BP 118

Physical Pharmacy-I Lab

Prepared by

Dr. Mst. Hajera Khatun

What are 3 ways to measure the concentration of a solution?

1. Normality:

Normality (N) is defined as the number of gm equivalents per liter of solution

normality = number of gm equivalents/1 L of solution.

A 1 N solution is said to be "one normal."

For calculation of weight to prepare normal solution

Weight=SMV/1000

Here S=Strength

M=Gram equivalent weight

V= Volume

Example; How can you prepare 0.1 N 250 ml NaOH solution?

Answer: Here S=0.1 N

M= 40 gm

V= 250 ml

Weight= SMV/1000

=0.1X 40 X 250/1000

= 1 gm

So to prepare 0.1 N 250 ml NaOH solution, firstly weigh 1 gm of NaOH and take into 250 ml volumetric flask and dissolve it in 200 ml distilled water. Finally make the volume upto 250 ml with distilled water.

2. Molarity:

Molarity is defined as the moles of a solute per liters of a solution. Molarity is also known as the molar concentration of a solution.

Molarity formula and units

The units of molarity are *M* or mol/L. A 1 *M* solution is said to be "one molar."

Molarity equation

***M* = moles solute / liters solution**

For calculation of weight to prepare molar solution

Weight=SMV/1000

Here S=Strength

M=Molecular weight in gram

V= Volume

Example; How can you prepare 0.1 M 500 ml NaOH solution?

Answer: Here S=0.1 M

M= 40 gm

V= 500 ml

Weight= SMV/1000

=0.1X 40 X 500/1000

= 2 gm

So to prepare 0.1 M 500 ml NaOH solution, firstly weigh 2 gm of NaOH and take into 500 ml volumetric flask and dissolve it in 300 ml of distilled water. Finally make the volume upto 500 ml with distilled water.

3. Molality:

Molality (*m*), or molal concentration, is the amount of a substance dissolved in a certain mass of solvent. It is defined as the moles of a solute per kilograms of a solvent.

Molality formula and units

The units of molality are *m* or mol/kg.

Molality equation

m **= moles solute / kilograms solvent**

Difference between Molality and Molarity

	Molarity (M)	**Molality (m)**
Measure of	Concentration	Concentration
Definition	The moles of a solute per liters of a solution	The moles of a solute per kilograms of a solvent
Units	*M*	*m*
Equation	*M* = moles solute / liters solution	*m* = moles solute / kg solvent
Ratio of moles to:	Volume (in liters)	Mass (in kilograms)

Titration:

Titration refers to a process where the use of a solution of known concentration takes place for the determination of the concentration of an unknown solution.

Titrant: The known solution whose concentration is known, is added from a burette to a known quantity of the analyte.

Analyte: The unknown solution whose concentration is to be determined.

An acid-base titration is an experimental procedure used to determine the unknown concentration of an acid or base by precisely neutralizing it with an acid or base of known concentration.

Neutralizing reaction:

$HCl + NaOH = NaCl + H_2O$

End point: The point during a titration when an indicator shows that the amount of reactant necessary for a complete reaction has been added to a solution.

Indicator: A substance that changes color in response to a chemical change. An acid–base indicator (e.g., phenolphthalein) changes color depending on the pH. ... A drop of indicator solution is added to the titration at the beginning; the endpoint has been reached when the color changes.

Examples of indicator

Indicator	**Acidic**	**Alkaline**
Methyl orange	Red	Yellow
Phenolphthalein	Colourless	Pink
Methyl red	Red	Yellow
Bromothymol blue	Yellow	Blue

	H_2SO_4	NaOH	Na_2CO_3
M.W	98	40	106
E.W	49	40	53

1 N NaOH solution

=40 gm NaOH dissolved in 1 l (1000 ml) dH_2O

0.1 N Na_2CO_3 500 ml solution

1 M NaOH solution

=40 gm NaOH dissolved in 1 l (1000 ml) dH_2O

1 N Na_2CO_3 solution

=53 gm Na_2CO_3 dissolved in 1 l (1000 ml) dH_2O

1 M Na_2CO_3 solution

=106 gm Na_2CO_3 dissolved in 1 l (1000 ml) dH_2O

0.1 M Na_2CO_3 500 ml solution