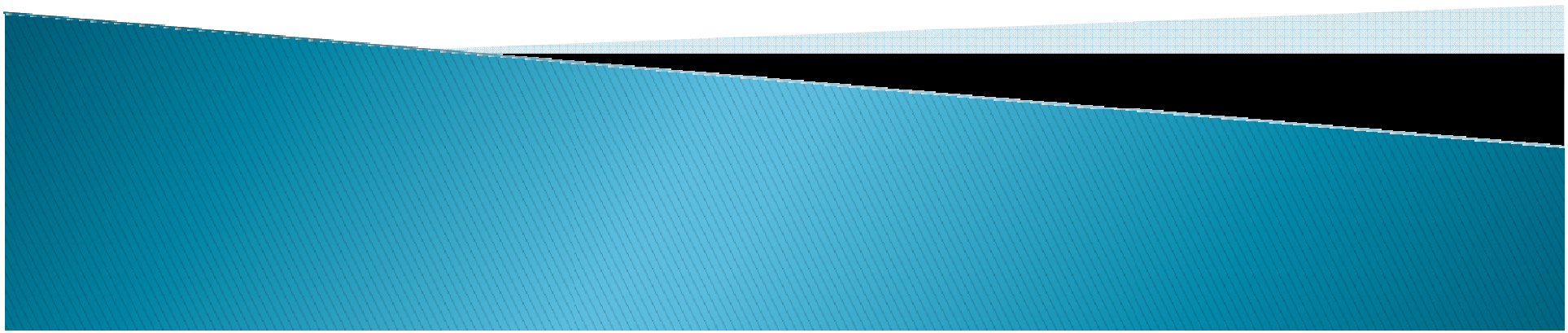
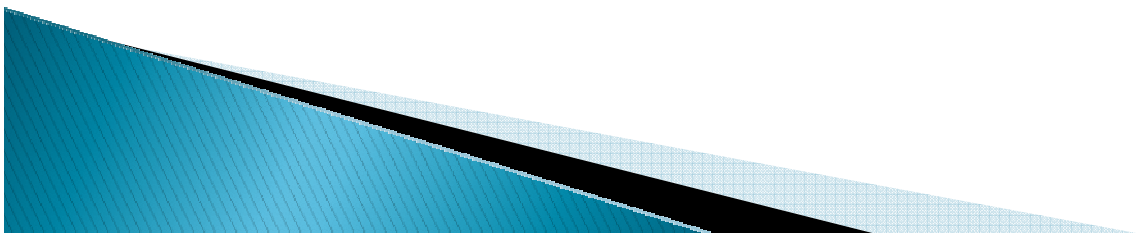
Molarity & Normality



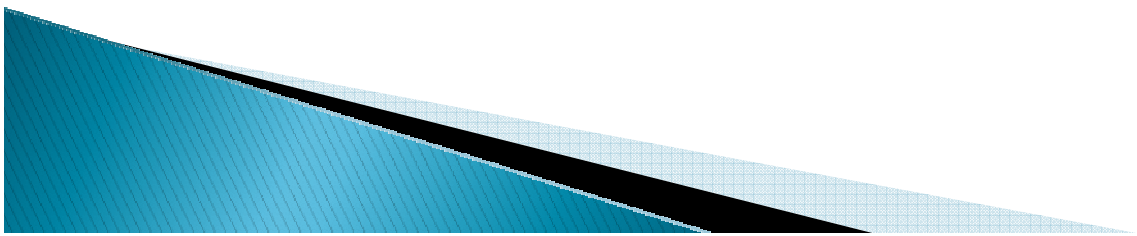
- Both Normality and Molarity are measures of concentration .
- Molarity is a measure of the no. of moles per liter of solution .
- Normality changes depending on the solution's role in the reaction.



- Weight/volume (w/v) :
  - Solid is dissolve in liquid.

