Chemical Reactions and Equation

Chemical Reaction →

Chemical Reaction are the process in which new substance with new properties are formed.

Chemical Equation →

The method of representing a chemical reaction with the help of symbols and formula of the substance, ~~are called comb~~ involved in it. is known as a chemical Reaction.

Type of Chemical Reaction →

(i) Combination Reaction → (A+B → AB) Those reaction in which two or more substance combine to form a single substance is known as combination Reaction.

Ex :- $2Mg + O_2 \xrightarrow{\text{Combination}} 2MgO$

$2H_2 + O_2 \xrightarrow{\text{Combination}} 2H_2O$

(ii) Decomposition Reaction → AB → A+B Those reaction in which a compound split (break) up into two or more simpler substance are known as decomposition reaction.

Ex → (i) By Heat →

$CaCO_3 \xrightarrow[\Delta]{\text{Heat}} CaO + CO_2$

Calcium carbonate (Lime Stone) — Calcium Oxide — (Carbon dioxide)

(ii) By current → (Electrolysis)

$2NaCl \xrightarrow[\text{Current}]{\text{Electricity}} 2Na + Cl_2$

(Sodium chloride) — (Sodium) (Chlorine)

(iii) By light → (Sun light)

$2AgCl \xrightarrow{\text{light}} 2Ag + Cl_2$

(Silver chloride)

(3) Displacement Reaction →

$$A + BC \longrightarrow AC + B$$

Those reaction in which one elements takes a place of onther element in a compound are known as displacement reaction

High reactive metal

$$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$$

(zinc) + copper sulphate) → copper

(4) → Double displacement Reaction →

$$AB + CD \longrightarrow AD + BC$$

Those reaction in which two compounds react by an exchange of ions to form two new compounds are called Double Displacement reaction

$$AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$$

(Silver Nitroded) (Sodium cloride)

(5) → Oxidation & Reductions Reaction →

(i) **Oxidation →** The ~~adding~~ addition of oxigen or remove of hydrogen form a substance is called oxidation.

(ii) **Reductions →** The ~~adding of~~ addition of ~~reaction~~ hydrogen and remove of ~~hydrogen~~ oxigen form a substance is called oxidation.

Redox → The oxidation and reduction reaction are also called Redox Reaction

Remove of oxigen :. Reduction

$$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$$

adding of oxigen : oxidation

Effects of oxidation Reaction

(i) Corrosion :- (संक्षारण)

जब कोई metal, air, moisture और chemical surface के साथ रखा जाता है, या उसकी Presence में रखा जाता है। तो वह metal धीरे-धीरे कमजोर होते जाता है।

Rusting (जंग लगना) of Iron metal is the most common form of corrosion.

Ex → 4Fe + $3O_2$ + 2x H_2O → $2Fe_2O_3 \cdot xH_2O$

Hydrated iron (III) oxide (Rust)

Gold & silver ऐसे metal hai जो जल्दी से corrode नही होते,

(ii) Rancidity → Fats और oils Food, oxidation (In presence of oxygen). उनका test और smell Change हो जाता है को Rancidity कहते है

Rancidity से बचाने के तरीके →

(i) Rancidity of Food को कम करने के लिए उसमे anti oxidants डाल दे.

(ii) खाने को Nitrogen gas के साथ Pack करे

(iii) Rancidity को कम कर सकते है खाना frige मे रखकर

(iv) खाने को Air & light containers मे रख कर कम कर सकते है

(v)

Exothermic Reaction → (Heat release)

The reaction in which heat is envoled (Produce) is known as Exothermic reaction)

$$C + O_2 \longrightarrow CO_2 + \text{Heat}$$

Endothermic Reaction →

The reaction in which heate is absorbed is known as Endo thermic rxn.

$$CaCO_3 \xrightarrow{\text{Heat}} CaO + CO_2$$

(Calsium Carbonate)
(lime stone)

$$N_2 + O_2 + \text{Heat} \rightarrow 2NO$$

Balanced Chemical Equation →

No. of atoms in reactant = No. of atoms in products
(Base- law of Concervation of mass)

Nuclear Fusion (मिलना) →

light Hydrogen atoms. मिलकर एक Heleam (He) atom बनाते
large amount of energy release होती है

$$_1H^1 + {}_1H^1 + {}_1H^1 + {}_1H^1 \longrightarrow {}_2He^4 + \text{Energy (large amount)}$$

K High
Mg
Ca
mg
Al
Zn
Fe
Sn
PB

H
Cu
Hg
Ag
Au (low)

Nuclear Fission (break) →

$$_{92}U^{235} \xrightarrow{\text{on Nutron}} \text{Barium} + 3\text{ neutron} + \text{Kripton}$$

U → Zn, Kr
U → Be, Sr, Kr
U → Be, Sr, Kr

12-07-21

ACIDS. Base and Salt

ACID → (i) Those chemical substance, which have sour test.

(ii) It turns blue litmus papap to Red.

(iii) If the acids are reacted to metals, they are released hydrogen gas.

$$H_2SO_4 + Zn = ZnSO_4 + H_2\uparrow$$

(Acids) (metal)

(iv) In Acids, Hydrogen is present every time.

(HCl, H_2SO_4)

(v)- Acids solution conduct electricity.

There are two types of Acids →

(i) Organic

(ii) Mineral

(i) **Organic acids** → Those acids are present in plants and animals are called organic acids, Those acids are weak acids.

	Acids	Source of Acid
1-	Acetic acid (CH_3COOH)	Venger
2.	Citric acid	- tamarind
3-	Oxalic acid	- Tomato
4.	Formic acids	-
5.	Malic acid	- Tea leaves
6.	Carbonic acids (H_2CO_3)	- Rain water

(ii) **Mineral acids** → The acids prepared from minerals of earth are called mineral acids, these acids are strong acids

(a) HCl, H_2SO_4, HNO_3

(b) ~~Etchan~~

Bases → Base are those chemical substance, which have baffar (Litmus) test.

Alkaline → A base, which is soluble in water is called an Alkaline,

OR

"Water soluble base are known as alkaline."

⇒ Turn Red litmus to blue.

⇒ NaOH, KOH → strong base

⇒ $Ca(OH)_2$, $Mg(OH)_2$ → Weak base

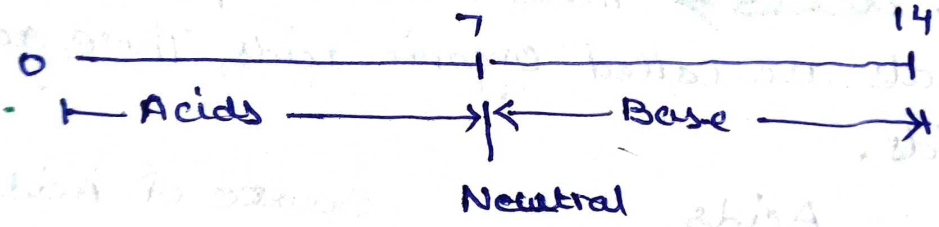
⇒ Base react with acids to form salt and water.

$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

IF PH value < 7 — acids

" " > 7 — base

PH value = 7 — Neutral (H_2O)



ACIDS and Base Theory →

(i) - Arrhenius theory → According to this concept, acids are those substance, which gives H^+ ion on dessolving in water and Base are those substand which gives OH^- ions on dissolving in water.

Ex:- Acids → $HCl \longrightarrow H^+ + Cl^-$

Base - $NaOH \longrightarrow Na^+ + OH^-$

More H^+ ⇒ Strong acids

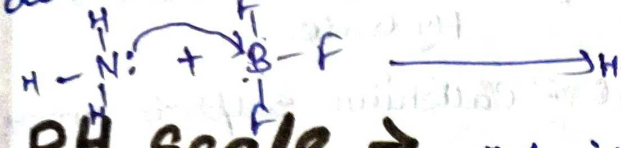
More OH^- ⇒ Strong base.

(ii) → Brönsted - Lowry Theory →

An acid is a substance, which loss proton and (CH_3COOH)
Base is a substance. which accept proton.

(HOH)
$CH_3COOH + HOH \longrightarrow CH_3COO^- + H_3O^+$

(iii) Lewis Concept → An acids is a substance which (BF_3)
accept pair of electron and Base is a substanee which
donate pair of electron. (NH_3)



PH Scale → It is a scale. which is used to find the strength of acids and base.

It is depends on the concentration of H^- ion. The scale has number 0 to 14

→ $7 < PH < 14$
(Base

Salt

"Salt is a compound, formed ~~to~~ from an acid by replacement of Hydrogen in the acid by a metal."

~~Salt~~ Salt are generally from when an acid react with base.

(i). The salt of strong acid ~~and~~ on strong base give netureal solution call Salt.

$NaOH + HCl \longrightarrow NaCl + H_2O$

(ii) The salt of strong acid and weak base gives acids solution

$NH_4OH + HCl \longrightarrow NH_4Cl + H_2O$
(weak base) Strong Acid

(iv) The salt of week acid and strong base gives basic solution.

$H_2CO_3 + NaOH \longrightarrow Na_2CO_3 + H_2O$
Weak acid Strong base

Main member of Salt →

(i) Comman Salt - NaCl - Sodium Chloride
(ii) Castic Soda - NaOH - Sodium Hydroxide
(iii) Bleaching Powder - $CaOCl_2$ - Calishium Oxy Chloride
(iv) Banking Soda - $NaHCO_3$ - Sodium Hydro Carbonate
(v) Washing Soda - $Na_2CO_3 10H_2O$ - Sodium Carbonate deca Hydrate
(vi) Plaster of Paris - $CaSO_4 . \frac{1}{2} H_2O$ - Calishium Salphate. hydrate

1→ Comman Salt → NaCl (Sodium Chloride)

It is formed by combination of NaOH & HCl.

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

(i) Comman Salt obtain from sea water also from under ground deposite.

use → (i) It is use as Raw metrial.
(ex.. NaOH, Na_2CO_3, $NaHCO_3$)
(ii) It is used to manifractare of Shop.
(iii) it is use as is pickle.

2→ Castic Soda - (NaOH) →

It is formed by electrolysis of aquious solution of Nacl.

In this process, clorine gas is produce is at anode and hydrogen at cathode. This process is known as Chor-alkali process.

$$2NaCl + H_2O \longrightarrow 2NaOH + Cl_2 + H_2$$

use - It is use to prpaired shop and dellagent.
⇒ used is the manfrature of paper
⇒ used in oil Refining.

3) Baking Soda - ($NaHCO_3$) → (Sodium Hydro Carbonate)

It is prepared by Reacting solution of NH_3 and CO_2.

$$NaCl + NH_3 + CO_2 + H_2O \longrightarrow NaHCO_3 + NH_4Cl$$

(Baking Soda)

use → ① Remove acidity of stomach.

② Use in making Baking Powder (Bread & Cake)

(4) Washing Soda ($Na_2CO_3\,10H_2O$) -

(Sodium Carbonate deca Hydrate)

It is prepared by two step of Baking Soda.

$$2NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + H_2O + CO_2\uparrow$$

$$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3\,10H_2O$$

(i.e. Washing Soda)

use → (i) Used of manufruture of Sope and Paper.

(ii) Used of removing permanant Hardness of water.

(5) Bleaching Powder → ($CaOCl_2$) → Calshium oxy Chloride

Prepared by passing chlorine gas over $Ca(OH)_2$ (Slaked lime)

$$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$$

(Bleaching Powder)

use

(i) Manifracture of Chaloroform ($CHCl_3$)

(ii) To Disinfectant water

(iii) Bleaching of clouth.

(6) Plaster of Paris → It is made from Gypsum, when Gypsum is heated at 373°K, POP is obtained.

$$\underset{\text{Gypsum}}{CaSO_4 \cdot 2H_2O} \xrightarrow[\Delta]{373^\circ K} \underset{\text{POP}}{CaSO_4 \cdot \tfrac{1}{2}H_2O} + \tfrac{1}{2}H_2O$$

use → (i) Making wall surface smooth

(ii) Making plaster to set up fractured bones.

Some Imp Reaction →

Metal + Acid → Salt + Hydrogen gas

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow$

Buffer Solution → (विरोधी)

It's a chemical solution. which resist chang to its pH and acidity.

It is a solution in water of mixture of a weak acid or base its salt.

Ex - CH_3COOH + CH_3COONa

weak acid — Weak salt

Calcination → Caborate ore is heated in the absence of air.

$ZnCO_3 \xrightarrow{Heat} ZnO + CO_2$

Rosting → Zinc Shulphide ore is heated in the presence of air

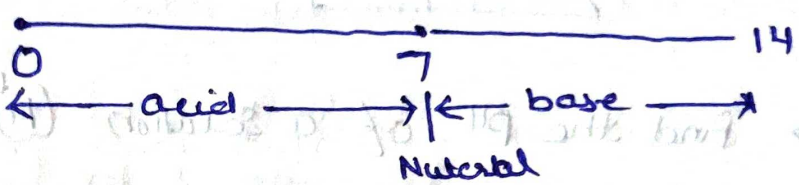
$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$

PH-Value (Potential Of Hydrogen)

"pH scale to measure. constration of H^+ ion in a solution."

(i) To find the strength of any acid and base.

(ii) The scale has value 0 to 14



$0 < PH < 7$ – acid

$7 < PH < 14$ – basis

$pH = 7$ = Nutral (water)

Formulas >

1> $pH = -\log [H^+]$ – Hydrogen ion Constration

$(H^+) = -\log(pH)$

2> $[H^+] + [OH^-] = 10^{-14}$

(3) $pH + pOH = 14$

$[OH^-] = -\log pOH$

$\log 2 = 0.3010$
$\log 3 = 0.4771$
$\log 5 = 0.6990$
$\log 10 = 1$

Ques> Find pH of an acids whose $[H^+]$ is 0.001

Solution

$[H^+] = 0.0001$

$= 10^{-4}$

$pH = -\log [H^+]$

$= -\log 10^{-4}$

$pH = 4$ ✓

~~$H^+ = 10^{-4}$~~

~~$H^+ = 10^{-pH}$~~

=

Ques → Find the pH of $\frac{M}{100}$ HCl

Solution

$$[H^+] = \frac{1}{100} = 10^{-2}$$

$$pH = -\log[H^+]$$

$$= -\log 10^{-2}$$

$$\boxed{pH = +2}$$

Ques → Find the pH of a solution (H^+) is 2×10^{-3}

$$[H^+] = 2 \times 10^{-3}$$

$$pH = -\log[H^+] \quad \left[\log mn = \log m + \log\right.$$

$$= -\log(2 \times 10^{-3})$$

$$= -(\log(2) + \log 10^{-3})$$

$$= -0.3010 + 3$$

$$\boxed{pH = .26990}$$

Ques → Find pOH of a solution wher pH is 10

$$pH + pOH = 14$$

$$pOH + 10 = 14$$

$$\boxed{pOH = 4.}$$

Ques. Find the pH of $\frac{M}{10}$ NaOH Solution

As $[OH^-] = \frac{1}{10} = 10^{-1}$

$$pOH = -\log(OH^-)$$

$$= -\log 10^{-1}$$

$$pOH = +1$$

$$pH + pOH = 14$$

$$pH + 1 = 14$$

$$\boxed{pH = 13}$$

Ques → Find the pH of 0.001 M. H_2SO_4.

$$H_2SO_4 = 2H^+ + SO_4^{--}$$

$$[H^+] = 0.001 \times 2$$

$$[H^+] = 0.002 = 2 \times 10^{-3}$$

$$pH = -\log(2 \times 10^{-3})$$

$$= -[\log 2 + \log 10^{-3}]$$

$$= -\log 2 + 3$$

$$= -.3010 + 3$$

$$\boxed{pH = .2699}$$

Ques → Calculate of 0.01 m H_2SO_4.

$$H_2SO_4 \rightleftharpoons 2H^+ \; SO_4$$

$$pH = -[\log H^+]$$

$$[H^+] = 0.01\,m \times 2 = .02\,m$$

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

$$pH = -\log[2 \times 10^{-2}]$$

$$= -\log 2 + \log 10^{-2}$$

$$= -.3010 + 2$$

$$= 1.6990 \quad \text{Ans}$$

$\frac{1}{500} = .002$

$= 2 \times 10^{-3}$

Metal and Non Metal

Properties of metals

1- Hard & have high tensile strength (तन्य)
(Except - Na, K, are salt)

2- Solid at room temprature. (Except Mercury Hg is liquid)

3- Good Conducter of heat and Electricity
(Ag (Silver is best)

4) Malleable, i.e. Can be beaten into thin sheets, Gold is highly malleble.

5- Ductile; i.e can be drown into thin wires.
(Gold is most ductile)

6- High melting and boiling Point.

7- चमकदार होते है

8) Sounderus (Ringing Sound)

⇒ Metal are known as electropositive elements because they can from positive ion by losing electron.

⇒ The most abundant metal in the earth caust is aluminum (Al.)

Properties of Non-metal →

1- Non metal are solid, liquid and Gas, Br (Bromen) is only nonmetal formd in liquid State.

2- Non metals are ~~bitter~~ brittle. ie. Can be broken into thin pieces.

3- Non metals are non-mallable and non ductile.

4- कोई चमक नहीं होती (Except Iodine)

5- Bad Conducter of heat and electricity (Except Graphite)

(6) - Soft [Except Diamond - Hardest natural]

(7) - Non Sonorous | Non metal have many different colour. | The most abundant non metal in the earth crust is Oxigen.

⇒ Non metal are the elements which from negative ions by gaining electron (or accepting electron)

⇒ Non metal are small in numbers as compared to metals. but they play a very important roal in our daily life (like Carbon)

Some Imp Chemical properties of Metals →

1⇒ Metal react with water and produce H_2 gas.

Metal + Water → Metal Hydroxide + H_2

$2Na + 2H_2O \rightarrow 2NaOH + H_2$

⇒ Cu. Ag (Silver). and Au (Gold) never react with water

2⇒ Metal react with Oxigen and form metal oxide metal oxide are basic

Metal + O_2 → Metal Oxide (Basic)

$2Mg + O_2 \rightarrow 2MgO$ (Basic)

Reactivity series

K (High Reactive)
Na
Ba
Mg
Al
Zn
Fe
Ni
Pb
H
Cu (Decreasing reactivity)

⇒ High Reactive metal से least reactive metal को उसके यौगिक से हटा सकता है।

Eg- $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

Occurrence of metals → Most of the elements (metals) occur in nature in the compound state. Some found in free state.

Minerals (खनीज) - All the compound in earth crust in which metal present are known as minerals

Ores (अयस्क) → ~~मिश्र~~ हर minerals के अन्दर से metal को नही निकाल सकते, जिन में से metal nikal sakte है, उन्हे ores कहते है।

जैसे Na हमे Nacl में मिलता है।

Any things "which occupies space and has mass. called matter".

Matter in Our Surroundings

Characteristics of Particles of Matter →

(i)- The partical of matter are very small.

(ii) The partical of matter have spael between them.

(iii) The partical of matter are constantly moving

(iv) The partical of matter attract each orther

Solid state ⇄ (Heat / cool) Liquid state ⇄ (Heat / cool) Gaseous State

Classification of matter as solid, liquid and Gas :-

Properties	Solid	liquid	Gas
Shape	fixed	Non fixed	Non-fixed
Volume	Fixed	Fixed	Non-fixed
Rigidity (कठोरता)	Highest	less than Solid	less than liquid
Fluidity (द्रवता)	Less than Liquid	less than Gas	~~Heig~~ Hightest
Kinetic energy	less than liquid	Less than gas	Highest
Density	Heighest	less than solid	Less than Liquid

↙

$D = \frac{\text{mass}}{\text{Volume}}$

Diffusion → The spreading out and mixing of a substance with another substance due to the motion of its partical is called **diffusion**.

Diffusion is a property of matter. which is based on the motion of ~~his~~ its particles.

Diffusion is fastest in gases and slowest in Solid.

Melting for fusion → (M.P of ice = 0°c)

The process in which a solid substance change into a liquid on heating is called melting (or Fusion)

Boiling (OR Vaporisation) →

The process in which a liquid substance changed into is gas.

Raiditity on heating is called boulleng.

Condensation →

The process of changing a gas to a liquid by cooling is called condensation.

Freezing → The process of changing a liquid to solid by colling is called Freezing

(Freezing Point of water = 0°c

(Hidden)

Lalent heat

The heat energy. which has to be supplied to change the state of a substance is called is latent heat.

Lalent heat is two types

(i) Lalent heat of fusion

(ii) Lalent heat of vapourisation.

(i) Lalent heat of fusion → The heat which is going into ice but not increasing its temprature. is the energy required to change the state of ice from solid to liq

(ii) Latent heat of vapourisation → With out any change of temprature, the quantity of heat in jolules required to convert 1 Kilogram of liquid to gas. called Latent heat of vapourisation.

Sublination

1 → Solid को directly gas mai (heat देकर) change करना और vapors को " Solid में cooling देकर change करने की process को sublimation कहते है।

$$\text{Solid} \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} \text{Gas}$$

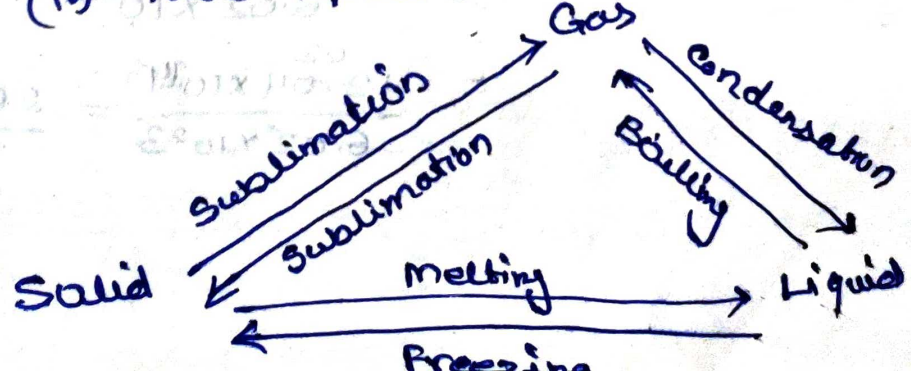
Example → $AlCl_3$, Iodine, Napthalene.

Evaporation → boiling point से नीचे, liquid को vapour (or gas) change करने के लिए की गई Process Evaporation कहलाती है।

Factor Affecting Evaporation →

The evaporation of a liquid depends on the following factor.

(i) Temp
(ii) Surface Area
(iii) Humidity
(iv) Wind speed.



03/07/2024

Mole Concept

Mole → Collection of atoms or molecules.

1 mole = 6.02×10^{23} atoms or molecules
(Avagadro Number)

Formulas -

$$\text{No. of mole} = \frac{\text{Wt of substance in gm}}{\text{atomic wt}}$$

$$\text{No. of mole} = \frac{\text{Total no of atoms}}{6.02 \times 10^{23}}$$

Neumericals →

Ques → Find the number of moles in 11 gm CO_2.

Solution -

atomic weight of CO_2 = $12 + 16 \times 2 = 44$

$$\text{No. of moles} = \frac{\text{Wt of Substance}}{\text{Atomic weight}}$$

$$= \frac{11}{44} = \frac{1}{4} = 0.025 \text{ gm}$$

Ques → Find the number of moles of a substance having 12.04×10^{24} atoms.

Solution →

Total No. of atoms = 12.04×10^{24}

$$\text{No. of moles} = \frac{\text{Total no.s of atoms}}{6.02 \times 10^{23}}$$

$$= \frac{12.04 \times 10^{24}}{6.02 \times 10^{23}} = 20$$

Ques - Find the atoms in 5 moles of CO_2

$$\text{No of moles} = \frac{\text{Total no of atom}}{6.02 \times 10^{23}}$$

$$5 = \frac{\text{Total no of atoms}}{6.02 \times 10^{23}}$$

Total No. of atoms = 30.10×10^{23}

Ques → Find the ~~mole~~ weight of CH_4 (0.5 moles)

Solution → Given ⇒ No. of moles = 0.5 mole

Atomic weight of $CH_4 = 12 + 1 \times 4$

$= 16$

$$\text{No. of moles} = \frac{\text{Total weight of substance}}{\text{Atomic weight}}$$

$$0.5 = \frac{\text{Weight}}{16}$$

$$\text{wt} = 0.5 \times 16$$

wt = 8 gm

Ques → Find the wt of H_2O having ~~602~~ 1.204×10^{29} atoms,

Solu → Atomic weight of $H_2O = 2 \times 1 + 16 = 18$

Total atoms $= 1.204 \times 10^{29}$

$$\text{No. of moles} = \frac{\text{Total weight of } H_2O \text{ (gm)}}{\text{Total Atomic weigh}}$$

$$= \frac{\text{Total weight}}{18} \quad -- (1)$$

$$\text{No. of moles} = \frac{\text{Total No. of atoms}}{6.02 \times 10^{23}}$$

$$= \frac{1.204 \times 10^{29}}{6.02 \times 10^{23}} \quad -- (2)$$

equation (1) = equation (2)

$$\frac{\text{Total weight}}{18} = \frac{1.204 \times 10^{29}}{6.02 \times 10^{23}} = \frac{2}{3.01} \times 10^{6}$$

$$\text{Total Weight} = \frac{18}{5} \times 10^{6+1} = 3.6 \times 10^{7} \text{ gm}$$

Ques: Find number of atoms in 3.2 gm CH_4.

Solution: Number of atoms = ?

Total weight of CH_4 = 3.2 gm

Atomic Weight of CH_4 = $12 + 1 \times 4 = 16$

$$\text{No of moles} = \frac{\text{Total weight of Substance}}{\text{Atomic weight}}$$

$$= \frac{3.2}{16} = \frac{32}{16} \cdot 10^{-1} = 2 \times 10^{-1}$$

$$\text{No. of moles} = \frac{\text{No. of atoms}}{6.02 \times 10^{23}}$$

$$\text{No. of atoms} = 2 \times 10^{-1} \times 6.02 \times 10^{23}$$

$$= 12.04 \times 10^{22} \text{ Ans}$$

$$= 1.204 \times 10^{23}$$

Ques: What is the mass of 0.2 mole of oxygen atom.

Solution:

No. of mole = 0.2 mole

Atomic mass O_2 = $16 \times 2 = 32$

$$\text{No. of mole} = \frac{\text{Total Weight (gm)}}{\text{Atomic mass}}$$

$$0.2 = \frac{\text{Total Weight}}{32}$$

Total weight = 6.4 gm

O_2 = 6.4 gm

O = 3.2 gm

02 atoms of oxygen = 6.4 gm

01 atom = 6.4/2

= 3.2 gm

Ques → Calculate the mass of 0.5 mole of water Molecules

Ans → No. of mole = 0.5

Atomic weight of H_2O = 1×2 + 16 = 18

$$\text{No. of mole} = \frac{\text{Total weight}}{\text{Atomic weight}} =$$

$$\boxed{\text{Weight} = 0.5 \times 18 = 9.0 \text{ gm}}$$

Ques →

Molarity & ~~Molality~~ Normality

Molarity → Molarity of a substance means, how many moles of solute is present of 1 ltr solution.

$$\text{Molarity} = \frac{\text{No. of moles of solute}}{\text{Volume of Solution (In Ltr)}}$$

M =

~~Molality~~ →

Equivalent Weight ⇒

Equivalent weight of for any elements or compounds = $\frac{\text{Atomic wt}}{\text{Valency}}$

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

Eq weight of Base = $\frac{\text{Atomic weight}}{\text{No. of } OH^- \text{ ion}}$

Normality →

$$N = \frac{\text{No. of gram Equivalence of Solute } \sout{\text{weight (gm)}}}{\text{Volume of Solution (In Ltr)}}$$

OR

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

Relation between Molality (M) and Normality (N)

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

If solution of volume V_1, Normality N_1, is neutralize by V_1, , N_2 then

$$N_1V_1 = N_2V_2$$

Ques→ If 5.85 gm NaCl dissolved in water and make solution 500 ml. Find its Molarity & Normality. - Volume of Solution = 500 gm = $\frac{1}{2}$ L

Sol→ Wate of Solute = 5.85 gm

Atomic weight of NaCl = 23 + 35.5 = 58.5

No. of moles = $\frac{\text{Atomic weight of Solu}}{\text{Atomic w}}$

$= \frac{5.85}{58.5}$

Molarity = $\frac{\text{No. of moles of Solute}}{\text{Volume of solution (in Ltr)}}$

$= \frac{5.85}{58.5 \times \frac{1}{2}}$

$= \frac{2}{10} = 0.0.2$

$M = 0.2$

Normality ⇒ $NaCl \longrightarrow Na^+ + Cl^-$

Valency $H^+ = 1$

Equivalent Weight = $\frac{58.5}{1}$

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

$N = 0.2$

Ques ⇒ Find the Equivalent weight for following (13)

(i) NaOH

Sol- At wt of NaOH = 23+16+1=40

$NaOH \longrightarrow Na^+ + Cl^-$

Valency of NaOH = 1

Equivalent wt = $\frac{\text{Atomic weight}}{\text{Valency}}$

$= \frac{40}{1} = 40$

(ii) $CaCl_2$

Atomic weight of $CaCl_2$

$= 40 + 2 \times 35.5$

$= 40 + 71 = 111$

$CaCl_2 \rightarrow Ca^{++} + 2Cl^-$

Valency = 2

Equivalent wt = $\frac{\text{At wt}}{\text{Valency}}$

$= \frac{111}{2} = 55.5$

(iii) H_2SO_4

At wt of $H_2SO_4 = 2 \times 1 + 32 + 4 \times 16$

$= 2 + 32 + 64$

$= 98$

$H_2SO_4 \Longrightarrow 2H^+ + SO_4^{--}$

Valency = 2

equivalent weight = $\frac{\text{Atomic wt}}{\text{Valency}} = \frac{98}{2} = 49$

⇒ What is Solution ⇒ A solution is a homogenious mixture of two or more substanel..

