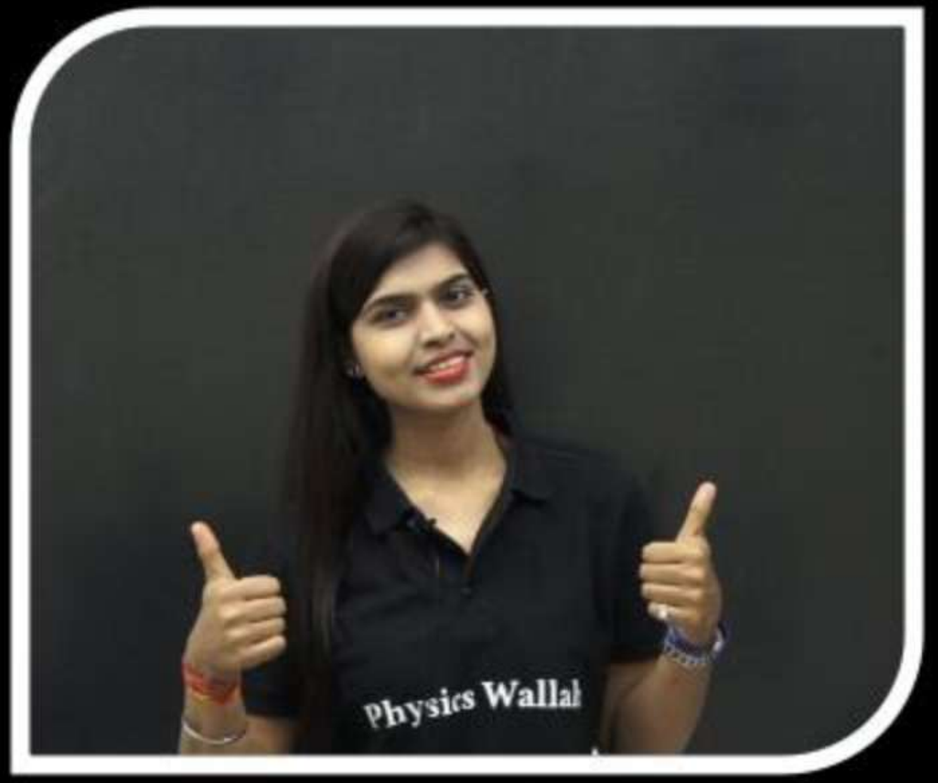
ARJUNA NEET BATCH

SOME BASIC CONCEPTS OF CHEMISTRY

LECTURE - 14



BY : DOLLY SHARMA

LOSCHMIDT Number → No. of gas molecules present in 1 ml of gas at STP.

$\{1\ ml = 1\ cc = 1\ (m^3)\}$

$$\frac{N_0}{N_A} = \frac{V_L}{22.4} \Rightarrow N_0 = \frac{1}{22.4 \times 1000} \times 6.02 \times 10^{23}$$

$$\Rightarrow 2.69 \times 10^{19} \text{ molecules}$$

Equivalent Concept

$$\left[\begin{array}{l}\text{No. of gm Equivalents of Reactants} = \text{No. of gm Equivalents of Product}\end{array}\right]$$

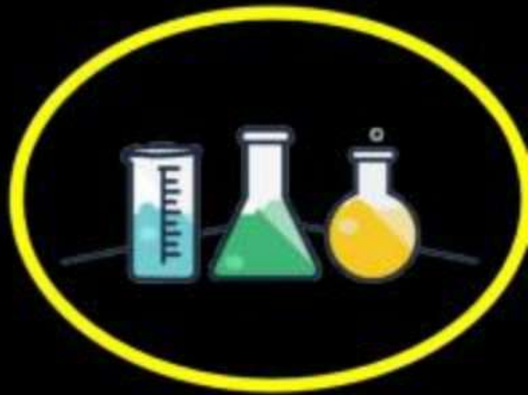
$$\forall \text{ No. of gm Equivalent} = N \times V(L)$$