    A solution containing 5 gm of Na_2SO_4 dissolved in water and diluted to a final volume of 100 ml of solution as 5% (w/v) solution.
- Volume/volume (v/v) :
  - Liquid is diluted with liquid

    5 ml of glacial acetic acid diluted with water to a total volume of 100 ml of solution as a 5% (v/v) acetic acid solution.



Weight/weight (w/w) :

Solid is disolved in liquid(gm) but taken in weight unit.

5 gm Na_2SO_4 dissolved in 95 gm of water (approx. 95 ml)

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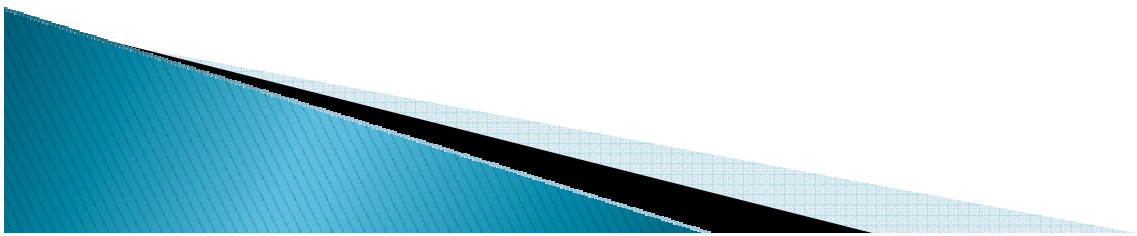
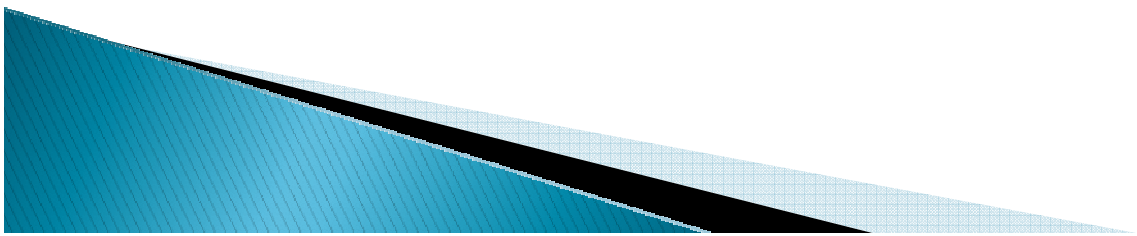
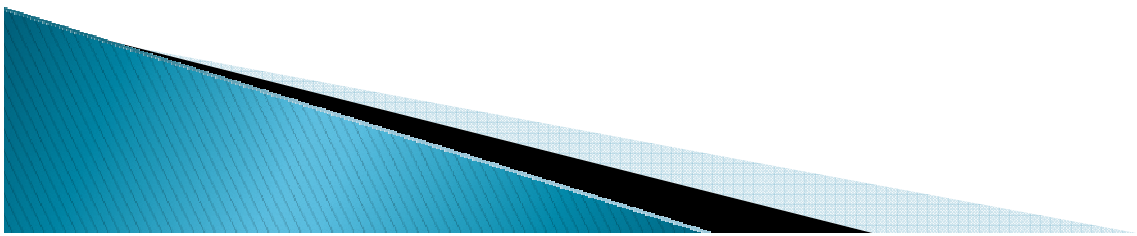


Molarity

- Molarity expresses concentration as the number of moles per liter of solution.
- The relative number of molecules available in the solution to react with other molecules .
- Molarity unit = mol/lit , mmol/lit

