

Pharmaceutical analysis- BP102T**UNIT: 1 (Pharmaceutical analysis, its definition and scope, methods expressing techniques)****CLASS:2****TOPIC: Methods of Expressing Concentration of Solution**

Concentration of solution is the amount of solute dissolved in a known amount of the solvent or solution. The concentration of solution can be expressed in various ways as discussed below,

(1) **Percentage:** It refers to the amount of the solute per 100 parts of the solution. It can also be called as parts per hundred (pph). It can be expressed by any of following four methods,

(i) Weight to weight percent

$$\% \text{ w/w} = \frac{\text{Wt. of solute}}{\text{Wt. of solution}} \times 100$$

(ii) Weight to volume percent

$$\% \text{ w/v} = \frac{\text{Wt. of solute}}{\text{Volume of solution}} \times 100$$

(iii) Volume to volume percent

$$\% \text{ v/v} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

(i) Volume to weight percent

$$\% \text{ v/w} = \frac{\text{Volume of solute}}{\text{Wt. of solution}} \times 100$$

(2) Parts per million (ppm) and parts per billion (ppb):

When a solute is present in trace quantities, it is convenient to express the concentration in parts per million and parts per billion. It is the number of parts of solute per million (10^1) or per billion (10^9) parts of the solution. It is independent of the temperature.

$$Ppm = \frac{\text{mass of solute component}}{\text{Total mass of solution}} \times 10^1$$

$$Ppb = \frac{\text{mass of solute component}}{\text{Total mass of solution}} \times 10^9$$

(3) Normality (N)

It is defined as the number of gram equivalents (equivalent weight in grams) of a solute present per litre of the solution. Unit of normality is gram equivalents litre⁻¹. Normality changes with temperature since it involves volume. When a solution is diluted times, its normality also decreases by times. Solutions in term of normality generally expressed as,

N= Normal solution; 5N= Penta normal,

10N= Deca normal; N/2= semi normal

N/10= Deci normal; N/5= Penti normal

N/100 or 0.01N= centinormal,

N/1000 or 0.001= millinormal

Mathematically normality can be calculated by following formula

$$\text{Normality (N)} = \frac{\text{Number of gm eq. of solute}}{\text{Volume of solution (l)}}$$

(* 1 equivalent = 1000 mill equivalent or meq.)

(4) Molarity

The number of moles of solute per litre of solution OR the molar concentration of a solution usually expressed as the number of moles of solute per litre of solution.

It is also known as molar concentration, is the number of moles of a substance per litre of solution. Solutions labelled with the molar concentration are denoted with a capital M. A 1.0 M solution contains 1 mole of solute per litre of solution.

$$\text{Molarity (M)} = \frac{\text{Mole of solute}}{\text{Litres of solution}}$$

Molarity - M → moles per litre solution

(5) Molality

The number of moles of solute per kilogram of solvent. It is important the mass of solvent is used and not the mass of the solution. Solutions labelled with molal concentration are denoted with a lower case m. A 1.0 m solution contains 1 mole of solute per kilogram of solvent.

$$\text{Molality (m)} = \frac{\text{Mole of solute}}{\text{Kg of}}$$

solvent Molality - m → moles per

kilogram solvent

Very Short Answer Questions:

1. Define the following

A) Molarity

B) Normality

2. What is the relation between Molarity and molality

3. Define Molality and its formula

Short Answer Questions:

1. Explain in detail about methods expressing concentrations