Chapter - 2

Solution

Page No.:
Date:
YOUVA

Qu.1 What is Solution? give its classification.

Ans The homogeneous mixture of two or more than two substances is called solution.

example — sugar solution, brass (mixture of Cu and Zn)

The solution of two compounds known as binary solution

Solvent :→ High quantity of substance in solution is called solvent

Solute :→ low quantity of substance in solution is called solute.

Classification :→ on the basis of Concentration.

i) **Dilute solution :→** A solution in which a relatively small amount of solute is dissolved in the solvent is called dilute solution.

ii) **Concentrated solution :→** A solution in which relatively a large amount of solute dissolved in the solvent is called Concentrated solution.

iii) **Saturated solution :→** A solution in which no more solute can be dissolve at a given temperature is called Saturated solution.

iv) **Unsaturated solution :→** A solution in which some more solute can be dissolved at a given temperature is called an unsaturated solution.

v) Super saturated Solution :→ A solution in which excess of Solute is dissolved that can be present in a saturated Solution is called Super saturated Soln.

Qu.2 Define the Concentration of Solution?

Ans :→ The amount of Solute dissolved in a given amount of solvent or Solution is called Concentration of Solution.

$$\text{Concentra}^{n} = \frac{\text{amount of solute}}{\text{amount of Solution.}}$$

Qu.3 Define the following

1) Percentage :→ The percentage is expressed as, the parts of Solute dissolved per 100 parts of Solution by weight or volume.

i) Percentage weight by Volume :→ Weight of Solute (in gram) dissolved in Per 100 ml of Solution is called Volume percentage. ~~it is represented by V~~

$$\text{Percentage} = \frac{\text{weight of Solute}}{\text{Volume of solution (in ml}} \times 100$$

ii) Percentage by weight :→ The mass of Solute dissolved in per 100 gram of Solution is known as weight/mass percentage

$$\text{Percentage} = \frac{\text{weight of Solute}}{\text{weight of Solution}} \times 100$$

example 1) Calculate the amount of NaOH in 200gm. 10% NaOH Solution.?

Solution :→ Percentage Concentration $= \frac{\text{mass of Solute}}{\text{mass of Solution}} \times 100$

$$10 = \frac{\text{mass of NaOH}}{200} \times 100$$

Amount of NaOH = 20gm. Ans.

exam.2 ⇒ Calculate percentage of H_2SO_4 in a Solution having 40g. H_2SO_4 in 1000 ml Solution.

Solution → Percentage $= \frac{\text{mass of Solute}}{\text{Volume of Solution}} \times 100$

$$\text{Percentage} = \frac{40 \times 100}{1000}$$

$$= 4.0\% \text{ Ans}$$

---

2) Strength or Gram per litre Concentration :→ The amount of Solute in gram dissolved in one litre of a Solution is known as strength or gram per litre Concentration it is represented by S

$$\text{Strength} = \frac{\text{mass of Solute (in gm)}}{\text{Volume of Solution (in litre)}}$$

$$= \frac{\text{mass of Solute}}{\text{Volume of Solution}} \times 1000$$

$$\boxed{S = \frac{WB}{V} \times 1000}$$

3) **Molarity of Solution :→** The number of moles of Solute dissolve in 1 litre / 1000 ml of Solution is known as molarity of solution.
it is represented by M

$$M = \frac{\text{No of moles of Solute}}{\text{Volume of Solution (L)}}$$

$$M = \frac{\text{mass of Solute (in gram)}}{\text{molecular weight of Solute}} \times \frac{1000}{\text{Volume of Solu (in ml)}}$$

$$M = \frac{W_B}{M_B} \times \frac{1000}{V}$$

example :→ 5.85 gm of Nacl is dissolved in 200 ml of water. Calculate the molarity of Solution.

