2/8/2019

Mole fraction + mole percent

(last conc unit...)

X_{solute}

mol frac(solute) $= x_{solute} = \frac{n_{solute}}{n_{solution}} = \frac{n_{solute}}{n_{solute} + n_{solvent}}$

mol % $= x_{solute} \times 100$

ex: Dissolve 12.0 g CH_2O in 78.8 g H_2O.
Q: What is x_{CH_2O}?

$x_{CH_2O} = \frac{n_{CH_2O}}{n_{CH_2O} + n_{H_2O}}$

$n_{CH_2O} = 12.0\,g\,CH_2O \times \frac{1\,mol\,CH_2O}{30.03\,g\,CH_2O} = 0.3996\,mol$

$n_{H_2O} = 78.8\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.02\,g\,H_2O} = 4.373\,mol$

$= 0.0837$

mol percent? $x \times 100 = 8.37\,\%$

p496 12.4

~~p591~~, ex: ~~12.14~~ 5 conversions. Do these!

ex: 12-5 % by mass → molarity.

12.0 g CH_2O in 78.8 g H_2O.
- Q: What is its molal conc?

No wonder I was confused here! In the 4th edition of the textbook, these two example problems are on pages 591 & 592 (13-4, and 13-5)

In the "principles of chemistry" edition of the textbook (which you might also find in your eText app), these two example problems are on pages 496 & 497 (12-4, and 12-5)

$$\text{molal conc} = \frac{\#\text{mol solute}}{\#\text{Kg solvent}}$$

$12.0\,g\ CH_2O$ (solute)

$78.8\,g\ H_2O$ (solvent).

$$78.8\,g \times \frac{Kg}{10^3\,g} = 0.0788\,kg$$

$$12.0\,g\ CH_2O \times \frac{1\,mol}{30.03\,g} = 0.3996\,mol$$

$\frac{mol}{Kg} = mol \cdot Kg^{-1}$

$$\text{molal conc} = \frac{0.3996\,mol}{0.0788\,Kg} = 5.07\,m$$

Colligative Properties

Physical properties of solutions that depend upon TOTAL solute conc, not ID.

ex: bp elevation
fp depression
osmotic pressure
} $\propto$ tot. solute conc.

1 M $C_6H_{12}O_6(aq)$ (glucose)
1 M $CH_2O(aq)$ (formaldehyde)
↖↙ same colligative props.

1 M 1 M

What 1 M $NaCl(aq)$ (salt)

- NO IT DOESN'T! It behaves like 2 M soln!

$NaCl(aq) \longrightarrow Na^+(aq) + Cl^-(aq)$

1 M → 1 M, 1 M

tot. solute conc: 2 M

consider H_2O