Concentration of solution → The ratio of amount of solute to the volume of solution in liter is known as concentration of solution.

Conc of Solution = $\frac{\text{Amount of solute in gm}}{\text{Volume of solution in liter}} \times 100$

Strength precentage by Volume ⇒ = $\frac{\text{Wt of Solute}}{\text{Volume of solution}} \times 100$

Strength % by weight ⇒ $\frac{\text{wt of solute}}{\text{wt of Solution}} \times 100$

Solubility - $\frac{\text{Wt of solute}}{\text{wt of Solvent}} \times 100$

Ques → If 30 gm NaCl dissolved in 50gm water than calculate its strength %.age by weight

Ans → weight of Solute = 30gm

Weight of solution = 30 + 50 = 80gm

Strength %.age by wt = $\frac{\text{weight of Solute}}{\text{wt of Solution}} \times 100$

$= \frac{30}{80} \times 100 = \frac{150}{4} = 37.5\%$

Ques → If 40gm of Solute is dissolved in 100ml Soln. then calculate strength %.age by volume.

Ans →

Strength %.age by volume = $\frac{\text{wt of Solute}}{\text{wt of Sol'n}} \times 100$

$= \frac{40}{100} \times 100 = 40\%$

Ques → If 50 gm NaCl is dissolved in 1 ltr solution than Calculate its strength (gm/l)

Ans → Weight of Solute = 50 gm

Dissolved 1 ltr Solution then = 1 ltr

weight of Solution = 1000gm

Strength of Sol'n = $\frac{50}{1000} \times 100$

$= 5\%$

Ques → To make Saturated solution 36gm NaCl is dissolved in 100gm water at 293 K. Find its Concentration at this temp.

Ans → Solute wt = 36 gm

Solution wt = 36 + 100 = 136 gm

Conc of Sol'n = $\frac{36}{136} \times 100$

$= \frac{300}{11} = 27.2$

$= \frac{450}{17} = 26.46\%$

Ques → If 20 gm NaCl is dissolved in 80 gm water. find its Concentration.

Ans →

wt of Solute = 20gm

wt of Solution = 20 + 80 = 100gm

Concentration of Solution = $\frac{20}{100} \times 100$

$= 20\%$

Ques →

Sol → mass of Solute = 60 gm

mass of Solution = 60 + 400

= 460gm

Concentration of Soln = $\frac{60}{460} \times 100$

$= \frac{300}{23} = 13.17\%$

Ques → If 20 gm Sugger in dissolved in 80 gm water find its Solubility at 20°C

Ans → weight of Solute = 20 gm

weight of Solvent = 80 gm

Solubility = $\frac{20}{80} \times 100 = \frac{100}{4} = 25\%$

Ques → If 40gm NaCl in dissolve in water and make Sol'n 90 gm at 20°C. Find Solubility.

Ans →

Weight of Solute = 40 gm

weight of Solution = 90 gm

weight of Solvent = Solution − Solvent

$= 90 - 40 = 50$

Solubility = $\frac{\text{wt of Solute}}{\text{wt of Solution}} \times 100$

$= \frac{40}{50} \times 100 = 80\%$.

Atomic Structure - Part- 1st

Atom → Atoms are made up of three subatomic Particle, electron, Proton and neutron.

Particle	Discovered by	Charge	Mass
Electron	JJ Thomson	-1.6×10^{-19} C	9.1×10^{-31} Kg
Proton	Rutherford	-1.6×10^{-19} C	1.67×10^{-27} Kg
Neutron	James Chadwick	NO. (Neutral)	1.66×10^{-27} Kg

Thomson Atomic Model → According to this modal the most part of ~~particle~~ atom is hallow and electron are distributed in it in, such a way like seeds of in watermelon.

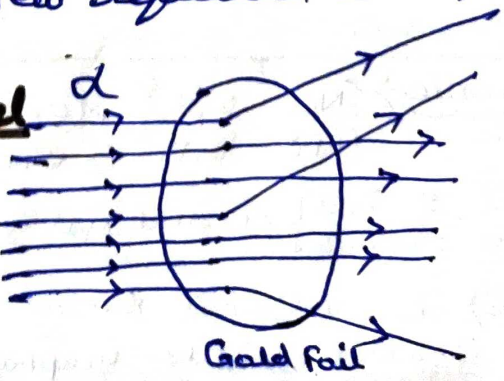
Drowback - When he gives his model there were ~~not~~ no discovery of Proton and neutron.

Rutherford α - Particle Scattering Experiment

"In this experiment, he passes high speed α particle over gold foil, he observed most of α-Particle Pass through it without any deflection, some deflected at small angle and very few reflected back.

Rutherford Atomic model

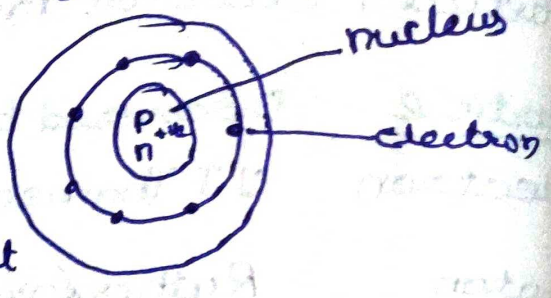
1. Most of the part of atom is hallow.
2. There is a positive nucleus of the centre of atom.
3. The sub atomic Particle, Proton and Neutron present in nucleus.
4. Electron ~~remove~~ revolve around the nucleus in all circular Path. (Orbits)



Drawback of Rutherford atomic model

(i) It can't explane the stability of atom.

According to electro magnitic theory, when charge particle undergoes accelerated motion it radiate energy continuously and it deeresses in path and finaly drop into nucleus. which is not Possible.



Neils Bohr Atomic Model:-

(i) Most of the part of atom is hollow.

(ii) Proton and Newtron are present ~~of~~ in nucleus.

(iii) ~~New~~ electron (e^-) revolve around the nucleus in there orbit, where angler momenthum is multiply of $h/2\pi$

Angler momenthum $= nh/2\pi$

$$mvr = nh/2\pi$$

where h = Plank's constant. $= 6.6 \times 10^{-34}$ J/sec

(iv) When electron revolve in there orbits it does not radiate energy. This fixed energy level are known as shell.

Iso electronic → {Ne - 2,8 / Na⁺ - 2,8,} Atoms and ions having same no. of electron

Cl^- = 2.8.8 } Ar = 2.8.8 } Cl^- and Na^+ acchived nearcast nobal gas configration

Metaloid → Those element having metal and non metal properties is together. Exple- Graphait.

Why Bonding → H_2O; NaCl, $CaCO_3$

(i) To acchive to stability

(ii) " " a nobal gas configiration

Nobal Gas
He - 2
Ne - 2,8
Ar, 2,8,8
Kr, 2,8,8,8

Isotopes → The atoms of the same element, whose atomic number is same but atomic mass is different is known as isotopes.

Ex- Hydrogen has three isotopes

$_1H^1$, $_1H^2$, $_1H^3$

$_1H^1$ → Protium, $_1H^2$ → Deutirium, $_1H^3$ → Tritium

Isobar → The atom of different elements whose ~~atomic~~ atomic mass are same but Atomic No. is different. Known as Isobar.

Ex → $_{18}Ar^{40}$, $_{20}Ca^{40}$

Isotones → The atom of different elements, whose has same number of neutrons are known as Isotones

Ex → $_6C^{14}$ and $_8O^{16}$ has same neutron.

Electronic Configration → This is first type of configration, how to distribute ~~to~~ electron in the atom.

It is bassed on shell and suggested by Bohr-Bussy, Accourding to him,

(1) Each shell has maximum no. of electron $= 2n^2$
(where n = no of shell)

$n = 1$ (K shell) ⇒ max e = $2 \times 1^2 = 2$

$n = 2$ (L shell) ⇒ max e = $2 \times 2^2 = 8$

$n = 3$ (M shell) ⇒ max e = $2 \times 3^2 = 18$

$n = 4$ (N shell) ⇒ " " = $2 \times 4^2 = 32$

(2) - When a shell ~~fill~~ the electron, enter into next shell.

(3) → Generally any shell of atom does not have more than 8 electrons. Ex. → Na = 11 = 2, 8, 1 (K, L, M, N)

Ca = 20 = 2, 8, 8, 2

~~Valency~~

Valency → It is ~~divisible~~ decided by valency electron (Outermost shell).

This rules of Bohr Burry can be applied to find Valency of lighter elements up to Ca (at no. 20) only

Rule Valency = n if $n < 4$ (metal)

Valency = $n = 8$ if $n > 4$ (Non metal)

Exmple → (i) Na = 11 = 2.8.1

Valency = 1

$(n < 4)$

(ii) Mg = 12 = 2.8.2

(Valency $n < 2$).

$_{17}Cl$ = 2.8.7

Valency = 7 - 8

= - 1

$n > 4$

(iv) $_8O$ = 2.6

Valency = 6 - 8

= - 2

$n > 4$

⇒ Any Elements Can be represented as

$$^{A}_{Z}X$$ (A: Atomic mass or Mass No.; Z: Atomic No)

$Z = e = P$ $\quad$ $A = N + P$

Ques → find. P, e, n in $_{11}Na^{23}$

Solution → $P = 11$, $e = 11$

N = Atomic mass − Proton

= 23 - 11

$n = 12$

Atomic Structure · Part-2

Quantum No.- To describe, each electron of an atom in different orbit, we need Quantum Numbers.

OR

To Provide complete information of the position and energy of an electron in the atom, we needs Quantum Numbers. They are four types.

(i) - Principle Quantum No.
(ii) - Azimuthal Quantum No.
(iii) - Magnetic Quantum No.
(iv) - Spin Quantum No..

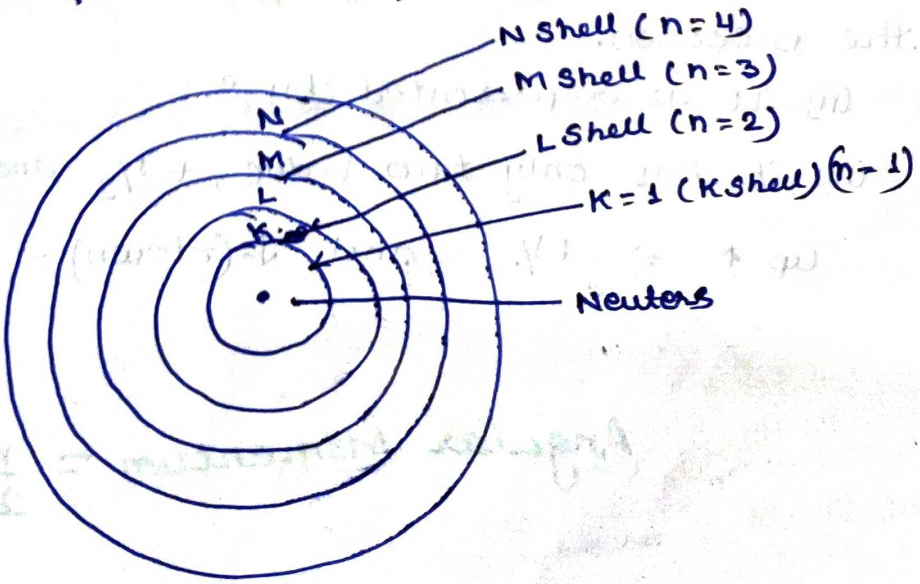
(i) Principle Quantum No.-

(i) This Quantum No. determine the main energy shell in which the electron are present.

(ii) It is tell the average distance of electron from Neuteous.

(iii) It is represented by 'n', the value of n is become 1, 2, 3, 4, - - - - .

(iv) Bore also represented it from K, L, M N- -



(ii) Azimuthal Quantum Number (l)

(i). This Quantum Number determine the angular momenthum of the electron.

(ii) It is also called Secondary Quantum No..

(iii) It is represented by l

(iv) It is also describe the size of orbital

(v) The value of l is from 0 to $(n-1)$

Ex ⇒ $n = 1$, $l = 0$ (1S Sub Shell)

$n = 2$, $l = 0, 1$ (2S,P Sub Shell)

$n = 3$, $l = 0, 1, 2$ (3S,3P,3d. Shell)

(iii) Magnetic Quantum Number (m)

(i) This Quantum Number discribe the behavior of electron in magnetic field.

(ii) It is represent by m.

(iii) The value of m is $-l$ to $+l$.

$l = 1$, $m = -1, 0, 1$

$l = 2$, $m = -2, -1, 0, +1, 2$

(iv) Spin Quantum Number (S) →

(i) This Quantum No. describe the spin orientation of the electron.

(ii) It is represented by S.

(iii) it has only two value, $+1/2$ and $-1/2$

up ↑ ⇒ $+1/2$ and ↓ (down) $= -1/2$

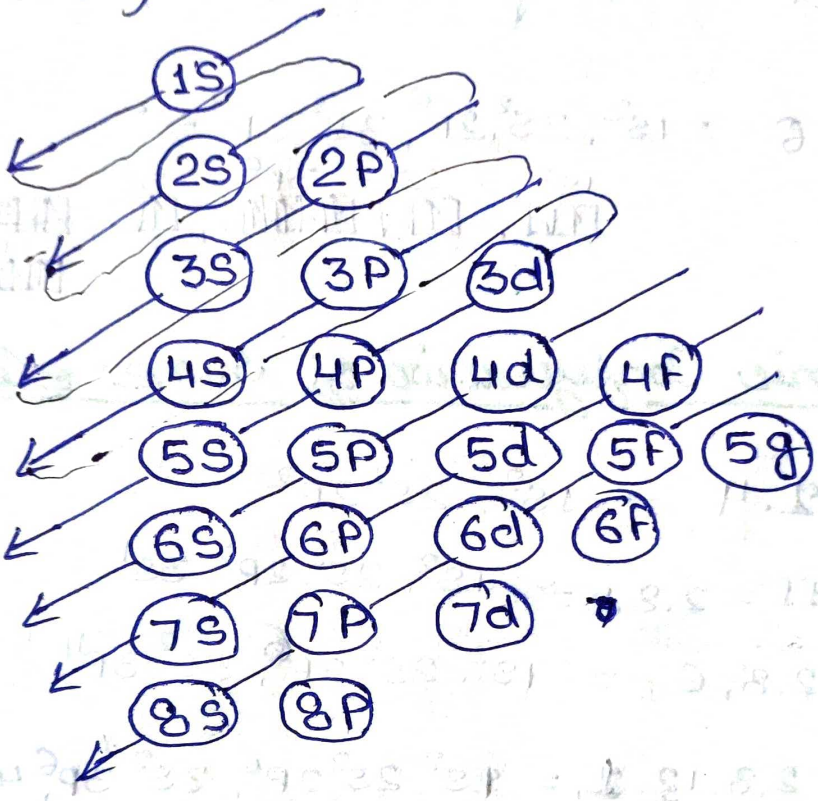
$$\text{Angular Momentum} = \frac{n}{2\pi}\sqrt{l(l+1)}$$

Electronic configration of atom (on the basis of Shubshell → filling ⇒)

Aufbow Principal → According to this law,

(i) electron (e). First occupy lower energy orbital.

(ii) electron are filling in increasing orber of energy of orbital / subshell,



1S < 2S < 3S < 2P < 4S < 3P, 5S, 4P, 3d, 6S, 5P, 4d

7S, 6P, 5d, 4F, 8S, 7P, 6d, 5F,

Pauli Princple → According to this law, No. two electrons is an atom can have same value for all four Quantum Nos.

(ii) Each orbital having mapimum two electron with opfosite spin

$_{12}Mg$ = 2, 8, , 2

1S, 2S, 2P, 3S

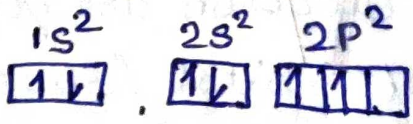
↑↓, ↑↓, ↑↓ ↑ ↑, ↑↓

$1s^2$, $2s^2$, $2p^6$, $3s^2$

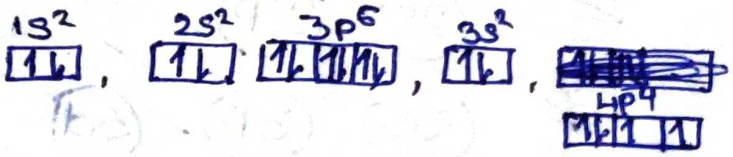
n = 3
l = 0
m = 0
s = +½

n = 3
l = 0
m = 0
s = -½

Hund's law → According to this rule electron pairing will not take place in the orbital of same energy. will each orbital singly filled.

$_6C = 2, 4 = 1s^2, 2s^2 2p^2 \Rightarrow$ 

$_{16}S = 2, 8, 6 = 1s^2, 2s^2, 2p^6, 3s^2 3p^4 \Rightarrow$



Electronic Configration of same element

$C_6 = 2, 4 = 1s^2, 2s^2 2p^2$

$Na = 11 = 2, 8, 1 = 1s^2, 2s^2, 2p^2 3s^1$

$S_{16} = 2, 8, 6 = 1s^2, 2s^2 2p^6, 3s^2 3p^4$

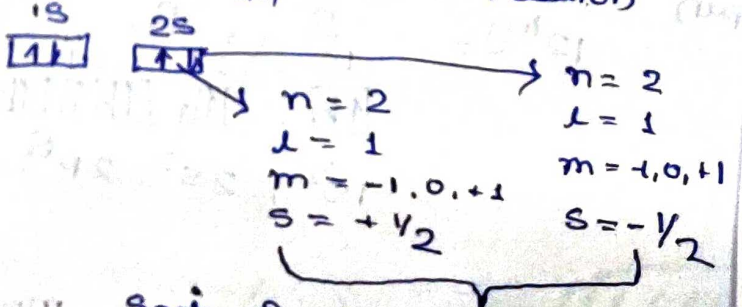
$Cr_{24} = 2, 8, 13, 1 = 1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^1, 3d$

Heisenberg's Uncertainity principle →

It is impossible to determine simultaneously and accurately the exact position and exact momenthum of a particle

$(\Delta n)(\Delta P) \geq \frac{4}{4H}$ [ΔP = momenthum, Δn = Position

Ex → 4 → 2.1 -



Chemical Bonding →

The atoms combines to each other to achives the inert gas electron arrangement (Configration) and become more stable.

OR

Why Bonding → (i) atoms formed Chemical bond to achive stability.

(ii) Getting the inert gas electronic Configration.

How to Bonding →

(i) By losing one or more electron.
(ii) By Gaining one or more electron
(iii) By Shairing one or more electron.

Nobal Gas → Those elements, which have 8 electrons in there out most energy shell, They are stable.

Ex:-			K	L	M	N
He - Helium -	2	-	2			
Ne - Neon -	10	-	2	8		
Ar - Argon -	18	-	2	8	8	
Kr - Krypton -	36	-	2	8	8	8

Ions → An ions is an electrically charged ion. they are two types.

(i) **Cation →** A positive charge ion is known as cation. Cation is formed by the loss of one or more electrons

$Na - e^- \rightarrow Na^+$ (Monovalent cation)
(2,8,1) (2,8)

$Mg - 2e^- \rightarrow Mg^{2+}$ (divalent cations)
(2,8,2) (2,8)

$Al - 3e^- \rightarrow Al^{+++}$ (Trivalent cation)
(2,8,3) (2,8)

Difference between atom and Cation →

1→ A cation has less electron than his present atom.
2→ Size of cation is smaller than its present atom. due to loss of a shell.
3→ Atom is reactive but cation is stable.
4- atoms is neutral but cation is +ive charged.

(ii) **Anion** → A negative charged ion is known as anion. it is formed by losing of one and more electron.

$Cl\ (17) = 2,8,7 \Rightarrow Cl + e^- \rightarrow Cl^-_{(2,8,8)}$

$S\ (16) = 2,8,6 \Rightarrow S + 2e^- \rightarrow S^{--}_{(2,8,8)}$

$P\ (15) = 2,8,5 \Rightarrow P + 3e^- \rightarrow P^{---}_{(2,8,8)}$

Difference between atom and Anion →

(i) An anion has more electron than its parent atom.

(ii) Size of anion is larger than its parent atom. to formation of an electron cloud around an atom.

(iii) atom is reactive but anion is stable.

(iv) atom is neutral but anion is -ive charged

(v) Anion has less proton than electron.

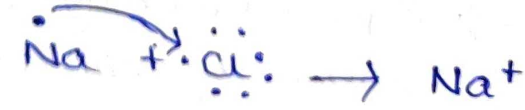
Type of Chemical Bond →

(i) Electro Chemical Bond (Ionic Bond)

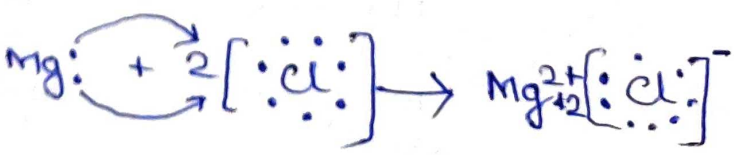
(ii) Co-valent Bond

(i) Electro Chemical Bond (Ionic Bond) → This bond, which is formed by transfer of electron from one atom to another.

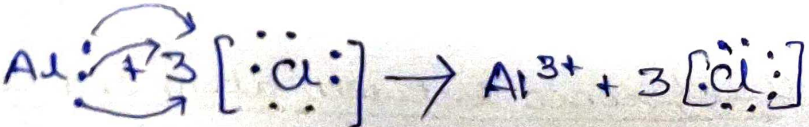
Na (2,8,1) Cl (2,8,7)



Mg (2,8,2) Cl (2,8,7)

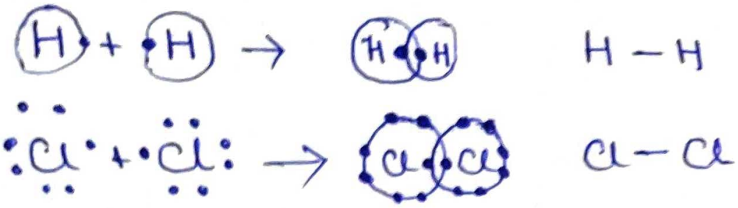


Al (2,8,3) Cl (2,8,7)

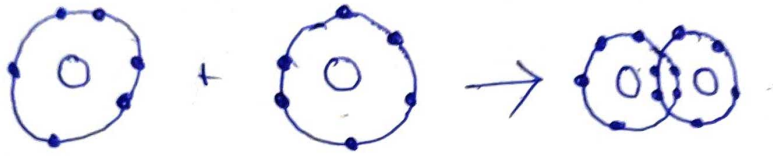


COVALENT BOND → The chemical bond formed by sharing of electron between two atoms. (Non metal + non metal)

(i) Single Co-valent bond →



(ii) Double covalent bond →

$O_2 \Rightarrow$  or O=O

(ii) Triple Bond →

$N_2 \Rightarrow$  or N≡N

Note → Compounds Cantaining both ionic and covalent Bond.

$\Rightarrow$ NaOH · Na (2.8.1) OH (2,6,1) → $Na^+ + OH^-$

· $H_2SO_4 \longrightarrow 2H^+ + SO_4^{--}$

Electro covalent Bond (Ionic)	Covalent Bond (Petrol)
1→ Crystaline Solid	(i)- Solid liquid Gas
2→ Conduct electricity in molten State (water)	(ii) Do not conduct electricity
3→ Stable in water	(iii) In soluble in water
4→ High Melting and boiling Point	(iv) Low melting and boiling Point.

Chemical Bonding

The various atoms present in any molecules are linked with each other by different forces, these force are called chemical bond. The are three types:-

(i) Ionic or Electro-valent Bond

(ii) Co-valent Bond

(iii) Cordinate Bond →

(i) Ionic or Electro-valent Bond →

"The bond, which is formed by transfer of electrons from one atom to other, is known as Ionic or Electro-valent bond."

Ex→ ① NaCl → Na_{11} → 2,8,1

Cl_{17} → 2,8,7

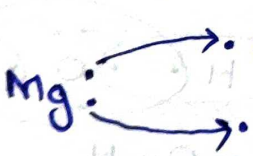
$Na - e^- \Rightarrow Na^+$ (cation)

$Cl + e^- \Rightarrow Cl^-$ (Anion)

$Na^+ + Cl^- \Rightarrow NaCl$

② $MgCl_2$ → $_{12}Mg$ = 2,8,2

$_{17}Cl$ = 2,8,7



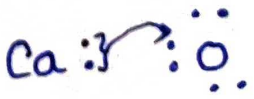
$Mg - 2e^- \rightarrow Mg^{++}$

$2Cl + 2e^- \rightarrow 2Cl^-$

$Mg^{++} + 2Cl^- \rightarrow MgCl_2$

③ CaO → $_{20}Ca$ → 2,8,8,2

$_8O$ → 2,6



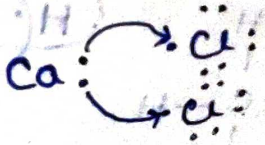
$Ca - 2e = Ca^{++}$

$O + 2e = O^{--}$

$Ca^{++} + O^{--} \rightarrow CaO$

④ $CaCl_2$ → $_{20}Ca$ = 2,8,8,2

$_{17}Cl$ = 2,8,7



$Ca - 2e^- \Rightarrow Ca^{++}$

$2Cl + 2e^- \Rightarrow 2Cl^-$

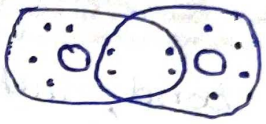
$Ca^{++} + 2Cl^- \rightarrow CaCl_2$

(ii) Co-valent Bond →

The bond formed by sharing of electron is known as co-valent bond.

Type of co-valent bond →

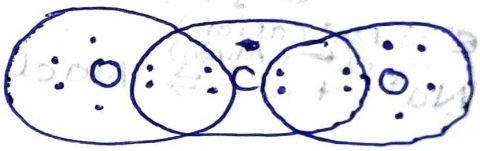
(i) Non polar co-valent band → It is a type of Chemical band, where two atoms share equally pair of electron. Ex- O_2 $_8O = 2,6$



O = O

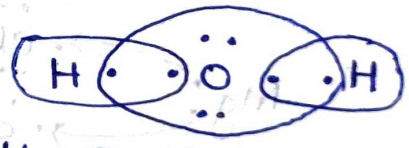
(ii) Polar co-valent Bond → It is a type of Chemical bond, where a pair of electron shared unequally between two atoms.

(i) CO_2 → $C_6 = 2,4$
$O_8 = 2,6$



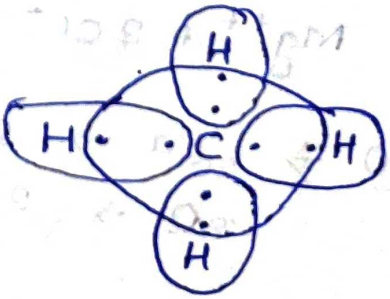
O = C = O

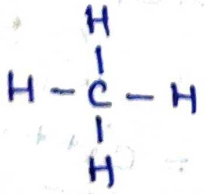
(ii) H_2O ⇒ $H_1 = 1$
$O_8 = 2,6$



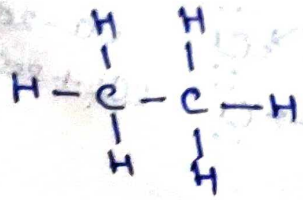
H – O – H

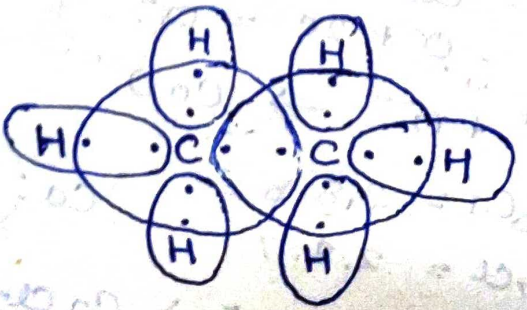
(iii) CH_4 ⇒ $C_6 = 2,4$
$H_1 = 1$





(iv) C_2H_6



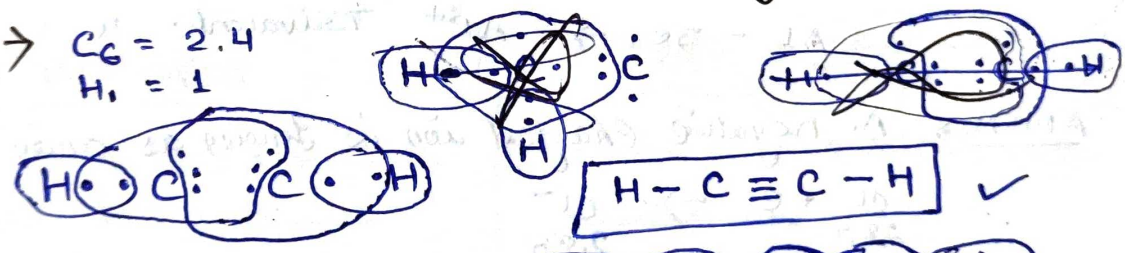


Difference between Electrovalent (Ionic) and Covalent bond

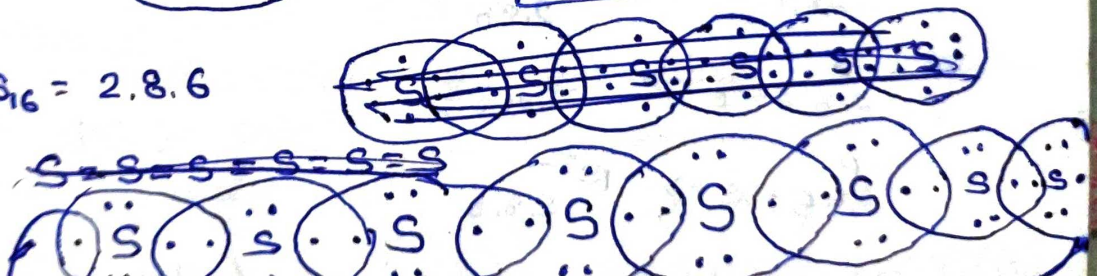
Electrovalent (Ionic)	Co-valent Bond
1- formed by transfer of e^-.	1. formed by sharing of e^-.
2→ formed by ions. so high melting and boiling point	2- low B.P & M.P.
3→ dessolve in water	3- does not dessolve in water
4→ Good Conduct of electricity	4→ does not conduct electricity
5→ Ex- Nacl	5→ Ex- Etanol.

