Chem 116 Lecture 10
10-7-08 (LL)

i-clicker question

Answer: A, Na and Cl ions
Solute-Ions
Solvent- H_2O
Once NaCl is mixed into the solution is it no longer in the solid form, it breaks into ions

Know the difference between mass and moles

What does the "partial" pressure of He mean? Fraction on the He atoms that collide with the walls of the container

Pressure is from collision of gas particles with the walls

Boiling – The vapor pressure of the solvent is at or higher than P_{atm}

Water- extends a liquid phase, increase the boiling point and decreases the melting point

Normal boiling point example: Pure Water boils at 100.00C when the P_{atm} = 1 atm (normal pressure)

In a solution that contains a solvent and solute has a higher boiling point then just the solvent alone

What does the boiling point elevation depend on?
Being solute and not just pure solvent

Non idea solute has a non negligible vapor pressure

Particle level model of boiling point elevation

In a solution (solute + solvent) there are less water molecules escaping into the vapor phase because of the ion – dipole forces that are holding the water molecules and solvent molecules together

Also more energy is holding the water molecules and solvent molecules together so that less water molecules can escape into the vapor phase

Vapor Pressure of solvent over solution vs. vapor pressure of pure solvent

Solution vapor pressure is *lower* than solvent vapor pressure

Boiling point of solution is *higher* than boiling point of solvent. Because it requires a higher temperature to reach the same vapor pressure

Effective molality = (i) * (Molality of units dissolved)

i = How many parts the solute breaks into
ex: NaCl breaks into Na^+ and Cl^- ions so **i** would be 2

K = a constant of nature that depends on the Solvent only

An example: Boiling point elevation in a solution

1) Solvent- water 75% by mass
Solute- $HOCH_2CH_2OH$ 25% by mass

Solution $T_{b=}$?

T_b – (effective molality)(K_b solvent)

$HOCH_2CH_2OH$ is molecular so i = 1

m= molality= mols solute/ kg solvent

m= 25.0 g $HOCH_2CH_2OH$ / 62.1 g/mol / 75g H_2O/1000 = 5.368 m

T_b = (5.368)(0.51 c/m)= 2.7 C *this is only the temperature change

T_b solution = 100.0C + 2.7C= 102.7C
(100.0C is the BP of pure water)

An example: Vapor Pressure in a solution

- Always helpful to draw pictures

Colligative properties= Comparison between pure solvent and solution

P water= 1070 torr (in gas phase at 110C)

Vapor pressure of solvent is lower over the solution because the solute is in the way (molecules can not escape as easily)

Patm- 1.00atm

Solution = solvent + solute

P of water in the solution = (mole fraction of Xwater in the solution) * (vapor pressure of pure water)

Xwater= mol fraction
Xwater= Pwater/ P (pure) water

760 torr/ 1070 torr= .710 torr Xwater

1 -.710= .290 X ethylene glycol