VICTORY ZONE CHEMISTRY CLASSES

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CHAPTER SCHEDULE

SOME BASIC CONCEPT IN CHEMISTRY

14 APRIL 2025 TO 18 MAY 2025

S. NO	CLASS DETAIL	TOPICS DETAILS	CHECK LIST
1.	LECTURE NO. 1	BASIC MATHS	✓
2.	LECTURE NO. 2	UNITS AND MEASUREMENT	✓
3.	LECTURE NO. 3	NUMERICAL OF BASIC MATHS 25Q	
4.	LECTURE NO. 4	ATOMIC, MOLECULAR, FORMULA MASS etc. LAW OF CHEMICAL COMBINATIONS	
5.	LECTURE NO. 5	MOLE CONCEPT THEORY	
6.	LECTURE NO. 6	MOLE CONCEPT NUMERICAL 30Q	
7.	LECTURE NO. 7	MASS-VOLUME, MASS-NUMBER, VOLUME-NUMBER 30Q	
8.	LECTURE NO. 8	STOICHIOMETRIC 10Q	
9.	LECTURE NO. 9	STOICHIOMETRIC 20Q	
10.	LECTURE NO. 10	LIMITING REAGENT 20Q	
11.	LECTURE NO. 11	LIMITING REAGENT 20Q	
12.	LECTURE NO. 12	LIMITING REAGENT 30Q	
13.	LECTURE NO. 13	EMPHERICAL FORMULA, EMPHERICAL MASS, RELATIONSHIP	
14.	LECTURE NO. 14	EMPHERICAL FORMULA, EMPHERICAL MASS, NUMERICAL 20Q	
15.	LECTURE NO. 15	SOLUTIONS MOLARITY, MOLALITY	
16.	LECTURE NO. 16	NCERT BACK QUESTIONS	
17.	LECTURE NO. 17	SOLUTIONS MOLARITY, MOLALITY 30Q	
18.	LECTURE NO. 18	SELF ANALYSIS PAPER IN CLASS	
19.	TEST NO. 1	16/05/2025 MCQS 30Q MM:120 (YOUR MARKS)	
20.	TEST NO. 2	18/05/2025 THEORY 16Q MM:30 (YOUR MARKS)	
21.	HOME WORK	NUMBER OF QUESTION DONE BY YOUR SELF	
22.	HOME WORK	NCERT BOOK READING LINE TO LINE	

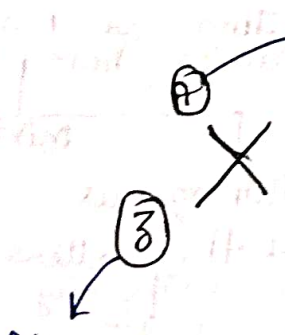
Chap-1 Some Basic Concept in Chemistry

1) Introduction :- Atomic mass, Molecular mass, formula mass, empherical mass, Atomic number, gram molecular mass, Average Atomic mass, fundamental Particles, SI units, Unit & conversions, precision, Accuracy, Significance number.

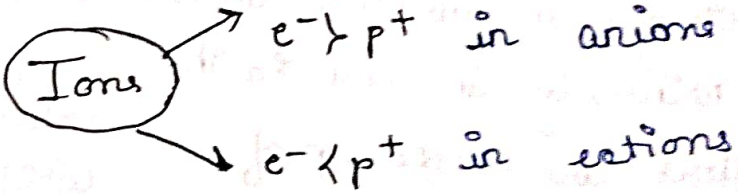
2) Laws of Chemical combination :-
   i) Law of Conservation of mass.
   ii) Law of Constant proportion.
   iii) Law of multiple proportion
   iv) Law of reciprocal proportion
   v) Avagadro Law.
   vi) Gay Lussac Law
   vii) Dalton's Atomic theory.

3) Mole Concept :-
   i) Conversions
      Mole → Mass
      Mass → No.
      No. → Volume
      Volume → ~~Mass~~ Mole.

   ii) Stoichiometric → Balanced Chemical Equation.
   iii) Limiting Reagent / Excess Reagent.



no. of e^- = no. of proton
{only for neutral / uncharged}

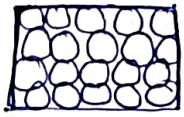


1. Matter :- All the things which occupies space that is called Matter.

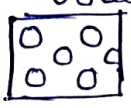
Matter are classified into 2parts :-

Matter → Physical classification
→ Chemical classification

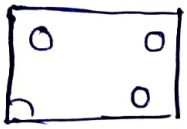
I Physical classification
i. Solid :- A substance in which matter are closely packed
ii. Liquid Solid have a particular shape & volume.
iii. Gas

 ← Shape & Volume.

ii. Liquid :- Matter are not closely packed, they have only volume not a proper shape.



iii. Gas :- Matters are freely packed with each other. They do not have fixed volume or shape.



II Chemical classification
Matter also have a chemical classification.

Pure
→ A substance which have only one type of matter. (atom or molecules)

→ Pure
- Elements
- Compounds

Elements
- Elements are a substance which is found naturally in our Earth. All matters are made up of elements. Elements are 118 They are further classify into various groups, periods

Mixture
→ Mixture are substance which've a combination of two or more matters.* But don't have definite composition.

Mixture
- Homogenous → the matters are uniformly mixed. The mixture called homogenous which have do not the features of each other. & they cannot be
- Heterogenous.

, block, Metal, Non-metal & metalloids.

Metal :- Elements they've specific properties, meallable, ductile, sonorous, etc.

Non-metal :- substance / element they don't have metal like property, hard but brittal.
eg :- Glass.

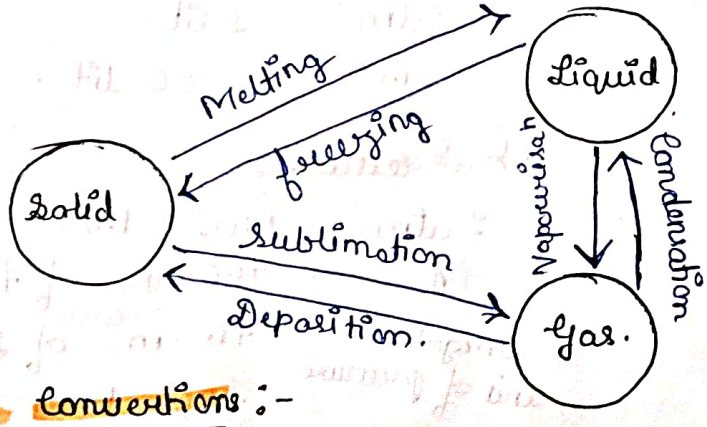
Metalloids :- They've both metal & non-metal property.

2) Compounds :- Are the subs. which have a composition 2 or more different elements

repersated by normal physical method.
eg :- Milk in water.

2) Heterogenous :-
A mixture which can be seperated by normal physical method or naked eyes is called Heterogenous mixture.
eg :- Sand in water.
Oil in water.

UNITS & CONVERTIONS. :-



← with respect to H2O

* Units & Conversions :-

sort
- SI unit :- International standard.
- CGS unit :- cm, gram, sec
- MKS unit :- meter, kg, sec.

* SI units :- 7 SI units are their, others're derive.

1) length → meter (m)
2) mass → Kilogram (kg)
3) Time → Sec (s)
4) Temperature → Kelvin (K)
5) Intensity of light → Candella (cd)
6) Current Electricity → ampere (A)
7) Amount of Substance → Mole (mol)

Physical Quantity :- 've Two value 1) Numeric Value 2) Units.

* Convertion

1) Time :-

1 hr = 60 mins
1 mins = 60 sec
1 day = 24 hrs.

2) Temperature :- Heat

°C °F °K

°C + 273 = K

°F = $\frac{9}{5}$ °C + 32

3) Length. → Distance

1 miles = 1760 yards
1 yard = 3 feet
1 foot = 12 inches
1 inch = 2.54 cm

Size of atom → 1 Angstrom
= A° = 10^{-10} m

Size of Nucleus → 1 fermi
= 10^{-15} m.

4) Mass :- weight

1 kg = 1000 g
1 g = 1000 mg
1 quintal = 100 kg
1 ton = 1000 kg
1 u = 1.67×10^{-27} kg
(amu) = 1.67×10^{-24} g.

5) Volume :-

1 litre = 1000 ml
1 cm^3 = 1 cc = 1 ml
1 litre = 1000 cc
1 dm^3 = 1 lit.
1 m^3 = 1000 lit.

6) Pressure :-

1 atm = 1.013 bar
↑ = 760 mm of Hg
Longest unit of pressure = 76 cm of Hg
= 760 torr
smallest unit of pressure → = 1.013×10^5 pascal
= 1.013×10^5 N/m^2

7) Energy :-

4.2 J = 1 cal

1 L atm = 1 x 101.3 J

1 J = 10^7 erg

1 eV = 1.6×10^{-19} J

What is Chemistry?

A Branch of Science which deals with matter its composition & their physical & chemical property.

* Ideal Gas Equation :-

In physics - Gas law.

$$PV = nRT$$

- P → Pressure (atm)
- V → Volume (Lit)
- n → no. of moles (mol)
- R → Universal gas constant
- T → Temperature (k)

R:
- 0.0821 L atm mol^{-1} k^{-1}
- 8.314 J mol^{-1} k^{-1}
- 1.98 Cal mol^{-1} k^{-1}

* Accuracy & Precision :-

Accuracy :- The closest value of measurement measuring by any physical equipment or measuring device is called Accuracy.?

eg :- Vernier Calipers, Screw Gague.

Precision :- The closeness of two or more measurements to each physical quantity is known as Precision.

eg :- Temp. of room → about 27°C.

Precision can be more refined by repitations.

