1. a) State Raoult's Law for a non-volatile solute in a single volatile solvent.

b) Suppose you had a solution of 6.84 g of sugar (sucrose, C_{12}H_{22}O_{11}) in 90.0 g of water.

   (i) Calculate the number of moles of sugar and water present. (H=1; C=12; O=16)

   (ii) Calculate the mole fraction of the water in the solution.

   (iii) At 100°C, the saturated vapour pressure of water at its boiling point is 101325 Pa. Calculate the vapour pressure of the solution at that temperature. (Remember to give your answer to a suitable number of significant figures.)

   (iv) Would the solution of sugar in water boil at this temperature, assuming the external pressure remains at 101325 Pa? Explain your answer.

2. Raoult's Law only really works for ideal solutions. An ideal solution is defined as one which obeys Raoult's Law.

   How do the following affect how ideal a solution is?

   a) The concentration of the solution.

   b) The forces between the particles in the solution.

   c) Changes to the solute molecules when they dissolve.

3. The diagram shows a part of the phase diagram for water around the triple point.

   a) Copy the diagram and sketch on it the equivalent diagram for a dilute solution of a non-volatile solute in water.

   b) Use your diagram to explain what happens to the freezing point and boiling point of water when a non-volatile solute is dissolved in it.