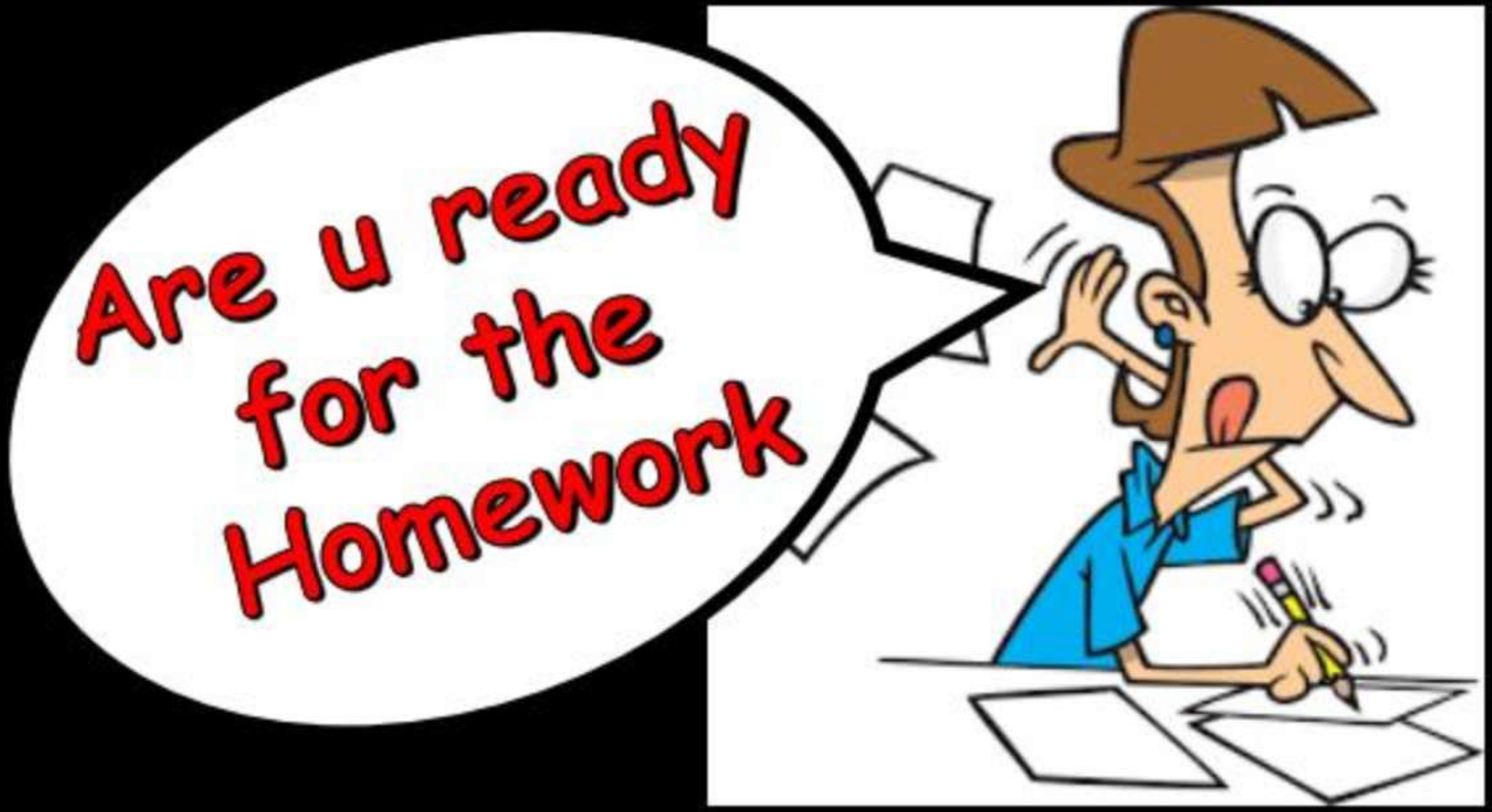
$$= M \times n\text{-factor} \times V(L)$$

$$= \frac{\omega}{E_M} \quad \exists \text{ no. of moles} \times n$$

Objective of today's class

NUMERICAL PRACTICE




Are u ready for the Homework

Q. 2.5 litre of 1 M NaOH solution mixed with another 3 litre of 0.5 M NaOH solution. Then find out molarity of resultant solution.

