# Topic - Molarity, Normality

2018

**Molarity** - The number of moles of Solute present in 1 litre of Solution is known as Molarity. Represented by M

$$M = \frac{\text{number of moles of Solute}}{\text{Volume of Solution in litre}} = \frac{\text{wt of Solute in gm}}{\text{Atomic wt} \times \text{Volume (l)}}$$

In short $M = \frac{W(\text{In gm})}{\text{At wt} \times V(l)}$

**Equivalence wt** - $\text{Eq wt for any element or Compound} = \frac{\text{Atomic wt}}{\text{Valency}}$

$$\text{Eq wt for Acid} = \frac{\text{Atomic wt}}{\text{no. of } H^+ \text{ ion}}$$

$$\text{Eq wt for Base} = \frac{\text{Atomic wt}}{\text{no. of } OH^- \text{ ion}}$$

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2017

**Normality** - The number of gram Equivalence of Solute present in 1 litre of Solution is known as Normality. Represented by N.

$$N = \frac{\text{no. of gram Equivalence of Solute}}{\text{Volume of Solution in litre}}$$

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OR

$$N = \frac{\text{wt of Solute in gm}}{\text{Eq wt} \times \text{Volume of Solution (l)}}$$

**Note** (Imp) ① Relation b/w M and N

$$\frac{N}{M} = \text{Valency}$$

② If Sol$^n$ of Volume $V_1$, Normality $N_1$ is neutralize by $V_2$, $N_2$ then

$$N_1V_1 = N_2V_2$$

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**Example**

2017 ① If 5.85 gm NaCl dissolved in water and make Sol$^n$ 500 ml find its Molarity, Normality.

Sol$^n$ - At wt of NaCl = 23 + 35.5
= 58.5

$$\text{Eq wt} = \frac{\text{At wt}}{\text{Valency}} = \frac{58.5}{1}$$

NaCl → $Na^+$ $Cl^-$

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Volume V = 500 ml $= \frac{500}{1000} = \frac{1}{2}$ l

$$\text{Molarity } M = \frac{\text{wt of Solute in gm}}{\text{At wt} \times \text{Volume of Soln(l)}}$$

$$= \frac{5.85}{58.5 \times \frac{1}{2}} = \frac{2}{10} = 0.2 \text{ Ans}$$


$$\text{Normality } N = \frac{\text{wt}}{\text{Eqwt} \times \text{Volume}} = \frac{5.85}{\frac{58.5}{10} \times \frac{1}{2}}$$

$$N = 0.2 \text{ Ans}$$

Ques2- find the Equivalence wt for following -

(i) NaOH (ii) $CaCl_2$ (iii) $Na_2CO_3$ (iv) $H_2SO_4$

Soln- (i) At wt of NaOH = 23 + 16 + 1

= 40

$NaOH \rightarrow Na^{+} + OH^{-}$

$$\text{Eq wt} = \frac{\text{at wt}}{\text{Valency}} = \frac{40}{1} = 40$$

(ii) $CaCl_2$ $\quad CaCl_2 \rightarrow Ca^{++} \; 2Cl^{-}$

At wt = $40 + 35.5 \times 2 = 111$

$$\text{Eq wt} = \frac{111}{2} = 55.5$$

(iii) $Na_2CO_3 \rightarrow 2Na^{+} \; CO_3^{--}$

At wt = $23 \times 2 + 12 + 16 \times 3 = 106$

$$\text{Eq wt} = \frac{106}{2} = 53$$

(iv) $H_2SO_4 \rightarrow 2H^{+} + SO_4^{--}$

At wt = $2 \times 1 + 32 + 16 \times 4$

= 98

$$\text{Eq wt} = \frac{98}{2} = 49$$

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2019

Ques3- If the Eq wt of a substance is 40 and Valency is 2 find its atomic wt.

Soln- $\dfrac{\text{Atomic wt}}{\text{Valency}} = \text{Eq wt}$

so $\dfrac{\text{At wt}}{2} = 40$

At wt = 80 Ans

2017, 2019

**Ques 4-** Calculate the amount of 400 ml of $\frac{N}{10}$ $Na_2CO_3$ soln?

**Soln** At wt of $Na_2CO_3$ = $23\times2 + 12 + 16\times3 = 106$

$Eq\ wt = \frac{106}{2} = 53$

$N = \frac{1}{10} = 0.1$ , $V = 400\ ml$

$= \frac{400}{1000} = 0.4\ l$

$$N = \frac{wt}{Eqwt \times Volume(l)}$$

$$0.1 = \frac{wt}{53 \times 0.4}$$

So wt = 2.12 gm **Ans**

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2020

**Ques 5-** 15 ml 0.1N NaOH soln is neutralised by 10 ml of HCl soln. find out Normality of soln. (HCl)

**Soln -** $N_1 = 0.1$ , $V_1 = 15\ ml$ , $N_2 = ?$ , $V_2 = 10$

$N_1V_1 = N_2V_2$

$\frac{0.1}{10} \times 15 = N_2 \times 10$

So $N_2 = \frac{15}{100}$

$= 0.15N$ **Ans**



**Ques 6-** 4 gm NaOH is dissolved in water and soln become 250 ml find Molarity, Normality (Ans- 0.4, 0.4)

Ques7- If 20.6 g of NaBr is dissolved in 500 ml water Calculate Molarity (Ans- ~~0.53~~ 0.4)
2016

Ques8- How much Amount of Sodium Carbonate ($Na_2CO_3$) is required to prepare 500 ml Solution of 0.01 M $Na_2CO_3$ Soln (Ans- 0.53 gm)

Ques9- $\frac{1}{10}$ of Equivalent wt of HCl is present in 500 ml Solution. Calculate Normality (Ans- 0.2)
2014, 15

Ques10- Calculate the molarity of water. Density of water is 1 gm/ml. (Ans- 55.6)

Ques11- Determine the amount of NaOH needed to prepare 250 ml of 0.1 N Soln (Ans- 1 gm)

Ques12- If 11.70 gm NaCl is dissolved in 100 ml find Molarity (Ans- 2M)

Ques13- 20 ml of 0.2 NaOH Soln is Neutralised by 10 ml of HCl Soln. find out normality of HCl Soln (Ans- 0.4)
2018

Ques14- Calculate the normality of a Soln Containing 6.3 gm Of Oxalic Acid Crystal (mol mass 126) dissolved in 500 ml Soln. (Ans 0.2N)

Ques15- find out Equivalence wt of (a) HCl (b) $MgSO_4$

Ans- (a) 36.5
(b) 59



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