

2/8/2019

# Mole fraction + mole percent

(last conc unit...)

$$X_{\text{solute}} \quad \text{mol frac(solute)} = X_{\text{solute}} = \frac{n_{\text{solute}}}{n_{\text{solution}}} = \frac{n_{\text{solute}}}{n_{\text{solute}} + n_{\text{solvent}}}$$

$$\text{mol \%} = X_{\text{solute}} \times 100$$

ex: Dissolve 12.0g CH<sub>2</sub>O in 78.8g H<sub>2</sub>O.

Q: What is X<sub>CH<sub>2</sub>O</sub>?

$$X_{\text{CH}_2\text{O}} = \frac{n_{\text{CH}_2\text{O}}}{n_{\text{CH}_2\text{O}} + n_{\text{H}_2\text{O}}}$$

$n_{\text{CH}_2\text{O}} = 12.0\text{g CH}_2\text{O} \times \frac{1\text{ mol CH}_2\text{O}}{30.03\text{g CH}_2\text{O}} = 0.3996\text{ mol}$

$n_{\text{H}_2\text{O}} = 78.8\text{g H}_2\text{O} \times \frac{1\text{ mol H}_2\text{O}}{18.02\text{g H}_2\text{O}} = 4.373\text{ mol}$

$$= 0.0837$$

mol percent?  $X \times 100 = 8.37\%$

p496, ex: 12-4  
 p591, ex: 12-5

5 conversions. Do these!  
 % by mass → molarity.

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)

12.0g CH<sub>2</sub>O in 78.8g H<sub>2</sub>O.  
 - Q: What is its molal conc?

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)

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

12.0g CH<sub>2</sub>O (solute)  
78.8g H<sub>2</sub>O (solvent).

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

$$12.0\text{g CH}_2\text{O} \times \frac{1\text{mol}}{30.03\text{g}} = 0.3996\text{mol}$$

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

$\frac{\text{mol}}{\text{kg}} = \text{mol} \cdot \text{kg}^{-1}$

## Colligative Properties

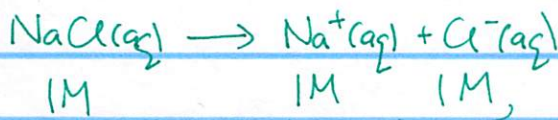
Physical properties of solutions that depend upon  
TOTAL solute conc, not ID.

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

1M C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>(aq) (glucose)  
1M CH<sub>2</sub>O(aq) (formaldehyde) } same colligative props.

What 1M NaCl(aq) (salt)

- NO IT DOESN'T! It behaves like 2M sol<sup>n</sup>!



tot. solute conc: 2M

1/6 M





consider H<sub>2</sub>O

