SAFALTA CLASS™

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MOLE CONCEPT

- Atomic Mass (परमाणु द्रव्यमान)
- Molecular Mass (आणविक द्रव्यमान)
- Molar mass (मोलर द्रव्यमान)
- Equivalent Weight (तुल्यांकी भार)
- Molarity (मोलरता)
- Molality (मोललता)
- Normality (नॉर्मलता)

① No. of moles = ? ⇒ 32 gm of Oxygen (Gas)?

O_2 ⇒ M = 2 × 16

= 32

$$n = \frac{m}{M} = \frac{32}{32}$$

$n = 1$

② 32 gm Oxygen

$n = 2$

(2) 176 gm of CO_2

(i) No. of moles = ?

(ii) No. of CO_2 molecules?

(iii) No. of O atom?

$$\Rightarrow n = \frac{176}{44} = 4$$

$N = n \times N_0$

$\Rightarrow N = 4 \times 6.022 \times 10^{23}$

$N = 24.088 \times 10^{23}$

CO_2

1 C + 2O

48.176×10^{23}

③ 16 g Solid Sulfur, Sulfur अणु की संख्या = ?

⇓

⇒ S_8 ⇒ M ⇒ $8 \times 32 = 256\ gm$

$$n = \frac{16}{256} = \frac{1}{16}$$

$$N = \frac{1}{16} \times 6.022 \times 10^{23}$$

EQUIVALENT WEIGHT

(तुल्यांकी भार)

$$\text{Eq. Wt.} = \frac{\text{Molecular Wt.}}{\text{X-Factor}}$$

$$\text{तुल्यांकी भार} = \frac{\text{आणविक भार}}{\text{X}}$$

* X-Factor:-

Acid (अम्ल) ✓	Base (क्षार)	Salt (लवण)
{H+ आयन की संख्या}	{OH⁻ आयन की संख्या}	Total Positive charge on cation

① HCl ⇒ Eq. Wt.

Step 1 →

$$Eq.Wt = \frac{mol.\ wt}{X}$$

HCl → Acid ⇒ H^+

$HCl \Rightarrow H^+ + Cl^-$

M ⇒ H + Cl

1 + 35.5 = 36.5gm ✓

X ⇒ 1

$$Eq.Wt. = \frac{36.5}{1}$$

$$= 36.5$$

③ H_2SO_4 (अम्ल)

H^+

$$\text{Eq. Wt.} = \frac{98}{2} = 49$$

$M = 2H + S + 4O$

$M = 98$

$X \Rightarrow 2$

⇗

④ Oxalic Acid :- Eq. wt = ?

$$\left\{ \begin{array}{l} C_2(H_2)O_4 \cdot 2(H_2)O \\ (COOH)_2 \cdot 2H_2O \end{array} \right\}$$

(X)

$\Rightarrow$ Eq. Wt $= 2[12+32+1] + 2(18)$

$\Rightarrow 90+36 = 126$

$M = 126\,gm$

$x = 2$

$$Eq.Wt. = \frac{126}{2}$$

$$= 63\,gm$$

* Base:-

⇒ NaOH ⇒ Eq.wt = ?

NaOH ⇒ Na^+ (OH^-)

M = 40gm

X = 1

$$Eq.Wt = \frac{40}{1} = 40$$

* $Ca(OH)_2$ ⇒ $Eq.Wt. = \frac{74}{2} = 37$

M = Ca + 2(OH)

= 40 + 2(17)

= 40 + 34

= 74

X = 2

* Salt (नमक):- $NaCl \Rightarrow Na^{+} + Cl^{-}$

$M = 23 + 35.5$

$M = 58.5\ gm$

$X = 1$

Eq. Wt. $= \frac{58.5}{}$

* $AlCl_3$ $X = 3$

Al^{+3} Cl^-

M ⇒ $Al = 26.9$

$Cl = 3 \times 35.5$

$AlCl_3 = 133.4$ ✓

$Eq.\ Wt. = \frac{133.4}{3}$

* $Al_2(SO_4)_3$ → mol. wt. ⇒ M

$X = ?$

$X = 6$

$$\text{Eq. wt.} = \frac{M}{6}$$

* $H_2SO_4 + NaOH \longrightarrow NaHSO_4 + H_2O$

$H^+ \Rightarrow x = 1$

Eq. Wt. $\Rightarrow H_2SO_4$?

$$\text{Eq. Wt.} = \frac{M}{x} = \frac{98}{2} = 49x$$

$x = 2$, $M = 98$

$$\text{Eq. Wt} = \frac{98}{1}$$

$x = 1$

$= 98$

① Na_2CO_3 ⇒ Eq. wt = ?