Solution :→ we know that

$$M = \frac{W_B \times 1000}{M_B \times V}$$

Given :- $W_B = 5.85$ gm, $V = 200$ ml, $M_B = 58.5$

$$M = \frac{5.85 \times 1000}{58.5 \times 200}$$

$$M = \frac{1}{2} = 0.5 \text{ gm. Ans.}$$

4) **Molality :→** The number of moles of Solute dissolved in 1 kg / 1000 gm of Solution Solvent is known as molality of Solution.
it is denoted by m

$$m = \frac{\text{No. of moles of Solute}}{\text{mass of Solvent (kg)}}$$

$$m = \frac{\text{mass of Solute}}{\text{molecular mass of Solute}} \times \frac{1000}{\text{mass of Solvent (in gram)}}$$

$$m = \frac{W_B \times 1000}{M_B \times W_A}$$

example :→ Calculate the molality of Solution in which 4 g NaOH is dissolved in 500 gm H_2O

Solution :→ We know —

$$m = \frac{W_B \times 1000}{M_B \times W_A}$$

Given :— $W_B = 4$ gm , $W = 500$ gm , $M_B = 40$

$$m = \frac{4 \times 1000}{40 \times 500}$$

$$m = \frac{1}{5} = 0.2 \text{ gm. Ans.}$$

⑤ Normality :→ The number of gram equivalent of Solute dissolved in one litre / 1000 ml of Solution is called normality of Solution.
it is denoted by N

$$N = \frac{\text{No. of gram equivalent of Solute}}{\text{Volume of Solution (in L)}}$$

$$N = \frac{\text{mass of Solute} \times 1000}{\text{equivalent mass of solute} \times \text{Volume of Solution}}$$

$$N = \frac{W_B}{E} \times \frac{1000}{V}$$

Note :→ Equivalent weight = $\frac{\text{molecular weight}}{\text{Valency factor (x)}}$

Valency factor "x"

For acids

in case of acids the valency factor x is Basicity mean How many H^+ ions donate in aqueous Solution

example $HCl \begin{cases} H^+ \\ Cl^- \end{cases}$

Basicity = 1 (x=1)

equivalent weight = $\frac{1+35.5}{1}$

= 36.5 Ans.

$H_2SO_4 \begin{cases} 2H^+ \\ SO_4^{-2} \end{cases}$

Basicity (x) = 2

equivalent weight = $\frac{98}{2}$

= 49

For Bases

in case of Base the valency factor x is acidity mean How many OH^- ions donate in aqueous Solution

exp → NaOH

Na^+ OH^-

acidity (x=) = 1

equivalent weight = $\frac{40}{1}$

= 40

For salts

in case of Salts the x Factor is no. of cation (+) or anion (-)

example :→

Na^+ Cl^-

x=1

equivalent weight = $\frac{58.5}{1}$

= 58.5

2020/9/19 14:50

POCO X2.VIKAS SAVNER

then

mole fraction of Solute $X_B = \frac{n_B}{n_A + n_B}$

mole fraction of Solvent $X_A = \frac{n_A}{n_A + n_B}$

Note :→ The sum of mole fraction of all Componen of Soln is always 1

$$X_A + X_B = 1$$

Ppm :→

Part per million is known as ppm Concentration. it may be define as — number of part of Solute in one million part of Solution is known as ppm Concentration

$$Ppm = \frac{\text{Part (mass) of Solute}}{\text{mass of Solution}} \times 10^6$$

Qu. 4 Give the differences b/w Molarity and molality?

Ans.

	Molarity	Molality
1)	No. of moles of Solute dissolved in 1 litre of Solution is Called molarity	No of moles of Solute dissolved in 1 kg of Solvent is Called molality
2)	It is represented by M	it is represented by m.
3)	it is change with temp.	it does not change with tem
4)	Expressed in mole per litre	expressed in mole per kg
5)	$M = \frac{W_B \times 1000}{M_B \times V}$	5) $m = \frac{W_B \times 1000}{M_B \times W_A}$

Q. 5 Calculate the amount of urea (NH_2CONH_2) which is dissolved in 250ml solution (molarity is M/40)

Ans ⇒ Given :-

molarity of solution $M = 1/40$

Volume of solution $V = 250\,ml$

molar mass of urea $M_B = 60$

weight of urea $W_B = ?$

$$\text{Molarity } M = \frac{W_B \times 1000}{M_B \times V}$$

$$\frac{1}{40} = \frac{W_B \times 1000}{60 \times 250}$$

$$\frac{1}{40} = \frac{W_B}{15}$$

$$W_B = \frac{15}{40} \quad (3/8)$$

$$\boxed{W_B = \frac{3}{8}\ gm.}$$

Q. 6