* Significance number

Prefix :-

10^{-24}	→	yocto (y)
10^{-21}	→	zepto (z)
10^{-18}	→	atto (a)
10^{-15}	→	femto (f)
10^{-12}	→	pico (p)
10^{-9}	→	nano (n)
10^{-6}	→	micro (M)
10^{-3}	→	milli (m)
10^{-2}	→	centi (c)
10^{-1}	→	deci (d)

10	→	Deca (D)
10^{2}	→	hecto (H)
10^{3}	→	Kilo (K)
10^{6}	→	Mega (M)
10^{9}	→	Giga (G)
10^{12}	→	Tera (T)
10^{15}	→	Peta (P)
10^{18}	→	exa (E)
10^{21}	→	zeta (Z)
10^{24}	→	yotta (Y)

8) 17°C → X

300 K → Y

c° + 273 → K.

300 = c° + 273

300 − 273 = c°

27 = c°

$\frac{9}{5}$ °C + 32 = °F

$\frac{9}{5}$ °C = 96.4 − 32

$\frac{9}{5}$ °C = 64.4

9°C = 64.4 × 5

9°C = 322.0

°C = $\frac{322}{9}$ 64.4

= 64.4

°C = 35.7 //

11) $\frac{190}{760}$

① 760 torr = 1 atm

1 torr = $\frac{1}{760}$

190 torr = $\frac{1}{760}$ × 190 = 0.25

16) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

② 1.013×10^5 Pa = 1 atm

1 Pa = $\frac{1}{1.013 \times 10^5}$

2.53×10^4 Pa = $\frac{1}{1.013 \times 10^5}$ × 2.53×10^4

PV = nRT P = 1 V = 22.4

$\frac{PV}{RT}$ = n T = 30° + 273 = 303 K.

$\frac{1 \times 22.4}{0.0821 \times 303}$ = n

$\frac{22.4}{0.0821 \times 303}$ = n

1 Pa = $\frac{1}{1.013 \times 10^5}$ atm.

$\frac{0.2 \text{ atm}}{190}$

$\frac{9}{5} \times 14.5 + 32$

$\frac{9}{5} \times 14.5 + 32$

$\frac{9}{5} \times 64.5 + 32$

$\frac{1}{1.013 \times 10^5} \times 546$

$\frac{1}{0.0821} \times 546$

$\frac{22.4}{0.0821} \times 546$

$\frac{22.4}{134.1}$

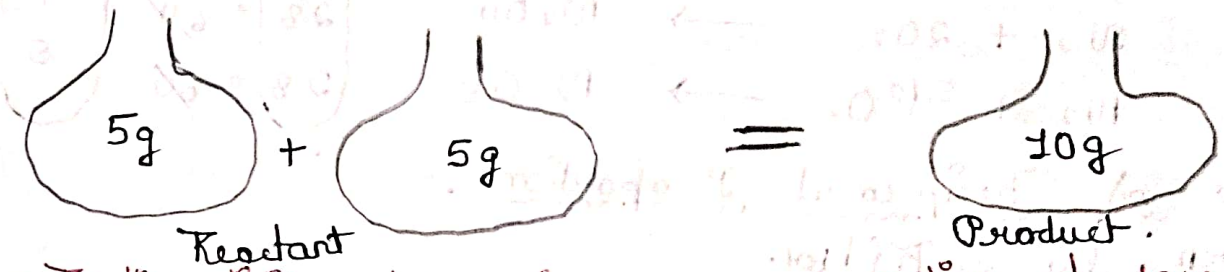
= 16.7

* Laws of Chemical Combination :- (6 laws with three)

1) Law of conservation of Mass :-

Given by Lavosier in 1789.

According to this law :- Mass can neither be created nor be destroyed in a balanced chemical equation if a reactant completely convert into product then the sum of mass of Reactant = Sum of Mass of Product.
The total no. of Reactant = The total no. of Product.



Note :- Radio activity decay is an exception of law of conservation of mass.

$$C + O_2 \longrightarrow CO_2$$
$$12g \quad x \quad 44g$$

$12 + x = 44$
$x = 44 - 12$
$x = 32g.$

2) Law of Definite Proportion (Constant) :-

J. Proust

According to this law :- A compound can be obtain from different sources but the ratio of each component are exactly the same of proportion of element by weight.

$$2H_2 + O_2 \longrightarrow 2H_2O$$
$$4 : 32 = 1 : 8$$

sea water, tapwater, ice water, A.C. water.

Exp. :- Isotopes

3) Law of Multiple Proportion :-

given by John Dalton.

Acc^{n} to this law :- Multiple proportion means - two elements combine & form more that one compound, the masses of one element that combine with a fixed mass of the other element in the ratio of small whole no.

$N_2 + 1/2\,O_2 \longrightarrow N_2O$

$N_2 + O_2 \longrightarrow 2NO$

$N_2 + 3/2\,O_2 \longrightarrow N_2O_3$

$N_2 + 2O_2 \longrightarrow N_2O_4$

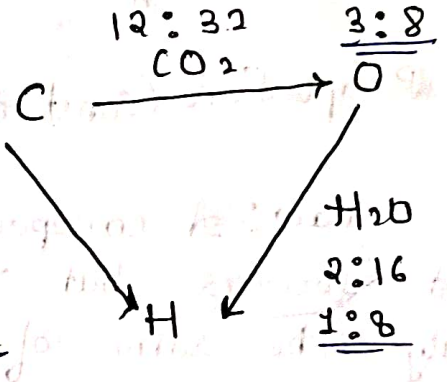
$N_2 + 5/2\,O_2 \longrightarrow N_2O_5$

fixed		
28	: 16	1
28	: 32	2
28	: 48	3
28	: 64	4
28	: 80	5

4) Law of Reciprocal Proportion :-

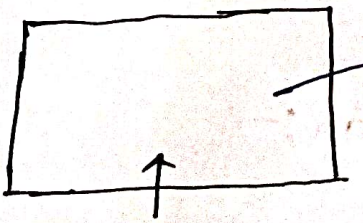
given by J. Richter.

When two element combine with a fixed mass of third element the ratio of their masses it is either the same or a whole no. multiple.



5) Avagadro Law :-

"Equal volume of all gases contain equal no. of molecules at same temp. & pressure"



N_2, O_2, CO_2, N_2O_5 etc.

Volume same

Pressure same

temp. same.

* THE DALTON'S ATOMIC THEORY :-

John Dalton who was firstly developed a theory on the structure of atom, Later it is known as "Dalton's Atomic Theory".

Acc^n to him :- "i) All the matter are made up of many very small indivisible particles called atoms"

ii) All the atoms of a given elements are identicals in all including mass, shape, size etc.

iii) Atom cannot be created or destroyed by any chemical process.

iv) Atoms of different elements are different in nature.

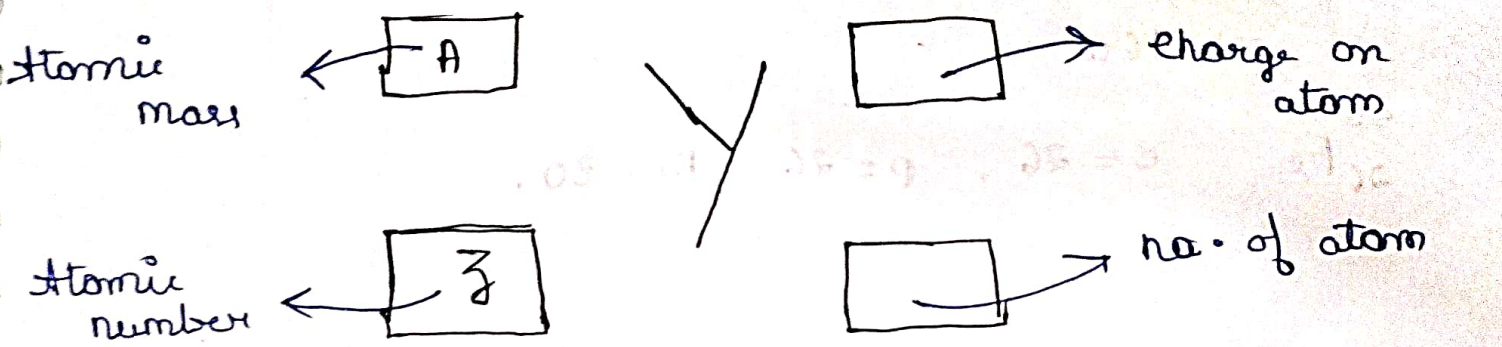
v) During any chemical reaction a complete atom can participate, not its part.

* Atoms Fundamental Particles :-

$p^+ + e^- \longrightarrow$ nucleus.

Sub particles	Name	Discovered by	Home	Charge	Mass
1) Electron	e^-	J. J Thomson	Orbits	-1.6×10^{-19} C	9.1×10^{-31} kg
2) Proton	p^+	E-Goldstein	nucleus	$+1.6 \times 10^{-19}$ C	1.67×10^{-27} Kg
3) Neutron	n^0	J. Chadwick	nucleus	0	1.67×10^{-27} Kg.

no. of electron & $p^+ \longrightarrow Z$ no. of neutron $\longrightarrow A - Z$.



Atomic Mass :-

The atomic mass or mass of an atom which is relatively mass of e^- + p^+, neutron.

→ Mass of e^- are lesser than 10,000 times than mass of p^+ & neutron so that the mass of any atom are represent as the mass of ~~non~~ p^+ + mass of e^-

Defn 2 :- Atomic mass or atomic mass unit (amu) the standard mass of $\frac{1}{12^{th}}$ or mass of atom of carbon's twelve isotopes.

$$1\,amu = 1.67 \times 10^{-27}\,kg$$
$$= 1.67 \times 10^{-24}\,g.$$

$$1\,amu = 1\,Dalton$$
$$= 1\,Da$$

amu = atomic mass unit.