Ques→ Draw electric structure for following:-

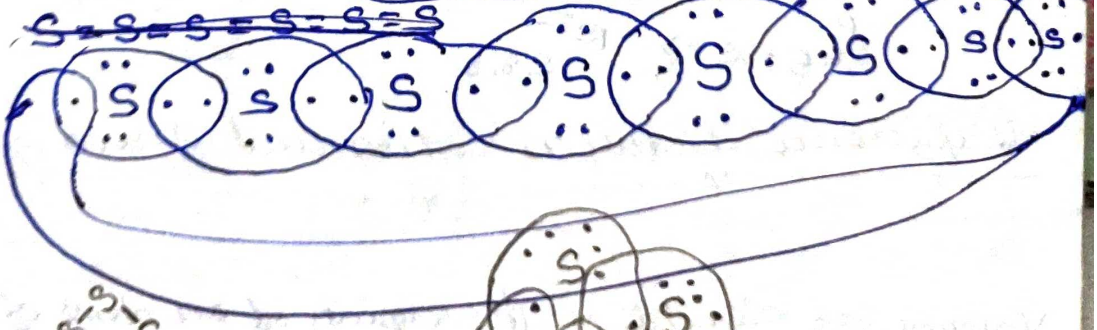
(i) C_2H_2 → $C_6 = 2,4$, $H_1 = 1$



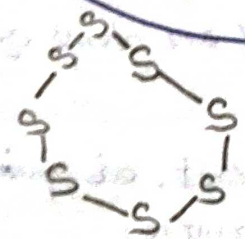
(ii) S_8 $S_{16} = 2,8,6$



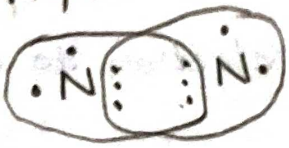
(iii) Cl_2



(4) - N_2



$N_7 = 2,5$



$N \equiv N$

5→ H_2

Chemical bonding → The atoms combines with each other to achieve the inert gas configration.

Atoms formed chemical bond to ~~as~~ achieved stability by be getting the inert gas ~~con~~ electron configration.

How → (i) by losing one ~~or~~ more electron
(ii) by gaining one or more electron
(iii) by sharing one or more electron

Example → $_{20}X^{40}$ $_{2,8,8,2}$ $_{8}Y^{10}$ $_{2,6}$ $_{18}Z^{37}$ $_{2,8,8}$ (Z is noble gas)

Ions → An ions is an electrically charged ion.
Na^+ Cl^-, Mg^{++}

(i) **Cation** → A positive charge ion is known as cation. it is formed by loss of one and more electron

$Na_{2,8,1} - e \longrightarrow Na^+$ Monovalent cation

$Mg_{2,8,2} - 2e \longrightarrow Mg^{2+}$ divalent "

$Al - 3e \rightarrow Al^{3+}$ Trivalent. "

ANION → A negative charged ion is known as anion.

$Cl_{2,8,7} + e \rightarrow Cl^-_{2,8,8}$

$S_{2,8,6} + 2e \rightarrow S^{--}_{2,8}$

$P_{2,8,5} + 3e \rightarrow P^{3-}_{2,8,8}$

Difference between cation and anion →

Valency of elements → The capicity of an atoms of an elements to form chemical bond.

Electrovalency → The no. of electron lost. ~~or gained by one~~ to achive nearest inert gass configration.

$Na^+ = 1$ $O^{2-} = 02$

Covalency → No. of shared of electron to acchived the nearest gas configration

$H-H = 1$ $O=O = 02$ $N\equiv N = 03$

Carbon and its Compound

Allotropy → It is a property of some chemical element to be able to take two or more different form, where the atoms are arrange differently by chemical bond, the form are known as allotropes and the phenomena is known as allotropy.

Allotropes of Carbon →

Carbon has three Allotropes :-

(i) ~~Dimond~~ Diamond
(ii) Graphite
(iii) Buckminster fullerenee (- - -)

Diamond

(1) It is a colourless transparent substance having extra ordinary brilliance
(2) Made upto carbon only
On burn turn completly into CO_2
(iii) It does not conduct electricity
(iv) Dimand is extemely hard.
(v) It Symbol is taken to be C.

Graphite

(धुसला) (अपार दर्शी)
(i) It is greyesh black opaque substance.
(ii) It is also made upto carbon only
(iii) It Conduct electricity.
(iv) Graphite is soft to touch
(v) It Symbol also be taken to be C.

⇒ The physical properties of Carbon allotropes (Dimand & Graphite) are different.
It is caused by difference in their structure

Hydrocarban →

A compound made up of hydrogen and Carban at only, is known as hydrocarban.

Type of hydrocarban → There (Two) Type of hydrocarbon

(i) Saturated hydrocarbn

(ii) Un-Saturated hydrocarbn

(i) Saturated hydrocarban →

Hydrocarban in, which Carbon atoms are connected by single bond is known as saturated Hydrocarban.

It is generally known as alkane.

its General formula is C_nH_{2n+2}

Ex ⇒ CH_4 (methane), C_2H_6 — Ethane.

(ii) Unsaturated hydrocarban → Hydrocarban

in which Carban atoms are connected by double or triple bond is known as unsaturated hydrocarbn

It can be classified in two ways :-

(i) Alkene

In which Carbon atoms are Connected by double bond, its General formula is C_nH_{2n}

Ex ⇒ C_2H_4 (Etene)

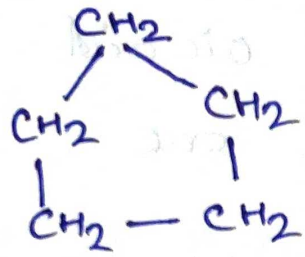
(ii) Alkyne

In which Carbon atoms are connected by triple bond. its Generly formula is C_nH_{2n-2}

Ex - C_2H_6 (Ethyne)

Cyclic Hydrocarbon → There are some other hydrocarbon in which carbon atoms are connected in the form of ring known as cyclic Hydrocarbon.

Ex-



Cyclo Butane

Imp

Ques → Define homologus series, Describe its properties?

Ans. Homologus Series → It is a series of ~~Compounds~~ Compounds with same functional group and similear chemical Properties.

Properties →

(i) It's members have same chemical properties.

(ii) It's members are different by CH_2 Group.

(iii) It's members are different by atomic mass (14 Unit)

(iv) Physical properties different.

IUPAC → Used for naming of Compounds.

Prefix Suffix

(i) Prefix → ~~Prefix~~ (No. of C atom) ← Prefix

C_1	= Meth
C_2	= Eth
C_3	= Prop
C_4	= Bute
C_5	= Pent
C_6	= Hex
C_7	= Hept
C_8	= Oct
C_9	= Non
	= Dec

(ii) Suffix.

Alkane (–) = ane

Alkene (=) = ene

Alkyne (≡) = yne

Functional Group →

		Suffix
Alcohal Group	– OH	– ol
Aldehyde Group	– CHO	– al
Carboxylic Acid	– COOH	– oic acid
Ketone	– C(=O)–	one

Halogen Group →

– Cl	→ Chloro
– Br	→ Bromo
– I	→ Ido
– F	→ Floro

Alkyl Group → It is formed by removal one ~~Name (IUPAC)~~ hydrogen from alkane.

Ex → – CH_3 – Methyl.

Isomerism → The organic compound have some molecular formula but is different ~~formula~~ Structure are known as isomers and this phenomena is called Isomerism.

Ques → (IUPAC) Name for Following :

(i) $\overset{4}{CH_3}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{CH_3}$ — Butane

(ii) $\overset{3}{CH_3}-\overset{2}{CH}\equiv\overset{1}{CH_2}$ — Propene - 1

(iii) $\overset{3}{CH_3}-\overset{2}{CH_2}-\overset{1}{CH_2}-OH$ — Propanol

(iv) $\overset{5}{CH_3}-\overset{4}{CH_2}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{CHO}$ — Pentenal.

(v) $\overset{3}{CH_3}-\overset{2}{CH_2}-\overset{1}{CH_2}-Cl$ — Chloro-propane

(vi) $\overset{5}{CH_3}-\overset{4}{CH_2}-\overset{3}{CH}(\overset{1}{CH_3})-\overset{2}{CH_2}-\overset{1}{CH_3}$ — 2,3 di Methyl Pentane

Isomers Example

① → Butain → C_4H_{10} C_nH_{2n+2}

$CH_3-CH_2-CH_2-CH_3$ → Butain

2 Isomers $\overset{3}{CH_3}-\overset{2}{CH}(\overset{1}{CH_3})-\overset{1}{CH_3}$ 2-Methyl-propane

② - Pentane — C_5H_{12} $-C_nH_{2n+2}$

3 Isomers

① $\overset{5}{CH_3}-\overset{4}{CH_2}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{CH_3}$ → Pantanl

② $CH_3-CH_2-\overset{2}{CH}(\overset{1}{CH_3})-CH_3$ → 2 Methyl. Butane

③ $\overset{3}{CH_3}-\overset{2}{C}(\overset{1}{CH_3})(CH_3)-CH_3$ → 2,2 di Methyl Propane

Some Imp Carban Compound and there Reaction →

Ethonol [C_2H_5OH]

Reaction →

① Ethonal is heated in presence of acidified $KMnO_4$ (oxidation)

$$C_2H_5OH \xrightarrow[KMnO_4]{\text{acidified}} \underset{\text{Ethanoic acid}}{CH_3COOH} + 2H_2O$$

② Ethnal is heated at 170°C in presence of Conc H_2SO_4

$$C_2H_5OH \xrightarrow[170°C]{\text{Conc } H_2SO_4} CH_2 = CH_2 + H_2O$$

Ethene.

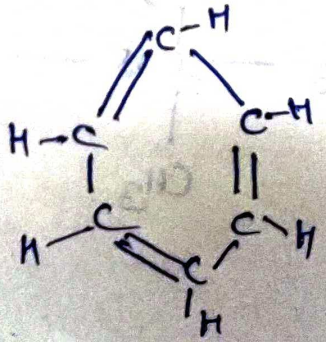
Ethanoic Acid

(Acctic acid) (CH_3COOH)

Esterification Rxn → Reaction → When acidic acid react with alcohol in presence of some drops of Conc H_2SO_4 it will form ester. and Reaction is known as Esterification

$$CH_3COOH + C_2H_5OH \longrightarrow \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2$$

Benzine →



Soponification Reaction →

It is simply the process of making soaps In this reaction. Ester react with Inorganic base to produce alcohal & soap.

Ester + Inorganic base → Soap + Alcohol

It is also known as hydralysis of ester

$$CH_3COOC_2H_5 + NaOH \longrightarrow \underset{\text{Alcohal}}{C_2H_5OH} + \underset{\text{Soap}}{CH_3COONa}$$

Note → It can also be written as

Factor + Base → Soap + Glyceral.
oil

Some basic paint releted to Carbon →

1. Carbon is non metal (allotropes- Dimond, graphite
2. In our earth crust %.age of Carbon is 0.18%.
3. All living Organism made up of Carbon Compound.
4. Carbon atomic no = 6. ant its electronic configration

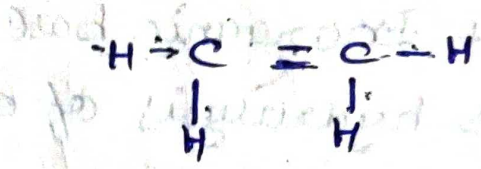
$$_6C = 2,4 = 1s^2, 2s^2 2p^2$$

5. → Carbon ke outer shell me 04 electron h. it is know as tetravelent.
6. → Carbon always formed covelent Bond

Sigma (σ) and Pi (π) Bond

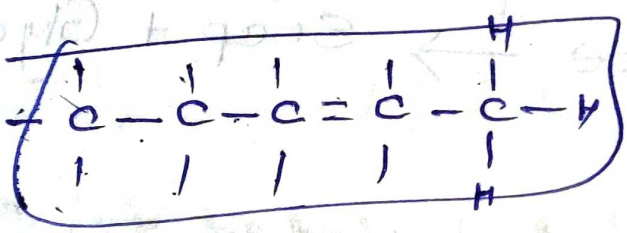
		Sigma	Pi (π)
Single	–	1	–
double	=	1	1π
Triple	≡	1	2π

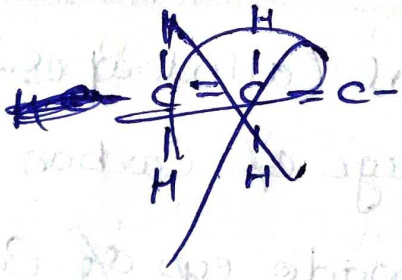
C_2H_4 →

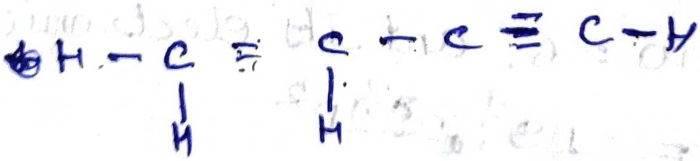


σ bond = 5
π bond = 1
Total = 5 bond.

σ 5 + 1π
= 06







σ 7 + 2π + 2π
(σ 7 + 3π)

Electro-Chemistry

(Date)

The study of Chemical Reaction, which are caused by passing electric current is known as electro chemistry.

Electrolyte → A solution in which current can pass called electrolyte. Ex- (NaCl)

Electrodes →

- Anode (Positive electrode)
- Cathode (Negitive electrode)

Ions

- Cations (Positive ion)
- Anion (negitive ion)

Electrolysis → The decome position of electrolyte one passing electric current is known as electrolysis.

Electrolysis of NaCl- When current is passed through molten sodium chloride by the help of electrodes, NaCl breakes up into Na^+ and Cl^-.

following reaction take place at electrody

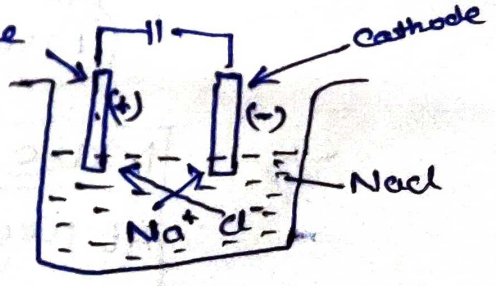
At Cathode

$$Na^+ + e^- \rightarrow Na$$

$$2Cl^- + 2e^- \rightarrow Cl_2$$

Ryan

$$2NaCl \xrightarrow{\text{current}} 2Na + Cl_2$$



Faraday's law of Electrolysis →

Faraday's gives two law of electrolysis.

I^st Law → According to this law, in the process of electrolysis, mass deposite on electrode is directly proportional to quantity of current pass.

$$m \propto q$$

$$m \propto it \qquad (q = it)$$

So ⇒ $\boxed{m = zit}$

where z is a constant, it is known as electro chemical equivalence, unit of z is gm/Coulomb

II^nd law → According to this law, if same amount of current passed through two different solution, then the mass deposite on electrodes is directly proportional to Equivalent wt.

$$m \propto E \qquad -①$$

$$\frac{m}{E} = \text{Constant}$$

So $\frac{m_1}{E_1} = \frac{m_2}{E_2}$ or $\boxed{\frac{m_1}{m_2} = \frac{E_1}{E_2}}$

Condition → F = 96500 Coulomb

(Faraday)

$$\Rightarrow \boxed{\frac{\text{Mass}}{\text{At weight}} \times \text{Charge} = \frac{it}{F}}$$

Numerical

Ques → A current 3A passing through $AgNO_3$ Solution for 20 min deposite 4 gm silver, Calculate E.C.E of Ag.

Solution → Given $i = 3A$

$t = 20 \text{ min} = 20 \times 60 = 1200 \text{ sec}$

$m = 4 \text{ gm}$ $\quad z = ?$

$m = z it$

$$z = \frac{m}{it} = \frac{4}{3 \times 1200} = \frac{1}{9} \times 10^{-2} \frac{gm}{coulomb}$$

Ques → Same amount of current for same time through $AgNO_3$ and $CuSO_4$ solution, 0.390 gm Cu and 1.322 gm Ag Collected of electrocity, IF Equivalent wt of Cu is 31.8 Find equivalent wt of Ag.

Solution

mass of Cu $m_{Cu} = 0.390 \text{ gm}$

" " Ag $M_{Ag} = 1.322 \text{ gm}$

Equivalent weight of Cu $E_{Cu} = 31.8$

Find - $E_{Ag} = ?$

By Faraday second law ⇒ $\frac{M_1}{m_2} = \frac{E_1}{E_2}$

$$\frac{m_{Cu}}{M_{Ag}} = \frac{E_{Cu}}{E_{Ag}}$$

$$E_{Ag} = \frac{E_{Cu} \times M_{Ag}}{m_{Cu}} = \frac{31.8 \times 1.322}{.390}$$

$$= \frac{31.8 \times 1322}{390}$$

$$= \frac{31.8 \times 43.1}{13}$$

$$= 105.26$$

31.8
3.31
318
954
954
105.258

Ques → How much quantity of Cu will be deposite on electrode by passing 0.5 ampere current for 30 min in $CuSO_4$ solution.

$CuSO_4 = Cu^{++}, SO_4^{--}$

Ans → $M_{Cu} = ?$

$i = 0.5$ amp

$t = 30$ min $= 30 \times 60 = 1800$ sec

Atomic weight Cu = 63.5

$$\frac{M_{Cu}}{\text{atomic weight of Cu}} \times \text{Charge} = \frac{it}{F}$$

$$\frac{M_{Cu}}{63.5} \times 2 = \frac{0.5 \times 1800}{96500}$$

$$M_{Cu} = \frac{0.5 \times 63.5}{\frac{96500}{1800}} = \frac{57.15}{193}$$

$$= 0.296 \text{ gm}$$

Ques → 20.14 gm Ag is deposited on electrodes by passing 5 A Current for 70 min in $AgNO_3$ solution, find out ECE.

Solution → Mass of Ag $= m = 20.14$ gm

$i = 5A$

$t = 70$ min

$t = 70 \times 60 = 4200$ sec

$Z = ?$

$$m = Z it$$

$$\therefore Z = \frac{m}{it} = \frac{\frac{20.14}{10.07}}{5 \times \frac{4200}{2100}}$$

$$= \frac{10.07}{10500}$$

$$Z = .00096 \text{ gm/cmm}$$

Ques → Same amount of Current passes for same time through $AgNO_3$ and $CuSO_4$ Soln. Eq wt of Ag is 108 and for Cu is 31.5, Calculate quantity of Cu deposite on electrode if quantity for Ag is 45 gm.

Solution →

Eq wt of Ag $E_{Ag} = 108$

" " " Cu $E_{Cu} = 31.5$

$M_{Ag} = 45$ gm

$M_{Cu} = ?$

$$\frac{E_{Ag}}{E_{Cu}} = \frac{M_{Ag}}{M_{Cu}}$$

$$\frac{108}{31.5} = \frac{45}{M_{Cu}}$$

$$M_{Cu} = \frac{45 \times 31.5}{108} = 13.125 \text{ gm}$$

Ques → How much electric current will be passed in KI Solution to liberate 10 gm I_2 in 1 Hours.

I = 53 = 2.8, 18, 18.7 $i = ?$ $m = 10$ gm $t = 60 \times 60 = 3600$ sec

Mass of $I_2 = 127 \times 2$

$$\frac{\text{mass of } I_2}{\text{Atomic mass}} \times \text{Charge} = \frac{it}{F}$$

$$\frac{10}{127 \times 2} \times 1 = \frac{i \times 3600}{96500}$$

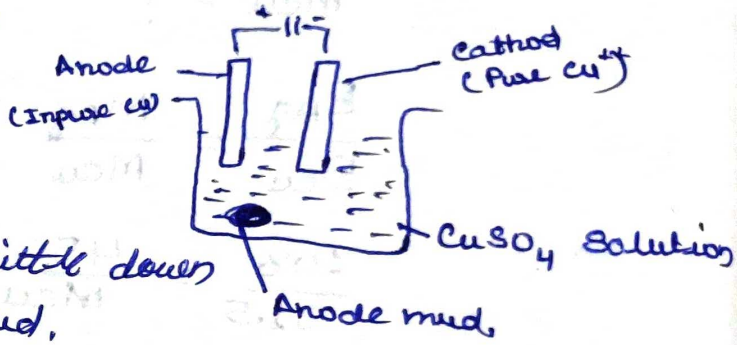
$$i = \frac{5 \times 965}{36 \times 127} = \frac{4825}{4572}$$

Imp →

Electrolytic Refining → It is the process of electrolysis in which Impure metal to get pure metal.

Electrolytic Refining of Cu → In this process Impure Cu is made as anode and pure Cu is made as cathode.

Any solution of Cu like $CuSO_4$ is used as electrolyte. in a tank. By passing electric current the anode (Impure Cu), start to dissolve in the solution and equal amount of pure Cu start to go at cathode.



The impurities are sittle down below anode as anode mud.

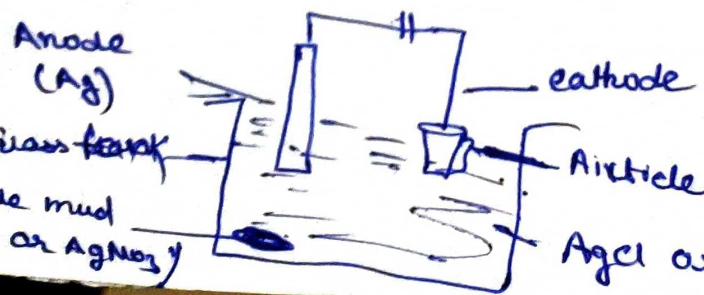
Anode (Impure Cu) become thinner and cathode (Pure Cu) become thicker.

Electroplating → The process of coating of metal over the other with the help of Electrolysis is known as Electroplating.

Method → In this process we make the electroplated metal as cathode and the metal who has take electroplate is makes as anode and in tank electrolyte of same metal which has to make anode.

On the current passing. Anode metal dissolve in solution and then deposite on cathode metal.

Coating of Ag (Silver) on a Article →



Empirical Formula

Empirical Formula - It Show simple ratio of atom present in Compound.

Molecular Formula → It Show actule no. of atom present in compound.

Molecular formula = (Empirical Formula) n

where = $n = \frac{\text{Molecular formula Wt}}{\text{Empirical formula Wt.}}$

Note ⇒ Molecular wt = 2 × Vapar density

Ques → An organic compound consist of C = 26.67%, H = 2.22%, and remaning oxgen. If molecular wt is 90, find. its Empirical formula and molecular formula

Sol ⇒ C = 26.67%

H = 2.22%

O = 100 − 28.89 = 71.11 %.

least ↗

Elements	% age	at wt	% age / at wt.	Simple Ratio
C	26.67%	12	$\frac{26.67}{12} = 2.22$	$\frac{2.22}{2.22} = 1$
H	2.22%	1	$\frac{2.22}{1} = 2.22$	$\frac{2.22}{2.22} = 1$
O	71.11%	16	$\frac{71.11}{16} = 4.44$	$\frac{4.44}{2.22} = 02$

So ⇒ Empirical Formula = $C_1H_1O_2$

Empirical wt = 12 + 1 + 16 × 2 = 45

$$n = \frac{\text{Molecular wt}}{\text{Empirical wt}} = \frac{90}{45} = 2$$

Molecular Formula = (Empirical Formula) 2

= $C_2H_2O_4$

Note: In Simple Ratio no should by perfect integer.

like 1.9 = 2

1.1 = 1

Ques: An Organic compound consist of C = 57.8%, H = 3.6%, O = 38.6%, If the molecular weight is 166. find its Emperical and Molecular formula.

Solution: Given C = 57.8%
H = 3.6%
O = 38.6%
and Molecular weight = 166

Elements	% age	At. wt	$\frac{\%\text{ age}}{\text{At. wt}}$	Simple Ratio	Simple Integer
C	57.8%	12	$\frac{57.8}{12} = 4.82$	$\frac{4.82}{2.41} = 2$	2 × 2 = 4
H	3.6%	1	$\frac{3.6}{1} = 3.6$	$\frac{3.6}{2.41} = 1.5$	1.5 × 2 = 3
O	38.6%	16	$\frac{38.6}{16} = 2.41$ (Least)	$\frac{2.41}{2.41} = 1$	1 × 2 = 2

Empirical formula = $C_4H_3O_2$

Empirical formula wt = 12 × 4 + 1 × 3 + 16 × 2
= 48 + 3 + 32 = 83

$$n = \frac{\text{Molecular wt}}{\text{Empirical wt}} = \frac{166}{83} = 2$$

Molecular formula = (Empirical formula) n
= $(C_4H_3O_2)\,2$

Molecular formula = $C_8H_6O_4$

Ques → In Organic compound C = 65.73%. H = 15.06%. and N = 19.21%. (28)
its molecular wt is 74. Find its Empirical, Molecular formula.
[Ans → $C_4H_{11}N$] - both

Elements	% age	At wt.	%/age / At. wt	Simple Ratio	
C	65.73%	12	$\frac{65.73}{12} = 5.48$	$\frac{5.48}{1.37} = 04$	
H	15.06%	1	$\frac{15.06}{1} = 15.06$	$\frac{15.06}{1.37} = 11$	
N	19.21%	14	$\frac{19.21}{14} = 1.37$ (Least)	$\frac{1.37}{1.37} = 1$	

Empirical formula = $C_4H_{11}N_1$

⇒ Molecular weight = 74 Eimpirical wt = 12×4 + 1×11 + 1×14
= 48 + 11 + 14 = 74

So → $n = \frac{\text{molecular wt}}{\text{Eimpirical wt}}$

$n = \frac{74}{74} = 1$

Molecular Formula = (Empirical formula) n
= $(C_4H_{11}N_1)\,1$

Molecular formula = $C_4H_{11}N_1$

Ques → An organic compoud Cartain C = 66.7%, H = 7.4% and N = 25.9%.
Its vapour density is 54, ither find its empirical and molecular formula.
(Ans → C_3H_4N, $C_6H_8N_2$)

Reaction Based Numericals

Given by

Law of Conservation of mass :- (Laussier)

In a chemical reaction mass of a Reactant is always equal to mass of product.

(Mass neither be created nor be destroyed)

Ques → In a reaction 5.3 gm of Sodium carbonate reacted with 6 gm of ethonoic acid. The product were 2.2 gm of CO_2, .09 gm water and X of Sodium ethanoate. Find the value of X.

Solution →

Sodium carbonate + ethonoic acid → CO_2 + H_2O + Sodium ethanoate

5.3 gm + 6 gm → 2.2 gm + .09 gm + X

$11.3 = 3.1 + X$

$X = 11.3 - 3.1$ gm

$\boxed{X = 8.2 \text{ gm}}$

Law of constant perp. proportion → (Given by Proust)

According to this law, A Chemical compound always consist of the same element combined together in same ratio. (H_2O = 1:8)

Ques → Hydrogen and oxigen combained to the ratio of 1:8 by mass of form water. what mass of oxigen gas would be required to react camplelly with 3gm of H_2 gas.

Sol →

1 gm H_2 = 8 gm O_2

3gm H_2 = 3×8 gm O_2

= 24 gm O_2

$\frac{1}{8} = \frac{3}{x}$

$x = 24$ gm

Ques. Find out the wt of magnisium oxide formed with 3gm mg are burned in oxigen.

Sol

$$2Mg + O_2 \longrightarrow 2MgO$$

At. wt $2 \times 24 = 48 \longrightarrow 2(24+16) = 80$

48 gm mg — 80 gm MgO

1 gm mg — $\frac{80}{48}$ gm mgo = 5/3 gm mgo

3 gm mg → $\frac{5}{3} \times 3$ gm mgo

= 5gm mgo Ans

Ques → 10 gm of H_2 is burnt in presence of oxigen, Calculate how ~~mated~~ much of water Formed.

Ans. Sol. →

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

At wt $2 \times 2 \times 1 = 4$ $\longrightarrow$ $2(2\times1 + 16) = 36$

4 gm H_2 → 36 gm H_2O

1 gm H_2 → $\frac{36}{4} = 9$ gm H_2O

10 gm H_2 → 9×10

$= \underline{90 \text{ gm } H_2O}$

Ans

Ques → How much of copper oxide will be obtain by Heating 12.35 gm at Copper Carbonate.

$$CuCO_3 \xrightarrow{\text{Heat}} CuO + CO_2$$

Atomic wt $63.5 + 12 + 3\times16$ $\quad$ $63.5 + 16$

$= 75.5 + 48$ $\quad$ $= 79.5$

123.5

123.5 gm $CuCO_3$ on heate → 79.5 gm CuO

1 gm $CuCO_3$ on heat → $\frac{79.5}{123.5}$ gm CuO

12.35 gm $CuCO_3$ on heat → $\frac{79.5}{123.5} \times \frac{12.35}{10}$ gm CuO

→ 7.95 gm CuO

Water (H_2O)

Some point →

(1) It is a tastless and orderless liquid at S.T.P..

(2) It frizer into ice at 0°c

(3) It's boiling paint is 100°c.

(4) The density of water is 1 gm/cm³ or 1000 kg/m³.

(5) The molecular water from by the covlent bond.

(6) In water molecule bond angle is 104.5°.

Source of water →

(i) earth में 97 % salt water है और केवल 3% ही fresh water है. जिसका 2/3 भाग glacier और Ice के रूप में है.

Fresh water, mainly ground water के रूप में मिलता है

There are following source of water.

