1. Consider dissolving 50 mol of a non-volatile solute in 100 mol of liquid water at 100 °C.

   (a) What is the vapor pressure of this solution? Assume ideal behavior.

   (b) How would the vapor pressure in part (a) change if the solute-solvent interactions became more favorable?

2. Consider the following information.

   $\Delta H_f^o[CaCl_2\ (s)] = -795.4\ kJ/mol$ $\Delta H_{sub}[Ca\ (s)] = 154\ kJ/mol$ $\Delta H_{BE}[Cl_2] = 240\ kJ/mol$

   $IE_1[Ca] = 590\ kJ/mol$ $IE_2[Ca] = 1145\ kJ/mol$ $EA[Cl] = -349\ kJ/mol$

   (a) Calculate the lattice energy (U) of $CaCl_2$. Draw an energy diagram, with energy on the y-axis, of the Born-Haber cycle that enables you to calculate the lattice energy (U).

   (b) Would you expect the lattice energy of $MgCl_2$ to larger or smaller than that of $CaCl_2$?

3. The osmotic pressure of a 0.0100 M $CaCl_2$ solution at 298 K is 0.605 atm. How many moles of ions are dissociated for every mole of $CaCl_2$ dissolved in solution.

4. The wasp, *Bracon cephi*, survives in sub-freezing climates by elevating levels of glycerol, a compound composed of only C, H, and O atoms, in their blood as high as 5.00 mol/kg to depress the freezing point of blood. If typical blood (K_f = 1.853 °C/m) freezes at –1.50 °C, what is freezing point of wasp blood?