Atomic mass :- unit = U = amu

$_1^1H$

$1 \times 9 \times 1 \times 10^{-31}\,kg + 1.67 \times 10^{-27}\,kg$

e p n

1 1 0.

$$1U = 1.67 \times 10^{-27}\,kg$$
$$= 1.67 \times 10^{-24}\,kg.$$

$_8^{16}O$

e p n

8 8 8

$= 16\,u$

$_{26}^{56}Fe$ $\quad e = 26, \quad p = 26, \quad n = 30.$

Atomic mass = 26 x no. of e^- = neglect

26 x no. of p = 26 x U

30 x no. of n = 30 x U

56

Molecular Mass :-

The molecular mass of basically it is the mass of nucleons which is present in the form of nucleus.

H_2O => 2 x mass of H + 1 x mass of O

2 x 1 + 1 x 16

=> 18u //

N_2O_5 = 2 x mass of N + 5 x mass of oxygen.

= 2 x 14 + 5 x 16

= 28 + 80

= 108u //

Formula Mass :-

Some substance such as NaCl don't contain discrete molecule as their constituent units, so in that case we use to consider a formula mass such as NaCl.

In NaCl. Na^+ surrounded by Cl^- ions.

* Average Atomic Mass :- Many elements exist with more than one Isotopes for eg- H has 3 isotopes protium, deuterium, tritium. The average mass of that element with respect to their natural abundance is called Average atomic mass.

Note :- During calculation we have to considered fractional abundance.

* Isotopes :- * Many of the elements found in the nature having different atomic mass but same atomic number are called Isotopes.

Isotopes are elements which have same no. of electron, same no. of proton but no. of neutron are different.

eg :- $_{1}^{1}H$ $_{1}^{2}H$ $_{1}^{3}H$, $_{6}^{12}C$ $_{6}^{14}C$

e^-	1	1	1	6	6 ← Carbon
p^+	1	1	1	6	6
n	0	1	2	6	8

↑ Hydrogen.

Average Atomic Mass Writing Method :-

Isotopes	Natural Abu.	fractional abu.	Molar Mass
^{35}Cl	75	$\frac{75}{100} = 0.75$	35
^{37}Cl	25	$\frac{25}{100} = 0.25$	37

Av. atomic Mass = ^{35}~~80~~ × 0.75 + 37 × 0.25 = 35.5

Isotopes	Natural abu.	fractional abu.	Molar Mass.
^{80}Br	80%	$\frac{80}{100} = 0.80$	80
^{82}Br	20%	$\frac{20}{100} = 0.20$	82

Av. atm. mass :- $\underline{80 \times 0.80 + 82 \times 0.20 = 80.4}$

* Gram Atomic Mass :- When we write atomic mass in the terms of gram. molecular mass.

* Gram Molecular Mass :- Wh we write atomic mass or Molar mass in terms of molecular mass.

Gram atomic mass :-

$^{16}_{8}O$ ⟶ 16 g

$^{14}_{7}N$ ⟶ 14 g

Gram molecular mass :-

H_2O ⟶ 2 × g Atomic mass of H + 1 × g Atomic mass of O

⟶ (2 × 1 × 16) g

⟶ 18 g

* Empherical formula :- An empherical formula represents the simplest whole no. ratio of various atom present in a compound.

* Molecular formula :- The molecular formula shows the ~~or Molar mass~~ exact the no. of different types of atoms present in a molecule of a compound.

H_2O → M.F } Same
H_2O → E.F }

H_2O_2 ⟶ M.F

2 : 2

1 : 1 ⟶ E.F

2 : 1 ← one is "1" ⟶ simplest form.

Sugar :- $C_{12}H_{22}O_{11}$

12 : 22 : 11 : ⟶ M.F as well as E.F

Glucose :- $C_6H_{12}O_6$

6 : 12 : 6 ⟶ 1 : 2 : 1 ← simplest form.

↑ M.F

↓ E.F

* Percentage Composition :- This is represent as mass of that element present in compound with respect the molar mass of the compound. This is also called Mass % of that element.

Mass % of Element :- $\frac{\text{mass of that element in compound}}{\text{molecular mass of compound}} \times 100\ \%$

eg :- CH_4 → Molecular Mass => 1 × mass of Carbon + 4 × H.

=> 1 × 12 + 1 × 4

=> (12 + 4) g

=> 16 g (gram coz we are solving gram Mw)

Que. What is the mass % of C & H in Methane? →

Mass % → Molar → 16 g.

% of Carbon = $\frac{1 \times 12}{16} \times 100 = 75\ \%$

% of Hydrogen = $\frac{1 \times 4}{16} \times 100 = 25\ \%$

Que. Mass % of C, H & O in $C_6H_{12}O_6$. Mw = 180 g.

=> Mass % → $\frac{\text{Mass of that element in compound}}{\text{Molar mass of compound (existing)}} \times 100\ \%$

Carbon = $\frac{6 \times 12}{180} \times 100$

=> $\frac{72}{180} \times 100$

=> 40 %

Hydrogen = $\frac{1 \times 12}{180} \times 100$

=> 6.66 %

Oxygen = $\frac{6 \times 16}{180} \times 100 = \frac{960}{180} = 53.3\ \%$

NCERT's Ex :- 1.3 & 1.8

Que:- A compound x → Fe → 69.9 %
→ O → 30.1 %

Elements	Sign	% mass	At. mass	Ratio	Avg. Ratio	Simplest Ratio
Iron	Fe	69.9 %	56	$\frac{70}{56} = 1.25$	$\frac{1.25}{1.25} = 1$	$1 \times 2 = 2$
oxygen	O	30.1 %	16	$\frac{30}{16} = 1.88$	$\frac{1.88}{1.25} = 1.5$	$1.5 \times 2 = 3$

$\Rightarrow Fe_2O_3$ // ← Emphirical formula

* Relationship between Emphirical formula & Vapour density & Molar Mass / Mw.

$$2 \times V.D = \text{Molar Mass}$$

E.F → E.M

$CH_2O \longrightarrow 1 \times C + 2 \times H + 1 \times O$

$1 \times 12 + 2 \times 1 + 1 \times 16$

$12 + 2 + 16$

$14 + 16$

$30 g.$

Molar Mass → 180g. & What is the molecular ~~mass~~ formula for CH_2O

$$\frac{Mw}{EF} = \frac{180}{30} \quad (6)$$

$6(CH_2O) \longrightarrow C_6H_{12}O_6$ //

Que. 85 pg - 27 :-

Elements	Sign %	At. mass	Ratio	Avg Ratio	Simplest Ratio
X	50%	10	$\frac{50}{10} = 5$	$\frac{5}{2.5} = 2$	2
Y	50%	20	$\frac{50}{20} = 2.5$	$\frac{2.5}{2.5} = 1$	1

X_2Y //

Que. 86)

Elements	Sign	%	At. mass	Ratio	Av. ratio	Simplest ratio
Carbon	C	80%	12	$\frac{80}{12} = 6.66$	$\frac{6.66}{6.66}$ 1	1
Hydrogen	H	20%	1	$\frac{20}{1} = 20$	$\frac{20}{6.66}$ 3	3.

CH_3 . ← Emperical formula.

Emperical mass = $C \times 12 + H \times 3$

$= 12 + 3 = 15g$

Que. 137)

Element	Sign	%	At. mass	Ratio	Av. Ratio	Simplest Ratio
Carbon	C	9	$\frac{9}{12} = \frac{3}{4}$	$\frac{0.75}{0.25}$ 3	3	
Hydrogen	H	1	$1/1 = 1$	$\frac{1}{0.25}$ 4	4	
Nitrogen	N	3.5	$\frac{3.5}{14} = \frac{1}{4}$	$\frac{0.25}{0.25}$ 1	1	

3 : 4 : 1

E. formula → C_3H_4N

$= 3 \times 12 + 1 \times 4 + 1 \times 14$

$= 54g$.

Molecular Mass = 108 $\quad \frac{\text{M. mass}}{\text{E. mass}} = \frac{108}{54} = 2 = n$

$C_6H_8N_2$ → Molecular formula.

Pg. 15 Que. 1 DPP-04

Element	Sign	%	Mass / At.	Ratio	Avg. Ratio	Simp. R
M	60+	60%	$\frac{60}{24}$	$\frac{60}{24} = 2.5$	$\frac{2.5}{2.5}$ 1	1
O	−	40%	$\frac{60}{16}$	$\frac{60}{16} = 2.5$	$\frac{2.5}{2.5}$ 1	1

MO //

Que. 3) V. D = 30 ⇒ $2 \times 30 = Mw$. $60g = Mw$.

C 80% $\quad 80/12 = 6.66 \quad = \frac{6.66}{6.66}$ 1

H 20% $\quad 20/1 = 20 \quad = \frac{20}{6.66}$ 3

E. formula CH_3.

E. mass → $1 \times C + 3 \times H$

$1 \times 12 + 3 \times 1$

$12 + 3 = 15g$.

$\frac{Mw}{EM} = \frac{60}{15} = 4$

C_4H_{12}.

pg - 33 other Spp H.W

M	78%	$\frac{78}{56}$	$= \frac{1.4}{1.4} = 1$		FeO
O	22%	$\frac{22}{16}$	$= \frac{1.4}{1.4} = 1$		
M	70%	$\frac{70}{56}$	$= \frac{1.25}{1.25} = 1 \times 2$	$= 2$	
O	30%	$\frac{30}{56}$	$= \frac{1.875}{1.25} = 1.5 \times 2$	$= 3$	

Fe_2O_3

Oxygen same :-

$$\frac{FeO \times 3}{Fe_2O_3} = \frac{Fe_3O_3}{Fe_2O_3} = 3:2 \text{ //}$$

Que 13) $C = \frac{10.06}{12} = \frac{0.833}{0.84} 1$

$H = \frac{0.84}{1} = \frac{0.84}{0.84} 1$ CH_3Cl_3 //

$Cl = \frac{89.10}{35.5} = \frac{2.5}{0.84} 3$

* REDOX REACTION & BALANCING :-

Oxidation & Reduction :-

Reduction

i) Addition of hydrogen

ii) Removal of oxygen

iii) Gain of e^-

iv) Decreases in oxidation number.