1→ Natural Spring
2- lakes & River
3- Ocean
4- Well
5- Rain water,

The fress water sources are surface water ground water,

Type of water

(i) Tap water → यह वह water है जिसे हम direcly अपना face धो सकते है और cleaning · cooking और Gardig में use करते है

(ii) Mineral water → It is the water that naturally contain mineral with which its obtain, from underground sources, it is rich in mineral like, Ca, Mg, Mn.

(iii) Spring Water → In some places rain water accumulated accumulated under ground as a spring water.

(iv) Purified water → Raw water purified plant की help se water se bacteria को ~~kill~~ हटा कर पीने लायक बनाते, इस water को Purified water कहते है

(v) Distilled water → water को treatment के की help से mineral & Salt को remove करने की Process distillation कहते है

depending upon the behavior toward Salt solution with respect temprature..

" Lather formation. water may be classified as soft water and hard water.

(vi) Soft water → साबुन Soap और water आसानी से खाने पर Lather (झाग) देता है तो उसे soft wather कहते है जैसे Rain water and distilled water

(vii) Hard water → Water does not produces lether with Soap readily is called Hard water,

Eg → Sea water, River water, Spring water

Reason of Hardness of Water →

Hardness of water is due to the presence of biacarbonate, chloride and Sulphate of calisium and magnesium.

Type of hardness of water →

(1) Temporary Hardness
(2) Permanent Hardness.

1→ Temporary Hardness → This type of hardness due to the presence bi-carbonate of calcium and magnisium. $Ca(HCO_3)_2$. $Mg(HCO_3)_2$.

2→ Permanent Hardness - This type of hardnes due to the presence of Chloride and Sulphate of calicium and magnisium. $CaCl_2$, $MgCl_2$, $CaSO_4$, $MgSO_4$.

Method to removing Hardness of water

1→ For temporary Hardness →

(i) By Boilling ⇒ On boilling biocarbonates decompose to carbonate, which is removed by filteration.

$$Mg(HCO_3)_2 \xrightarrow{\text{boilling}} MgCO_3 + CO_2\uparrow + H_2O$$

(ii) Clark process → In this process quick lime is added to biocarbonate and it converted into carbonate which can be filtered and water become soft

quick lime = CaO
Slaned lime - $Ca(OH)_2$

$$Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3 + 2H_2O$$

(2) For Permanent Hardness →

(i) Washing soda Process →

Gaseous Law

P	V	T

Boyle's Law → According to this law at Constant Temprature. Pressure is inversaly proportional to Volume

$$P \propto \frac{1}{V}$$

$$PV = \text{Constant}$$

For to Gaseous,

$$P_1V_1 = P_2V_2$$

Charle's law → At Constant pressure, the volume of gas is directly proportional to its temprature (absolute).

$$V \propto T$$

$$\frac{V}{T} = \text{Constant}$$

For two gaseous ⇒ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Gay Lussac Pressure law → At Constant volume, Pressure is directly proportional to its temp.

$$P \propto T \text{ (absolute)}$$

$$\frac{P}{T} = \text{Constant}$$

For two Gases ⇒ $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

Ideal Gas → The Gas, which follows both Boyles law and Charle's law is known as ideal gas,

Suppose the inital prosses, volume and temp is P_1, V_1 and T_1. and final pressure, volume and temp is P_2, V_2 and T_2.

By Boyles law, at Constat Temp. $\left(P \propto \frac{1}{V}\right)$ — (A)

$$P_1 V_1 = P_2 V_2 \quad ---(1)$$

$$V_1 = \frac{P_2 V_2}{P_1}$$

by Charle's law ⇒ at Const Pressure, $V \propto T$ — (B)

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad --(2)$$

By Equation (1) and (2)

$$P_1 \frac{V_2 T_1}{T_2} = P_2 V_2$$

equation (A) and (B)

$$P \propto \frac{T}{V}$$

$$PV \propto T$$

$$\boxed{PV = RT}$$

for n mole

$$\boxed{PV = nRT}$$

$$R = 0.831 \text{ J (K-mal)}$$

Avagodro's law → According to this law equal volume of all the ideal gases at same temp and pressure contains the same no. of molecules,

$$\frac{V}{n} = \text{constant}$$

Ques → The volume of a gas sample is 100ml at 100°c. If Pressure constant at what temprature volume become 200 ml.

Sol → $V_1 = 100$ ml

$T_1 = 100°c = 100 + 273 = 373$ K

$V_2 = 200$ml

$T_2 = ?$

According charles law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{100}{373} = \frac{200}{T_2}$$

$$T_2 = 746 \text{ K}$$

$$T_2 = 746 - 273$$

$$\boxed{T_2 = 473°c}$$

Ques → The volume of gas sample is 500ml at 1 atm. If temp. is constant then calculate pressure at when volume become 100 ml.

Solution → $V_1 = 500$ml, $P_1 = 1$ atm

$V_2 = 100$ml $P_2 = ?$

By boyles law → $P_1V_1 = P_2V_2$

$$P_2 = \frac{P_1V_1}{V_2} = \frac{1 \times 500}{100} = \frac{5}{1}$$

$$\boxed{P_2 = 5 \text{ atm}}$$

Ques-3 → Calculate the temp. at when volume of a gas is double to volume at temp 0°c if pressure is constant.

$T_1 = 0°c = 0+273°K = 273K$

$V_1 = V$

$V_2 = 2V$, $T_2 =$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 = \frac{V_2 T_1}{V_1} = \frac{2V \times 273}{V}$$

$T_2 = 546\ K$

$T_2 = (546 - 273)°c$

$\boxed{T_2 = 273°c}$

Ques-4 → The volume of a gas is 100 ml at 2 atm and 0°c. Find new volume if pressure become 1 atm and tem 273°c.

Solution → $V_1 = 100ml$

$P_1 = 2\ atm$ $T_1 = 0°c = 0+273 = 273K$

$V_2 = ?$ $P_2 = 1\ atm$, $T_2 = 273°c$

$= 273 + 273$

$T_2 = 546\ K$

By Ideal Gas law →

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{2 \times 100}{273} = \frac{1 \times V_2}{546_2}$$

$\boxed{V_2 = 400\ ml}$

$$V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$$

$$= \frac{2 \times 100 \times 546}{1 \times 273 \times 2}$$

$= 400\ ml$

Discharge law → Under the same condition of temp & pressure, According to this law the rate of discharge of any gas is inversely perportional to the square root of the density of gas.

$$r \propto \frac{1}{\sqrt{d}}$$

for two gases ⇒

$$\frac{r_1}{r_2} = \frac{\sqrt{d_2}}{\sqrt{d_1}}$$

$$\frac{r_1}{r_2} = \sqrt{\frac{m_2}{m_1}}$$

m = molecular mass

2 V × D = molecular mass

Dalton partial pressure law →

According to this law of same gases, on filled in a container, which will never will flip in each-other then the total pressure of the container is equal to the paritial pressure of all the gasess.

Total Pressure $P = P_A + P_B + P_C + P_D$

where $P_A = \left(\frac{n_A}{n_T}\right) \times P$

Avagodro's Law → At Same ~~volume~~ temp and Pressure, Equal volume of gases contain equal number of molecules. $V \propto n$

$V = Kn$ (K = Constant)

$n = 6.02 \times 10^{23}$ molecules (Avagadero no.)

HYBRIDIZATION

It is define as the mixing of two atomic orbitals with same energy level to give a new hybrid orbitals.

This process is called hybridization, the new orbital thus formed is known as hybrid orbitals.

~~Types~~

Types of Hybridization →

Based on the types of orbitals invating in mixing the hybridization, can be classified as sp, sp^2, sp^3, sp^3d, sp^3d^2, sp^3d^3. etc..

(1) Sp Hybridization → It is observed, when one S and one P orbital in same shell mix to form new sp ~~hybridization~~ hybrided orbital.

It form linear moleeules with an angle 180°.

Ex.:- $BeCl_2$, C_2H_2.

(2) SP^2 Hybridization → It is observed, when one S and two P orbitals of same energy level are mix together from to form new sp^2 Hybridge orbital.

The shape of SP^2 hybrid orbital is Trigonal at angle 120°. Ex.:- BF_3, C_2H_4.

(3) Sp^3 Hybridization → It is observed when one S and three P orbitals belonging to same shell, mixed together and form sp^3 hybridization.

The shape of sp^3 ⇒ Tetrahedrin makes an angle 109°28'.

Ex ⇒ C_2H_6, CH_4

(4). sp^3d Hybridization → The mixing of one s, three p and one d orbitals for the same energy shell is termed sp^3d hybrid orbital.

The shape of sp^3d Hybride orbital = Trigonal Bipyramidal at angle 120°.

Eg - PCl_5.

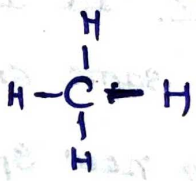
Sum		Type
2	–	Sp
3	–	Sp^2
4	–	Sp^3
5	–	Sp^3d
6	–	Sp^3d^2

~~So on~~

⇒ Shortcut to find Hybridization →

Hybridization of any atom = no. of atom attached + Lone pair of atom.

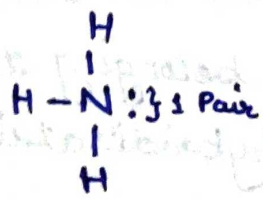
Ex→ (i) CH_4 ⇒



C (Hybridization) = 4 + 0 = 4 = sp^3

Shape = Tetrahydron, 109°28'

(ii) NH_3 ⇒



N_7 = 2.5

Hybridization of N = 3 + 1 = 4 = sp^3

Shape = Tetrahydron (109°28')

(3) H_2O ⇒ $O_8 = 2,6$

(O) Hybridization = 2 + 2 = 4 ⇒ SP^3

Shape - Tetrahydron

(4) $BeCl_2$ ⇒ $Be_4 = 2,2$

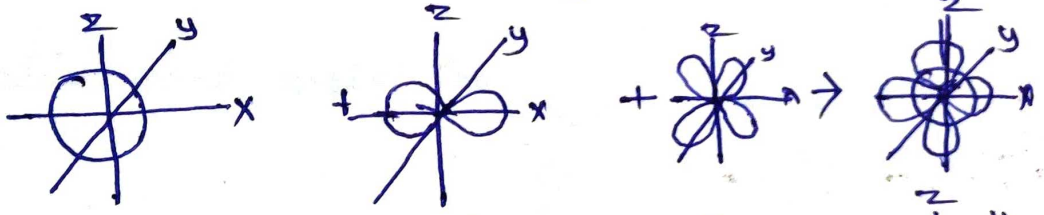
$Cl_7 = 2,8,7$

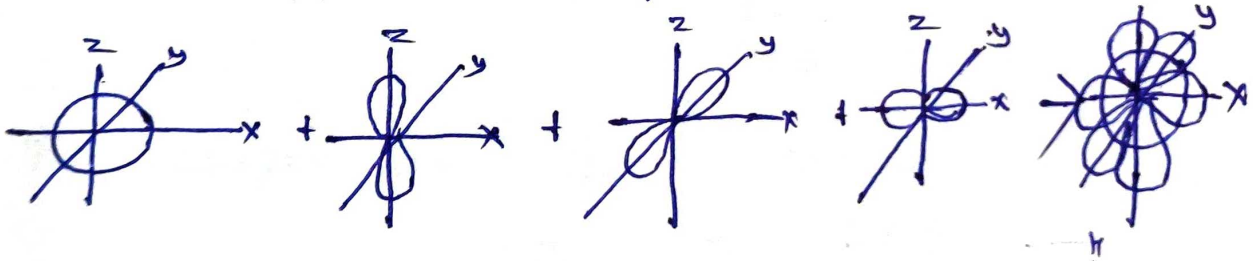
Cl - Be - Cl

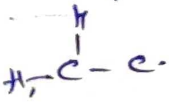
= Hybridized = 2 + 0 = 2 = SP

Shape ⇒ linear, 180°

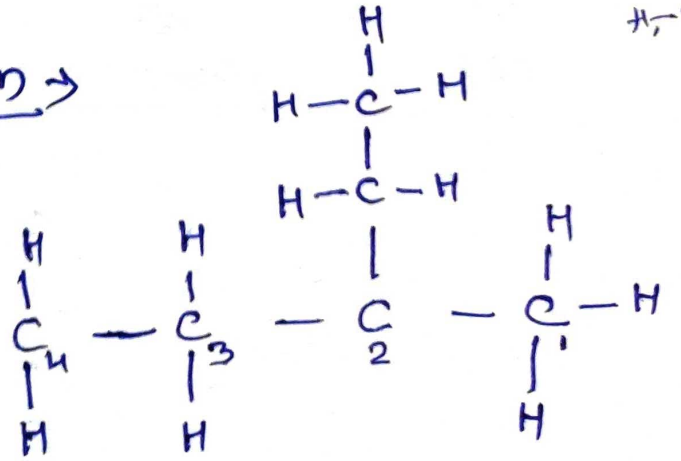
Hybridization (mixing of orbitals)

SP^2 ⇒ 

SP^3 ⇒ 



2 Eathyl Boo butain ⇒



Periodic Classification of Elements

2017

Dobereiner's Triads → when elements are arranged in the order of increasing atomic masses, groupes of three elements (Known as Triads) having similar chemical properties are obtained.

The atomic mass of the middle element of the ~~atomic masses~~ triad being equal to the arithmetic mean of the atomic masses of the other two elements.

(1). The Alkali metal group

Symbol	At mass.
Li	7
Na	23
K	39

(2) The Alkaline earth metal Gp

Sy.		At mass
Ca	–	40
Sr	–	88
Ba	–	137

(3) The Helogen Gp →

Sy.		At. mass
Cl	–	35.5
Br	–	80
Iodine	–	127

Newland's law of Octove →

1→ When elements are arranged in the order of increassing atomic mass, the properties of eight elements are a repetation of the properties of the first elements.

1	2	3	4	5	6	7	8
सा	रे	गा	मा	पा	धी	नी	सा

Limitation → (i) New lands law of octaves was aplicable to the classificatio of elements up to Calisum(Ca).

(ii) After calusin, every elements did not obey of octave law.

(iii) According to newlands only 56 element in exested in nature and no more elements would be discovered in the feature.

(iv) In newlands table. same elements are placed in same slot. (Eg. Co & Ni).

(v) Co and Ni is placed is same slote but Fe is placed to far from there, while Fe (Irons) propeby is same to there.

Mendeleeves periodic law →

The properties of elements are periodic function of there atomic mass.

There are seven periods - Horizontal rows and Eight Vertical colours - Groups, in his table

~~In his table~~

Mendeleeves was guided by two factor

(i) Increasing atomic masses

(ii) Group elements having similar properties.

Merits of mendeleve's classification →

1→ Predicted the existenel of some elements, not discovered then.

(iii). Nobal gases is arrange help of arrangi of.

Anmerits दोष) →

(i) The position of isotopes could not be explained. Since isotopes of have different mass, $_1H^1$, $_1H^2$, $_1H^3$.

(ii) Wrong order of atomic mass of some elements could not be explained.

Cobalt (58.9) comes first to Ni (58.7)

(iii) A correct possition of Hydrogen could not be assigned in the pel table.

(iv) Hydrogen also combined with alkali metals Li, Na, K., Hydrogen like halogens exists in di atomic form H_2, Cl_2.

Modern Periodic law →

Properties of the elements are periodic function of their atomic number.

There are seven (07) period and 18 Groups

Position of hydrogen →

① Hydrogen has 1 valance electron as Alkali metals [Li - 2,1] [Na, 2 8, 1)

But it is very small. its peroperties are different like halogens.

It can also gain 1 electron to get it valancy shell complete.

So far this controversy. it has been placed above alkali metal separately.

Properties of Periods

~~H Be B C N O F Ne~~

Na mg Al Si P S Cl Ar ~~K Ca~~

2,8,1 2,8,2 2,8,3 2,8,4 2,8,5 2,8,6 2,8,7 2,8,8

1→ On going left to right in a period, atomic size decreases.

2→ On moving left to right is a period ↑ no. of valence electrons increases.

3→ Valency on moving left to right in each period increase 1 to 4 and then decreases to zero.

1, 2, 3, 4, 3 2 1 0

4→ Metallic Character → L to R in a period metallic Character is decreases and non metetalic character increases

5→ Chemical Reactivity → L to R. First decreases and then increases

Na Mg Al Si P S Cl Ar

Na — very Reactivit

Si — Least Reactive

Ar — very reactive

Ionisaition Potential → Energy required to liberate an electron from an isolated gasess atom from its balance shell.

$$Na + energy \rightarrow Na^+$$

Electron affinity or Electron gain Enthalpy →

$$Cl + e^- \longrightarrow Cl^- + energy$$

energy ~~required~~ released by an isolated gaseous atom on gaining an electron

Properties of Group →

	Alkali metals	Helogen
	Li (2,1)	2,7
	Na (2,8,1)	2,8,7
	2,8,8,1	2,8,8,7

(1) Valence electron → Going down to group, No. of valence electron remain same.

(2) Valency → Going down a group, valency remain same

(i) Size of atoms - down to group size of ~~electron is~~ atoms is increases

(ii) metalic character & Chemical Reactivity increase

(v) Nature of oxides → There is no change in the Nature of oxide going down in period

Ques→ How many gram of moles present in 11 gm CO_2.

Solution→ wt of substance = 11 gm

Atmoic wt of CO_2 = 12 + 2×16 = 12+32 = 44

$$\text{No. of moles} = \frac{\text{wt of Substance (in gm)}}{\text{At wt of substance}}$$

$$= \frac{11}{44\,4} = \frac{1}{4} = 0.25 \text{ atoms}$$

Ques→ Calculate OH^- Conc of solution whose p^{OH} is 10.

Solution→ $p^{OH^-} = ?$ $\quad p^H = 10$

$$p^H + p^{OH} = 14$$

$$p^H + 10 = 14$$

$$p^H = 14 - 10$$

$$\boxed{p^H = 4}$$

$$p^{OH} = -\log [OH^-]$$

$$4 = -\log [OH^-]$$

$$[OH^-] = \text{Anti log } (-4]$$

$$[OH^-] = 2 \log 2$$

$$= 2 \times (.3010)$$

$$\boxed{(OH^-) = .6020}$$

Ques-3→ Calculate the p^H of a solution $\frac{N}{10}$ NaOH Solution.

Solution→ $[OH^-] = \frac{1}{10} = 10^{-1}$

$$p^{OH} = -\log [OH^-]$$

$$p^{OH} = -\log 10^{-1}$$

$$\boxed{p^{OH} = +1}$$

$$p^H + p^{OH} = 14$$

$$p^H = 14 - 1$$

$$\boxed{p^H = 13}$$

Ques-3 Find the pH of a solution whose hydrogen ion Conc. is 2×10^{-3}

$$[H^+] = 2 \times 10^{-3}$$

$$pH = -\log [H^+]$$

$$= -\log (2 \times 10^{-3})$$

$$= -[\log 2 + \log 10^{-3}]$$

$$= -[\log 2 + (-3)\log 10]$$

$$= -\log 2 + 3(1)$$

$$= -\log 2 + 3$$

$$= -0.3010 + 3$$

$$\begin{array}{r} 3.0000 \\ -0.3010 \\ \hline 2.6990 \end{array}$$

$$\boxed{pH = 2.6990}$$

Ques Calculated the hydrolysis constant of NaCl

$(Na = 1.8 \times 10^{-5})$

atomic mass = $23 + 35.5 =$

$Na \rightarrow Na^+ + Cl^-$

No. of mole = $\frac{\text{wt of substance (gm)}}{\text{atomic wt}}$

$= \frac{1.8 \times 10^{-5}}{58.5}$

$\begin{array}{r} 58.5 \\ -19.5 \\ \hline 6.5 \end{array}$

$= \frac{3}{65} \times 10^{-5}$

Ques→ 1.62 gm of metal was dissolved in Nitric acid to Prepare its Nitrate on strong heating of Nitrate 2.02 gm oxide obtain find equivalent wt. of metal.

Ans→

Ques → A solution contains 40 gm of common salt in 320 gm of water. Calculate the concentration in terms of mass by mass % of the solution.

Mass of Salute = 40 gm

Mass of Solvent = 320 gm

Mass of Solution = mass of Salute + mass of Solvent

= 40 + 320 = 360 gm

$$\text{Mass \% of Solution} = \frac{\text{mass of Salute}}{\text{mass of Solution}} \times 100$$

$$= \frac{\cancel{40}^{20}}{\cancel{360}_{\cancel{18}\ 9}} \times \cancel{100}^{5} = \frac{100}{9} = 11.1\%$$

Law of Chemical Combination →

(i) Law of Conservation of mass → According to this law, mass can neither be created nor distroyed in a chemical Reaction.

(ii) Law of Constant proportions →

In a chemical substance the elements are always present in definite proportions by mass.

gram atomic mass

(1) Hydrogen - (H) - 1 gm

(2) Oxygen - (O) - 16 gm

Gram molecular mass →

(1) Hydrogen (H_2) → 2 gm

(2) Oxygen (O_2) → 32 gm

(3) Water (H_2O) → 2+16 = 18 gm

⇒ 1 mole of atom represent. gram atomic mass

⇒ " " " molecules " - " molecular mass

⇒ 1 mole = 6.023×10^{23} atoms & molecules.

Ques → How many moles are there is 34.5 gm of Na, (Atomic mass of Na = 23)

Solution → No. of moles = $\frac{\text{Weight of Substance (gm)}}{\text{Atomic mass (Na)}}$

$= \frac{34.5}{23} = 1.5$ moles

Ques → Find the mass of 2 moles of Oxygen atoms.

No. of moles = $\frac{\text{mass (in gm)}}{\text{atomic wt}}$

$2 = \frac{\text{mass}}{16}$

mass = 32 gm

Ques → What is the number of zinc atoms in a piece of zinc weighing 10 gm. (Zn = 65)

$\frac{\text{No. of atoms}}{6.02 \times 10^{23}} = \frac{\text{weight (in gm)}}{\text{atomic mass}}$

No. of atoms = $\frac{10 \times 6.023 \times 10^{23}}{63}$

$= \frac{10 \times 6023 \times 10^{20}}{63}$

$= 95.60 \times 10^{23}$

$= 9.56 \times 10^{24}$ atoms

16> IF 16 gm of oxygen contains 1 mole of oxygen atoms Calculate the mass of one atom of oxygen.

(O)

1 mole = 16 gm

2 mole = 32 gm

~~One atoms~~ — ~~1.6~~ / ~~6.02×10^{23}~~ = ~~16~~ atoms = 6.02

1 — mass / 16

Ques > find the number of molecules present in a drop of chloroform ($CHCl_3$) weighing 0.0239 gm.

atomic weight = $12 + 1 + 35.5 \times 3 = 13 + 106.5 = 119.5$

weight in gm = 0.0239 gm

No. of mole = $\frac{\text{weight (gm)}}{\text{atomic mass}} = \frac{0.0239}{119.5}$

$= \frac{239}{119.5} \frac{*10}{10^4}$

moles. $= 2 \times 10^{-4}$

no. of moles = $\frac{\text{No. of molecules}}{6.02\times10^{23}}$

No. of molecules = $2\times10^{-4} \times 6.02\times10^{23}$

$= 12.04 \times 10^{19}$ molecules

Ques > 2> Calculate the number of S atoms in one mole of S_8

1 mole = 6.02×10^{23} atoms

8 mole = 48.16×10^{23} atoms.

$n = \frac{mw}{atw}$

256 g mol

$N_{atom} = 6.02 \times 256 \times 10^{23}$

Q4 The number of molecules in 2 gm of neon (wt = 20)

Ans>

$\frac{\text{weight of substance}}{\text{atomic weight}} = \frac{\text{No. of molecules}}{6.02\times10^{23}}$

No. of molecules = $\frac{2 \times 6.02 \times 10^{23}}{20}$

$= 602 \times 10^{20}$

$= 6.02 \times 10^{22}$ molecules

Ques 4 → Which of the flowing has a larger number of molecules.

(i) 4.4×10^{-6} gm of CO_2

atomic weight = $CO_2 = 12 + 32 = 44$

$$\frac{\text{Weight of gm}}{\text{atomic mass}} = \frac{\text{No. of molecules}}{6.02 \times 10^{23}}$$

$$\text{No. of molecules} = \frac{4.4 \times 10^{-6} \times 6.02 \times 10^{23}}{44}$$

$$= \frac{60.2 \times 10^{16}}{10}$$

$$= 6.02 \times 10^{16} \text{ molecules}$$

(ii) 3.6×10^{-6} g of H_2O

atomic weight = $2 + 16 = 18$

$$\text{No. of molecules} = \frac{3.6 \times 10^{-6} \times 6.02 \times 10^{23}}{18}$$

$$= \frac{2 \times 10^{-6} \times 6.02 \times 10^{22}}{9}$$

$$= \frac{60.2 \times 10^{15}}{9}$$

$$= 6.70 \times 10^{+15}$$

Ques → If 1 gm of sulphur dioxide contains x molecules. how many molecules will be present in 1 gm of oxygen.

Sol → $SO_2 = 32 + 32 = 64$

$$\frac{1}{64} = \frac{x}{6.02 \times 10^{23}}$$

$$x = \frac{3.01 \times 10^{23}}{32}$$

$$= \frac{3.01 \times 10^{24}}{32}$$

$$x = 9.40 \times 10^{21}$$

$O = 16 \times 2 = 32$

$$\frac{1}{16 \times 2} = \frac{x_1}{6.02 \times 10^{23}}$$

$$x_1 = \frac{6.02 \times 10^{23}}{16 \times 2}$$

$$x_1 = \frac{6.02 \times 10^{21}}{16 \times 2}$$

$$= \frac{301 \times 10^{21}}{16}$$

$$x_1 = 18.8 \times 10^{21}$$

Oxygen molecule of 2x times gretater than SO_2

Ques → How many moles are represented by 100gm of glucose $C_6H_{12}O_{16}$

Ans → atomic mass $C_6H_{12}O_{16} = 12 \times 6 + 12 \times 1 + 16 \times 16 = 72 + 12 + 256 = 340$

$$\text{No. of moles} = \frac{100}{340} = \frac{5}{170} = \frac{1}{34} = .029 \text{ moles}$$

Ques → 8 → Calculated the mass in grams of 0.17 mole of hydrogen sulphide (H_2S). atomic mass $H_2S = 2 + 32 = 34$

$$0.17 = \frac{\text{weight (gm)}}{34}$$

$$\text{weight (in gm)} = \frac{17 \times 34}{100} = \frac{289}{50} = 5.8 \text{ gm}$$

Solute and Solvent →

The substance (Sugar), which is dissolved in a liquid (water) is called solute.

The liquid is called solvent.

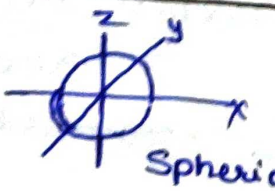
The mixture of solute and solvent is known as solution.

Solution	Colloids	Suspensions
1→ A Homogenious mixture	(i) Heterogeneous	Hetrogeneous
2→ Size → diameter 10^{-8} cm	(ii) 10^{-7} to 10^{-5} cm	(ii) 10^{-5} cm
3→ Cannot be seen with a microscope	3→ seen at microscope	3→ Can be seen easily
4→ Solution particles pass through filter paper	4→ Can not pass filter	Do not pass
5→ Very Stable	Stable	Unstable
6→ Scatter light Salt Solution does not	Scatter light milk. Ink	→Scatter light (muddy water)

Tyndall Effect → The scattering of light by colloidal particles is called Tyndall effect.

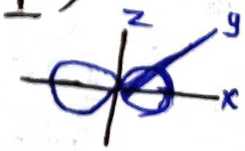
Shape of orbitals →

S →



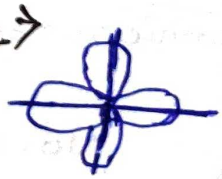
Spherical.

P →



dumbell

d →



Duble dumbell

Elements → A Substance, which can not be split up into two or more simpler substance by the chemical method. (apply heat and light)

1 a.m.u. (One atomic mass unit) →

$$1\ amu = \frac{1}{12} \text{ of } C_{12}$$

Homogeneous mixture → A mixture has uniform composition throughout its mass. (Sugar + mass)

Heterogeneous mixture → A mixture has non uniform composition throughout its mass. (Sand + Water)

Compound → A compound made up of two or more elements. Chemically combined in a fixed ratio of weight [($CaCO_3$) = (1 : 1 : 3)]

Alloys → Alloys are homogeneous mixture of metals. The can not be separated with there compounds by physical method.

[Brass = Copper + Zinc]

$$\text{Mass precent} = \frac{\text{Mass of Solute}}{\text{Mass of Solution}} \times 100$$

Mole Fraction →

Substance A is dessolved in substance B.

No. of moles of A = n_A. No. of moles of B = n_B

$$\text{Mole fraction of A} = \frac{\text{No. of moles of A}}{\text{No. of moles of Solution}} = \frac{n_A}{n_A + n_B}$$

$$\text{Mole fraction of B} = \frac{\text{No. of moles of B}}{\text{No. of moles of Solution}} = \frac{n_B}{n_A + n_B}$$

Molarity (M) →

$$\frac{\text{No. of moles of Solute}}{\text{Volume of Solution (in ltr)}} = \frac{\text{No. of moles of Solute}}{\text{Volume of solution (in ml)}} \times 1000$$

Ques → Calculate the molarity of NaOH in the solution prepared by dissolving its 4 gm amerough water to form NaOH Solution of 250 ml.