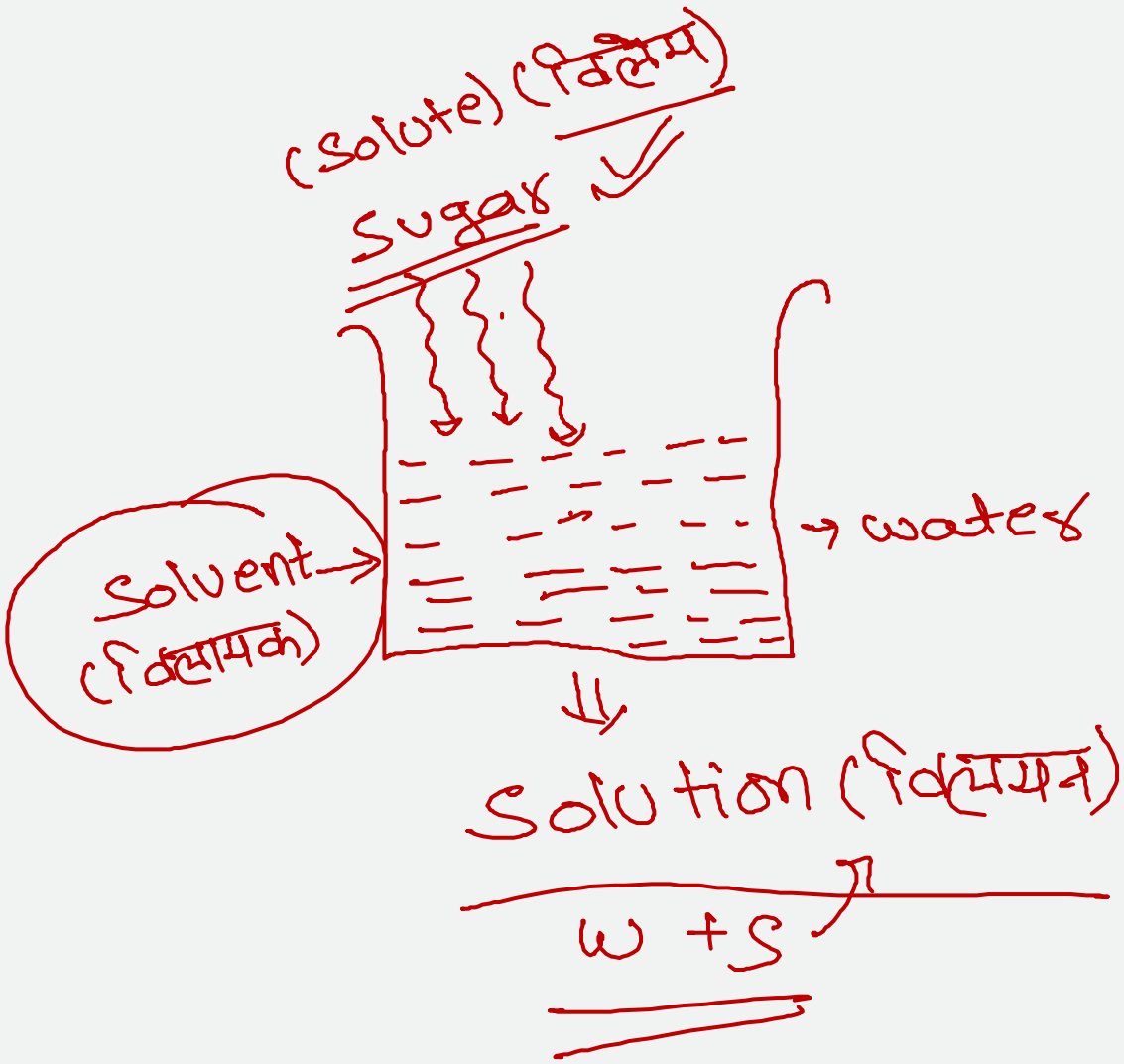
$M = 2Na + C + 3O$

$= 2 \times 23 + 12 + 3 \times 16$

$M = 106\ gm$

$Eq.Wt. = \frac{106}{2}$

$= 53$


(Solute) (विलेय)
Sugar
Solvent
(विलायक)
water
Solution (विलयन)
W + S

Molarity (मोलरता)