Oxidation

i) Addition of oxygen.

ii) Removal of hydrogen.

iii) Loss of e^-

iv) Increases in oxidation number.

Self Bonding = Oxi. no. = 0

$S_8 = 0$ $H_2 = 0$ $Na = 0$

$O_2 = 0$ $F_2 = 0$ $Ca = 0$

$N_2 = 0$ $Mg = 0$

Hydrogen → Non-metal = +1

Hydrogen → Metal = −1

oxygen → −2 Normally.

Florine → always −1

eg → $x + 5 = x\ 3$

$x = -2$

(i) $Na_2 \overset{*}{S}O_4$

→ $2 \times 1 + x + (-2 \times 4) = 0$

⇒ $2 + x - 8 = 0$

$x - 6 = 0$

$x = +6$

(ii) $ZnCl_2$

⇒ $x - 1 \times 2 = 0$

$x - 2 = 0$

$x = +2$

(iii) $k\overset{*}{M}nO_4$

⇒ $+1 \times x \times (2 \times 4)$

⇒ $x - 7 = 0$

⇒ $x = +7$

(iv) $k_2 \overset{*}{C}r_2O_7$

⇒ $+1 \times 2 + 2x + (-2 \times 7) = 0$

⇒ $2 + 2x - 14 = 0$

⇒ $2x - 12 = 0$

⇒ $x = +6$

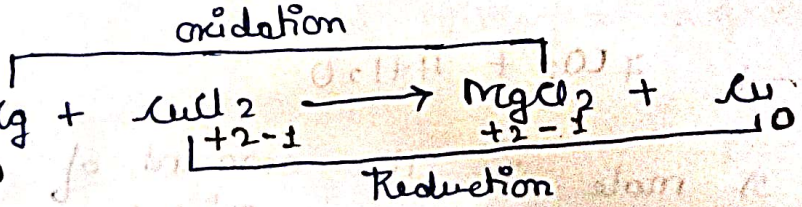
(v) $\overset{*}{N}H_4^{-1}$ ← Charge

⇒ $x + 1 \times 4 = -1$

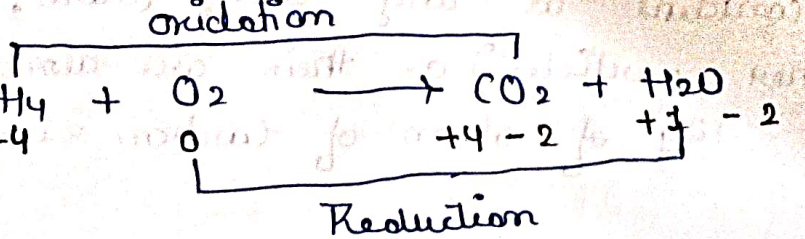
$x = -5$

* Redox Reaction :- Redox Reaction in which oxidation & Reduction takes place simontaniously. is called Redox Reaction.

(i)



(ii)



* Oxidation Number Method Balancing.

1) $2Al + 3MgCl_2 \longrightarrow 3Mg + 2AlCl_3$

Oxidation numbers: Al = 0, Mg in $MgCl_2$ = +2, Mg = 0, Al in $AlCl_3$ = +3

(Al: 0 → +3, 3×2; Mg: +2 → 0, 2×3)

2) $Al + 3NaCl \longrightarrow AlCl_3 + 3Na$

Oxidation numbers: Al = 0, Na in NaCl = +1, Al in $AlCl_3$ = +3, Na = 0

(Al: 0 → +3, 3; Na: +1 → 0, 1×3)

* Fuel Balancing.

$CH_4 + \frac{4}{2} O_2 \longrightarrow CO_2 + 2H_2O$

$C_2H_6 + \frac{7}{2} O_2 \longrightarrow 2CO_2 + 3H_2O$

$C_2H_4 + \frac{6}{2} O_2 \longrightarrow 2CO_2 + 2H_2O$

$C_2H_2 + \frac{5}{2} O_2 \longrightarrow 2CO_2 + H_2O$

$C_5H_{10} + \frac{15}{2} O_2 \longrightarrow 5CO_2 + 5H_2O$

* Half the no. of H → H_2O
* No. of Carbon = CO_2.

$C_3H_8 + \frac{10}{2} O_2 \longrightarrow 3CO_2 + 4H_2O$

$C_4H_{10} + \frac{13}{2} O_2 \longrightarrow 4CO_2 + 5H_2O$

$C_6H_6 + \frac{15}{2} O_2 \longrightarrow 6CO_2 + 3H_2O$

$C_7H_8 + \frac{18}{2} O_2 \longrightarrow 7CO_2 + 4H_2O$

*** MOLE CONCEPT :-** A mole is the amount of subs. that contains as any entities (atom, molecule or other particles) as there are atoms is exactly 12g of atom of carbon isotopes.

What is Mole ?

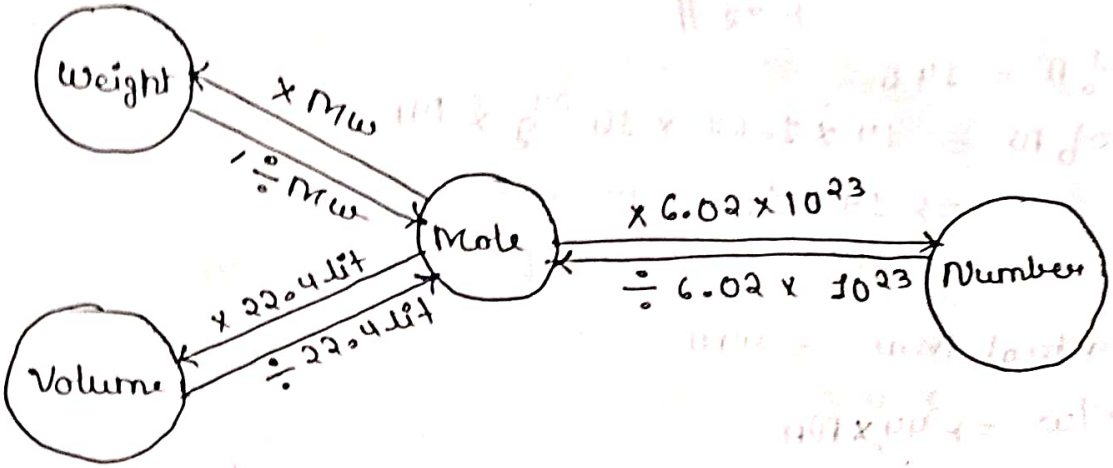
↳ SI unit → Amount of substance.

1 Mole → Number → 6.02×10^{23}

→ Weight → AT. weight / molecular weight / Molar mass in gram

at STP/NTP → Volume → 22.4 lit

↳ only for gas.



⇒ 1 mole :-

1) CO_2 = 1 × mass in g + 2 × mass of oxygen in g

= 1 × 12g + 2 × 16g

= 12g + 32g

= 44g //

2) N_2O_5 = 2 × mass of Nitrogen in g × 5 × oxy. in g

= 2 × 14 + 5 × 16

= 108g.

3) Glucose = $C_6H_{12}O_6$

= 6 × C + 1 × H + 6 × O

= 6 × 12 + 1 × 1 + 6 × 16

= 180g.

4) CH_4.

= 1 × C + 4 × H

⇒ 1 × 12 + 4 × 1

⇒ 12 + 4

⇒ 16g

1 Mole = 6.02×10^{23}

↓

Weight H_2 → actual mass → 2g

↳ $2 \times 1.67 \times 10^{-24}$ g ← u

⇒ 1 Molar mass :-

$2 \times 1.67 \times 10^{-24} g \times \frac{6.02 \times 10^{23}}{1}$

⇒ (2 × 1) g

⇒ 2g //

⇒ 1 atom of N = 14 u

1 Mole of N = $14 \times 1.67 \times 10^{-24} g \times N_A$

⇒ 14 × 1g

⇒ 14g

⇒ 1 CO_2 = Actual Mass = 44 u

M/w ⇒ 44 u × N_A

⇒ 44 × 1g

⇒ 44g //

* MOLE CONCEPT :-

चुकि Method.

10₹ → 3 केले etc.

Q. How many moles in 10g of $CaCO_3$.

चुकि method,

Mw = 1 mole

1 × mass of Ca = 40

+ 1 × mass of C = 12

+ 3 × mass of O = 48

100g

चुकि ∵ 100g of $CaCO_3$ = 1 mole.

1g of $CaCO_3$ = $\frac{1}{100}$ mole.

10g of $CaCO_3$ = $\frac{1}{100} \times 10$

⇒ 0.1 mole //

for NEET.

II⁺ Acch to Y shape

$\frac{10}{100}$ = 0.1 mole //

Que:- 1 Mole = H_2SO_4

Atom = $2\times H + 1\times S + 4\times O$

$\Rightarrow$ 7 atoms of NA.

Molecule = $1\times NA$.

Number of Oxygen = $4\times NA$

no. of e^- $\longrightarrow$ $2\times {}^{1}_{1}H \longrightarrow 2\times 1 = 2$

$1\times {}^{32}_{16}S \longrightarrow 1\times 16 = 16$

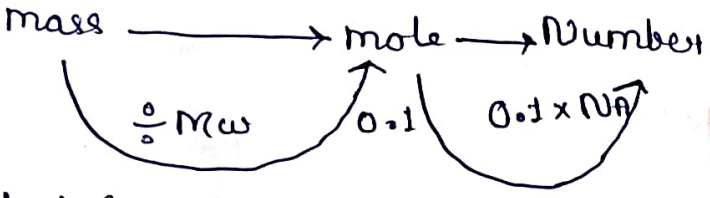
$4\times {}^{16}_{8}O \longrightarrow 4\times 8 = 32$

$\Rightarrow 50\times NA\, e^-$.