Atomic weight : NaOH = 23 + 16 + 1 = 40

$$\text{No. of moles of NaOH} = \frac{\text{Given mass}}{\text{atomic mass}} = \frac{4}{40} = 1/10 \text{ mole}$$

$$\text{Molarity} = \frac{\text{No. of moles}}{\text{Volume of Solution (in ltr)}} = \frac{1/10}{250} \times 1000$$

$$= \frac{10}{25} = .4\,M$$

~~Molarity (M)~~ →

$$\text{Molality } (m) = \frac{\text{No. of moles of Solute}}{\text{mass of Solvent (in kg)}} = \frac{\text{No. of moles of Solute}}{\text{mass of solvent (in gm)}} \times 1000$$

Ques → The density of 3 M solution of NaCl is 1.25 gm/ml calculate molality of the solution.

Solution → $M = 3 \frac{\text{mole}}{\text{Ltr}}$

Atomic mass (NaCl) = 23 + 35.5 = 58.5

1 mole NaCl = 58.5 gm

Solute → 3 mole NaCl = 3 × 58.5 = 175.5 gm

mass of 1 ltr of Solution = Volume × density

= 1000 × 1.25

= 1250 gm

mass of water = mass of solution − mass of solute

= 1250 − 175.5

= 1074.5 gm

= 1.0745 Kg.

$$\text{Molality} = \frac{\text{No. of moles of Solute}}{\text{mass of Solvent}} = \frac{3}{1.0745}$$

Molality = 2.79 m

Limiting Reagent → The reactant which is present in lesser amount. consumed it no further reaction are possible.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

$$2 \times 14 + 3 \times 2 \rightarrow 2$$

$$28 \quad 6$$

In above N_2 (28) and H_2 (6) than H_2 is limiting reagent

Rates of Chemical Reaction →

Rate of reaction:

(i) $A \longrightarrow B$

= [Rate of disapperarance of A] = [Rate of appearance of B]

$$-\frac{\Delta[A]}{\Delta t} = \frac{\Delta[B]}{\Delta t}$$

(ii) $A + B \longrightarrow 2C$

$$-\frac{\Delta[A]}{\Delta t} \pm -\frac{\Delta[B]}{\Delta t} = \frac{1}{2}\left[\frac{\Delta[C]}{\Delta t}\right] \quad \frac{\text{mole/Ltr}}{\text{Sec}}$$

Law of mass action →

The rate of a chemical reaction is directly perportional to the product of the molar constrations of the reactions.

$$a\,A + b\,B \rightarrow \text{Product}.$$

$$\text{Rate of reaction} = K[A]^a[B]^b$$

K = rate constant.

Order of reaction →

(i) Zero order Reaction → If the reaction rate is independent of the concentration of the reacting species. ~~A → Product~~.

$$\text{Rate} = K[A]^0 = \text{mole/Ltr/sec}$$

$$= \text{mole } L^{-1} \text{ Sec}^{-1}$$

(ii) First ~~Second~~ order Reaction → The rate of reaction is depended upon the one consentration of the reacting species

$A \longrightarrow$ Product

$$\text{Rate} = K[A]^1 = \text{mole/Ltr/sec}$$

$$\text{mole/Ltr/sec} = \text{mole}^1\,\text{Ltr}^{-1}\,\text{sec}^{-1}$$

$$[K = \text{Sec}^{-1}]$$

(ii) Second Order reaction →

The rate of Concentration is depends upon the two Concentration terms. of the reacting species

$A + A \rightarrow$ Product Rate $= K[A]^2$

$M L^{-1} s^{-1} = K \; M^2 L^{-2}$

$$K = M^{-1} L^{+1} \text{ sec}^{-1}$$

(iii) Third Order reaction →

The rate of Conserbration upon the three Concentration term of the reacting species

$A + A + A \rightarrow$ Product

$$\text{Rate} = K[A]^3$$

$$\text{Mole } L^{-1} \text{ sec}^{-1} = K(\text{Mole}^3 \; L^{-3})$$

$$K = M^{-2} L^2 \text{ sec}^{-1}$$

Ques → The rate of cone. Change of C in the reaction

$\frac{d[C]}{dt} = 1 \text{ mol } L^{-1} s^{-1}$

$2A + B = 2C + 3D$

$$-\frac{1}{2}\left[\frac{d(A)}{dt}\right] = -\frac{d[B]}{dt} = \frac{1}{2}\frac{d[C]}{dt} = \frac{1}{3}\left[\frac{d[D]}{dt}\right]$$

$$-\frac{1}{2}\frac{d[A]}{dt} = \frac{1}{2}[1]$$

$$\frac{d[A]}{dt} = 1 \qquad \frac{d[B]}{dt} = \frac{1}{3}\frac{d[D]}{dt}$$

$$0.5 \times 3 = \frac{d[B]}{dt}$$

$$\frac{d[B]}{dt} = 1.5$$

Ques → find the volume of a gas having 2 mole at N.T.P.

Sol→ At N.T.P –

For 1 mole = 22.4 ltr

2 mole = 2×22.4 l = 44.8 l.

Ques → How much CO_2 is formed on burning 24 gm Carbon.

Sol→ $C + O_2 \longrightarrow CO_2$

12 → 12+32 = 44

12 gm Carbon on burn = 44 gm CO_2

24 gm " " " = $\frac{44}{\cancel{12}} \times \overset{2}{\cancel{24}}$ gm CO_2

= 88 gm CO_2

Ques→3→ Find the hydroxide ion conc for a solution whose pH is 10

Sol→ $p^H = 10$ $p^{OH} = ?$

$p^H + p^{OH} = 14$

$p^{OH} = 14 - 10$

$\boxed{p^{OH} = 04}$

Ques→ Find the pH of $N/_{500}$ HCl Soln.

Sol→ $\frac{1}{500}$ N HCl

$= [H^+] = \frac{1}{500} = .002 = 2 \times 10^{-3}$

$p^H = -\log[H^+] = -\log(2 \times 10^{-3}] = -[\log 2 + \log 10^{-3}]$

$= -\log 2 + 3 \log 10$

$= -.3010 + 3$

$\boxed{p^H = 2.697}$

Ques → Cl has two isotopes $_{17}Cl^{35}$ and $_{17}Cl^{37}$. if its average atomic mass is 35.5. find their % age

Sol →

(75%)	(25%)
$_{17}C^{35}$	$_{17}C^{37}$
X %	(100-X) %

$$35.5 = 35 \times \frac{X}{100} + 37 \times \frac{(100-X)}{100}$$

$$3550 = 35X + 3700 - 37X$$

$$2X = 150$$

$$X = 75\%$$

Ques → Calculate the no. of faraday for 20 gm $CuSO_4$ (Z or ECE = 1/500)

Ans → $M = zit \Rightarrow m = zq$

$$q = \frac{m}{z} = \frac{20}{1/500} = 10000\ C$$

$$1F = 96500\ C$$

$$\text{no. of Faraday} = \frac{10000}{96500} = 0.9$$

Ques-19 → How many gram of mg will have the same no. of atoms ~~in one gram~~ as 6 gm of Carban (Mg 24, C=12)

Let x gm = Mg

Atomic mass = 24

$$\frac{\text{Weight of mg}}{\text{atomic wt}} = \frac{\text{No. of atoms}}{AV}$$

$$\frac{x}{24}(AV) = \text{No. of atoms} \quad \text{--- (2)}$$

Atomic weight = C = 12

Weight of Carban = 6 gm

$$\frac{\text{No. of atoms}}{\text{Avagedro}} = \frac{\text{Wt. of carban}}{\text{atomic weight}}$$

$$\text{No. of atoms} = \frac{6}{12} \times (AV) \quad \text{--- (1)}$$

In Given the No. of atoms is same than eq (1) = eq (2)

$$\frac{x}{24_{12}}(AV) = \frac{6}{2\,12}(AV)$$

$$\boxed{x = 12 \text{ gm}}$$

Ques-20 → The mass of one atom of an elements X is 2.0×10^{-23} gm

(i) Calculate the atomic mass of X.

Sol → No. of atom = 1

Wt of element (X) = 2.0×10^{-23}

$$\frac{\text{Weight of element}}{\text{atomic mass}} = \frac{\text{No. of atoms}}{6.02 \times 10^{23}}$$

$$\frac{2.0 \times 10^{-23}}{\text{atomic mass of X}} = \frac{1}{6.02 \times 10^{23}}$$

Atomic mass of X = $12.04 \times 10^{-23} \times 10^{23}$

= 12.04 Ans (Carban)

(ii) What could element X be ?

Given → Atomic weight = 40 + 12 + 48 = 100

$$\frac{\text{Mass (weight)}}{\text{Atomic weight}} = \frac{\text{No. of atoms}}{6.02 \times 10^{23}}$$

$$\text{mass} = \frac{1 \times 100}{6.02} \times 10^{-23}$$

$$= \frac{1000}{602} \times 10^{-22}$$

$$= 301$$

mass of X = 1.66×10^{-22} gm

$$301 \overline{)500}\ (1.66$$

301

1990

1806

1840

Ques The molecular formula of sulphuric acid is H_2SO_4

(i) Calculate the molecular mass of H_2SO_4.

Atomic mass of $H_2SO_4 = 2\times1 + 32 + 4\times16$

$= 2 + 32 + 64$

Molecular mass of $H_2SO_4 = 98$

(ii) How many moles are there in 9.8 gm of H_2SO_4

$$\text{No. of moles} = \frac{\text{Weight in Substance (gm)}}{\text{Atomic weight}}$$

$$= \frac{9.8}{98} = \frac{1}{10} = .1 \text{ mole}$$

(iii) How many gram-atoms of each elements are there in 9.8 gm of sulphuric acid

$$\frac{\text{Weight}}{\text{Atomic weight}} = \frac{\text{No. of atoms}}{6.02\times10^{23}}$$

$$\frac{9.8}{98_{10}} = \frac{\text{No. of atoms}}{6.02\times10^{23}}$$

$$\text{No. of atoms} = \frac{6.02\times10^{23}}{10} = \cancel{60.2\times}$$

$$= 6.02\times10^{22} \text{ atoms}$$

---

98 gm Sulfuric acid $= 6.02\times10^{23}$

$$9.8 \text{ gm} = \frac{6.02\times10^{23}}{\cancel{98}_{10}} \times \cancel{9.8}$$

$$= 6.02\times10^{22} \text{ atoms}$$

$H_2SO_4 \longrightarrow 2H^+ + SO_4^{--}$

Ques-16 → What mass of Oxygen, O_2 will contain the same number of molecules as.

Atomic mass O_2 = 32

$$\text{No. of moles} = \frac{\text{No. of molecules}}{6.02 \times 10^{23}} = \frac{\text{mass weigh}}{\text{atomic}}$$

$$\text{No. of molecules} = \frac{\text{Mass of } O_2}{32} \times (AV) \quad --- (1)$$

(a) → 2.5 moles of Chlorin, Cl_2 →

Atomic mass = 35.5 × 2 = 71

$$2.5 \text{ moles} = \frac{\text{No. of molecules } (Cl_2)}{(AV)}$$

$$\text{No. of molecules} = 2.5 \times (AV) \quad --- (2)$$

equation (1) = equation (2)

$$\frac{\text{Mass of } O_2}{32} \times (AV) = 2.5 \times (AV)$$

$$\text{mass of } O_2 = 32 \times 2.5 = 32 \times \frac{25}{100}$$

$$\boxed{\text{mass of } O_2 = 8 \text{ gm.}}$$

(b) → 6.4 gm of sulphur dioxide (SO_2) →

atomic weight SO_2 = 32 + 32 = 64

$$\frac{\text{No. of molecules}}{(AV)} = \frac{\text{Weight}}{\text{Atomic mass}}$$

$$\text{No. of molecules} = \frac{6.4}{64} \times AV$$

$$\text{No. of molecules} = \frac{1}{10} \times (AV) \quad --- (3)$$

equation (1) = equation (3)

$$\frac{\text{mass of } O_2}{32} \times (AV) = \frac{1}{10} (AV)$$

$$\boxed{\text{mass of } O_2 = 3.2 \text{ gm}}$$

(c) 6.023×10^{22} molecules of water.

equation (1) Put value of molecules,

$$6.023 \times 10^{22} = \frac{\text{mass of } O_2}{32} \times 6.023 \times 10^{23}$$

$$\frac{1}{10} = \frac{\text{mass of } O_2}{32}$$

$$\boxed{\text{mass of } O_2 = 3.2 \text{ gm}}$$

Ques → Calculate the ratio of molecules present in 16 gm of methane (CH_4) and 16 gm of O_2

Ans →

Atomic mass of (CH_4)
$= 12 + 4 = 16$

No. of moles $= \frac{\text{mass}}{\text{Atomic mass}}$

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

No. of moles $= \frac{\text{No. of molecule}}{AV}$

No. of molecules $= (AV)$ ----(1)

Atomic mass of O_2
$= 16 \times 2 = 32$

No. of moles $= \frac{\text{mass}}{\text{atomic mass}}$

$= \frac{16}{32} = \frac{1}{2}$

No. of moles $= \frac{\text{No. of molecule}}{(AV)}$

$\frac{1}{2}(AV) =$ No. of molecules ----(2)

Condition → $\frac{\text{equation (1)}}{\text{equation (2)}} =$

$\frac{\text{No. of molecules } (CH_4)}{\text{" " " } O_2} = \frac{AV}{\frac{1}{2}AV} = \frac{2}{1}$

$= 2 : 1$ **Ans**

PHYSICS PORTION

Motion
(Part-1)

Scalar quantity ⇒ Magitude ki जरूरत होती है

Ex – ~~Direction~~, distance, time.

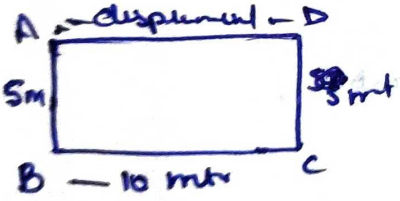
Vectore quantity ⇒ Need Direction & magnitude

Ex – force

Distance	**Displacement**
(1) Total lenght of moving Path body is known as distance	⇒ Shorlest distance ~~Path~~ between initial and final Point is known as Displacemt
(2) Scalar quantity	⇒ Victor quantity
(3) Can not zero	⇒ zero ho sakta hai
(4) Unit – mtr	mtr

Que ⇒ In the figure distance and displacement.

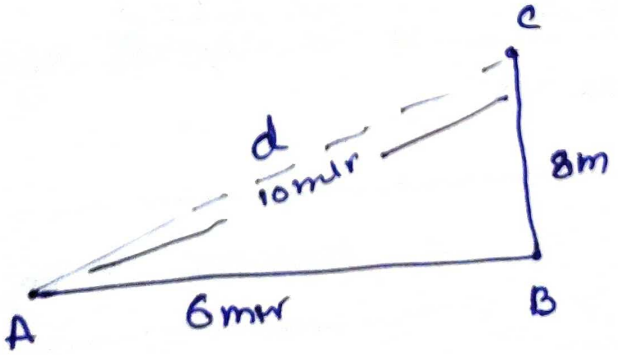
(1)



distance = 5 + 10 + 5 = 20 mtr

displacemt = 10 mtr

(2)



dista = 6 + 8 = 14 mtr

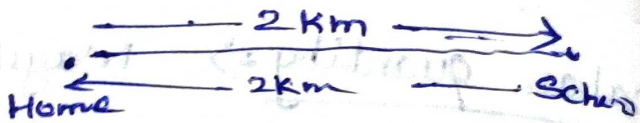
displacemt = $d^2 = AB^2 + BC^2$

$= 36 + 64$

$d = 10$ mtr

Ex:- Ram goes to his school from home at 2Km, and due to clousing he return to home find distance and displacement.

Soln



distance = 2 + 2 = 4 Km

displacement = Final Distn - initial Distance

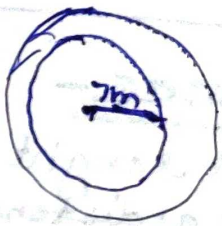
= 2 Km - 2 Km

= 0

Distance = 1 Round = $2\pi r$

$= 2.\frac{22}{7}.$

= 44 mtr



~~2 Round~~ = displacement. = 0 mtr

02 Round ⇒ distance = 2 × 44 mt = 88 m

" ⇒ displacement = 0

1 1/2 Round = 44 + 22 = 66 mtr

displacement = 2r = 14 mtr.

Part-2

The ratio of distance to the time of any body is known as **Speed**

⇒ $V = \frac{\text{distance}}{\text{time}}$

⇒ Scalar quantity

⇒ Unit = m/s

⇒ For moving body never zero

The ratio of distance (Displacement) to the time is known as **Velocity**.

⇒ $V = \frac{\text{displacement}}{\text{time}}$

⇒ Vector quantity

⇒ Unit. m/s.

⇒ Can be zero

$$1\ \text{Km/H} = \frac{\overset{5}{\cancel{1000}}\ \text{mtr}}{\underset{3}{\cancel{60}} \times 60\ \text{sec}} = \frac{5}{18}\ \text{mtr/sec}$$

Ques - A Car travels ? 1200 mtr × 2 mint find speed in m/s and Km/hr

$$\text{Speed} = \frac{\text{dis}}{\text{time}} = \frac{\overset{20}{\cancel{1200}}\ \text{mtr}}{2 \times \cancel{60}\ \text{sec}} = 10\ \text{m/s}$$

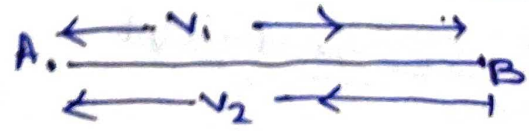
$$\text{Speed} = \frac{\overset{6}{\cancel{1200}}}{\cancel{10000}} \frac{\cancel{60}}{\cancel{2}} = 36\ \text{Km/sec Hrs}$$

$$\text{Avarage Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

$$\text{Avarage Velocity (Displa)} = \frac{\text{Total Displacement}}{\text{Total Time}}$$

$$\boxed{\text{Avarage Speed} = \frac{2V_1 \cdot V_2}{V_1 + V_2}}$$

Ques



$V_1 = 36\ \text{Km/H}$

$V_2 = 18\ \text{Km/H}$

$$\text{Vav} = \frac{2V_1V_2}{V_1 + V_2} = \frac{2 \times 36 \times 18}{36 + 18} = \frac{\overset{2}{\cancel{2}} \times 36 \times \overset{1}{\cancel{18}}}{\underset{1}{\cancel{18}} \times \cancel{3}}$$

$$= 24\ \text{K/Hr}$$

Part-3

Kinematic

Acceleration → $a = \frac{\text{Change of velocity}}{\text{Time}}$

$$a = \frac{v-u}{t} \quad m/s^2$$

The rate of Change of velocity of a body is known as Acceleration.

Equation of motion →

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

(iii) $v^2 = u^2 + 2as$

u = Initial velocity
v = final velocity
t = time
s = displacement
a = acceleration

Ques → 1st = $v = u + at$

by = $a = \frac{v-u}{t}$ --

$at = v - u$

$v = u + at$

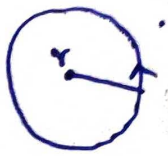
(2) → ~~Distance = Speed × time~~

$s = \frac{u+v}{2} \times t$

$s = \frac{ut + ut + at}{2}$

=

Uniform Circular method → When a body is revolving in a circular path, when the speed of this body is constant.



Suppose the radius of this circular path is r. and t is the time taken in one round.

$$v = \frac{2\pi r}{t}$$

Numricals →

Ques - $v = 36$ Km/Hrs , $u = 0$

$= \frac{36 \times 1000}{60 \times 60}$

$= 10$ m/s

$t = 10$ sec , $a = ?$

$v = u + at$

$10 = 0 + a\,10$

$a = 1$ m/sec^2

Ques → $u = 0.5$ m/s

Solut $a = -0.05$ m/sec^2

$t = ?$

$v = 0$.

$v = u + at$

$0 = 0.5 + (-0.05)t$

$t = \frac{0.5}{.05} = \frac{5 \times 100}{5 \times 1} = 10$ sec

Ques → $a = 4$ m/sec^2

$u = 0$,

$t = 10$ sec

$S = ?$

$S = ut + 1/2\, at^2$

$= 0 \times 10 + 1/2\, 4 \cdot 100^2$

$S = 200$ mtr

Ques → $u \Rightarrow 20$ Km/H,

$= \frac{20 \times 1000}{60 \times 60} = \frac{50}{9}$ m/se.

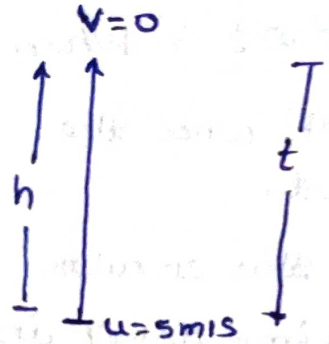
$t = 8$ sec , $a = ?$

$v = 60$ Km/Hr.

$= \frac{60 \times 1000}{60 \times 60} = \frac{150}{9}$ m/s

$v = u + at$ .. $a = \frac{100}{9 \times 8} = \frac{50}{27}$ m/s^2

Ques →



$t = ?$

$a = -10 m/sec^2$

$v = u + at$

$0 = 5 + (-10)t$

$10t = 5$

$t = 1/2$ sec.

$s = ut + 1/2 at^2$

$h = 5 \cdot 1/2 + 1/2 (-10)(\frac{1}{2})^2$

$= 5/2 + \frac{(-5)}{4}$

$= \frac{10 - 5}{4} = +5/4 = 1.25 m$

Drive Equation of motion →

1st Equation → suppose a body has initial velocity u moving under a uniform acceleration motion and the time t, its final velocity is v,

$$a = \frac{v - u}{t}$$

$$at = v - u$$

$$\boxed{v = u + at} \quad \text{--- (1)}$$

IInd Equation → suppose the distance travelled by the body is s.

So → s = avarage velocity × time

$$s = \frac{u + v}{2} \times t$$

$$s = \frac{u + u + at}{2} \times t$$

$$s = \left(\frac{2u + at}{2}\right) t$$

$$\boxed{s = ut + \frac{1}{2} at^2}$$

IIIrd Equation → Again the distance travelled

$$s = \frac{u + v}{2} \times t$$

From equn (1) $v = u + at$

$t = \frac{v - u}{a}$

$$s = \left(\frac{u + v}{2}\right)\left(\frac{v - u}{a}\right) = \frac{v^2 - u^2}{2a} \Rightarrow s = \frac{v^2 - u^2}{2a}$$

$$\boxed{v^2 = u^2 + 2as}$$

ERROR PART-1

The difference in the value, which is true and Expreimental is known as Error.

Type of Error →

(1) Absalute Error
(2) Relative Error
(3) Presentage Error.

(i) Absalute Error → The difference between Expremental value and True value is known as absalute Error.

> Absalute Error (Δa) = True value ~ Experemental value

(2) Relative Error →

It is the ratio of absalute Error (Δa) and its true value(a).

$$\text{Relative Error} = \frac{\Delta a}{a}$$

(3). Precentage Error → If a relative Error is represented in the from of %age, then it is known as %age Error.

$$\text{Precentage Error} = \frac{\Delta a}{a} \times 100 \ \%$$

Ques → The value of gravity is $9.8\ m/s^2$. If it is measured $10\ m/s^2$ find

(i) Absolute Error (ii) Relative Error

(iii) Precentage Error

Solution →

(i) Absolute Error = Measured value - True value

$$\Delta a = 10 - 9.8$$

$$\boxed{\Delta a = 0.2\ m/s^2}$$

(ii) Relative Error → $= \dfrac{\text{absolute Error}}{\text{True value}} = \dfrac{\Delta a}{a}$

$$= \frac{.2}{9.8\ 49} = \frac{1}{49} = 0.02 \text{ (Approx)}$$

$$= .02 \text{ (Approx)}$$

(iii) Precentage Error = (Relative Error) X100

$$= \left(\frac{\Delta a}{a}\right) X100$$

$$= \frac{.2}{9.8} X100$$

$$= 1/49\ X100$$

$$= 2\%. \text{ (Approx}$$

Rules →

(i) $y = a + b$

$$\boxed{\Delta y = \Delta a + \Delta b}$$

(ii) $y = ab$

$$\left|\frac{\Delta y}{y}\right| \times 100 = \left|\frac{\Delta a}{a}\right| \times 100 + \left(\frac{\Delta b}{b}\right) \times 100$$

(iii) $y = a/b$

$$\text{min} = \left|\frac{\Delta y}{y}\right| \times 100 = \left(\frac{\Delta a}{a}\right) 100 - \left(\frac{\Delta b}{b}\right) \times 100$$

Imp

$$\text{max} = \left[\frac{\Delta y}{y}\right] \times 100 = \left(\frac{\Delta a}{a}\right) 100 + \left(\frac{\Delta b}{b}\right) \times 100$$

(iv) → $y = a^b$

$$\left(\frac{\Delta y}{y}\right) 100 = b\left[\frac{\Delta a}{a}\right] \times 100$$

Ques → A quantity $y = \frac{a^2 b^2}{c\sqrt{d}}$ it the Precentage Error in a, b, c, d are 6%, 4%, 3%, and 2%.

Find Error in y.

Solution → Given ⇒ $a = 6\%$

$b = 4\%$

$c = 3\%$

$d = 2\%$

$$y = \frac{a^2 b^2}{c\sqrt{d}} = \frac{a^2 b^2}{c(d)^{1/2}}$$

$$\text{max} = \left[\frac{\Delta y}{y}\right] \times 100 = 2\left[\frac{\Delta a}{a}\right] \times 100 + 2\left[\frac{\Delta b}{b}\right] \times 100 + \left[\frac{\Delta c}{c}\right] \times 100 + \frac{1}{2}\left[\frac{\Delta d}{d}\right] \times 100$$

$$= 2 \times 6 + 2 \times 4 + 3 + \frac{1}{2} 2$$

$$= 12 + 8 + 3 + 1$$

$$= 24\ \%$$

Ques → The radius of a sphere is 4 ± 0.3

Find its %age in volume.

Solution → Radius $r = 4$

Error $\Delta r = 0.3$

Volume of Sphere $V = 4/3\ \pi (r^3)$

$$\text{Error form} = \left[\frac{\Delta V}{V}\right] \times 100 = 3\left[\frac{\Delta r}{r}\right] \times 100$$

$$= 3\left[\frac{0.3}{4}\right] \times 100$$

$$= .9 \times 25$$

$$= 22.5\ \%$$

Ques → The length of and breadth of a rectangle is 4 mtr and 3 mtr. If there least count is 0.1 then find its precentage Error

Solution → $l = 4$ mtr , $b = 3$ mtr

$\Delta l = .1$ mtr $\quad \Delta b = .1$ mtr

Area of Rectangle $= l \times b$

$$A = l \times b$$

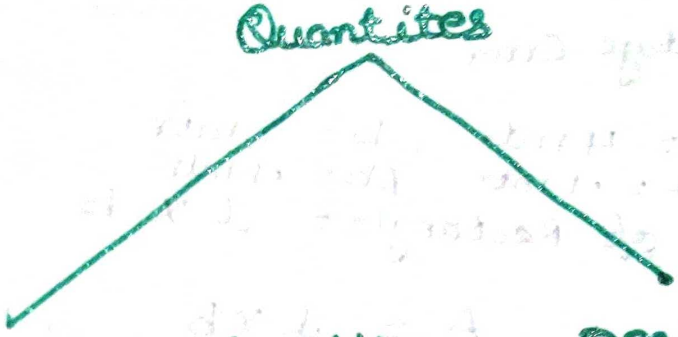
$$\left[\frac{\Delta A}{A}\right] \times 100 = \left(\frac{\Delta l}{l}\right) \times 100 + \left[\frac{\Delta b}{b}\right] \times 100$$

$$= \frac{.1}{4} \times 100^{25} + \frac{.1}{3} \times 100$$

$$= 2.5 + 3.3$$

$$= 5.8\%.$$

DIMENSION ANALYSIS



(Which does not depend to other and has self units)

(Which depends on other and its unit obtain from other quantity.)

Ex→ ~~Displacement~~

Distance – Metre

Mass – Kilogram

Time – Second

Ex→

(1) Speed = $\frac{\text{distance}}{\text{time}}$ m/s

(2) Acceleration = $\frac{\text{Change in velocity}}{\text{Time}}$

Unit - m/s^2

Dimension → It is Expression for Fundamental Quantites.

Quantites	Dimension
(1) Distance	L
(2) Mass	M
(3) Time	T
(4). Current	A
(5) Temprature	Θ

Dimension Formula- It is expression of unit of physical Quantites in terms of the Fundamental Quantites.

