Answer on Question #56061 - Chemistry - General chemistry

Question:

Calculate the freezing point and boiling point of each of the following solutions:
1. the freezing point of the solution: 55.0 g of glucose, C6H12O6, added to 134 g of water (Kf=1.86◦C)
Express your answer using one decimal place.
2.the boiling point of the solution: 55.0 g of glucose, C6H12O6, added to 134 g of water (Kb=0.52◦C)
Express your answer using one decimal place.

Answer:

1. The change of the freezing point is defined by the equation:

   $\Delta t = K_f \times C$, where K_f – the cryoscopic constant (K_f = 1.86 K kg mol^{-1} for water) and C – the molality of the solution.

   C = ν/m, where ν – the number of moles of dissolved compound and m – the mass of the solvent.

   ν = 55.0 g/180 g mol^{-1} = 0.306 mol

   C = 0.306 mol/0.134 kg = 2.28 mol/kg

   Thus, $\Delta t = K_f \times C$ = 1.86 K kg mol^{-1} × 2.28 mol/kg = 4.2 K

   The freezing point of the solution is -4.2 ^oC.

2. The change of the boiling point is found using the similar equation:

   $\Delta t = K_b \times C$, where K_b – the embullioscopic constant (K_b = 0.52 K kg mol^{-1} for water) and C – the molality of the solution.

   Thus, $\Delta t = K_b \times C$ = 0.52 K kg mol^{-1}× 2.28 mol/kg = 1.2 K

   The boiling point is 101.2 ^oC.