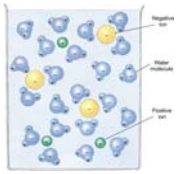
Chemistry BC2001x: General Chemistry I



Lecture 9: Thursday October 8, 2009
Solutions: Concentration units, Raoult's Law

Hand in Problem set 4

Pick up the following:

1) Problem set 5

2) Colligative Properties

and maybe...

Graded Exam I; answers on course web page.

What to do after taking an exam.

Summary from last lecture:
Data relevant to intermolecular forces:
comparisons among non-polar molecules

Substance	**a** (atm·L²/mole²)	**ε** (kJ/mole)	ΔH_{vap} (kJ/mole)	T_{bp} (K)
He	0.034	0.085	0.084	4.2
H_2	0.244	0.308	0.904	20
N_2	1.390	0.790	5.56	77
O_2	1.360	0.977	6.82	90
CH_4	2.253	1.23	8.16	109
Xe	4.194	1.84	12.64	166

Correlations of trends in the values of

the empirical constant a in the van der Waals gas equation,
the depth of the well ε in the intermolecular potential energy function,
the heat of vaporization ΔH_{vap}, and
the normal boiling point T_{bp}

Larger values indicate stronger intermolecular interactions.

None of these is polar, none makes H-bonds. (All are gases at room T)

More electrons → larger polarizibility → stronger dispersion forces.

Heavier molecules have more electrons, so they have stronger forces.

Multiple component systems: Solutions
one or more solutes in a solvent
(in this course, solvent usually water: aqueous solutions)

Need to characterize the concentration:
relative amount of solute and solvent
many different ways to do so.

Intensive property (like T, P): value same for any part of the sample as for the whole sample.

mole fraction: $X_k \equiv n_k/n$ (k is the solute)
$= $ (moles solute)/(moles solution)

% by weight ≡ 100 x (mass solute)/(mass solution)

molality (m) ≡ (moles solute)/(kg solvent)

molarity (M) ≡ (moles solute)/(L solution)

Preparing and using solutions using Molarity
Volumetric techniques with precise glassware:
volumetric flasks, pipets, and burets

molarity (M) ≡ (moles solute)/(L solution)

Colligative property:
(1) Vapor pressure lowering:
P_w (solution) < $P_w°$ (pure). Why?