It is Express as = $[M^a L^b T^c]$

Examples→

(1) Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{[L]}{[T]} = [LT^{-1}]$

(2). Acceleration = $\frac{\text{Change of velocity}}{\text{Time}} = \frac{[L]/[T]}{[T]} = [LT^{-2}]$

3→ Force = Mass × acceleration

$= [M] \times [LT^{-2}] = [MLT^{-2}]$

4→ Work = Force × displacement

$= [MLT^{-2}] \times [L] = [ML^2T^{-1}]$

(5) Pressure = $\frac{\text{Force}}{\text{Area}} = \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$

(6) Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{[M]}{[L^3]} = [ML^{-3}]$

(7) Momenthum = Mass × velocity = $[M] \times [LT^{-1}] = [MLT^{-1}]$

(8) Impulse = Force × Time = $[MLT^{-2}]\,[T] = [MLT^{-1}]$

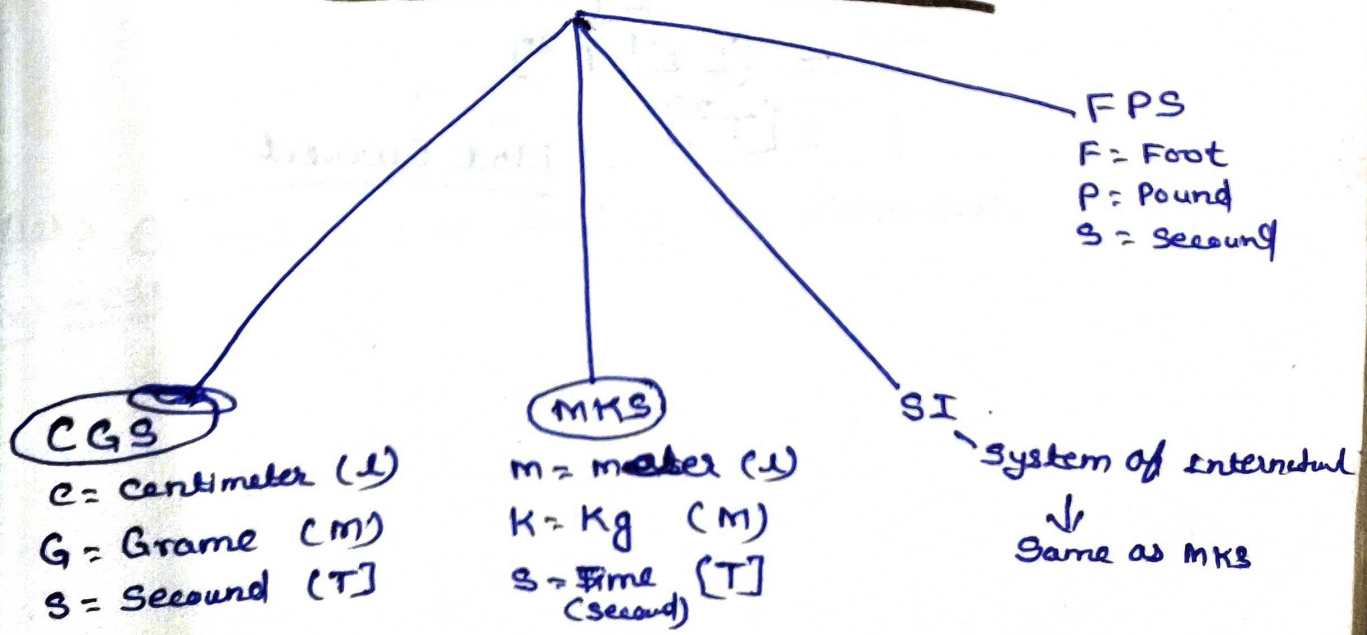
3→ Gravitational Constant ⇒

$$F = G\frac{m_1 m_2}{r^2}$$

$$G = \frac{Fr^2}{m_1 m_2} = \frac{[MLT^{-2}][L^2]}{[M^2]}$$

$$= [M^{-1}L^3T^{-2}]$$

Unit School System



Neumricals

Ques-1→ Check the relation $S = ut + \frac{1}{2}at^2$ is dimensionaly correct or not.

Solution → $S = ut + 1/2\,at^2$

LHS

$S = [L]$ ---①

RHS

$= ut + 1/2\,at^2$

$= [LT^{-1}][T] + \frac{1}{2}[LT^{-2}][T^2]$

$= L + \frac{1}{2}[L]$

$= [L]$

LHS = RHS → Yes it is dimensionaly correct.

Ques - Check the relation $T = 2\pi(l/g)$ is dimensionaly correct or not.

$T = 2\pi(l/g)$

$[T] = 2\pi\frac{[L]}{LT^{-2}}$

$= [L\,L^{-1}\,T^2]$

$= [T^2]$

Not correct.

Ques → Speed of Car is 36 Km/Hrs. Convert it into m/s by Dimension.

Solution → Dim of speed = L^1T^{-1}

$$n_2 = n_1\left[\frac{L_1}{L_2}\right]^1\left[\frac{T_1}{T_2}\right]^{-1}$$

$$= 36\left[\frac{Km}{mtr}\right]^1\left[\frac{HRS}{sec}\right]^{-1}$$

$$= 36\left[\frac{1000\,mtr}{mtr}\right]^1 \times \left[\frac{sec}{3600\,sec}\right]^1$$

$$\boxed{n_2 = 10\ m/sec}$$

Ques → Convert 1 Newton into dyne by dimmonsion.

Solution → Dimension of force = $[MLT^{-2}]$

MKS → CGS

$$n_2 = n_1\left[\frac{M_1}{M_2}\right]^1 \times \left[\frac{L_1}{L_2}\right]^1\left[\frac{T_1}{T_2}\right]^{-2}$$

$$= n_1\left[\frac{kg}{gm}\right] \times \left[\frac{meter}{cm}\right]\left[\frac{sec}{sec}\right]^{-2}$$

$$= 1\left[\frac{1000gm}{gm}\right] \times \left[\frac{100\,cm}{cm}\right]$$

$$= 1 \times 10^3 \times 10^2$$

$$\boxed{n_2 = 10^5\ dyne}$$

Ques → Convert 1 Jule to Erg by Dimension.

MKS → CGS

Marking Formula →

Ques → Time period of simple pendulum depends on its length and acceleration due to gravity, derive a relation b/w them by dimensions

Solution ⇒ $T \propto l \; g$

$$T = K l^a g^b \quad ---(1)$$

Dimension both side

$$[T] = K [L]^a [LT^{-2}]^b$$

$$[L]^0 [T]^1 = K [L^{a+b}] [T^{-2b}]$$

Comparing both side

$$a + b = 0 \quad \text{and} \quad -2b = 1$$

$$b = -1/2$$

$$a - 1/2 = 0 \qquad a = +1/2$$

Put the value a and b in equation (1)

$$T = K l^{1/2} \cdot g^{-1/2}$$

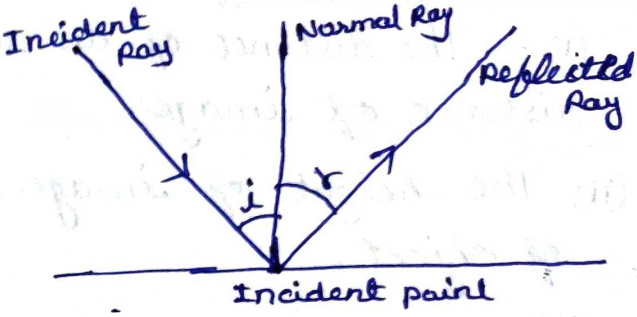
$$T = K \frac{l^{1/2}}{g^{1/2}}$$

$$\boxed{T = K \sqrt{l/g}}$$

Light Optic

Reflection of light -

"The process of bouncing back of light after falling on the surface of an object is called reflection of light.



Angle of Incident = i

Angle of Reflection = r

Law of reflection →

(1) Incident Ray, Reflected Ray and Normal ray all lie in same surface (Plane).

(2) - Angle of Reflection (r) is equal to Angle of Incidence (i) $\angle i = \angle r$

Image → The ray coming from a object to meet or appear (virtual) to meet at a point after reflection & refraction is known as its image.

Type of Image

(1) Real Image	(2) Virtual Image
(a) In this image, after reflection, rays actually meet.	(a) In this image, after reflection, rays apper melt.
(b) It is always inverted. (उल्टा)	(b) It is always erect.
(c) This image obtain on screen	(c) This image can not obtain on screen.

Mirror → It is two tyes.

(I) Plane Mirror

(II) Spherical Mirror.

(i) Plane Mirror →

(i) - The distance of an object is equal to the distance of image.

(ii) The height of image is equal to the height of object.

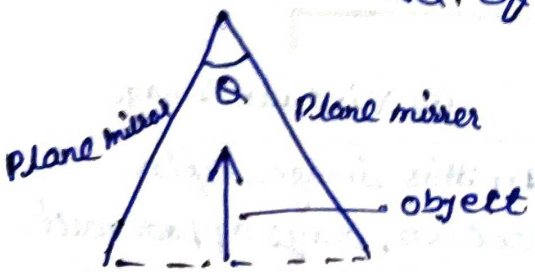
(iii) IF we want to see our full length in plane mirror then ~~the~~ its height should be minimum half (½) to our length.

(iv) The focal length of plane mirror is infinity (∞)

(v) Image formed by plane mirror is alway Vertical and erect.

IF two plane mirror inclined to each other by an angle Q. then the number of images of an object situated between them.

No. Of image $\boxed{N = \frac{360}{Q} - 1}$



Ques → $Q = 60^\circ$ $N = ?$

No. Of image $N = \frac{360}{Q} - 1$

$= \frac{360}{60} - 1 = 6 - 1$

$\boxed{N = 5}$

agar No. Of image point में आये तो पुराना वाला No लिया जाता है

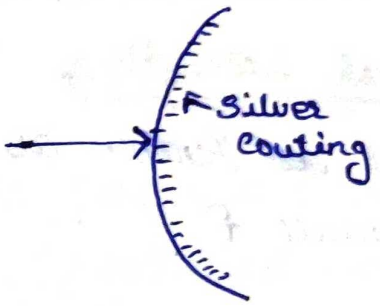
(ii) Spherical Mirror →

Spherical mirror is cut out from Hollow Sphere of ~~gale~~ glass. It is two types.

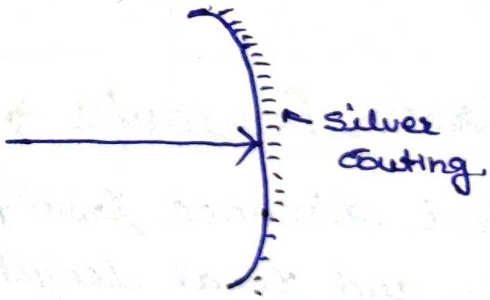
(i) Convex mirror

(ii) Concave mirror

(i) Convex mirror → In this mirror refluction take place from bulging surface.
(उभरा हुआ)



(ii) Concave mirror → In this type of mirror reflection take place from bent surface



Some turms →

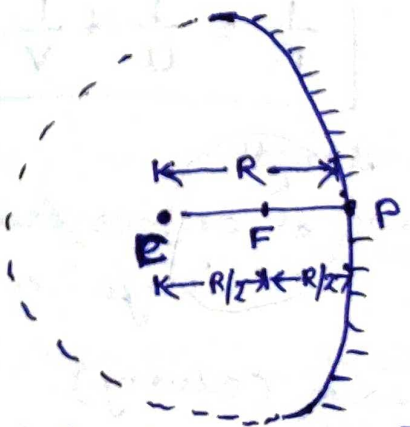
C = Centre of Curvature

~~PC = Pole to~~

CP = Principle axis

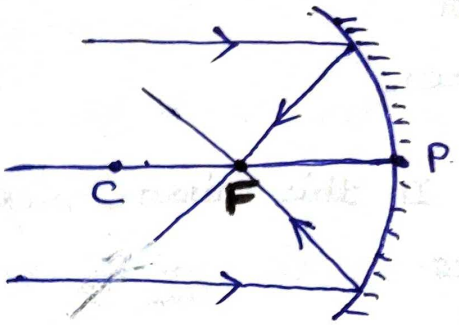
PF = Focal length

Distane from Pole to centere of Curvature PC = R
(Radus of Sphere)

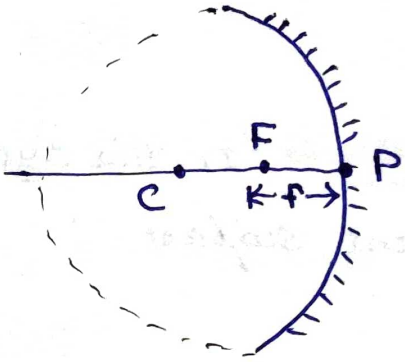


FP = Pole to Focule length = Focal length = R/2
= ~~Radius~~ .

Focal → In any Sherical Mirror, after the reflation Paraller Incident Ray, meet at a point. which is known as focal point of mirror. it is represented by capital F.



Focal Length → The distance between pole and focal is known as focal length, it is represented by small f.



Mirror Formula → The reation between object distance from pole, image distance from pole and focal length is known as mirror formula. which is follows.

$$\frac{1}{F} = \frac{1}{U} + \frac{1}{V}$$

F = Focal length
U = distance of object from pole
V = " " image " "

U = -ve (always)
F = +ve (convex mirror)
F = -ve (Concave mirror

Linear Magnification →

"The ratio of height of image to the height of object is known as linear magnification"

$$m = \frac{h_2}{h_1} = \frac{\text{height of image}}{\text{height of object}}$$

or $$m = -\frac{v}{u}$$

So $$m = \frac{h_2}{h_1} = -\frac{v}{u}$$

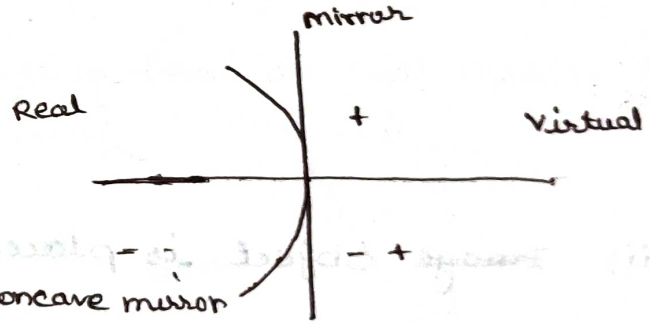
Nature of Image

(उल्टा)

m or h_2 = -ive (Real and inverted)

m or h_2 = +ive (~~Real~~ Virtual and erect (सीधा))

Sign ⇒



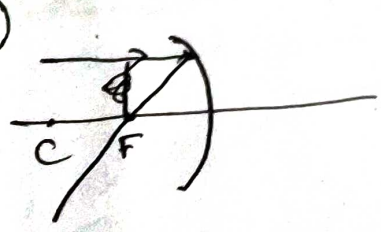
For Convex mirror	For concave mirror
(i) u = - ive	(i) u = - ve
(ii) f = + ve	(ii) f = - ve
(iii) v = + ve (always Formed virtual image)	(iii) v = - ve (For Real Image) v = + ve (For Virtual Image)

Condition ⇒ h_2 or m = - ve → Real

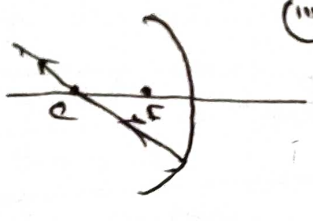
" " " = +ve → Vertual

Rule for image formation by Concave mirror

(1)



(2)



(iii)

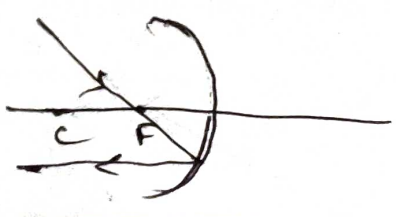
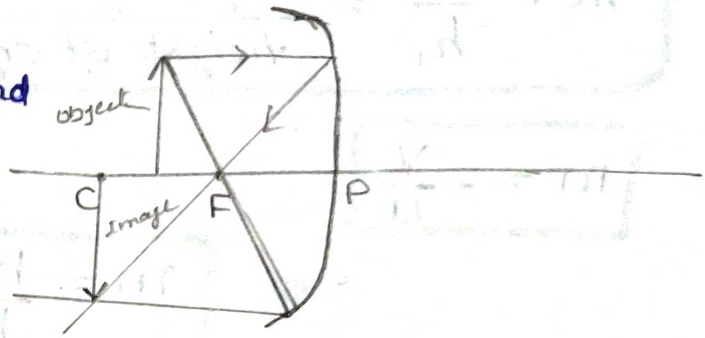


Image formed by concave mirror →

(I) ⇒ If object is placed between focal and Centre of Curvature.

Image = Real and Inverted



(ii) When object placed on centere of Cervature, ⇒

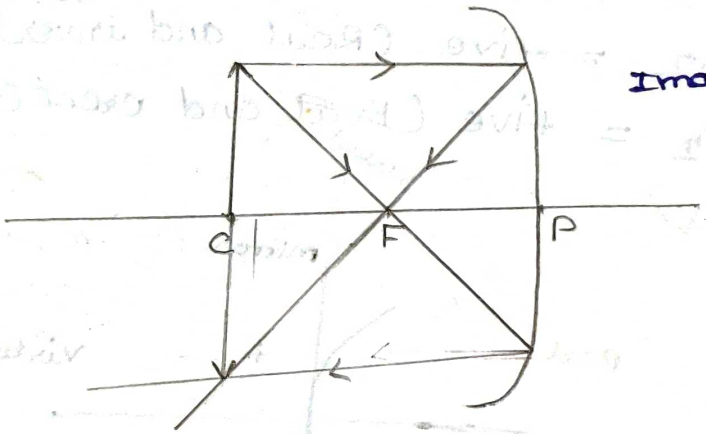


Image Real & Inverted

(iii) ~~Image~~ object is placed on object of C.

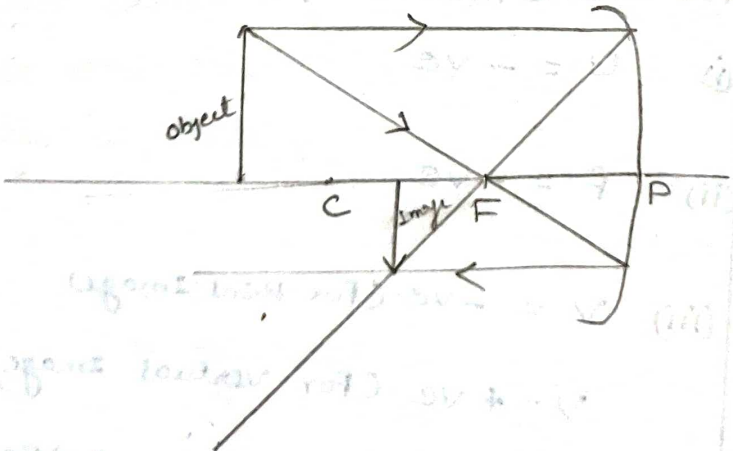
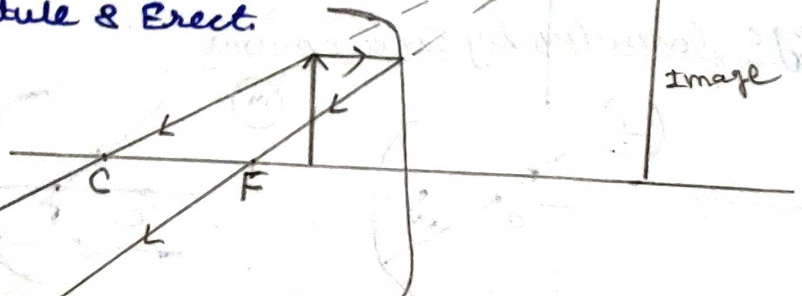


Image
Real & Inverted.

(iv) → When ~~Imo~~ object placed between F and P.

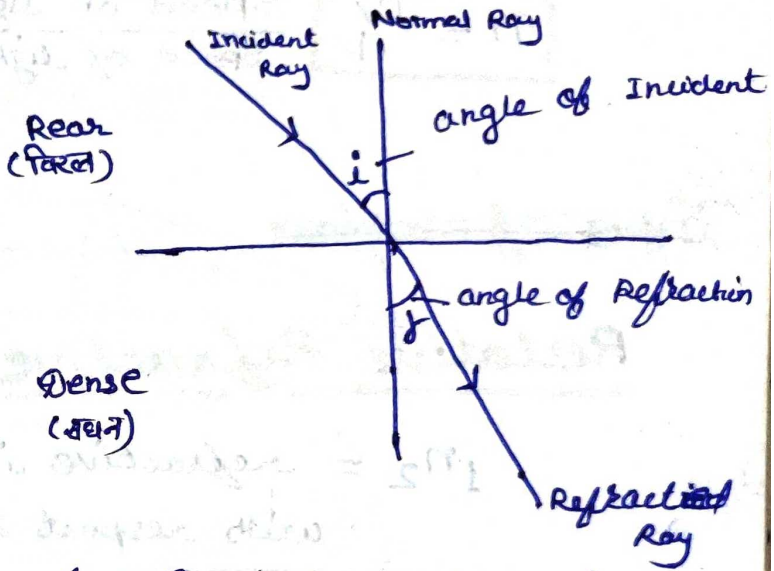
⇒ Image - vertule & Erect.



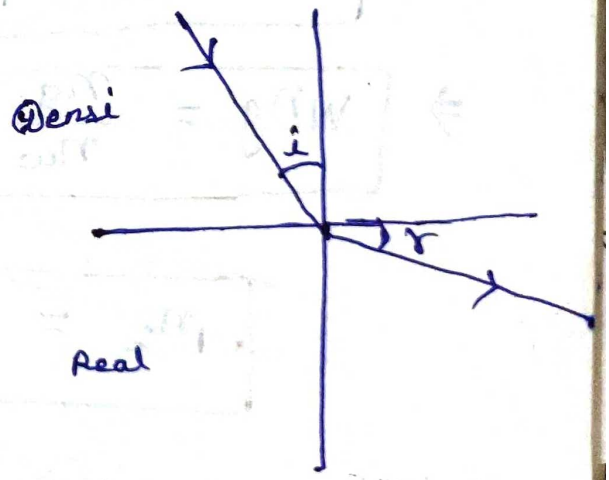
Refraction of light :

The binding of light, when it goes from one medium to another medium, is known as refraction of light.

(i) When a light ray goes from rear (विरल) to dense (सघन) medium, then its bend toward the normal.



(ii) When light rays goes from Densi to Real medium it bend away from the normal



Condition → $V_R > V_D$

[Speed of light $V_R = V_D$]

Low of Refraction of light → Two laws

(i)- Incident ray, refracted ray and normal ray all lie in the same surface.

II law → The ratio of sin of angle of Incident ray to the sin of angle of refraction is always constant.

Snell law

$$\frac{\sin i}{\sin r} = \text{Constant}$$

Refractive Index - (n) →

The ratio of ~~see~~ speed of light in air and the speed of light in any medium is known as refractive index, of that medium, it is represented by 'n', it has no Unit.

$$n = \frac{c}{v}$$ Speed of light in air / Speed of light in any medium

~~Type of refra~~

Relative Refractive index →

${}_1n_2$ = refractive index of medium 2nd with respect to 1st medium.

$$ {}_1n_2 = \frac{n_2}{n_1} $$

$$\Rightarrow {}_wn_g = \frac{n_g}{n_w}$$

g = glass
w = water

$$ {}_1n_2 = \frac{1}{{}_2n_1} $$

Note →

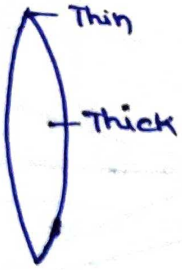
① $n_1 > n_2$
than $v_1 < v_2$

② ~~$n_1 < n_2$~~ $v_R > v_D$
~~than~~ $n_R < n_D$

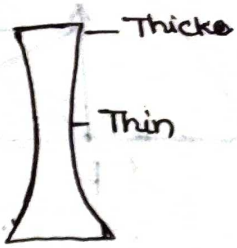
Lens

Lens are two types

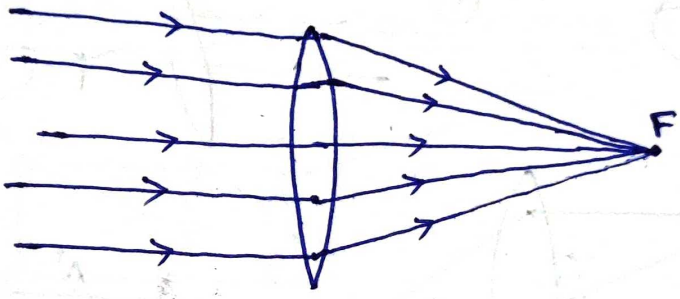
(i) Convex lens



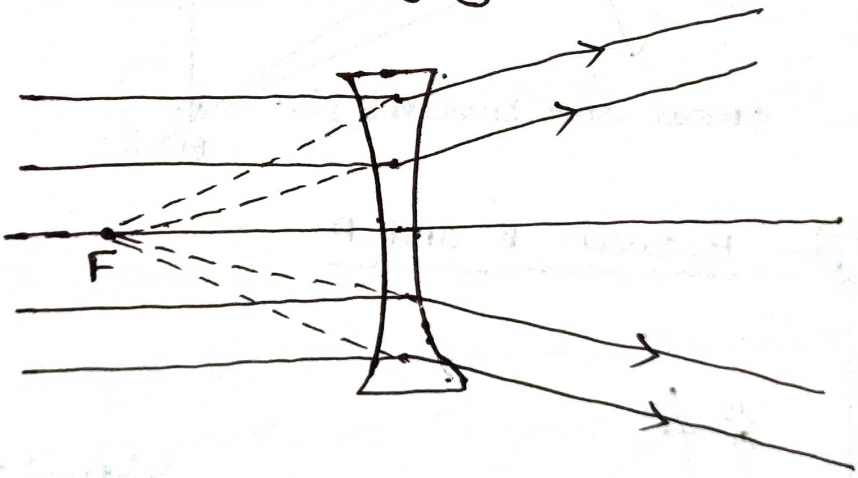
(ii) Concave lens



(1) Convex lens & Converging lens →



(2) Concave lens and Diverging lens →



Lens Formula →

$$\frac{1}{F} = \frac{1}{V} - \frac{1}{U}$$

Magnification →

$$m = \frac{h_2}{h_1} = \frac{V}{U}$$

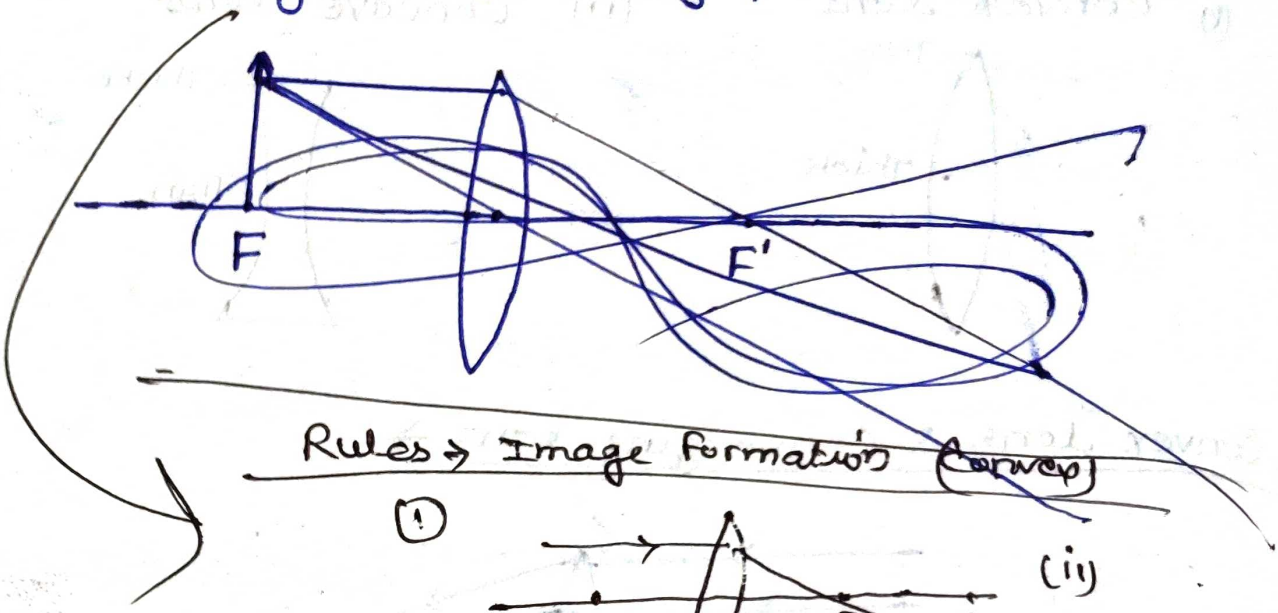
Sign

Convex lens.
U = - ive
F = + ive, V = + ive (Real)
V = - ive (Virtual)

Concave lens
-U, -F, and -V = - ve
(always virtual)

Image formation by Convex Lens →

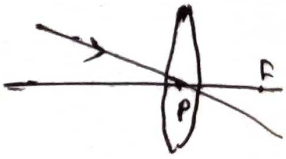
Case- 1st → Beyond F (Att any paint)



Rules → Image formation (Convex)

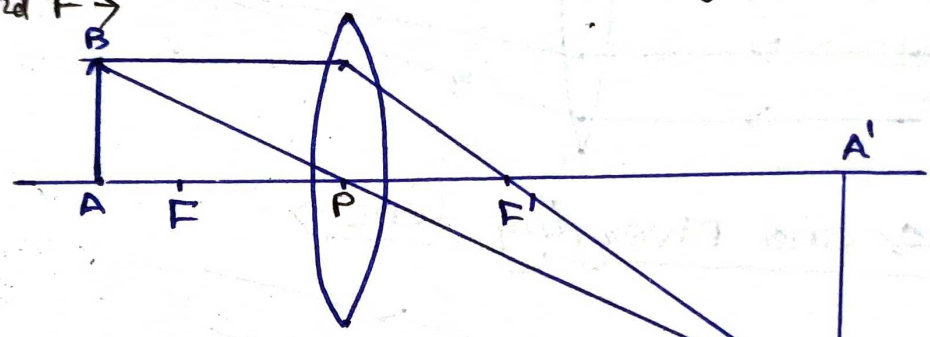
(i)

(ii)



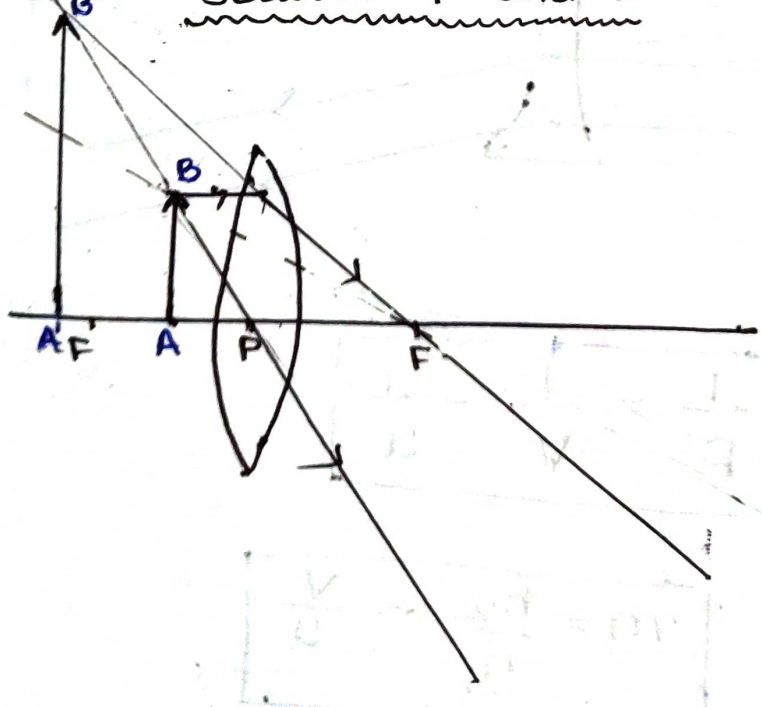
(iii)