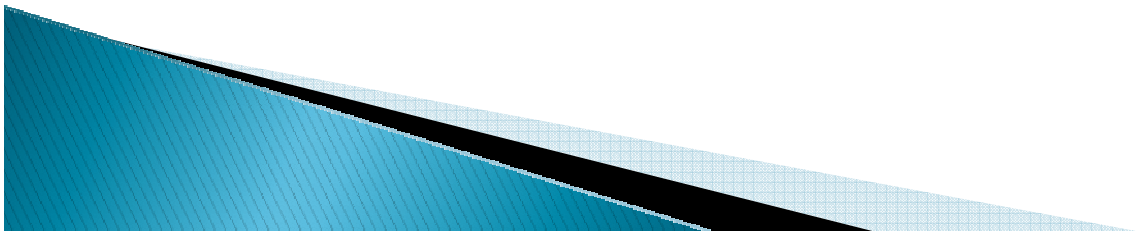


- One mole is the molecular weight of the substance in grams in one litre of solution.
- 1 milimole is 1/1000 of a mole.
- One-molar (1M) solution containing one mole of solute per liter of solution.



Calculation & example

- Mole = number of grams / molecular weight



Example :-

- 5 gm of Na_2SO_4 is equivalent to how many moles ?

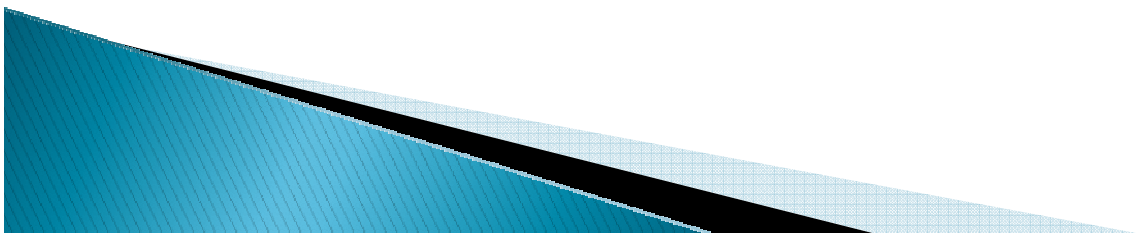
- The molecular weight of Na_2SO_4 is 142

  where as Na=23 , Na_2=46

  S=32

  O=16 , O_4=64

  So, 5/142 or 0.035 moles



If the 5 gm of Na_2SO_4 were dissolved in water to make 1 L of solution , the concentration would be 0.035 mol/liter.

0.035 mol/L = 35 mmol/L
(milimoles per liter)

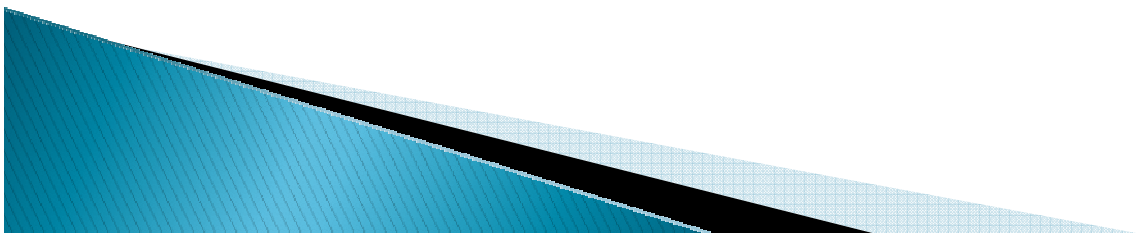
Micromoles $= 10^{-6}$
Nanomoles $= 10^{-9}$

Example :-

- what is the concentration of a solution containing 1.20 gm of Na_2CO_3 in 200 ml of solution ?
- Mol/L =(1.20x1000) / (106x200)