(A). 0.80 M

(B). 1.0 M

(C). 0.73 M

(D). 0.50 M

Base NaOH + Base NaOH

2.5 L 3 L

1M 0.5M

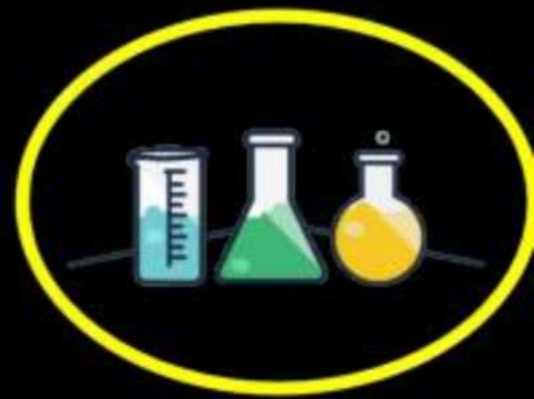
$M_1V_1 + M_2V_2 = M_3V_3$

$\Rightarrow 1 \times 2.5 + 0.5 \times 3 = M_3 V_3$

$\Rightarrow 2.5 + 1.5 = M_3(5.5)$

$\frac{460}{5.5} = M_3$

$M_3 = 0.73$



Q. What weight of calcium phosphate must be present in 250 ml of solution. So that molarity of solution becomes 0.2 M?

(A). 31.5 g
(B). 15.5 g
(C). 20 g
(D). 40 g

$M = 0.2$
$V = 250\,ml$
$W_B = ?$

$$M = \frac{W_B}{M_B \times V(L)}$$

$$0.2 = \frac{W_B \times 1000}{310 \times 250}$$

$$W_B = \frac{31}{2}$$

$$W_B = 15.5\,g$$

Ca^{+2} PO_4^{-3}

$Ca_3(PO_4)_2$

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Q. Mole fraction of the solute in a 1.00 molar aqueous solution is

[AIPMT (Mains)-2011]

(A). 1.7700

(B). 0.1770

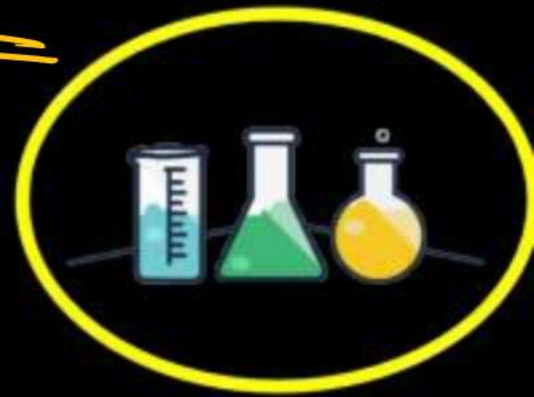
(C). 0.0177

(D). 0.0344

$X_B = ?$

$m = 1.00$

$$X_B = \frac{m}{55.55 + m} \rightarrow \frac{1}{55.55 + 1} \rightarrow \frac{1}{56.55} \rightarrow 0.0177$$



Q. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions, CO_3^{2-} are respectively

(Molar mass of Na_2CO_3 = 106 g mol^{-1})

[AIPMT (Prelims)-2010]

