Chemistry
C6 Solutions
Carmel High/Dooner

Colligative Properties

- **a property that depends only upon the NUMBER of solute particles, *not* upon their identity**

1) VAPOR PRESSURE LOWERING
2) BOILING POINT ELEVATION
3) FREEZING POINT DEPRESSSION

VAPOR PRESSURE LOWERING:

- **a solution that contains a "non-volatile" solute has a lower vapor pressure than the pure solvent**
- **the decrease in na solution's vapor pressure is proportional to the NUMBER OF PARTICLES the solute makes in solution,**

SO.....

IONIC SOLUTES THAT DISSOCIATE INTO 2 OR MORE IONS DECREASE THE VAPOR PRESSURE MORE THAN MOLECULAR COMPOUND

FREEZING POINT DEPRESSION:

- **the difference in Temperature between the FREEZING POINT of a solution and the FREEZING POINT of the pure solvent**
- **the MAGNITUDE of the freezing point depression is proportional to the NUMBER of solute particles dissolved in the solvent and DOES NOT depend upon their *identity***

ONE MOLE OF SOLUTE PARTICLES ADDED TO 1000 grams of H2O LOWERS THE FREEZING POINT BY 1.86 Degrees Celsius

FOR EXAMPLE: Salt on roads, antifreeze, etc.

BOILING POINT ELEVATION:

- **the difference in Temperature between the boiling point of a solution and the boiling point of the pure solvent**
- **adding solute DECREASES THE VAPOR PRESSURE, THEREFORE…….**

It INCREASES THE AMOUNT OF ENERGY THAT MUST BE ADDED TO ATTAIN EQUILIBRIUM WITH ATMOSPHERIC PRESSURE(i.e. "BOIL")

For example: cooks add salt to their boiling water so it gets hotter and cooks the pasta better

ONE MOLE OF SOLUTE PARTICLES ADDED TO 1000 grams of H2O RAISES THE BOILING POINT OF THE SOLUTION BY 0.512 degrees Celsius

HOMEWORK SOLUTIONS(p 490 # 24-28)

24) vapor pressure lowering, boiling point elevation, freezing point depression
25) the # of solute particles dissolved in the solvent
26) the concentrated sodium fluoride; because the magnitude of the boiling point(b.p.) elevation is proportional to the # of solute particles
27a) MgF2
27b) KI
27c) KI
28) Formation of "shells of solvation" around solute particles reduces the # of water molecules with sufficient KINETIC ENERGY(KE) to escape the solution; THEREFORE, Vapor Pressure goes DOWN relative to the vapor pressure of the pure solvent; on the other hand, since MORE ENERGY must be supplied to reach the boiling point, the Boiling Point GOES UP; solvation shells INTERFERE with the formation of HYDROGEN-BONDED ICE structures, THEREFORE, the FREEZING POINT GOES DOWN