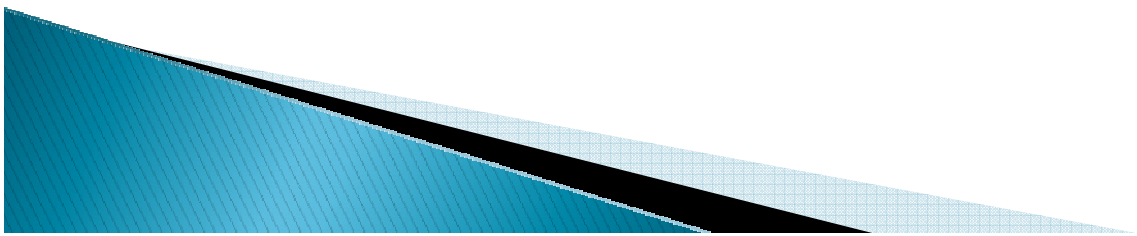
  = 0.0566 mol/L

  = 56.6 mmol/L



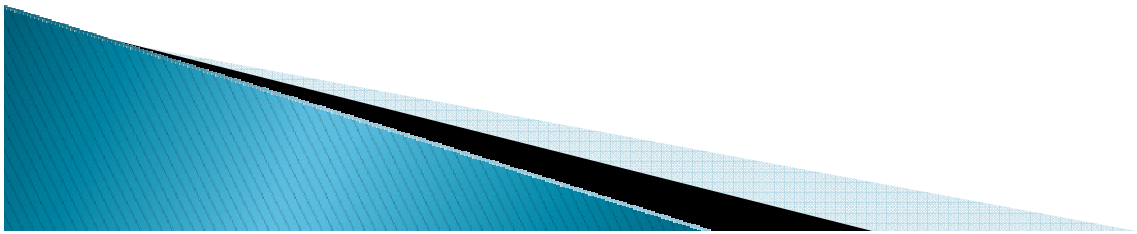
Normality

- Normality is a measure of concentration that is equal to the gram equivalent weight per liter of solution.
- Gram equivalent weight is a measure of the reactive capacity of a molecule.



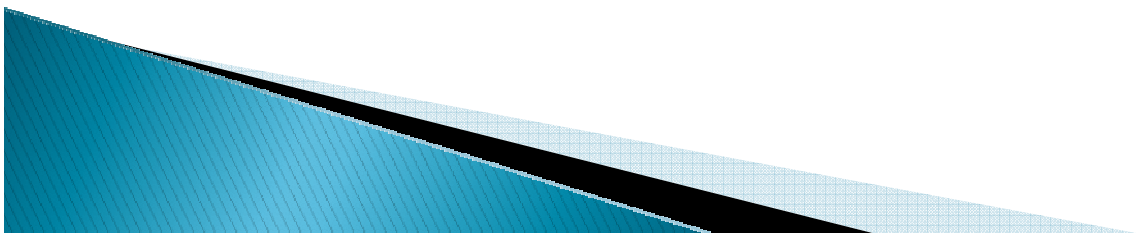
- Equivalent weight (N)

  = M.W. / Valence
- The equivalent weight may be determined by dividing the gram formula weight by the total positive or negative charge.



example :

- In Na_2O (2 Na^{+1} ,O^{-2}) the equivalent weight of oxygen is 16.00/2 = 8.00 & the equivalent weight of the compound Na_2O is 62/2 =31.
- 1 normal (1 N) solution contains 1 equivalent weight per liter.

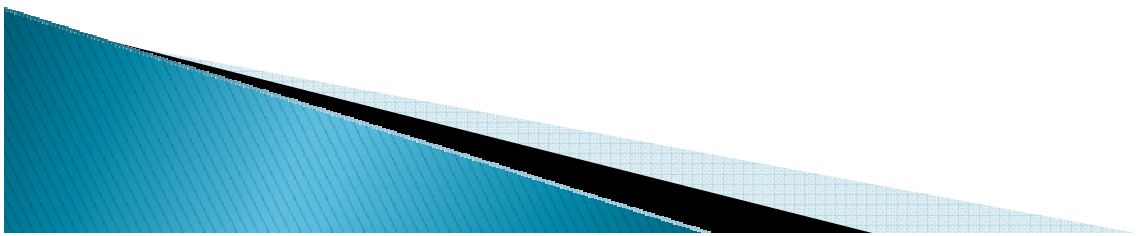


Calculation :-

To prepare another concentration of solution from known stock solution following formula is use.