$50e^-$ //

Que:- 1.6g of CH_4 have how many no. of molecules?

$\Rightarrow$ Accd to Y shape:-



$\Rightarrow \frac{1.6g}{16} \Rightarrow \frac{1\times C}{4\times H} \Rightarrow \frac{1\times 12}{4\times 1} = 16g.$

Que:-83) pg.27.

1) $CO_2 = 1\times C = 1\times 12$

$2\times O = 2\times 16$

Mw = 44g.

2) $H_2 = 2\times H$

$= 2\times 1\,g$

Mw of H_2 = 2g.

2) $O_3 = 3\times O$

$= 3\times 16$

Mw = 48g.

4) $SO_2 = 1\times 32 = 32$

$2\times 16 = 32$

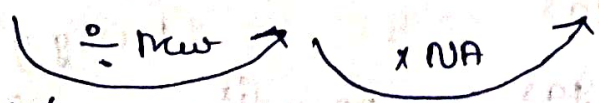
Mw = 64g.

1) mass $\longrightarrow$ mole $\longrightarrow$ Number. 2) $\frac{8.4}{2} = 4\times NA = 4\,NA$

$\Rightarrow \frac{44\,g}{44} \rightarrow 1$ mole $\Rightarrow 1\,NA$

4) $\frac{64}{64} = 1\,NA$ //

2) mass $\longrightarrow$ mole $\longrightarrow$ no.



$\frac{48}{48} = 1$ mole $\quad 1\times NA$

Volume

1 Mole = 22.4 lit.

avagadro law = at cons. temp. & pressure. Volume fix.

Ideal gas equation.

$PV = nRT$

Volume → fixed.

$P = 1\ atm$, $T = 0°C = 273k$. → STP / NTP

↓ Standared Temp. & Pressure

↓ Normal Temp. & Pressure.

$PV = nRT$

$R = 0.0821\ L\ atm\ mol^{-1}\ k^{-1}$ //

$PV = NRT$

$n = 1\ mole$

$R = 0.0821\ L\ atm\ mol^{-1}\ k^{-1}$

$T = 273\ k$

$P = 1\ atm.$

$$V = \frac{nRT}{P} = V = \frac{1\ mol \times 0.0821\ L\ atm\ mol^{-1}\ k^{-1} \times 273k}{1\ atm}$$

$$\Rightarrow V = 0.0821 \times 273\ //$$

Volume = 22.4 lit. = 1 mole only for gas at STP / NTP.

1 Mole CO_2 = 22.4 l

1 Mole NO_2 = 22.4 l , 1 mole N_2O_5 = 22.4 lit.

Ques. 4.2 g of Methane. How many lit at STP.

⇒ mass → mole → volume.

÷ Mw (4.2 / 16 mole) × 22.4 (4.2/16 × 22.4 lit.)

Ques. 5 lit → 16 g.

Ans :- 5 lit = 16 g of that gas

1 lit = 16/5 of that gas

22.4 lit = 16/5 × 22.4

= 71.68 g //

22.4 lit ≡ After. mole

1 mole = Mw

22.4 lit = Mw.

DPP = 2 pg = 12

Que.1) 5.6 lit = 7.5g.

22.4 lit = Mw.

चूकि → 5.6 lit = 7.5g

1 lit = $\frac{7.5}{5.6}$

22.4 lit = $\frac{7.5}{5.6} \times 22.4$

= 30g.

✓ 1) NO → 14+16 = 30g. ✓

DPP-01 Pg = 12

Que.) 5.6 lit = 7.5g.

=) # 22.4 lit = Mw

चूकि 5.6 lit = 7.5g

1 lit = $\frac{7.5}{5.6}$

22.4 lit = ?

DPP = 01 Pg = 10

Que.) opt = 4 All of these.

Que.2) 4.2g of N^{-3} no. of e⁻

14

? N^{-3} =) ? + 3 = 10 e⁻

1 N^{-3} = 10 e⁻

mass → Mole → Number.

÷ Mw × NA × 10 e

$\frac{4.2}{14}$ = 0.3 0.3 × 10 × NA

=) 3NA.

Que.6) Cl_2 = 35.5 × 2 = 71 amu

=) 71 × 1.67 × 10^{-24} g

=) 118.10⁻²⁴

=) ~~1108~~ 118.57 × 10^{-24} g.

Que.*) CH_4 = 1 × C = 1 × 12 =) 12+4 = 16.

1 × H = 4 × 1

16 × 1.67 × 10^{-24} g

26.7 × 10^{-24} g.

2.67 × 10^{-23} g.

Que.2) pg - 12 Qp DPP - 2 SO_2 = atom of 3.

Vol → Mole → No.

÷ 22.4 lit × NA × 3 ← Atom.

=) $\frac{11.2}{22.4} \frac{1}{2}$ =) $\frac{1}{2} \times NA \times 3$ =) $\frac{3}{2}$ NA //

Qu·3⁄ mass maximum ?

⁄ 0.1 gram of atom of C.

$= 0.1 \times 12 = 1.2\,g$.

2⁄ 0.1 mol × Mw = g

$NH_3 = g$

$14 \times 3 = g = 17g$.

$0.1 \times 17g = 1.7g$

13⁄ 6.02×10^{23}

No. → mole → mass

÷ NA × Mw

$= \frac{6.02 \times 10^{23}}{6.02 \times 10^{23}}$

$= 0.1\,mol \times 1g = 0.1g$.

14⁄ Vol → mole → mass

÷ 22.4 × Mw

$= \frac{22.4}{2} \times \frac{1120}{2240} = 2.2g$.

Qu·4⁄ 1.0 g of H_2 of NTP / STP

$= \frac{1}{5} = 0.5\,mol \times 22.4\,lit$.

$= 11.2\,lit$ //

Qu·5⁄ 22.4 lit = Mw.

5.6 lit = 11g

$1\,lit = \frac{11}{5.6}$

$22.4\,lit = \frac{11}{5} \times 22.4$

$= 44g$.

$CO_2 = Mw = 44g$ //

Qu·6⁄ Gram atomic weight

= only 1 atom $= O_2 = X$

$= O = 16g$.

Qu·7⁄ Only gas.

$O_2 = 32 = \frac{w}{Mw} = \frac{x}{32}$

$H_2 = 2 = \frac{x}{2}$

$CH_4 = 16 = \frac{x}{16}$

$\frac{x}{32} : \frac{x}{2} : \frac{x}{16}$ (×32)

1 : 16 : 2

Exercise Pg - 28

1.28) Which of the following has the longest no. of atoms?

=) 1g of Au

mass → mole → No.

÷ Mw ; × NA

$\frac{1}{197}$ mole → $\frac{1}{197} \times N_A$ → $\frac{N_A}{197}$ //

Similarly,

1 g of Na = $\frac{N_A}{23}$.

1g of Li = $\frac{N_A}{7}$ Ans.

1g of H_2 = $\frac{N_A}{71}$

Pg - 124)

Que.2) At NTP, what will be the volume of molecules of 6.022×10^{23} H_2?

=) Number → mole → Volume.

÷ NA ; × 22.4 lit.

=) $\frac{6.022 \times 10^{23}}{6.022 \times 10^{23}}$ = 1 mol × 22.4 lit

=) 22.4 lit //.

Que.3) Calculate the no. of molecules present in 0.5 moles of CO_2.

=) 1 mole of CO_2 = 6.022×10^{23} no. of CO_2.

0.5 = $6.022 \times 10^{23} \times 0.5$

= 3.01×10^{23} no. of the CO_2 molecules.

Que.4) 1L of a gas at STP weighs 1.97g. What is the Mw?

Ans 5) 1L gas at STP = 1.97g.

1 mole = Molar Mass

1L = 1.97g

to find the molar mass.

22.4 lit = 1.97 × 22.4 lit

Volume. = 44.128 // lit = Molar Mass.

Que.4) Calculate the no. of moles in the following masses -

1) 7.85g of Fe to find the Moles

=) Mass → Mole ; ÷ Mw

=) $\frac{7.85}{}$

Fe = 56g.

56g of Fe = 1 mol.

1g of Fe = $\frac{1}{56}$

7.85g of Fe = $\frac{1}{56} \times 7.85$ mol.

= $\frac{7.85}{56}$ =) 0.141 mol.

(iii) 7.9mg of Ca.

⇒ we know that 1 mol = Atomic mass of Calcium.

1 mol = 40g.

1g = 1/40 g

$7.9\,mg = \frac{1}{40} \times 7.9 \times 10^{-3}$ mol.

$\Rightarrow \frac{7.9}{40} \times 10^{-3}$

$\Rightarrow 2 \times 10^{-2}$

Que. 8) % of Carbon

Pg - 28) 1.33) Calculate the no. of atoms

⇒ i) 52 moles of He.

1 mole of He = 6.02×10^{23} no. of atom.

52 moles of He = $6.02 \times 10^{23} \times 52$ no. of He atoms

$= 313.144 \times 10^{23}$ no. of He atoms.

$= 313.14 \times 10^{23}$ no. of atoms.

Ans i) $M_w = N_A$

He = 4u = N_A

4u = 1 atom

1u = 1/4 atom

52u = 1/4 × 52 = 13 //

ii) 52 g of He

weight → mole → No.

÷ Mw, × N_A

$\Rightarrow \frac{52}{4}$ = 13 mol × N_A

$= 13 \times 6.03 \times 10^{23}$

$= 7 \times 8.26 \times 10^{23}$

$\Rightarrow 78.82 \times 10^{24}$ atoms.

Pg :- 107

i) $CuSO_4 \cdot 5H_2O \longrightarrow 9\,O_2$.

63.5g of Cu → 9 × 16g of O

144g of O → 635g of Cu

1g of O → 63.5/144 of Cu

8.64g → 63.5/144 × 8.64

b) ⇒ 3.81g

(ii) He : CH_4
1 lit : 1 lit
22.4 lit : 22.4 lit.
1 mole : 1 Mole.
4g : 16g.

