Wessner

Chemistry
Weeks 3 & 4

Name _____ Date _____ Class _____

Chapter 12 Solutions:
Week 4 packet

Concentration: a solution is a measure of the amount of solute in a given amount of solvent or solution

Concentrations are expressed in two ways
Molarity
Or
Molality

Molarity: is the number of moles of solute in one liter of solution(solvent)

Molality: is the number of moles of solute in one kilogram of solvent

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Finding Molarity:

One mole of NaOH has a mass of 40g. if this amount is dissolved in exactly one liter of water(solvent) then this solution is said to be a

1 molar solution, expressed as

1M NaOH

$$\text{Molarity (M)} = \frac{\text{amount of solute (mol)}}{\text{Volume of solution (L)}}$$

$$\frac{0.5 \text{ mol of NaOH}}{1.0 \text{ L water}} = 0.5 \text{ M NaOH}$$

In other words, this would give us a half concentration of a NaOH solution.

We can also use this ratio to dilute or increase solutions concentration.

$M_1V_1 = M_2V_2$

The initial molarity times the initial volume is equal to the ending molarity times the ending volume

We have a 1 L 0.5 M NaOH solution and we want to dilute the solution into 2 L of water. What is our ending Molarity?

$M1V1 = M2V2$

$$\frac{M1V1}{V2} = M2$$

$$\frac{0.5\ M)(\ 1L)}{(2L)} = 0.25\ M\ NaOH$$

We diluted a half solution of NaOH to a quarter solution.

When making solutions, we dissolve one mole of solute into less than 1 L of solvent. More Solvent is added afterwards to bring the solution equal to 1 L

Problems:

You have 3.5 L of solution that contains 90.0 g of NaCl. What is the molarity of the solution?

Given a 0.8 L 0.5 M HCl solution, how many moles of HCl does this solution contain?

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A 23.4 gram sample of potassium chromate is needed to react with silver chromate.
Given 5 L of 6.0 M K2CrO4, what volume of solution is needed to react?

What Molarity is made when you have a .75 M HCl if you dilute to 3 L?

What is the beginning Molarity if the beginning volume is 1 L and you diluted the solution to a 2L 1.5 M solution?

Molality:

Number of moles per kilogram of solvent

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$$\text{Molality (m)} = \frac{\text{moles solute}}{\text{Mass of solvent (kg)}}$$

This is similar to Molarity since we are talking about concentrations but

molarity is moles solute and volume Of solvent

Where

Molality is moles of solute and MASS of solvent

Notice too that the symbol for Molarity is a capital M and the symbol for Molality is a lower case m

So

A solution that contains 1 mole of NaOH that is dissolved in 1 Kg of solvent (water) is said to be a one Molal solution

$$\frac{0.5 \text{ mol NaOH}}{1.0 \text{ Kg H2O}} = 0.5 \text{ m NaOH}$$

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If the solvent is expressed in grams one must convert to kilograms

1 Kg = 1000 g

$\frac{1\text{Kg}}{1000\text{ g}}$ or $\frac{1000\text{g}}{1\text{ Kg}}$

Problems:

81.3 g of ethylene glycol $C_2H_6O_2$ are dissolved into .166 Kg of water, what is the molal concentration?

Urea CH_4N_2O, is used to treat dry skin and is a plant fertilizer. If you have 203 g CH_4N_2O dissolved in 2250 g solution, what is the molal concentration?

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What is the molality of 6.5 Kg of ethylene glycol , C2H6O2 dissolved into 1.5 Kg of water?