Bellringer: March 13

Determine the mass needed to make 1.0 L of a 2.5 M solution of NaCl.

$\frac{2.5\ M}{1} = \frac{x\ mol}{1.0\ L}$

$2.5\ mols \times \frac{58\ g}{1\ mol} = 145\ g$

Apr 4-8:30 AM

Wednesday March 21st

Objective: Students will learn how to express concentration in chemistry.

1. Bellringer
2. Notes on Colligative Properties
3. HW ?'s

Quiz Tomorrow

Due: Missing Work, Dilution Lab, Concentration/ Dilution Practice
Homework: Missing Work, Colligative Properties

Apr 4-8:16 AM

Molality:

m = mol/kg

1000 mL = 1 L

1 mL H_2O = 1 g H_2O (based on density of H_2O _____)

1000 g = 1 kg

Freezing point of water 0 °C
Boiling point of water 100 °C

Mar 10-7:39 AM

Practice:

What is the molality of a solution that contains 5.0 moles of sucrose dissolved in 2500 mL of water?

$m = \frac{5\ mol}{2.5\ kg}$ $\frac{2500\ g}{1000}$

$m = 2\ m$

Colligative Properties

Colligative Property: a property that depends only on the **number** of solute particles, and not the **type** of particle.

2 colligative properties we are studying:
1. Freezing Point Depression - decrease
2. Boiling Point Elevation - increase

Apr 25-8:04 AM

Freezing Point Depression

What happens when something freezes (for example, water)?

- Decrease in energy slows molecules/atoms down
- Intermolecular forces have more effect (atoms have less energy to fight them)
- Frozen water (ice) molecules are in an orderly pattern.

What happens when you add a solute?

The addition of another substance (a solute) disrupts and prevents water molecules from forming an orderly pattern.

Freezing Point Depression: adding a substance to a pure solvent *lowers* the freezing point

Mar 10-7:41 AM

Freezing Point Depression

To calculate the change in freezing point:

$$\Delta T_f = m \times k_f \times i$$

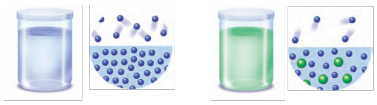
ΔT_f = change in freezing point

m = molality

kf = constant (water = 1.86)

i = dissociation factor

Boiling Point Elevation



Pure solvent *Solution containing nonvolatile solute*

Solute particles also get in the way of a solvent's ability to boil thereby increasing the boiling temperature.

Boiling Point Elevation: adding a substance to a pure solvent *increases* the boiling point

Mar 10-7:45 AM

Boiling Point Elevation

To calculate the change in freezing point:

$$\Delta T_b = m \times k_b \times i$$

ΔT_b = change in boiling point

m = molality

kb = constant (water = 0.512)

i = dissociation factor

Dissociation Factor

Dissociation factor:
How many particles the solute will break in to in solution.

Dissociation Factor

Covalent compounds: will not **dissociate** → *i* = ***1***

Ionic compounds: will dissociate into **ions** → *i* = *# of **ions** per **compound***

n+n
m

Mar 10-7:46 AM

Dissociation Factor examples

What is the dissociation factor for each compound?

I 1. $AlPO_4$ 2
C 2. N_2O_4 1
I 3. $LiCl$ 2
I 4. CaI_2 3
C 5. PCl_5 1
I 6. $Pb(OH)_4$ 5
C 7. XeF_4 1
I 8. Cu_2CO_3 3

Mar 10-7:47 AM

Practice: $\Delta T_f = m \times k_f \times i$

2

What is the freezing point of 10.2 grams of NaCl in 5.1 kg of water?

kf = 1.86 for water!

$m = \frac{0.18\ mol}{5.1\ kg} = 0.035$

$10.2\ g\ NaCl \times \frac{1\ mol}{58\ g} = 0.18\ mol$

$\Delta T_f = 0.035 \cdot 1.86 \cdot 2$

$= 0.13$

$0 - 0.13 = -0.13\ ^\circ C$

Practice

$\Delta T_b = m \times k_b \times i$

3

What is the boiling point of a solution containing 100.0 g (X) dissolved in 250.0g of water?

mol

Kg

kb = 0.512 for water!

$100g \times \frac{1\,mol}{94g} = \frac{1.06\,mol}{.25\,Kg} = 4.24\,m$

$\Delta T_b = 4.24 \cdot 0.512 \cdot 3$

$= 6.5 + 100 = 106.5°C$

Lab/Concentration Dilution ?'s

4 lab
4,1 dilution
3,7 conc

Quiz Tomorrow

② $\left[\frac{X}{275}\right] \frac{X100}{100} = \frac{15\%}{100}$

$\frac{X}{275} = \frac{15}{1}$

⑦ $X = 41.25\,g$

① $M_1V_1 = M_2V_2$

$125(.15) = M_2\,150$

④ $345(1.5) = 250(M_2)$

③ $0.05(V_2) = 250(10)$

Attachments

solutionSalt.zip

clipboard(20615).galleryitem