(A). 0.955 M and 1.910 M

(B). 1.910 M and 1.910 M

(C). 1.90 M and 1.910 M

(D). 0.477 M and 0.477 M

$W_{Na_2CO_3} = 25.3\ g$

$V_{L(sol^n)} = 250\ ml$

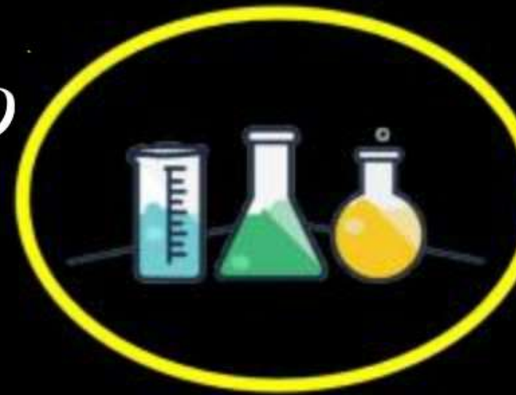
$Na_2CO_3 \rightarrow 2Na^+ + CO_3^{-2}$

M 2M M

$M = \frac{W_B}{m_B \times V(L)}$

$M = \frac{25.3}{106 \times 250} \times 1000$

$M = 0.955M$



$\Rightarrow Na^{+} \longrightarrow 2Na^{+} \longrightarrow 2 \times 0.955 \Rightarrow \underline{1.910\,M}$

$\Rightarrow CO_3^{-2} \longrightarrow 1\,(CO_3^{-2} \longrightarrow 1 \times 0.955 \Rightarrow \underline{0.955\,M}$

Q. Concentrated aqueous sulphuric acid is 98% H_2SO_4 by mass and has a density of 1.80 g mL^{-1}. Volume of acid required to make one litre of 0.1 M H_2SO_4 is

[AIPMT (Prelims)-2007]

(A). 5.55 mL
(B). 11.10 mL
(C). 16.65 mL
(D). 22.20 mL

$\Rightarrow$ % (w/w) = 98%

$\Rightarrow$ $d = 1.80\ g\ ml^{-1}$

$M_1 = \frac{10nd}{Mw}$

$H_2SO_4 \rightarrow 98$

$M = \frac{10 \times 98 \times 1.80}{98 \times 100}$

$M_1 = 18M$

$M_2 = 0.1M$

$V_2 = 1L$

$M_1V_1 = M_2V_2$

$V_1 = ?$

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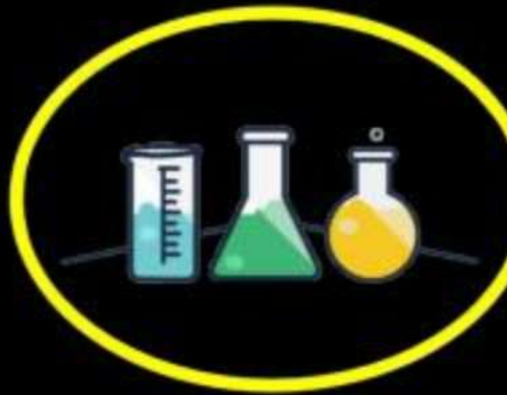
$\Rightarrow M_1V_1 \Rightarrow M_2V_2$

$\Rightarrow 18 \times V_1 = 0.1 \times 1$

$V_1 = \frac{0.1}{18} \Rightarrow$ 5.55 ml

NUMERICAL PRACTICE



Complete Revision

20 June

1st class

Some Basic of Chemistry

720

↓

Marks

↓

180 → Chemistry

45 Questions

↓

4 Neg → -1

Mole Concepts

→ Importance of Chemistry

→ Matter

- P
- C
  - Mixture
  - Pure Con

Mixture

- **Homogeneous**
  - → Lemon juice
  - → Tea
  - → Coins
  - → Ring
- **Heterogeneous**
  - → Oil + H_2O
  - → Sand + Fe

Physical Quantities

- **Unit**
  - **SI** = **Fundamental**
  - **Derived**
  - **Subsidiary Units**
    - 10^{-1}
    - 10^{-2}
    - 10^{-3}
    - 10^{-6}
    - 10^{-9}
    - 10^{-12}
    - 10^{-15}
- $d = \frac{m}{V}$ (kg/L)
- **Number**
  - **Significant figures**
    - **Meaningful digits**

Rule

1) 777 or 4444 → (3)

2) 707 → (3)

3) 07 (1) | 0.7 (1) | 70 (1) –

7000 (1) | 400 (1)

4) 70.0 → (3) | 7.000 (4)

4.0 → (2) | 4.000 (4)

5) 10^{19} → 0 S.F.