[1:4]

$\frac{4}{5} \times 100\%$ (20)

$\Rightarrow 80\%$

(iii) Mw = 22.4 lit.
22.4 lit = Mw O_2
22.4 lit = 32g
1 lit = $\frac{32}{22.4 \text{ lit}}$.
5.6 lit = $\frac{32}{22.4} \times 5.6$
$\Rightarrow$ Mw = $\frac{32}{4}$ $\frac{16}{2}$ $\Rightarrow \frac{11}{2}$.
d 8g ✓

(iv) $P_4 = 30 \times 4u$
$30 \times 4 \times u$
$120 \times 1.67 \times 10^{-24}g$.
$200 \times 10^{-24} g$.
$2 \times 10^{-22} g \times 10^{3}$
b) $2 \times 10^{-19} g$ ✓

Q1.
$\Rightarrow$ Volume → mol
÷ 22.4
$\frac{0.21}{22.4}$ mol = 0.0093 mol.
d) 0.0093 mol ✓

Que.94) pg = 101. [NEET - 2024]

a) 4 mol of He
= 4 × NA ✓

b) $\frac{4g}{4g}$ of He = 1 atom
1 Atom

c) $\frac{4g}{4g}$ × NA = 1 NA.

d) $\frac{22 \text{ lit}}{22.4}$ × NA.

pg - 100 NEET

Que. 88) a) $\frac{16}{32}$ × NA = $\frac{NA}{2}$.

b) $\frac{16}{48_3}$ × NA = $\frac{NA}{3}$.

c) $\frac{7}{28_2}$ × NA = $\frac{NA}{4}$

✓d) $\frac{2}{2}$ × NA = NA

Que. 90 in pg - 100 NEET
1 molecule = 18g = 18 ml / cc.
$\rho = \frac{m}{v}$
$\rho = 1$ 1ml = 1g.
$18u = 18 \times 1.67 \times 10^{-24} g$.
1ml = 1cc
18g = 18cc
1g = $\frac{18cc}{18}$ ≠ 1cc
$18 \times 1.67 \times 10^{-24} g = 18 \times 1.67 \times 10^{-24} \times 10 ml$
$= 3.006 \times 10^{-23} cm^3$ //

H.W → 26, 05 → 49-84

PYQues. IIT-JEE

Ans) $1e^-$ weight = 9.1×10^{-31} kg

1 kg = mole?

b) $\frac{1000\ g}{9 \times 10^{-28}\ g} = \frac{10^{+31}}{9.1}$ ✓.

Ques) a) $\frac{^{c}24}{12} \times N_A = 2N_A$ (b) $\frac{56}{56} \times N_A = N_A$.

(c) $\frac{27}{27} \times N_A = N_A$. (d) $\frac{108}{108} \times N_A = N_A$

* STOICHIOMETRIC

* Definition :- Ratio of moles of balanced of chemical Equation.

eg 1) $H_2 + Cl_2 \longrightarrow 2HCl$

Sto. of mole.	1 :	1	2.
Sto of Mass	2g	71g	73g.
Sto. of nos.	$1 \times N_A$	$1 \times N_A$	$2 \times N_A$
Sto. of vol.	1×22.4 lit	1×22.4 lit	2×22.4 lit.

eg 2) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$.

Sto. of mole.	2 :	1	2.
Sto. mass	2×64 128g.	1×32 32g	2×80 160g.
Sto. of no.	$2 \times N_A$	$1 \times N_A$	$2 \times N_A$.
Sto. Vol	2×22.4 lit	1×22.4 lit	2×22.4 lit.

Que:- 6g of carbon burns to form how much lit of CO_2 at STP?

=> $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$

1 mol 1 mol 1 mol.

12g ⟶ 22.4 lit (lit of CO_2).

12g of C = 22.4 lit CO_2.

1g of C = $\frac{22.4}{12}$ lit of CO_2

6g of C = $\frac{22.4}{12} \times 6$ = 11.2 lit.

Que:- 12g of CH_4 burn to form CO_2 & H_2O. Calculate vol of ~~H_2O~~ CO_2 & amount of water.

=> $CH_4 + CO_2 \longrightarrow CO_2 + 2H_2O$

16g ⟶ 22.4 lit : 36g.

चूकि :- 16g of CH_4 = 22.4 lit CO_2

1g of CH_4 = $\frac{22.4}{16}$

12g of CH_4 = $\frac{22.4}{16_4} \times 12^3$

=> 16.8 lit of CO_2.

(I)

If 16g of CH_4 = 36g of H_2O

1g of CH_4 = $\frac{36}{16}$ of H_2O

12g of CH_4 = $\frac{36}{16} \times 12$ of H_2O

=> 27g of H_2O

(II) 6g of carbon

$C + O_2 \longrightarrow CO_2$

1 1 1

give: $\frac{6}{12}$ $\frac{1}{2}$ 0.5×22.4

0.5 0.5 => 11.2 lit.

12g of CH_4 (II)

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

1 : 2 : 1 : 2

$\Rightarrow \frac{12}{16}$

0.75

0.75×22.4 lit.

$\Rightarrow 16.8$ lit.

1.5×18

$= 27$ g.

Pg-28 (Q5)

$C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

1 : 3 : 2 : 2

$\frac{2.8 \times 10^3}{28}$

$\Rightarrow 100$ mol

300 mol

$300 \times 32 \Rightarrow 9.6000$ kg $\Rightarrow 9.6$ g.

DPP-05

Pg - 16.

Que. 1) $Mg + \frac{1}{2}O_2 \longrightarrow MgO$

1 : 0.5 : 1

mole

1 mole of Mg = Mw = 24 g.

Ans 2) quantity → weight.

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

1 : 1 : 1

$40 + 12 + 48$

$\Rightarrow 100$ g

$40 + 16$

$\Rightarrow 56$ g.

$\text{Mole} = \frac{w}{Mw}$

1

$\frac{56000}{56}$

$\Rightarrow 1000$ mole

$\Rightarrow 1000 \times 100$

$\Rightarrow 100000$

$\Rightarrow 100$ kg

$Al + 2H + \frac{3}{2}O_2 \longrightarrow H_2O_3$

$2 : 1.5 : 1$

$\Rightarrow$ 9 gram of Al.

$\frac{9}{27}$ $\frac{1}{3}$

युक्ति :- If 2 mole of Al $\longrightarrow$ 1.5 mole O_2

1 mole of Al $\longrightarrow \frac{1.5}{2}$ mole of O_2.

$\frac{1}{3}$ mol of Al $\longrightarrow \frac{0.5}{2} \times \frac{1}{3}$

$\Rightarrow$ 0.25 mole of O_2.

$0.25 = \frac{1}{4} \times 32 = 8g$

Ans4) $Ag_2CO_3 \longrightarrow 2Ag + CO_2\uparrow_{(g)} + \frac{1}{2}O_2\uparrow_{(g)}$

$1 : 2 : 1 : 0.5$

$\frac{2.76}{276}$ 0.01 mole $\longrightarrow$ 0.02 mole.

0.02×108

2.16g.

Ans5) $CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2$ (gas only)

$1 : 2 \qquad 1 : 1$

$\Rightarrow \frac{100}{64}$ mole

$\Rightarrow$ 1.5625 mol $\longrightarrow$ 1.5625 x 22.4 lit.

$\Rightarrow$ 35 lit.

Ans6) $2SO_2 + O_2 \longrightarrow 2SO_3$

$2 : 1 \longrightarrow 2$

$\Rightarrow \frac{64}{32}$ 2 mole $\longrightarrow$ 4 mol x 22.4 lit.

$\Rightarrow$ 89.6 lit.//

DPP-7 pg-18.

Ans1) $C_4H_{10} + \frac{13}{2}O_2 \longrightarrow 4(O_2 + 5H_2O$.

$1 : \frac{13}{2} : 4 : 5$

$\Rightarrow \frac{2.24 \text{ lit}}{22.4 \text{ lit}}$ mol $\longrightarrow 0.1 \times 4$

0.1 lit $\longrightarrow$ 0.4 mol.

Ans 2) $C_8H_{18} + \frac{2}{5}O_2 \longrightarrow 8CO_2 + 9H_2O$

$\frac{1}{2}$ 1 mol = $\frac{25}{2}$.

2 mol = 25 × 22.4 lit = 560 lit.

Pg-54 Section - E.

Que. 1) $2P + Q \longrightarrow K$

2 : 1 : 1

8 mol — 4 mol.

(Ans 2) $2Al + \frac{3}{2}O_2 \longrightarrow Al_2O_3$

2 mol : $\frac{3}{2}$ mol : 1 mol

2 mol — 1.5 mol

2 × 27 = 54g //

* Limiting Reagent :- Reagent which is completely vanished during any chemical reaction.

Excess Reagent :-

$2A + 4B \longrightarrow 5C$

2 4

if $4A + 8B \longrightarrow 10C$

Lim = A & B both

Excess = no one

product = 10C

eg 2) $A + 2B \longrightarrow 4C$

1 : 2 4

5A 10B 20C

(Que. $50A + 30B \longrightarrow 100C$

50 30

100 60

Que. 10A, 10B = ?

Lim = B

Excess = A = 5

Product = 20C.

Que. 100A & 100B.

Limiting → A

Excess → B

Product → 200C.

Pg-116) Que. $A + B_2 \longrightarrow AB_2$

1 1 1

200 200

2 2.

A B_2

Que. 1) 300 200

atoms molecule

limiting - B

Excess - A

product - 200.

Que. 2) 2 mol & 3 mol.

A B_2

limiting → A

Excess - B

product - 2 mol.