* No. of moles of Solute in 1L of Solution.
विलेय के मोलों की संख्या → 1L विलयन में).

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

Unit (मात्रक) :- $\frac{\text{mol}}{\text{Lit}}$

e.g:- 250 ml विलयन में 40 gm NaOH को घोलने पर, मोलरता = ?

Solution = 250 ml

NaOH (Solute) = 40 gm

$$n = \frac{m}{M} = \frac{4g}{40} = 1$$

$$\text{(मोलरता) } M = \frac{1}{\frac{250}{1000}} = \frac{1000}{250}$$

$$= 4 \text{ mol/Lt}$$

① 500 ml विलयन में 196 gm H_2SO_4 घोला गया,

मोलरता ?

$$n = \frac{m}{M} = \frac{196}{98} = 2$$

$$\Rightarrow M = \frac{n}{\text{Solution (in L)}}$$

$$= \frac{2}{\frac{500}{1000}}$$

$$= \frac{2}{\frac{1}{2}}$$

$$\boxed{M = 4 \text{ mol/Lt}}$$

Molality (मोललता)

⇒ No. of moles of Solute present in 1 kg of Solvent

Solution = Solute + Solvent

विलयन = विलेय + विलायक

⇒ 1 kg विलायक में विलेय के मोलों की संख्या!

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

unit ⇒ mol/kg

e.g:- Find molality? 80gm NaOH dissolve in 200gm solution?

$\Rightarrow$ $m = \frac{n}{\text{Solvent (kg)}}$

$NaOH \rightarrow n = \frac{80}{40} = 2$

Solvent = Solution − Solute

= 200gm − 80gm

M $\Rightarrow$ Na + O + H

= 23 + 16 + 1

= 40

Solvent = 120gm

$m = \frac{2}{\frac{120}{1000}} = \frac{2000}{12}$

$= \frac{100}{6}$

$= 16.66$

② molality = ?

392 gm H_2SO_4 को ~~घोला~~ मिलाया जाता है, 700 gm विलायन में?

$$\text{विलायक} = \underset{\text{Solution}}{\text{विलायन}} - \underset{\text{Solute}}{\text{विलेय}} = 700\,gm - 392\,gm$$

$$= 308\,gm$$

(Solvent)

$$n = \frac{m}{M}$$

$$= \frac{392\,gm}{98\,gm}$$

$$n = 4$$

$$m = \frac{n}{\text{Solvent (kg)}}$$

$$m = \frac{4}{\frac{308}{1000}} = \frac{4000}{308}$$

$$= 12.$$

⇒ Numbes of Gram equivalant:-

ग्राम में तुल्यांक संख्या:-

$$\text{no. of gm. Eq.} = \frac{\text{mass (Given)}}{\text{Eq. wt.}}$$

(तुल्यांकी भार)

⇒ $$\text{no. of moles} = \frac{\text{mass (Given)}}{\text{molar mass}}$$

or

(mol. wt.)

(1) Find the no. of gm equivalant present in 0.4 gm of NaOH ?

$\Rightarrow$ no. of gm eq. $= \frac{\text{mass}}{\text{Eq. wt.}} = \frac{0.4}{40} = \frac{1}{100} = 0.01$

$$\text{Eq. wt.} = \frac{\text{mol. wt}}{x} = \frac{40}{1} = 40\ \text{gm}$$

NaOH में mol. wt $= 40$ gm

$x = 1$

* 0.98 gm H_2SO_4 $\Rightarrow$ no. of gm. eq = ?

$$\text{no. of gm. eq.} = \frac{\text{mass (Given)}}{\text{Eq. wt.}} = \frac{0.98 \text{ gm}}{49 \text{ gm}} = \frac{2}{100}$$

$$= 0.02$$

H_2SO_4 Eq. wt. $= \frac{\text{mol. wt}}{X} = \frac{98}{2} = 49$ gm

Normality (नार्मलता)

No. of gm. equivalant of Solute present in 1 L solution.