6) Exact no or const

↓

∞ S.F.

⇒ Rounding off

1) 85.68 ≈

→ 85.7

2) 85.63

→ 85.6

3) 85.65

even → as it is → even

⇒ 85.6

odd → ↑ by 1

Scientific Notation

Mole Concept

$H_2SO_4 \rightarrow 1\times2 + 32 + 16\times4$

Molecular mass $\Rightarrow$ 98

Atomic mass or Molecular mass $\rightarrow$ Unit $\downarrow$ u or amu

1 amu = 1 u

$= \frac{1}{N_A}$

= 1 Dalton

= 1 Avogram

= 1 Astom

$= 1.66\times10^{-24}$ gm

u $\longrightarrow$ gm

$\times \frac{1}{N_A}$

mole

$n = \frac{\omega}{MM} = \frac{N_0}{N_A} = \frac{V_L}{22.4}$ STP

$\omega \rightarrow$ given mass

$MM \rightarrow$ Molecular mass

$N_0 \rightarrow$ No. of molecules

Eg: Calculate No. of Valence $e^{\ominus}$ in 4.2 g Azide ion?

N_3^-

$$\frac{N_0}{N_A} = \frac{\omega}{mm}$$

$$N_0 = \frac{4.2}{42} \times N_A \times 16$$

$$= \frac{4.2}{42} \times 10 \times N_A \times 16$$

$$= 1.6\,N_A$$

$_7N \rightarrow 2,5$

$5 \times 3 + 1 = 16$

E.F & M.F

$C_6H_{12}O_6$ → M.F of glucose → CH_2O → E.F

Method to determine E.F & M.F.

1) Determine % of Elements
2) Determine Molar ratio
3) Simplest ratio

M.F

1) $n = \frac{\text{Mol. wt}}{\text{EF mass}}$

$$M.F = n \times E.F$$

$$\% \text{ Element} = \frac{\text{Atomic mass} \times n}{\text{Mol. wt.}} \times 100$$

* % Element — ?
* Min. Mol. mass — ?
  → $n = 1$
* $n = ?$

Stoichiometry

$n_1A + n_2B \rightarrow n_3C$

S-1 → Balance the chemical rxn

S-2 → $\frac{1}{n_1} \times n_A = \frac{1}{n_3} \times n_C$

Limiting Reagent

$n_1A + n_2B$

↓

n_3B

?

S-1 Balance.
S-2 Calculate no. of moles
S-3 no. of moles ↓ → L.R.
S-4 L.R. = Product

Eg 10 gm H_2 reacts with 64 gm O_2. Find the mass of water obtained ?

