hg**) of an aqueous solution of NaCl if 0.230 grams of the salt is dissolved in enough water to make 350.0 ml of solution at 25oC? (Remember that NaCl is a strong electrolyte!)
10. What is the molecular weight of an organic solute if 3.72 grams of this compound, when dissolved in water, produced an osmotic pressure of 79.8 mm Hg? The volume of the solution is 95.0 ml and the temperature is 80.0oC.
11. Define the following terms:
12. isotonic solution:
13. hypertonic solution:
14. hypotonic solution