1 L विलयन में विलेय की ग्राम में तुल्यांक संख्या

$$N = \frac{\text{no. of gm eq. of Solute}}{\text{Solution (in L)}}$$

unit ⇒ /L , gmeq/Lit

e.g:- 0.98 gm of H_2SO_4 dissolve in 500 ml of solution then find normality of solution?

$$\Rightarrow \quad N = \frac{\text{no. of gm. eq. of solute}}{\text{Solution (in L)}}$$

$$\text{no. of gm. eq of } (H_2SO_4) = \frac{\text{Given mass}}{\text{Eq. wt}} = \frac{0.98 \text{ gm}}{49}$$

$$\text{Eq. wt.} = \frac{\text{molar mass}}{x}$$

$$= \frac{98}{x} = 49$$

$$= \frac{2}{100}$$

$$= 0.02$$

$$N = \frac{0.02}{500} \times \frac{1000}{1000} = \frac{0.02 \times 1000}{500}$$

$$= \frac{2}{56} = \frac{1}{25} = 0.04$$

⇒ NOTE

At STP ⇒ (Standard Temp. & Pressure)

- ✓ Standard Temp. = 273.15 K or 0°C
- ✓ Standard Pressure ⇒ 1 bar = 10^5 Pa

M = 1 mole of any Gas = 22.4 L

Q: 44 gm CO_2, Find Volume at STP ?

$$n = \frac{44}{44} = 1$$

- The compound $C_6H_{12}O_4$ contains

1. 22 atoms per mole

2. twice the mass percent of H as compared to the mass percent of C

3. six times the mass percent of C as compared to the mass percent of H

4. thrice the mass percent of H as compared to the mass percent of O

- There are $6 \cdot 022 \times 10^{23}$ entities in 1 mole. So, option A is incorrect.
- Atomic mass of Carbon = 12
- Atomic mass of Hydrogen = 1
- Atomic mass of Oxygen = 16
- Molecular mass = (6 x 12) + (12 x 1) + (4 x 16)
- = 72 + 12 + 64 = 148
- Mass percentage of carbon = 72/148 = 49%
- Mass percentage of hydrogen = 12/148 = 8%
- Mass percentage of oxygen = 64/148 = 43%

How many moles are there in 200g of Na?

- Molecular mass of Na=23g/mole
- No. of mole=mass / molar mass
- In 200g of Na moles is
- n=200 gm /23g/mole
- =8.69moles of Na.

How many moles of hydrogen are present in one gm of hydrogen?

Molar mass of H=1g/mole

No. of moles in 1g of H=1g/ 1 gm / mole

=1 mole

Thus 1 mole of H is present in 1 g of H.

- Convert into mole 12g of O2 gas

  20g of water

  22g of CO2

  2g of helium

3·65 grams of HCl is dissolved in 16·2 grams of water· The mole fraction of HCl in the resulting solution is

a) 0·4

b) 0·3

c) 0·2

d) 0·1

Which one is correct?

a) Molality changes with temperature

b) Molality does not change with temperature

c) Molarity does not change with temperature

d) Normality does not change with temperature

1. Mixing of table salt in water makes:

- (a) Mixture (b) Compound (c) Colloidal (d) Solution

2. Which of the followings is electrolyte?

- (a) glucose (b) NaCl
- (c) sugar (d) Ether

3. For example 10 gm of sodium chloride is added in 90 gm of water. This solution is:

- (a) 10%
- (b) 50%
- (c) 90%
- (d) 100%

4. The number of moles of a solute per liter of a solution is

- (a) Molality
- (b) Normality
- (c) Molarity
- (d) None

5. The number of moles of a substance dissolved in in 1000 cm^3 of solution is:

- (a) Molality
- (b) Normality
- (c) Molarity
- (d) None

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