Beyond F →



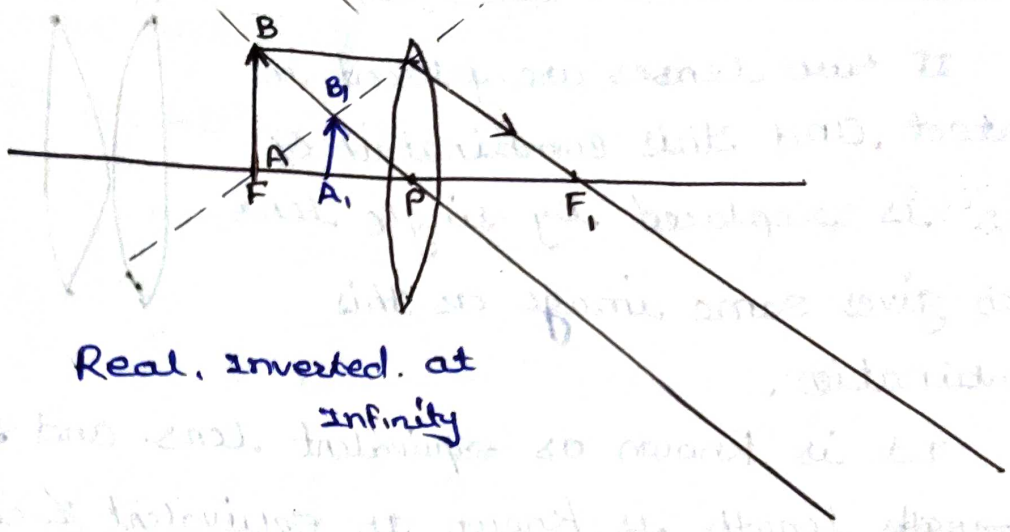
(Real and Inverted)

Case- 2nd - Between F and P



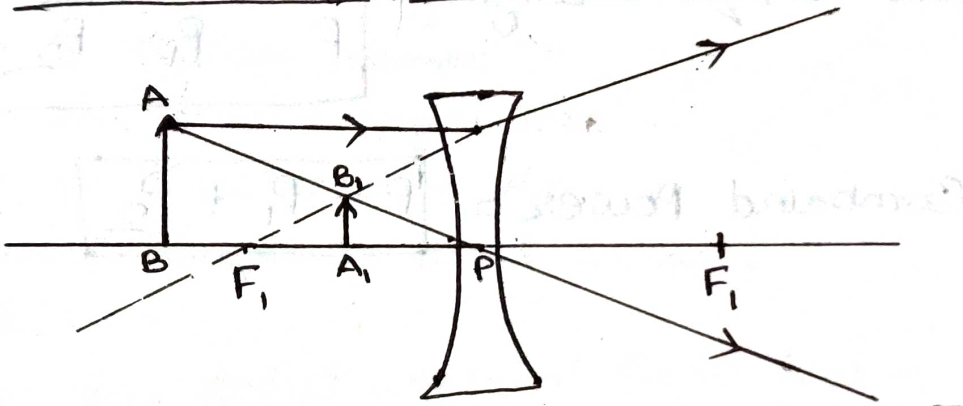
Virtual & Erect

Case - III^rd → IF Object at F



Real, Inverted, at Infinity

Image Formation by Concave ~~mirror~~ Lens →



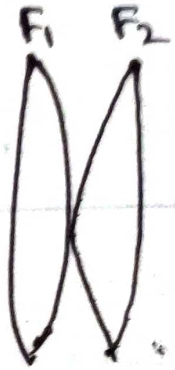
[Virtual and Erect (always)]

Power of Lens → It is ~~recipo~~ reciprocal to focal lenght of lens. It is represented by P, SI unit of power is Dioptre (D).

$$P = \frac{1}{F \text{ (In mtr}}$$

For Convex lens P = Positive (+)
" Concave lens P = Negitive (-)

Combination of lens →



If two lenses are placed in contact. And this combination of lens is replaced by single lens which gives same image as this combination.

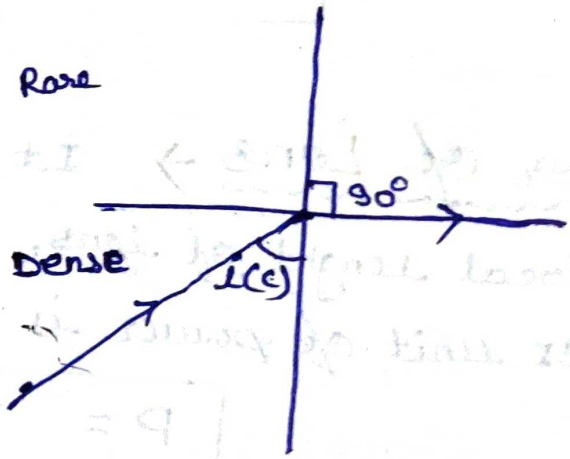
It is known as equivalent lens and its focal ~~Strength~~ length is known as equivalent focal length

Combination focal length = $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$

Combaind Power = $P = P_1 + P_2$

Critical Angle →

When the light ray goes from dense to rare medium. that the angle of incident ray at which ~~reflected~~ refracted angle become 90° is known as Critical angle. it is represented by C.



Relation between Critical angle (C) and refractive ~~angle~~ Index (n).

$$n = \frac{1}{\sin C}$$

Ques → If the critical angle of medium is 45°, find the refractive index of medium

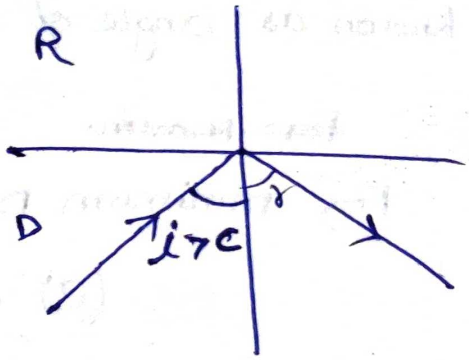
Solution ⇒

$C = 45°$, $n = ?$

$$n = \frac{1}{\sin C} = \frac{1}{\sin 45} = \frac{1}{1/\sqrt{2}} = \sqrt{2}$$

$$\boxed{n = \sqrt{2}}$$

Total Internal Reflection →



When the light ray goes from dense to rare medium, angle of incidence is slightly ~~close to~~ more then the critical angle, Then ray back to same medium the phenomena is known as total Internal reflection.

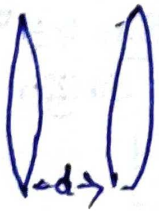
Condition for total internal Reflection :-

(i) Ray should go from dense to rare medium.

(2) Angle of incidence is slightly more than the critical angle ($i > C$)

Phenomena based on total Internal Reflection -

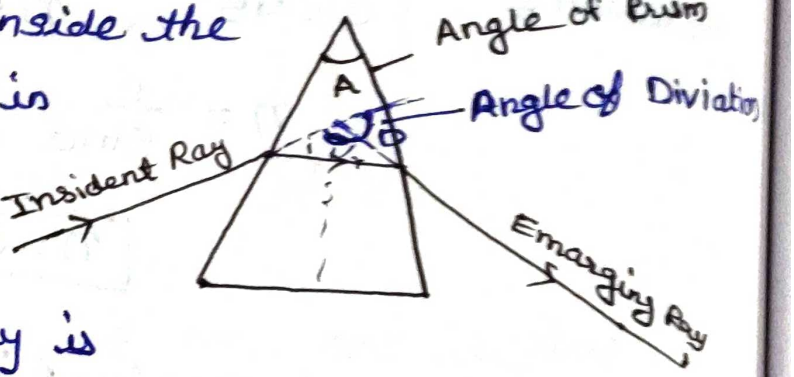
(1) Mirage →



Combination of focal length = $\boxed{\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{d}{F_1 F_2}}$

Refraction Through Prism →

When a Ray of light falls on the surface of a prism, then it parellel inside the Prism, and finally come out in the form of Emarging ray. The angle between Insident Ray and finally Emarging ray is known as angle of Deviation which is represented by D.



~~For Prism~~

For minimum Diviation →

$$(a)\ i = \frac{A+D}{2}$$

$$(b)\ r = A/2$$

We can find refractive index of Prism by Snells law $\quad n = \frac{\sin i}{\sin r}$

Ques → A ray of light falling at an angle of 45° is refracted through a prism and suffer minmum deviation. The angle of prism is 60°. Find refractive index for Prism ?

Solution → $\quad i = 45° \quad n = ?$

$A = 60° \quad r = A/2 = \frac{60}{2} = 30°$

$$n = \frac{\sin i}{\sin r} = \frac{\sin 45°}{\sin 30°} = \frac{1/\sqrt{2}}{1/2} = \frac{2}{\sqrt{2}} = \sqrt{2}$$

$$\boxed{n = \sqrt{2}}$$

Refractive Index (Numericals)

Ques → The speed of light in glass is 2×10^8 m/s. Find the refractive index.

Ans → $C = 3\times10^8$ m/s

$V = 2\times10^8$ m/s

$$n = C/V = \frac{3\times10^8}{2\times10^8} = \frac{3}{2} = 1.5 \text{ Ans}$$

Ques - If the refractive index of glass with respect of water is 9/8. Find refractive index of water with respect to glass.

Solution → $_wn_g = 9/8$

$$\text{now } {}_gn_w = \frac{1}{{}_wn_g} = \frac{1}{9/8} = 8/9 \text{ Ans}$$

Ques → If the refractive index of glass is 3/2 and for water is 4/3. Find the refractive index of ~~water~~ glass with respect to ~~glass~~ water

Sol → $n_g = 3/2$, $n_w = 4/3$, ~~$_gn_w$~~ = ?

$$_wn_g = \frac{n_g}{n_w} = \frac{3/2}{4/3} = 9/8 \text{ Ans}$$

Ques → The refractive index of glass is 3/2. Find the speed of light in glass.

Sol → $C = 3\times10^8$ m/s $\quad V = ?$

$n_g = 3/2$

$n_g = C/V$

$$V = C/n_g = \frac{3\times10^8}{3/2} = 2\times10^8 \text{ m/s}$$

Ques → If the refractive index of diamond is 2.42. what does its mean.

Ans: $n_D = 2.42 = \frac{121}{50} = \frac{C}{V} = \frac{3\times10^8}{V}$

$$V = \frac{3\times10^8}{2.42} = 1.24\times10^8 \text{ m/s}$$

$V = \frac{3\times10^8\times50}{121} =$ light in the Speed of Diamond $= 1.24\times10^8$ m/s

Numericals (Based on Lens)

Ques→ A diverging lense of focal length 15 cm, from an image 10 cm from lens, Calculate the distance of object from lens.

Sol- $F = -15\ cm$, $V = -10\ cm$, $U = ?$

$$\frac{1}{F} = \frac{1}{V} - \frac{1}{U}$$

$$-\frac{1}{15} = \frac{1}{-10} - \frac{1}{U}$$

$$\frac{1}{U} = \frac{1}{15} - \frac{1}{10}$$

$$\frac{1}{U} = \frac{2-3}{30} = -\frac{1}{30}$$

$$\boxed{U = -30\ cm}$$

Ques→ A Concave lens of focal length 15 cm from an image 10 cm from the lens. How far is object placed from the lens. Draw ray Diagram

$F = -15\ cm$

$V = -10\ cm$

$U = ?$

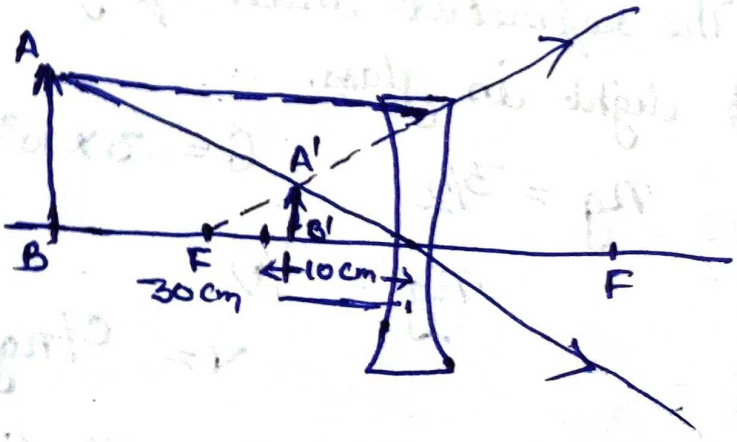
$$\frac{1}{F} = \frac{1}{V} - \frac{1}{U}$$

$$\frac{1}{-15} = \frac{1}{-10} - \frac{1}{U}$$

$$\frac{1}{U} = \frac{1}{15} - \frac{1}{10}$$

$$\frac{1}{U} = \frac{2-3}{30} = -\frac{1}{30}$$

$$\boxed{U = -30}$$



Ques → If an Object of 7 cm height is placed at distance of 12 cm from a convex lens of focal length 8 cm, find Position, nature and size of image.

Solution → $h_1 = 7$ cm

$u = -12$ cm

$F = 8$ cm

by lens formula → $\frac{1}{F} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{8} = \frac{1}{v} - \frac{1}{-12} \Rightarrow \frac{1}{8} = \frac{1}{v} + \frac{1}{12}$

$\frac{1}{v} = \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$

$\boxed{v = 24 \text{ cm}}$

$m = \frac{h_2}{h_1} = +\frac{v}{u}$

$\frac{h_2}{7} = +\frac{24}{-12}$ Real, Inverted image

$\boxed{h_2 = -14 \text{ cm}}$

Ques → An Object 4 cm high is placed of distance of 10 cm from a convex lens of focal length 20 cm find position, nature and size.

$h_1 = 4$ cm, $u = -10$ cm $f = 20$ cm

$h_2 = ?$ $v = ?$

$\frac{1}{F} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{20} = \frac{1}{v} - \frac{1}{-10}$

$\frac{1}{v} = \frac{1}{20} - \frac{1}{10} = \frac{1-2}{20} = -\frac{1}{20}$

$\boxed{v = -20 \text{ cm}}$ → Virtual, erect

$m = \frac{h_2}{h_1} = +\frac{v}{u}$

$\frac{h_2}{4} = +\frac{(-20 \text{ cm})}{-10}$

$h_2 = +4 \times 2 \quad h_2 = +8 \text{ cm}$

Ques → Calculate the focal length of a convex lens, which produce a virtual image of 50cm of an object placed 20 cm in front of it.

Ans → $F = ?$ $\quad V = -50\ cm$

$U = -20\ cm$

$$\frac{1}{F} = \frac{1}{V} - \frac{1}{U}$$

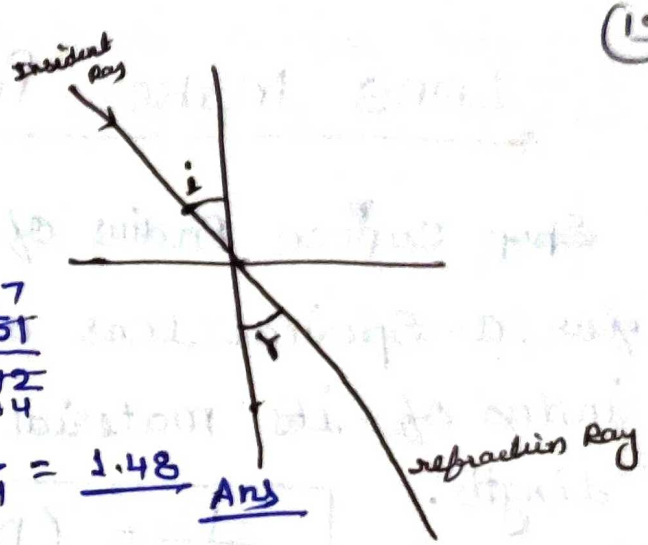
$$\frac{1}{F} = \frac{1}{-50} - \frac{1}{-20} = \frac{1}{20} - \frac{1}{50} = \frac{5-2}{100} = \frac{3}{100}$$

$$F = \frac{100}{3} = 33.33\ cm$$

Ques→

$i = 72^\circ$

$r = 40^\circ$



Refractive index $= \frac{\sin i}{\sin r}$

$$n = \frac{\sin 72^\circ}{\sin 40^\circ} = \frac{0.951}{0.642} = \frac{317}{214} = 1.48 \text{ Ans}$$

Ques→

$n_g = 1.50$

$c = 3 \times 10^8$ m/sec

$v = ?$

$$n_g = c/v = \frac{3 \times 10^8}{v} = 1.50$$

$$v = \frac{3 \times 10^8}{150} \times 10^2 = 2 \times 10^8 \text{ m/s Ans}$$

$$214 \overline{)317} \; 1.48$$

214

1030

856

1740

1712

Lens Maker formula →

Suppose Radius of Curvature of two Surface for a Spherical lens and R_1 and R_2, The refractive index of its material is n, then the focal length.

$$\frac{1}{F} = (n-1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

Conditions ⇒

(I)st Bi-convex lens	IInd By concave lens	IIIrd Plane Surface
R_1 = +ive	R_1 = -ive	$R = \infty$
R_2 = -ive	R_2 = +ive	

Ques → The radius of curvature of a bi convex lens are 20 cm, 30 cm. If its refractive index is 1.5 find its focal length.

Solution → Bi-convex lens

$R_1 = 20$ cm

$R_2 = -30$ cm $\quad n = 1.5$

$F = ?$

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= (1.5-1)\left(\frac{1}{20} - \frac{1}{-30}\right)$$

$$= .5\left(\frac{1}{20} + \frac{1}{30}\right)$$

$$\frac{1}{F} = \frac{1}{2}\left(\frac{3+2}{60}\right] = \frac{5}{60 \times 2}$$

$$F = \frac{12}{\cancel{60} \times 2} = 24 \text{ cm}$$

Ques → The radius of curvature of a bi-concave lens is 15 cm, 60 cm and its refractive index is 1.5 find its focal length

Solution → Bi-Concave lense

$R_1 = -15$ cm, $R_2 = 60$ cm $\quad n = 1.5$

$f = ?$

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{F} = (1.5-1)\left(\frac{1}{-15} - \frac{1}{60}\right)$$

$$\frac{1}{F} = .5\left(\frac{-4-1}{60}\right)$$

$$\frac{1}{F} = .5\left(\frac{-5}{60}\right)$$

$$F = \frac{-12 \times 10^2}{5} = -24 \text{ cm}$$ Ans

Ques → Find the focal length of a thin lens for which radius of one surface is 20 cm and other surface is plane. (refractive index of its metrial is 3/2)

Solution →

$R_1 = 20$ cm $\quad R_2 = \infty \quad n = 3/2$

$F = ?$

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= (3/2 - 1)\left[\frac{1}{20} - \frac{1}{\infty}\right)$$

$$= \frac{1}{2} \cdot \frac{1}{20}$$

$\left(\frac{1}{\infty} = 0\right)$

$$\boxed{F = 40 \text{ cm}}$$

Ques → If the focal length of bi-convex lense is 20 cm and radius of its spherical surface are same. find Radius. ($n = 1.6$)

Sol: $F = 20$ cm $\quad R_1 = R$

$R_2 = -R$

$n = 1.6$

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{20} = (1.6-1)\left(\frac{1}{R} - \frac{1}{-R}\right)$$

$$\frac{1}{20} = .6\left(\frac{1}{R} + \frac{1}{R}\right) = 0.6\left(\frac{2}{R}\right)$$

$$R = \frac{2}{20} \times 2 \times \frac{6}{10}$$

$$R = 24 \text{ cm}$$

$R_1 = 24$ cm

$R_2 = -24$ cm

Ques → The focal length of lens (convex) is 30 cm and the radius of curvature of its surface are 15 cm, 60 cm. Find refractive index.

$F = 30$ cm $\quad R_1 = 15$ cm

$n = ?$ $\quad R_2 = -60$ cm

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{30} = (n-1)\left[\frac{1}{15} - \frac{1}{-60}\right]$$

$$\frac{1}{30} = (n-1)\left[\frac{4+1}{60}\right]$$

$$\frac{1}{30} \times 60 \qquad 1/30 = (n-1)\left(\frac{1}{60}\right)$$

$$(n-1) = \frac{12}{30}$$

$$n - 1 = 6/15$$

$$n = \frac{6}{15} + 1 = \frac{6+15}{15} = \frac{21}{15} = \frac{7}{5} = 1.4$$

Ques → The focal length of a lens is 20 cm. If this lens is (21) immersed in water. find its new focal length.
(Given $n_g = 3/2$, $n_w = 4/3$)

Sol → $F = 20$ cm

for glass $n_g = 3/2$

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{20} = (3/2 - 1)\left[\frac{1}{R_1} - 1/R_2\right]$$

$$\frac{1}{20} = \frac{1}{2}\left[1/R_1 - 1/R_2\right]$$

$$\frac{1}{R_1} - 1/R_2 = 1/10 \quad \text{-- (1)}$$

Reflective index $wn_g = \frac{n_g}{n_w}$

$$\frac{1}{F} = (wn_g - 1)\left[\frac{1}{R_1} - 1/R_2\right]$$

$$\frac{1}{F} = \left(\frac{n_g}{n_w} - 1\right)\left[1/R_1 - 1/R_2\right]$$

$$\frac{1}{F} = \left(\frac{3/2}{4/3} - 1\right)\left(1/R_1 - 1/R_2\right]$$

$$\frac{1}{F} = \left(\frac{9}{8} - 1\right)\left(1/R_1 - 1/R_2\right)$$

$$\frac{1}{F} = 1/8\ \left(1/R_1 - 1/R_2\right) \quad \text{-- (2)}$$

Put the · compair equah 1 and 2

$$\frac{1}{F} = 1/8 \cdot \frac{1}{10}$$

$$\boxed{F = 80 \text{ cm}}$$

Refraction through thin prism →

If the prism is thin of prism Angle A and minimum deviation through prism is Dm

Then, $D_m = (n-1)A$

where n is ~~reflective~~ refractive index for Prism

2019

Ques → Thin prism of 5° angle gives a minimum deviation of 3.2°. what of n of prism.

Solution →

$A = 5°$

$D_m = 3.2°$

$n = ?$

$D_m = (n-1)A$

$3.2 = (n-1)5$

$(n-1) = \frac{3.2}{5}$

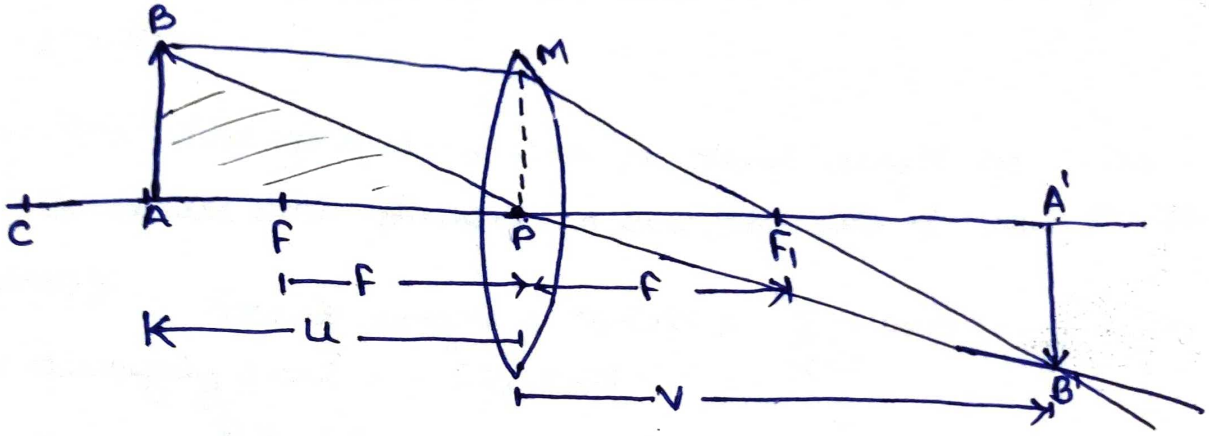
$(n-1) = .64$

$n = 1 + 0.64$

$\boxed{n = 1.64}$

Derivation of lens formula :

Suppose an object AB is placed b/w F and 2F of a convex lens of focal length f and its distance is u from pole P. Its real inverted image A'B' is formed at distance v.



$\Delta ABP \sim \Delta A'B'P$

by BPT $\frac{AB}{A'B'} = \frac{AP}{A'P}$ ---①

$(MP = AB)$

$\Delta MPF_1 \sim \Delta A'_1B'F_1$

So By BPT

$\frac{MP}{A'B'} = \frac{PF_1}{A'_1F_1}$ - ②

$\frac{AB}{AB'} = \frac{PF_1}{A'F_1}$ - ③

By Equation ① and ③

$$\frac{AP}{A'P} = \frac{PF_1}{A'F_1}$$

$AP = -u$

$A'P = v$

$PF_1 = f$

$A_1F_1 = v - f$

So: $\frac{-u}{v} = \frac{f}{v-f}$

$\frac{-v}{u} = \frac{v-f}{f}$

$\Rightarrow -\frac{v}{u} = \frac{v}{f} - 1$

$\Rightarrow v/f = 1 - v/u$

$\Rightarrow \frac{1}{f} = \frac{1}{v}(1 - v/u) \Rightarrow \boxed{\frac{1}{f} = \frac{1}{v} - \frac{1}{u}}$

Hence Proved

Ques → Define 1 dioptre power of lens.

Solution → $P = 1\ D$

$$F = \frac{1}{P} = \frac{1}{1} = 1\ mtr$$

① Power of lens is its ability to converge the rays of light.

✓ ① Th lens of power 1D will have a focal length of 1 mtr.

Ques → The diverging lens has a focal length of 3 cm, Calculate the power and give the unit of ~~pow~~ power

Solution → Focal length = 3 cm = $\frac{3}{100} \times$ ~~100~~ = $\frac{-3}{100}$ mtr

For diverging lens = $-3/100$ mtr

$$P = \frac{1}{F} = \frac{1}{-3/100} = \frac{-100}{3} = -33.3\ D$$

Ques → 3 →.

Solution → Convex lens → $F = 25\ cm = \frac{25}{100}\ mtr = \frac{1}{4}\ mtr$

$P = ?$

$$P = \frac{1}{F} = (+)1/4 = +4D$$ Ans

Ques → $P = -2D$. $F = ?$

$$P = \frac{1}{F} \Rightarrow f = \frac{1}{P} = \frac{1}{-2}\ mtr$$

$$= -\frac{1}{2} \times 100^{50}\ cm$$

$$= -50\ cm$$ Ans

Ques → Powere of lens →

It is reciprocal of to the focal length of lens, its SI unite is dioptre.

$P = 1/f$, Dioptre.

For convex lens. $P = +ive$

Concave lens $P = -ive$

Ques → 7 → An object of height 4 cm is placed at a distance of 15 cm in front of a concave lens Power of lens is −10 diptor. Find the size of image.

$h_1 = 4$ cm $u = -15$ cm

$P = -10$ D

$P = \frac{1}{F} \Rightarrow F = \frac{1}{P} = \frac{1}{-10}$ mtr.

$= -\frac{1}{100} \times 100 = -10$ cm

$\frac{1}{F} = \frac{1}{v} - \frac{1}{u}$

$-\frac{1}{10} = \frac{1}{v} - \frac{1}{(-15)} \Rightarrow -\frac{1}{10} = \frac{1}{v} + \frac{1}{15}$

$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$

$\frac{1}{v} = \frac{2+3}{30} = \frac{5}{30}$

$\frac{1}{v} = \frac{1 \times 2}{15 \times 2} - \frac{1 \times 3}{10 \times 3}$

$= \frac{2-3}{30} = -\frac{1}{30}$

$v = -30$ cm

$\therefore v = 6$ cm

$\frac{h_2}{h_1} = -\frac{v}{u}$ ⊖

$\frac{h_2}{4} = +\frac{6}{+15}$

$h_2 = \frac{24}{15} = 1.6$ cm

Ques → 8 → 12 A lens has a focal length of −10 cm. Whate is the Power of the lens and what is its name.

Solution → $F = -10\ cm = -\frac{10}{100} = -\frac{1}{10}\ mtr$

$P = \frac{1}{F} = \frac{1}{(-1/10)} = -10$ Dioptre.

It is concave lens.

(12) Ques →

$P = +4D$

$F = ?$ $\quad P = \frac{1}{F}$

$\Rightarrow F = \frac{1}{P} = \frac{1}{4}\ mtr = \frac{1}{4} \times 100^{25}\ cm$

$F = 25\ cm$

It is convex lens.

16 Ques → The power of a combination of two lenses X and Y is 5D. If the focal length of lens Y is −60 cm Calculate the focal len of X.