Que. 4) pg - 113) NCERT.

$$C + O_2 \longrightarrow CO_2$$
$$1 \quad 1 \quad 1$$

Ans) 1 mol of $CO_2 = 44g$.

given 1 mol → 0.5 $\quad$ 0.5×44
0.5 $\quad$ $= 22g$.

pg - 116) NCERT.

Que. 24) $N_2 + 3H_2 \longrightarrow 2NH_3$
$1 \quad 3 \quad 2$

given $2 \times 10^3 g \quad 1 \times 10^3 g$.

$\Rightarrow \frac{2 \times 10^3}{28}$ = Mole of $H_2 = 71.42$ mol.

$\frac{1 \times 10^3}{2} = 500$ mol

$\Rightarrow 142.84 \times 17 = 2428.28g$.

71.42×214.28 mol $\quad 142.84$ mol.

$\frac{500 - 24.28 \times 2}{\text{mol}} = g$

Que. 26) NCERT pg - 116.

$$2H_2 + O_2 \longrightarrow 2H_2O.$$
$$2 \quad 1 \quad 2$$
$$10V \quad 5V \quad 10V$$

$\Rightarrow \frac{1.5 \times 10^{22}}{6 \times 10^{23}} = \frac{1}{40}$

Que) $2H_2S + 3O_2 \longrightarrow 3S + 2H_2O$
$2 \quad 1 \quad 3 \quad 2$

$\Rightarrow 2.5 \times 10^{-2}$ mol $\quad \frac{2.5 \text{ mol} \times 10^{-2}}{2}$

$\Rightarrow 1.25 \times 10^{-2}$ mol.

$\frac{1}{10} \quad \frac{1.6}{64}$ $\quad O_2 = 32 + 32 = 64g$.

pg - 174) DPP - 06

$$A + 2B \longrightarrow C$$
$$1 \quad 2 \quad 1$$
$$4 \quad 8 \quad 4 \text{ mol} \quad \text{option - 4 mol} \checkmark$$
$$5 \text{ mol} \quad 8 \text{ mol} \quad ?$$

Que-24 $2H_2 + O_2 \longrightarrow H_2O$

2 1 1

0.250 0.125 0.25×18

$\Rightarrow 4.5g$.

$\frac{4}{2}$ 2 mol.

$\frac{4}{32} \frac{1}{8} = 0.125$ //

Pg-103 JEE 2022.

Que-30 $N_2 + 3H_2 \longrightarrow 2NH_3$.

1 3 2

0.7 mol 2.1 mol 1.4 mol

0.7 0.4 mol

is left.

Limiting Reagent :-

If A = 5 , B = 2 to final c.

$\Rightarrow$ Who is the limiting reagent

B

$\Rightarrow$ Excess Reagent

A

$\Rightarrow$ Output

4C

	A	+ B	$\longrightarrow$	2C
Stoi :-	1	1		2
Avai.	5	2		0
Need	2	2		4
Result	5-2 = 3	0		4

Page-28. Que-93

$N_2 + 3H_2 \longrightarrow 2NH_3$.

	N_2	$3H_2$	$2NH_3$
Stoi	1	3	2
Available	714.28	1500	
Need	500	1500	1000
Result	214.28	0	1000

20 kg of N_2 & 3 kg of H_2

$\Rightarrow \frac{20,000}{28} = 714.28$ mol

$= \frac{3000}{2} = 1500$ mol.

1000 $\rightarrow$ amount?

1000 mol $\times$ 17 = 17000 g of NH_3

$\Rightarrow$ 17kg //

Que 94) $2H_2 + O_2 \longrightarrow 2H_2O$

Stoi	2	1	2
Avai.	10,000	1000	0
Need	2000	1000	2000
Rest	8000	0	2000

↑ Excess Reagent ↑ Limiting Reagent ↑ output.

20 kg of H_2

$\Rightarrow \frac{20000}{2} = 10,000$ mole.

32 kg of O_2

$\frac{32,000}{32} = 1000$ mol

$H_2O = 2 \times H + 1 \times O$

$= 2 \times 1 + 1 \times 16 = 18g.$

$\therefore$ mass of H_2O

$\Rightarrow 2000 \times 18$

$\Rightarrow 36000 \Rightarrow 36$ kg //

Que 96) $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O.$

Stoi	4	5	4	6
Avai	1 mol	1 mol	0.	0
Need	0.8 mol	1 mol	0.8 mol	1.2 mol.
Rest	0.2 mol	0	0.8 mol	1.2 mol.

5 mol of O_2 = 4 mole of NH_3

1 mol = $\frac{4}{5} = 0.8$ mol of NH_3

Que 145) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$

Stoi	1	3	2	3
Avai	1	?		
Need	1	3 mol		

$1 dm^3 = 1$ lit.

$\Rightarrow 3 \times 22.4 = 67.2$ lit

$= 67.2$ dm^3.

Que 146) $PbO + 2HCl \longrightarrow PbCl_2 + H_2O$

Stoi	1	2	1	1
Avai	$\frac{6.5g}{223g}$	$\frac{3.2g}{36.5}$	0	0
	0.03	0.09		
Need	0.03	0.06		
	0.03.			

Que. 149) 1) $C + O_2 \longrightarrow CO_2$

Stoi	1	1	1
	$\frac{26}{12}$	$\frac{20}{32}$	
	2.16 mol	0.625	0
need	625	625	625
	0		

$N_2 + 3H_2 \longrightarrow 2NH_3$

1 3 2

60g 80g 0

$\frac{60}{28}$ $\frac{80}{2}$

2.14 40

2.15 6.45 4.30

0

Que. Pg-32.

$C_3H_8 + \frac{10}{2}O_2 \longrightarrow 3CO_2 + 4H_2O$

1 5 3 4

1 lit = 5lit.

~~Excess Mg → $0.7 \times 10^{-2} \times 24$~~

~~= 0.168g.~~

Que. Pg-33 $2Mg + O_2 \longrightarrow 2MgO$.

Stoi 2 1 2

Available $\frac{1}{24}$ $\frac{0.56}{32}$

4.2×10^{-2} 1.75×10^{-2}

3.5×10^{-2} 1.75×10^{-2} 3.5×10^{-2}

0.7×10^{-2} 0

Excess

Mg → $0.7 \times 10^{24} \times 24$

= 0.168g //

Que. 12 $N_2 + 3H_2 \longrightarrow 2NH_3$.

Stoi 1 3 2

Avai. $\frac{5}{28}$ 2 $\frac{10}{2}$ 5mol

2mol 6mol.

a) ✓.

Pg-55 Section - G.

1) $2P + Q \longrightarrow R$

Stoi 2 1 1

Ava. 8mol 5mol 0

Need 8mol 4mol 4mol

0 1mol 4mol.

Que. $A + 2B \longrightarrow C$

1 2 1

Av. 5mol 8mol 0mol

4mol 4mol //

Que. $2H_2 + O_2 \longrightarrow 2H_2O$

St. 2 1 2

Avai. $\frac{4}{2}$ 2 $\frac{8}{32}$ 4

2mol 0.125 mol

0.25mol × 18

= 4.5g.

Que. $2H_2 + O_2 \longrightarrow 2H_2O$

2 1 2

$\frac{8}{2}$ $\frac{16}{32}$

4mol 0.5

1mol 0.5 1mol //

3mol = 3 × 2 = 6 mol

* Equivalent Weight :-

The Equivalent weight of the substance is a no. of part by mass of the substance that combine with or displaced directly or indirectly 1.008 part by mass of oxygen hydrogen or 8 part of oxygen or 35.5 parts by mass of chlorine or 108 part by weight of Ag.

$H \longrightarrow 1 \longrightarrow \frac{Mw}{1} = 1.008$

$O \longrightarrow 2 \longrightarrow \frac{16}{2} = 8$

$Ag \longrightarrow 1 \longrightarrow \frac{108}{1} = 108$

$Cl \longrightarrow 1 \longrightarrow \frac{35.5}{1} = 35.5$

} equivalent weight

valency factor.

1) Elements = Valency factor = oxidation Number

2) Ion = V.F. = no. of cation / anion

3) Compound = $H_2SO_4 \longrightarrow 2 \times H^+ + SO_4^{-2}$

No. of cation + No. of anion.

4) Oxidation / Reducing agents = No. of transferred electron.

$H_2SO_4 \longrightarrow 2 \times H + 1 \times S + 4 \times O$

$2 \times 1 + 1 \times 32 + 4 \times 16$

$= 98\ g.$

Equi. weight $= \frac{Mw}{V.F} = \frac{98}{2} = 49\ g$ //

=> Acid = Acidity = V.F & Base = Basicity = V.F.

Acidity = no. of H^+ donation.

$H_2SO_4 = 2$

$HCl = 1$

$HNO_3 = 3$

$CH_3COOH = 1$

Exception :- $H_3PO_2 = 1$

$H_2PO_3 = 2$

$H_3PO_4 = 3$

$AgNO_3 \rightarrow 1 \times Ag + 1 \times N + 3 \times O$

$= 1 \times 108 + 1 \times 14 + 3 \times 16$

$= 170.$

$Eq = \frac{mw}{Ev} = \frac{170}{1}$

$= 170$ //

$AgNO_3 \longrightarrow Ag^{(+)} + NO_3^{(-)}$

1 1

Que:- $Na_2CO_3 \longrightarrow 2Na^{+} + CO_3^{-}$

$+1 \times 2 = -2$

$+2 = -2$

Valency factor.

$Eq = \frac{mw}{2}$

Que:- $AlCl_3 \longrightarrow Al^{+3} + 3Cl^{-}$

$+3 = -1 \times 3$

$+3 = -3.$

$Eq = \frac{mw}{3}$

$+3 =$ ↑ valency factor.

$Al^{+3} = eq.wt. = \frac{mw}{v.f} = \frac{27}{3} = 9.$

$Ca(OH)_2 \longrightarrow \frac{mw}{2} = eq.mass.$

Agents :- No. of electrons transferred.

reduction

$Fe^{+2} + MnO_4^{-} \longrightarrow MnO_2 + Fe^{+3}$

+2 +7 +4 +3

oxidation.