Calculation :

$$N_1V_1 = N_2V_2$$



Example :

1) Prepare 10 ml standard of 2 mg% creatinine from 1 gm% of stock solution ?

$N_1 = 2$ mg%

$V_1 = 10$ ml

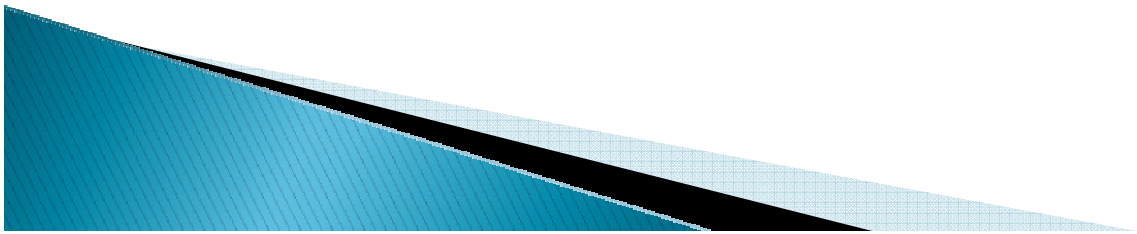
$N_2 = 1$gm%$=1000$ mg%

$V_2 = ?$

$$N_1V_1 = N_2V_2$$

$$V_2 = (N_1V_1) / N_2$$
$$= (2 \times 10) / 1000$$
$$= 0.02 \text{ ml}$$
$$= 20 \text{ µl}$$

2 mg% of Creatinine = 20 µl of 1 gm% stock solution + 1.990 ml D.W.



Example – 2 :

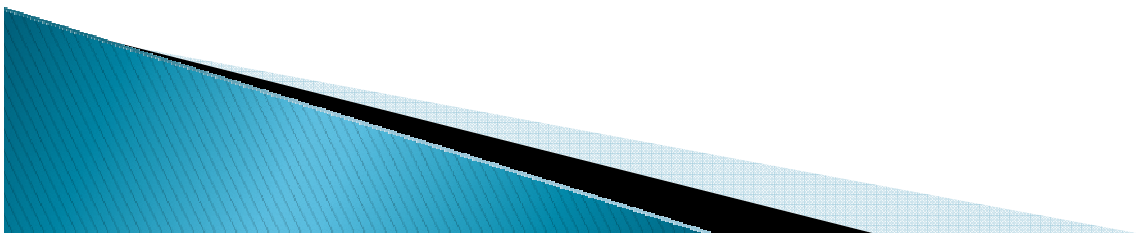
- Prepare 200 ml of 0.5 M NaOH from 10 M NaOH solution .

$N_1 = 0.5$ M

$V_1 = 200$ ml

$N_2 = 10$ M

$V_2 = ?$



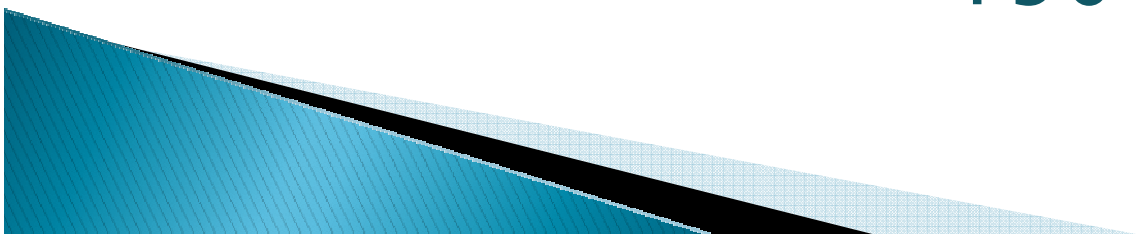
$$N_1V_1 = N_2V_2$$

$$V_2 = (N_1V_1) / N_2$$
$$= (0.5 \times 200) / 10$$
$$= 10 \text{ ml}$$

10 ml of 10 molar stock

0.5 M NaOH = +

190 ml D.W.



Thank you