1. Define the following concentration units:

a. molarity

b. molality

c. mole fraction

d. mass percent

2. Fill in the blanks:
When a nonvolatile solute is dissolved in a solvent, the freezing point ________________, the boiling point ________________, the vapor pressure ________________ and the osmotic pressure ________________.

3. Calculate the boiling point and freezing point of 10.0g of NaF dissolved in 50.0 g water.
(NaF: 42 g/mol, K_b = 0.51 °C kg/mol, K_f = 1.86 °C kg/mol)

4. Rank the following 1.0 M solutions from lowest to highest osmotic pressure:

C_6H_{12}O_6  CaCl_2  K_3PO_4  HCl  CH_3COOH
5. When NH₄NO₃ is dissolved in water, the solution gets cold. Predict the sign of ΔS for the dissolution of ammonium nitrate.

6. 15.0 g of a nonvolatile, nonelectrolyte solute are dissolved in 100 g water. The freezing point of the solution is -4.65 °C and the mole fraction of solute is 0.043. Calculate the vapor pressure of the solution at 100 °C.

7. The vapor pressures of pure methanol and propanol at 40°C are 303 and 44.6 torr
   a. A solution is made by mixing 0.677 moles of propanol and 0.428 moles of methanol at 40 °C. Calculate the vapor pressure of the solution assuming it behaves ideally.
   
   b. If the vapor pressure of a methanol-propanol solution is 212 torr at 40 °C, calculate the mole fraction of propanol in solution.