$MnO_4^{-} = \frac{mw}{3}.$

Ions trick :-

H ⟶ } 1

$KMnO_4$

$+1 + x + -2 \times 4 = 0$

$1 + x - 8 = 0$

$x = +7.$

$\Rightarrow MnO_4^{\ominus}$

$x + (-2 \times 4) = -1$

$x - 8 = -1$

$x = +7$ //

$MnO_2 = x + (-2 \times 2) = 0$

$= x - 4 = 0$

$= x = +4$ //

$K_2Cr_2O_7$

↓

$2x+1 \quad +2x - 2 \times 7 = 0$

$2x = 12$

$x = 6.$

$KMnO_4 \longrightarrow MnO_2$

+7 +4

3.

DPP – 08 pg – 19.

Que 1) $\frac{w}{2}$ = option – 1 //

Que-2) $O_2 = \frac{16}{4} = 4$

$\frac{-2 \\ +4\,2}{4}$

$O \longrightarrow O^{-2}$

$2O \longrightarrow 2O^{-2}$

↓ total charge = 4

$\frac{Mw}{charge} = \frac{16}{4}$ 4.

Que 3) 1g equivalent of H_2

$H \longrightarrow H^+$

$2H \longrightarrow 2H^+$

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

At NTP. = $\frac{1}{2} \times 1$ mol

$= \frac{1}{2} \times 22.4$ lit

$\Rightarrow 11.2$ lit.

Que. 4) $\frac{w}{3}$.

Que 5) $E = \frac{Mw}{V.F}$

$E = \frac{A}{n}$ $A = E \times n$ option – 1 //

DPP – 09 pg – 31.

Que 2) SO_3

1S + 3O

48g of O = 32g of S

1g of O = $\frac{32}{48}$ g of S

8g of O = $\frac{32}{48} \times 8$ of S

8g of O = $\frac{32}{48} \times 8$

$\Rightarrow \frac{16}{3}$ or $\frac{8 \times 2}{3}$ //

$Zn(OH)_2 + HNO_3 \longrightarrow Zn(OH)NO_3 + H_2O$

(+2 → +2, −1 −1)

$OH^- \longrightarrow 2OH^-$

$= 2^-$

$Zn(OH)_2$

$x - 1 \times 2 = 0$

$x - 2 = 0$

$x = +2$.

Donation of OH

Base

$eq = \frac{Mw}{Basicity} = \frac{Mw}{1}$

$$\text{Eq. wt} = \frac{\text{At. wt}}{\text{V.F.}}$$

$$20 = \frac{\text{At wt}}{3}$$

$$\text{At wt.} = 20 \times 3 = 60$$

$M^{+3} + O^{-2} \longrightarrow M_2O_3$.

$2 \times 60 + 3 \times 16$

$120 + 48$

$= 168g$.

* SOLUTIONS :-

are a substance which is made up of two things :-

i) Solute

ii) Solvent.

→ Solute are a substance which is found in very less amount in a solution.

→ Solvent are a substance which is found more in any solution.

In here we only study about Binary solution.

→ Binary solution :- means their is only one solute & one solvent.

→ Solution are Homogenous mixture.

↓

uniform (एकसार)

Expression Of Solution :-

i) $\frac{\text{Weight}}{\text{Weight}}$ % = weight of solute disolved in 100g of solution.

$$\frac{w}{w}\% \text{ or } \frac{\text{mass}}{\text{mass}}\% = \frac{\text{weight of solute}}{\text{weight of the solution}} \times 100\%$$

eg if A = solute

B = solvent.

$$= \frac{W_A}{W_A + W_B} \times 100\%$$

2) $\frac{\text{Volume}}{\text{Volume}}$ % = $\frac{\text{Volume of Solute}}{\text{Volume of solution}} \times 100\%$

A = solute

B = solvent

$$\frac{v}{v}\% = \frac{V_A}{V_A + V_B} \times 100\%$$

If × 100% is not than ... fraction ... where there is volume it depends on temp.

3) **Mole fraction** = $\frac{\text{उसका mole}}{\text{सबका mole}}$

$$X_A = \frac{n_A}{n_A + n_B} \qquad A = \text{solute} \ \& \ B = \text{solvent}$$

$$X_B = \frac{n_B}{n_A + n_B}$$

Not impo

$$X_A + X_B = \frac{n_A}{n_A + n_B} + \frac{n_B}{n_A + n_B} = \frac{n_A + n_B}{n_A + n_B} = 1$$

$$X_A + X_B = 1 \quad \leftarrow \text{proved}$$

if A + B + C = solution

$$X_A = \frac{n_A}{n_A + n_B + n_C} \qquad X_C = \frac{n_C}{n_A + n_B + n_C}$$

$$X_B = \frac{n_B}{n_A + n_B + n_C} \qquad X_A + X_B + X_C = 1$$

* some of all mole fraction = 1.

4) **Molarity**, M, [ ], Active Mass, S, C.
M = Moles of solute dissolved in 1 lit of solution.

A = solute

$$\frac{\text{Mole}}{\text{Volume}} = M = \frac{n_A}{V \text{ in lit}} = \frac{W_A}{Mw_A \times V(\text{in lit})} \quad (\text{in } l)$$

$$M = \frac{W_A \times 1000}{Mw_A \times V \text{ in (ml)}} \quad (\text{in ml})$$

5) **Molality** = moles of solute dissolved in 1 kg of solvent.

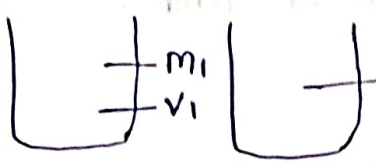
$$m = \frac{n_A}{W_B (\text{in kg})} \quad (\text{in kg})$$

A = solute.
B = solvent.

$$m = \frac{W_A \times 1000}{Mw_A \times W(\text{in g})} \quad (\text{in g})$$

* **MIXING** :- Comes in Equilibrium.

1) Dilution

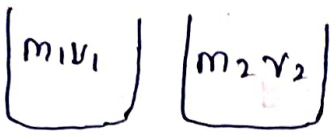


$M_1 V_1 = M_2 V_2$

$V_2 = V_1 + \text{volume of water}$.

$\Rightarrow M = \frac{M_1 V_1}{V_1 + V}$

2) Acid + Acid or Base + Base.



$$M = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}.$$

3) Acid + Base / Base + Acid.

$$M = \frac{|M_1V_1 - M_2V_2|}{V_1 + V_2}$$

mode = if 30-60 = -30 then -ve is removed 30.

6) Normality (N) → gram equivalent of solute mix in 1 lit of solution.

$$N = \frac{geq}{V(\text{in L})}.$$

$$geq = \frac{w}{eq\,wt}, -① \qquad eq\,wt = \frac{Mw}{V \cdot F} — ②.$$

$$\Rightarrow \frac{Mw \times V \cdot F}{Mw}$$

$$N = \frac{V \cdot F \times w \times 1000}{Mw \times V(\text{in ml})}.$$

Mixing :- $N_1V_1 = N_2V_2$

1) Dilution $V_2 = V_1 + \text{Vextra}$.

2) Acid + Acid / Bay + Base.

$$N = \frac{N_1V_1 + N_2V_2}{V_1 + V_2}$$

one M = Molarity is changed to N, N = Normality.

$V_2 = V_1 +$ Volume of H_2O or the other.

3) Acid + Base

$$N = \frac{|N_1V_1 - N_2V_2|}{V_1 + V_2}$$

* Relationship of N with m & m with N :-

$$N = N \cdot F \times \frac{W_A \times 1000}{M_{WA} \times V \text{ (in ml.}}$$

$N = N \cdot F \times M$

$$\frac{m \text{ \& } m}{\frac{1}{m} = \frac{d}{M} = \frac{M_{WA}}{1000}}$$

A = solute.

* PPM (Parts Per Million).

$$PPM = \frac{\text{Part of solute}}{\text{part of solution}} \times 10^6$$

part per million →

Pg = 28)

Qu. 97) Na_2CO_3 ⟶ N.F = 2.

$N = 0.2$

$M \times N \cdot F = N$

$M = \frac{n}{N \cdot F} = \frac{0.2}{2} = 0.1$ //

98) $M = \frac{N}{N \cdot F}$ H_2SO_4.

$M = \frac{N}{2}$ //

99) $V_1 = 10ml$. $N_1 = 10$

$V_2 = ?$ $N_2 = 0.1$

$N_1V_1 = N_2V_2$

$10 \times 10 = 0.1 \times V_2$

$\frac{100}{0.1} = 100 = V_2$.

$V_2 = V_1 + V_{water}$.

$1000 = 10 + V_{water}$.

$V_{water} = 1000 - 10$

$= 990$ ml.

100) 1kg water of 6mg O_2

$$ppm = \frac{\text{part of solute}}{\text{part of solution}} \times 10^6$$

$$= \frac{6 \times 10^{-3} g}{1000 g} \times 10^6$$

⇒ 6ppm.

101) H_2SO_4 = NF = 2

$M = 5$

$N = M \times N \cdot F = 5 \times 2$

$N = 10$.

$N_1V_1 = N_2V_2$

$\frac{N_1V_1}{V_2} = N_2$

$\frac{10 \times 1}{10} = \frac{10}{10} 1$ $N_2 = 1N$.

103) Solute $= \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 1 \times 10^{-3}$

$M = \frac{\text{mole}}{\text{volume (in lit)}}$ $\quad M = \frac{1 \times 10^{-3}}{100} \times 1000$

$M = 0.01\ M.$

104) $\frac{M_1V_1 + M_2V_2}{V_1 + V_2} = M_{new}.$

$\frac{1.5 \times 480 + 1.2 \times 520}{1000}$ $\quad M = 1.344$ //