$$2H_2 + O_2 \rightarrow 2H_2O$$

10 gm 64 gm

$\frac{1}{2} n_{H_2}$ $\frac{1}{1} n_{O_2}$

$\frac{10}{2}$ (2.5) $\frac{64}{32}$ (2) → LOR

$$2 = \frac{1}{2} \times n_{H_2O}$$

$$\boxed{n_{H_2O} = 4}$$

$$n_{H_2O} = 4$$

$$\frac{w}{mm} = 4$$

$$w = 4 \times 18$$

$$w = 72\ g$$

Equivalent Mass

$\Rightarrow$ MM

n-factor

n-factor → sab → total ions / total -ive

→ Acid → transferable H^+ ion

→ Base → no of OH^- ion

→ Valency x Atomicity

$$\Rightarrow E_M = \frac{W_m}{W_{O_2}} \times 8$$

$$\Rightarrow E_M = \frac{W_m}{W_{Cl_2}} \times 35.5$$

$$\Rightarrow E_M = \frac{W_m}{W_{H_2}} \times 1$$

$$E_{MO} = E_M + 8$$

$$E_{MCl} = E_M + 35.5$$

$$E_{MH} = E_M + 1$$

$$E_{MCO_3} = E_M + 30$$

$$n = \frac{2 \times V.D.}{E_M + 35.5}$$

$$V.D. = \frac{MM}{2}$$

Concentration Terms

Are u ready for the Questions

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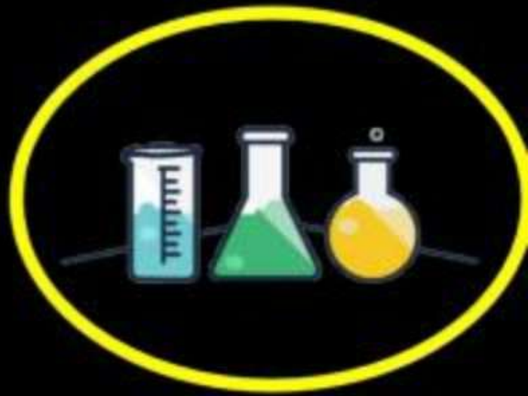
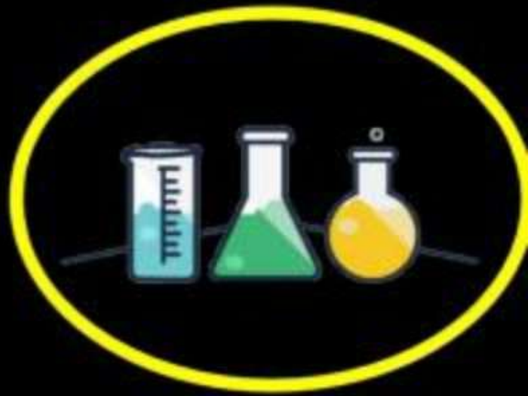
Q. What volume of 0.5 M H_2SO_4 is required to neutraliye 10 gm NaOH completely.



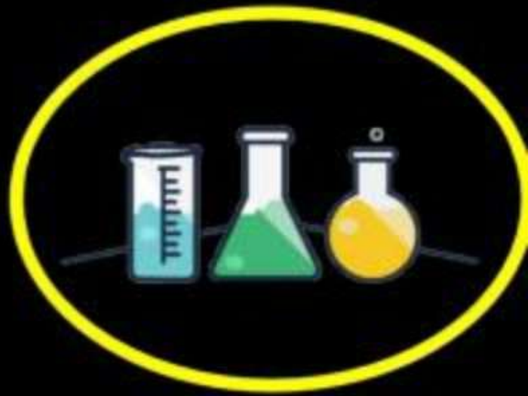
Q. Pyrolucite (MnO_2) on reaction with HCl produce Cl_2 gas at STP. How many kg of MnO_2 is required. Given that % yield of rx^n is 60%.

Mole



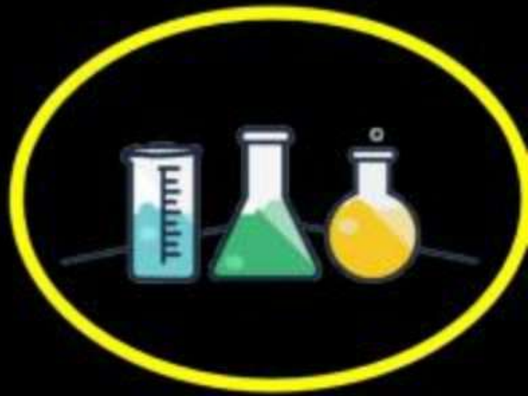
Q. A solution of Ammonium nitrate (NH_4NO_3) in water is 20% (W/V). If the density is 1.3 gm/ml , then find ole fraction of NH_4NO_3 in the solution?

Ans.



Q. At constant temp. and pressure air condenser 79% dinitrogen , 20% dioxygen, 1% CO_2 by volume. Find mole fraction of N_2 in air.

Now:



thanks
for watching