$P = P_1 + P_2$

$5 = P_1 + P_2 - (1)$

$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$

$\frac{1}{20} = \frac{1}{F_1} + \frac{1}{-60}$

$\frac{1}{F_1} = \frac{1}{20} + \frac{1}{60}$

$\frac{1}{F_1} = \frac{3+1}{60}$

$\frac{1}{F_1} = \frac{4}{60} = \frac{1}{15}$

$F_1 = 15\ cm$ Ans

$P = \frac{1}{F}$

$F = \frac{1}{5}\ mtr$

$= \frac{1}{5} \times 100^{20}\ cm$

$F = 20\ cm$

18 Ques → A convex lens of focal length 10 cm and a concave lens of focal length 20 cm are placed close contact with each other →

Ⓐ $F_1 = 10$ cm

$F_2 = -20$ cm

(a) → What is the power of this combination.

$$P = P_1 + P_2 \quad \text{---} \quad (1)$$

$$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$$

$$P_1 = \frac{1}{F_1} = \frac{1}{10 \text{ cm}}$$

$$= \frac{1}{10} \times 100 \text{ cm}$$

$$P_1 = 10 \text{ cm}$$

$$P_2 = \frac{1}{F_2} = \frac{1}{-20} \text{ mtr} = -\frac{1}{20} \times 100 \text{ cm} = -5 \text{ cm}$$

Put the value of P_1 and P_2 in equation (1)

$$P = 10 + (-5)$$

$$= 10 - 5 = 5D$$

$$\boxed{P = 5D}$$

$$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$$

$$= \frac{1}{10} + \frac{1}{(-)20} = \frac{1}{10} - \frac{1}{20} = \frac{2-1}{20} = \frac{1}{20}$$

$$\boxed{F = 20 \text{ cm}}$$

Ques → A Convex mirror has focal length 20 cm produced image $\frac{1}{3}$rd to size of object. calculate the distance of object and also nature of image.

Ans → $F = 20$ cm, $u = ?$

Suppose height of object is h_1 and image is h_2.

Given $h_2 = \frac{1}{3} h_1$

$$\frac{h_2}{h_1} = \frac{1}{3} = m = -\frac{v}{u}$$

$$-v = \frac{u}{3}$$

$$v = -u/3 \quad \text{-- (1)}$$

For mirror formula:

$$\frac{1}{F} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{20} = \frac{1}{-\frac{u}{3}} + \frac{1}{u} \Rightarrow \frac{1}{20} = \frac{1}{u} - \frac{3}{u}$$

$$\frac{1}{20} = \frac{-2}{u}$$

$$\boxed{u = -40 \text{ cm}}$$

$$v = -u/3 = -\frac{(-40)}{3} = \frac{40}{3} = +13.33 \text{ cm}$$

Image = Virtule & Ereot Ans

Magnetism

Magnetics field → The field arround at a magnet at which a magnetic needle placed. and it experience a force is known as magnetic field.

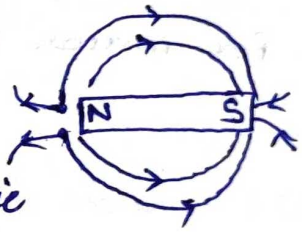
It is represented by B.

It's SI unit is Newtan/Ampair-meter or Tesla,

its other unit is Gauss

1 Gauss = 10^{-4} ~~Gauss~~ Tesla.

Magnetic field lines :-



The lines arround the magnet which represent the direction of magnetic field known as magnetic ~~field~~ field lines.

Properties →

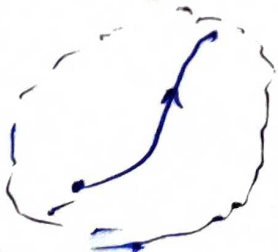
(i) They start from North and end at South pole.

(ii) Always clouse curve

(iii) They represent the direction of magnetic field.

(iv) ~~The~~ Two magnetic field lines never intersect each other because it they intersect then at the intersection point there will be two direction of magnetic field. which is not possible.

Magnetic effect of current → when a current passed in a wire then magnetic field produced around it which is known as magnetic effect of current.



Magnetic force

(a) ⇒ $F = iBl \sin\theta$

i = current

l = length of conductor

B = magnetic field

$F = qvB \sin\theta$

q = Charge of Conductor

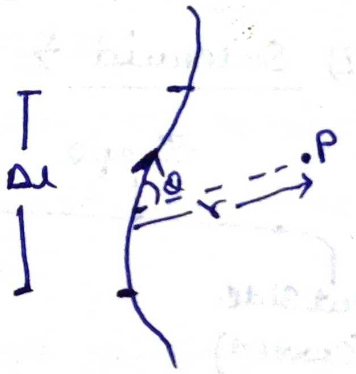
v = velocity

θ = Angle

Note → (i) Force maximum at $\theta = 90°$ (Perpendicular)

(ii) Force minimum at $\theta = 0°$, ~~Parallel~~ Parallel.

Bio-Savart law → According to this law magnetic field produced due to current element, depends on following factor:



(i) it is (B) directly perportinal to current flow $B \propto i$ ---①

(ii) it is directly perportional to small length $B \propto \Delta l$ --②

(iii) it is directly perportional to sin of angle θ

$B \propto \sin\theta$ --③

(iv) it is ~~directly~~ inversely perportional to the square of distance

$B \propto 1/r^2$ --④

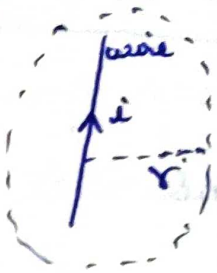
So $B \propto \frac{i \Delta l \sin\theta}{r^2}$

$$\boxed{B = \frac{\mu_0}{4\pi} \cdot \frac{i \Delta l \sin\theta}{r^2}}$$

where $\frac{\mu_0}{4\pi} = 10^{-7}$ = Constant

Magnetic field due to different shape of conductor →

① - Straight wire →



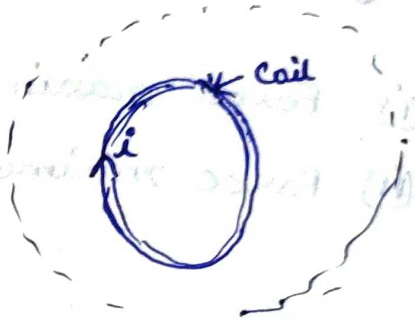
(i) Shape - Circular

(ii) Formula → $B = 2 \times 10^{-7} \left(\frac{i}{r}\right)$

(iii) Depends → (a) $B \propto i$

(b) $B \propto 1/r$

(2) Circular Coil →



Shape - Circular

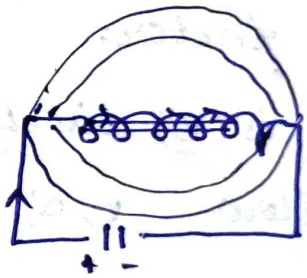
Formula → $B = \pi 2 \times 10^{-7} \frac{i}{r}$

Depends → $B \propto i$

$B \propto 1/r$

$\Rightarrow$ $B \propto$ no. of turn

(3) Solenoid →



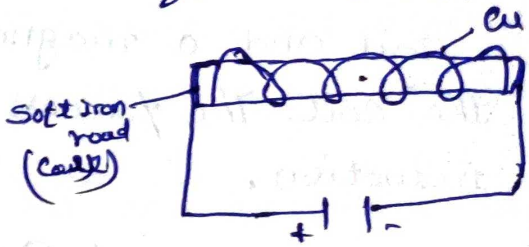
Shape

- Out side (Curved)
- Inside (Uniform) Straight line

depends - (i) $B \propto i$

(ii) $B \propto$ no. of turns.

Electromagnet → It is formed by wrapping insulated Cupper (Cu) wire on soft iron road.



Its Strength Depends on following factors.

(i) $B \propto i$

(ii) $B \propto$ no of turn

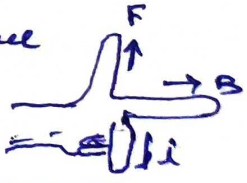
(iii) $B \propto$ Soft iron (Core)

Note → In electromagnet we use soft iron rod as a core not of Ni or Co because the do not loses magnetism easily.

Differanee b/w Electromagnet and Bar Magnet

Electro magnet	Bar Magnet
1→ Its is temporary magnet	(1). it is permanent magent
(2) It's produce strong force of attraction	(2). It produces weak force of attraction.
(3) its strength can be changed	(3). It's strength can be changed
(4) Its polarity can be changed	(4) It's polarity can not be changed (Fix Pole)

Fleming left hand Rule → According to this rule, if we raised the fore finger, middle finger and Thumb in such a way so that they are perpendicular to each other. then if our forefinger represented the direction of magnetic field, middle finger represent the direction of current, then our thumb represent the direction of magnetic force



Note → Gerenly its law is used to find the direction of magnetic field.

Electro magnetic Induction →

When there is a relative motion between a coil and a magnet, then current is induced in the coil. The process is known as Electromagnetic Induction.

Faraday laws of Electromagnetic Induction →

There are two laws

I^st law → When there is a change in flux in a coil, then electro motion force (emf) produced in coil.

II^nd law → The emf produced in coil is equal to the rate of change in flux.

$$\underset{(e)}{emf} = N\left(\frac{\Delta\Phi}{\Delta t}\right)$$

e = emf Produced
$\Delta\Phi$ = Change in flux
N = No. of turn in coil.

Magnetic flux →

The number of magnetic field lines passing through any surface is known as magnetic flux.

It is represented by Φ

$$\Phi = BA$$

A = Area of surface

SI unit of Φ is Weber (Wb)

Lenz's Law →

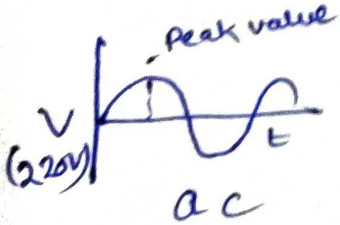
According to this law, "the polarity of the induced emf. is such that the oppose the change in the magnetic flux responsible for its production.

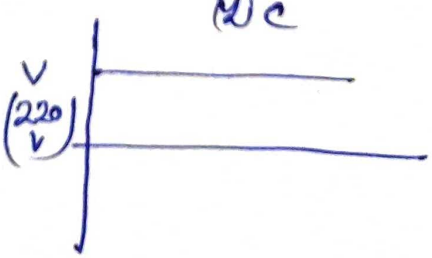
Difference between DC and AC

DC ⊣⊢	AC ∿
1⇒ The value of DC may be change or not but its Direction never be change	1- The direction and value of AC change. Periodically.
2⇒ It can be change by help of resistance ⏦	2⇒ AC can be changed by Chok coil.
03⇒ DC voltage can not be Changed by transformer	3- AC voltage can be changed by the help of transformer
04⇒ The cost of production of DC is very high	04. Its cost of production of very less.
05. It can not to a large distance	5. It can transmit to a long distance
6- It is less dangrous	6. It is more dangrous

220 Volt AC is more dangerous than 220 volt DC

Since the magnitude of DC is always remain same as 220 volt. but we know that AC magnitude is variable and its peak voltage (max voltage) is 220 volt = 311 volt but the peak value of DC will 220 volt, which is less to ac, so 220 volt ~~DC~~ AC is more dangerous than ~~DC~~ D.C.





max value of AC = $V\sqrt{2}$

$= 220 \times 1.414$

$= 311\ V$

Current Electricity

1 MC = 1 milli coulomb $= 1 \times 10^{-3}$ C
$1 \mu C = 10^{-6} C$

Electric Charge → It is a physical property of matter that cause it to experience a force with placed in an electric field. Electric charge is represented by q.

SI unit of Charge is ~~Ohms~~ coulomb.

It is two types →
(i) + ive charge - Donate e⁻
(ii) − ive charge - Gane e⁻

$q = ne$

e = Charge of electron
$e = -1.6 \times 10^{-19}$ Coulumb. (negative)

Electric current (i) →

" The rate of flow of charge is known as electric current. it is represented by

$$i = q/t$$

SI unit of current is Ampie

Point →
(i) Current is measured by ~~Ampair~~ Ampeare connected in series. (ii) Amiter has low resistance
(iii) i always flow opposite to electron (scalar quintity)
(iv) Current is scalar quintity

Electric potential (Voltage) (V) → The ratio of work done to carray an charge from infinity to a point, to that charge is known as electric potential. it is represented by V.

$$V = \frac{W}{q}$$

[SI unit = Volte]

Note → Electric potential is measured by Voltemeter connected in parallel.

Ohms law → If there is no change of temprature and pressure of ~~as~~ any body, then voltage applied is directly perportional to current flow. $V \propto i$ $\boxed{V = Ri}$ R = Resistance of Conductor

Limitation → (i) It is applicable only for conductor
(ii) There should be no change in temp and Pressure

Ques→ Calculated the number of electrons constituting one coulomb of charge.

Sol. $n = ?$ $q = 1$ Coulomb $e = -1.6 \times 10^{-19}$, Coulomb

$$q = ne \Rightarrow 1 = n(-1.6 \times 10^{-19})$$

$$n = \frac{1}{1.6 \times 10^{-19}} = \frac{100 \times 10^{18}}{16}$$

$$\boxed{n = 6.25 \times 10^{18}}$$

Ques→ How much work done to carry 2 coulombs charge to voltage 6 volt.

Sol→ $W = ?$ $q = 2$ Coulombs $V = 6$ volt.

$$V = W/q \Rightarrow q = \frac{W}{V} =$$

$$W = 2 \times 6 = 12 \text{ volt.}$$

Ques→ $V = 12$ volt, $R = ?$ $i = 2.5\,mA = 2.5 \times 10^{-3}\,A$

Sol→ $V = IR \Rightarrow 12 = 2.5 \times 10^{-3} R$

$$R = \frac{12}{2.5 \times 10^{-3}} = \frac{120}{25} \times 10^{3}$$

$$= \frac{120 \times 1000}{25} = 4800\,\Omega$$

Ques→4→ $i = ?$ $q = 96000$ $t = 20\,min = 20 \times 60 = 1200\,s$

$$q = it \Rightarrow i = q/t \Rightarrow i = \frac{96000}{1200} = 80\,A$$

Ques→5→ $n = ?$ $i = 0.5\,A$ $t = 2$ sec

$$i = \frac{5}{10}\,A = \frac{1}{2}\,A$$

$$q = ne \Rightarrow n = q/e = \frac{it}{e} = \frac{\frac{1}{2} \times 2}{-1.6 \times 10^{-19}}$$

$$= -\frac{100}{16} \times 10^{18}$$

$$\boxed{n = -6.25 \times 10^{18}}$$

Ques→6→ $V = ?$ $R = 50\,\Omega$ $i = 2$ Amp

$$V = iR$$

$$\boxed{V = 50 \times 2 = 100 \text{ volt}}$$

Ques→7→ $V_1 = 100$ volt $i = 5A$ If $V_2 = 200$ volt $= i = ?$

$$\Delta V = V_2 - V_1 = 200 - 100 = 100 \text{ volt}$$

$V_1 = I_1 R_1$

$\frac{100}{5} = R = R_1 = 20\,\Omega$

$V_2 = I R_2$

$200 = i\,20\,\Omega$ $i = 10$ Amp

Ques-8- $q = 96000$ Coulomb $V = 50$ Volt.

$W = ?$

$V = \frac{W}{q} \Rightarrow W = Vq$

$= 50 \times 96000$

$= 480000$ Jule $= 48 \times 10^4$ Jule

Risistance → It is a properties of any substane, which oppose the current flow. SI unit of Risistance is Ohm (Ω).

Factors of Risistance depends →

Risistance depends on the following factors:

(i) It is directly perportional to the length of conductor

$R \propto l$ ---①

(2) → It is inversely perportional to the area of cross section

$R \propto \frac{1}{A}$ --②

(3)- It is directly perportional to the nature of metal.

(4) " " " " " " temperature of metal.

Combin equation ① & ②

$R \propto l/A$ ρ (Rho)

$$\boxed{R = \rho\left(\frac{l}{A}\right)}$$

Resistivity

where ρ is a constant. it is called Specific Resistance or conductivity of solution. its unit is Ω-meter.,

Ques → The length of conductor is 2m. Area of cross section is 2 cm^2, it is resistivity is 4×10^{-3} Ω-mtr., find its Risistance

Solution → $l = 2m$ $A = 2\,cm^2 = 2\left(\frac{1}{100}\right)^2 m^2$

$\rho = 4 \times 10^{+3}$ Ω-mtr. $A = 2 \times 10^{-4}\ m^2$

So → $R = \rho\left(\frac{l}{A}\right) = 4 \times 10^{+3}\left(\frac{2}{2 \times 10^{-4}}\right)$

$= 4 \times 10^7$ Ω

Ques → The R of a wire is $10\ \Omega$. Calculate its new Resistance if. (i) Length become doble. (ii) length become doble by stre
(iii) length become half by folding
(iv) diameter become double
(v) diameter become half

Solution → $R = \rho\left(\frac{l}{A}\right) = 10$ ---①

(i) Length become double → $l = 2l$

$$R_1 = \rho\left(\frac{2l}{A}\right) = 2\rho\left(\frac{l}{A}\right) = 2\times10 = 20\ \Omega$$

(ii) length become double by strateching → $l = 2$ so $A = A/2$

$$R_1 = \rho\left(\frac{2l}{A/2}\right)$$

$$R. = 4\rho\left[\frac{l}{A}\right] = 4\times10 = 40\ \Omega$$

(iii) length become half by folding → $l = l/2$, $A = 2A$

$$R = \rho\left(\frac{l/2}{2A}\right) = \frac{1}{4}\rho\left(\frac{l}{A}\right) = \frac{1}{4}\times10 = 2.5\ \Omega$$

(iv) diameter become double → $d = 2d$ $\quad A = 2^2A = 4A$

$$R = \rho\left(\frac{l}{4A}\right) = \frac{10}{4} = 2.5\ \Omega$$

(v) diameter become half → $d = \frac{1}{2}d$

then $A = \frac{1}{2^2}A = \frac{1}{4}A \Rightarrow R = \rho\left[\frac{l}{\frac{1}{4}A}\right] = 4\times10 = 40\ \Omega$

Ques → $R = 20\ \Omega$. $\quad R = \rho(l/A) = 20\ \Omega$ ---①

(i) its length become 3 times → $l = 3l \Rightarrow R = \rho\left(\frac{3l}{A}\right) = 3\times20 = 60\ \Omega$

(ii) its length become 3 times by stretching → $l = 3l$ then $A = A/3$

$$R = \rho\left(\frac{3l}{A/3}\right) = 9\times20 = 180\ \Omega$$

(iii) its length become half and area of cross section become 4 times → $l = l/2$ $\quad A = 4A$

$$R = \rho\left(\frac{l/2}{4A}\right) = \frac{1}{8}\times20 = 2.5\ \Omega$$

Combination of Resistance → It is classified by two way :

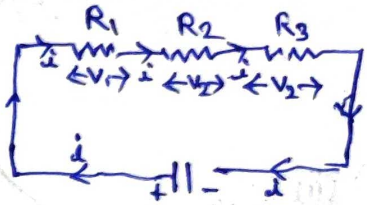
1→ Series Combination
2→ Parallel Combination

1→ Series Combination → In this resistance :

(a) one end of resistance is connected to one end of another Resistance and its other end is connected to new resistance

(b) In this combination current i will be same of each Resistance.

(c) Velocity will differ on each R.



for first resistance $V_1 = iR_1$

" second " $V_2 = iR_2$

" third " $V_3 = iR_3$

Short cut
Current flow - Same
Voltage applied - Differ

Total Voltage $V = V_1 + V_2 + V_3$

$iR = iR_1 + iR_2 + iR_3$

$$\boxed{R = R_1 + R_2 + R_3}$$

Note → (i) in this series equivalent Resistance is maximum

(ii) Decurating light bulb is connected in series.

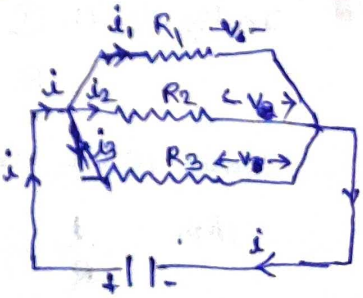
2→ Parallel Combination → In this combination,

(a) Both end of Resistance are connected.

(b) Current is diff on each R.

(c) Voltage become same on each R.

by Ohm's law → $V = iR$ $\quad i = V/R$



For Ist Resistance → $i_1 = V/R_1$

" IInd " → $i_2 = V/R_2$

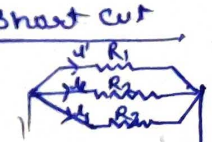
" IIIrd " → $i_3 = V/R_3$

Total Current $i = i_1 + i_2 + i_3$

$V/R_e = V/R_1 + V/R_2 + V/R_3$

$$\boxed{\frac{1}{R} = \frac{1}{R_1} + 1/R_2 + 1/R_3}$$

Short cut

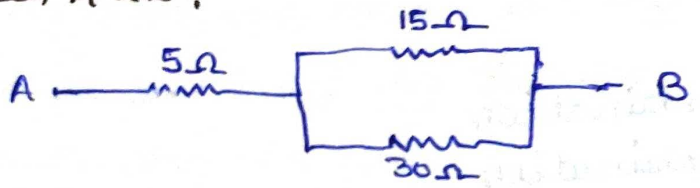


Current → differ
Voltage → Same

Note → In Parallel Combination Resistance is minimum.
→ Domestic Circuit is always

Ques→ In Given Combination of Resistance, find equivalent Resistance between A & B.

Ans→ (i)



In fig:- 15 Ω & 30 Ω are in parallel combination

$$\frac{1}{R_0} = \frac{1}{R_1} + \frac{1}{R_2} \Rightarrow \frac{1}{R} = \frac{1}{15} + \frac{1}{30} = \frac{2+1}{30} = \frac{3}{30} = \frac{1}{10}$$

$$R_A = 10\ \Omega$$

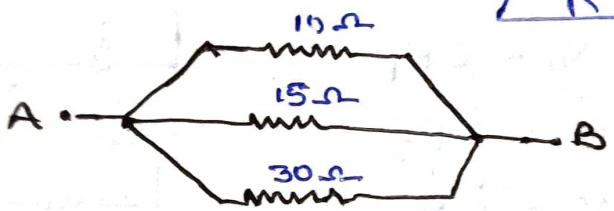
Now 5 Ω and 10 Ω are series form

Then Equivalent Resistance = $R = R_1 + R_2$

$= 5\Omega + 10\Omega$

$$\boxed{R = 15\ \Omega}$$

(ii)



In fig:- 10 Ω, 15 Ω and 30 Ω are in Parallel combination

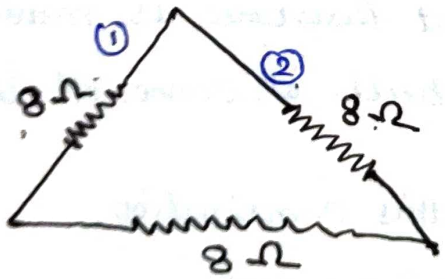
Equivalent Resistance $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$$\frac{1}{R} = \frac{1}{10\Omega} + \frac{1}{15} + \frac{1}{30}$$

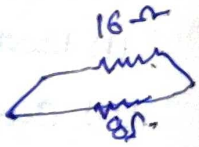
$$\frac{1}{R} = \frac{3+2+1}{30} = \frac{6}{30} = \frac{1}{5}$$

$$\boxed{R = 5\ \Omega}$$

(iii)



In Fig 8 Ω ① and 8 Ω ② are series form



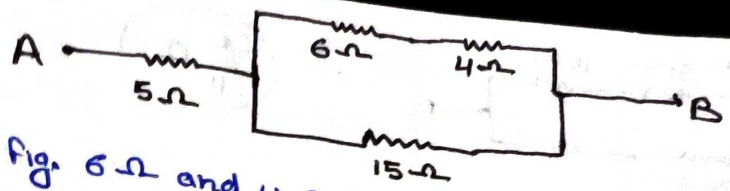
$$R = R_1 + R_2 = 8 + 8 = 16\ \Omega$$

Now 16 Ω and 8 Ω are Parallel combination

Then $\frac{1}{R} = \frac{1}{16} + \frac{1}{8} = \frac{1+2}{16} = \frac{3}{16}$

$$\boxed{R = \frac{16}{3}\ \Omega}$$

(IV) ⇒



Solution ⇒ In Fig. 6Ω and 4Ω are series combination

Then $R = 6\Omega + 4\Omega = 10\Omega$

$R_1 = 10\Omega$ ---- (1)

10Ω (R_1) and 15Ω are in also Parallel combination

$\frac{1}{R} = \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30}$

$\frac{1}{R} = \frac{5}{30} \Rightarrow R = 6\Omega$

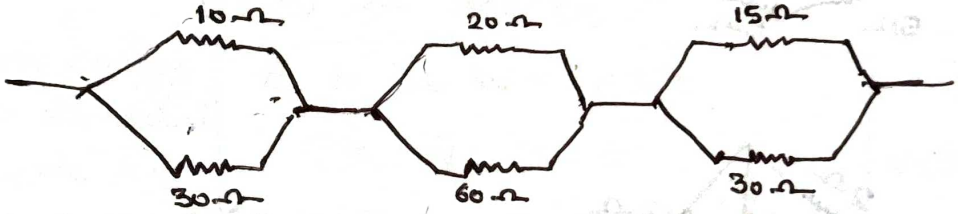
Now 5Ω and 6Ω are in series combination

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{5} + \frac{1}{20} = \frac{4+1}{20} = \frac{5}{20}$

$R = \frac{20}{5} = 4\Omega$

$R = 5\Omega + 6\Omega = 11\Omega$

(V) ⇒



32.5Ω

$\frac{1}{R_1} = \frac{1}{10} + \frac{1}{30}$ $\quad \frac{1}{R_2} = \frac{1}{20} + \frac{1}{60}$ $\quad \frac{1}{R_3} = \frac{1}{15} + \frac{1}{30}$

$\frac{1}{R_1} = \frac{3+1}{30}$ $\quad \frac{1}{R_2} = \frac{3+1}{60}$ $\quad \frac{1}{R_3} = \frac{2+1}{30}$

$\frac{1}{R_1} = \frac{4}{30}$ 15 $\quad \frac{1}{R_2} = \frac{4}{60}$ 15 $\quad \frac{1}{R_3} = \frac{3}{30} = \frac{1}{10}$

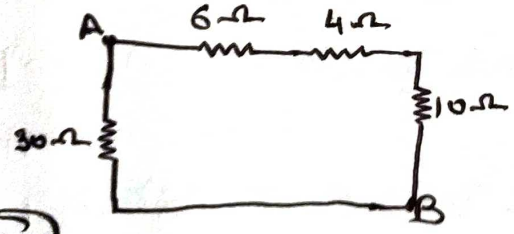
$R_1 = 15/2 = 7.5$ $\quad R_2 = 15$ $\quad R_3 = 10$

$R = R_1 + R_2 + R_3$

$= 7.5 + 15 + 10$

$R = 32.5\Omega$

(vi)



12Ω

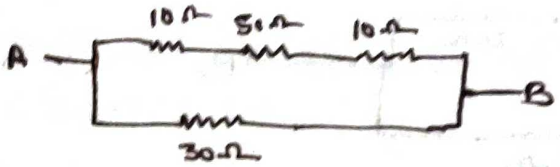
$R_1 = 6 + 4 + 10 = 20\Omega$

20Ω and 30Ω are connected in Parallel

$\frac{1}{R} = \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60} = \frac{1}{12}$

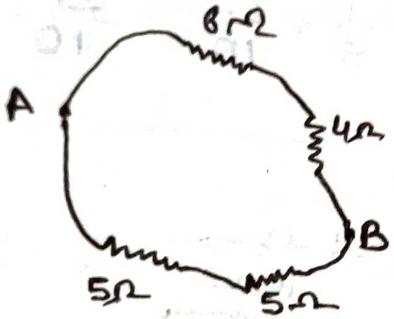
$R = 12\Omega$

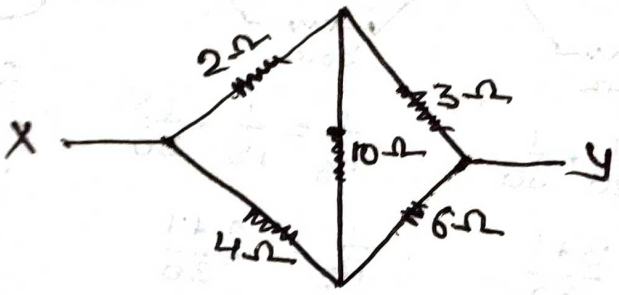
(vii)



$\frac{5}{11}\Omega$

(viii)





totat Risistance = ?

Electric power → The rate of electric energy of any appliance is known as its electric power. It is represented by P.

$$P = \frac{W}{t} \quad ---①$$

We know that electric potential $V = W/q$ Than $\Rightarrow W = qV$

$$P = \frac{Vit}{t} \qquad W = itV \qquad (\because q = it)$$

$$P = Vi \quad ---①$$

For ohm's law. $V = IR$

$$P = iRi$$

$$P = i^2R$$

$\because i = V/R$ Than $P = \frac{V^2}{R^2} \cdot R \Rightarrow P = \frac{V^2}{R}$

Electric energy (E) or Heat (H) ⇒

The electric energy consumed by an electrical appliance is given by the product of its power rating and the time for which it is used.

E, H or $W = P \times t$

$E = W = Vit$

$E = iRit = i^2Rt$

$E = \frac{V^2}{R^2}Rt = \frac{V^2}{R}t$

Unit - Jule.

Commercial unit of electric energy →

Commercial unit of energy is kilowate hours (Kwh) Generally it is known as unit

$$\text{No. of units} = \frac{\text{Watt} \times \text{hours} \times \text{day}}{1000}$$

$1\ Kwh = 3.6 \times 10^6$ Jule

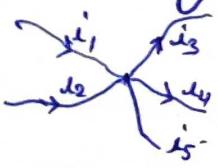
Kirchoff's laws → it gives two law,

I law → According to this law, the algebric sum of all the current meeting at a point in a junction is always zero,

OR

$$i_1 + i_2 + (-i_3) + (-i_4) + (-i_5) = 0$$

$$i_1 + i_2 = i_3 + i_4 + i_5$$

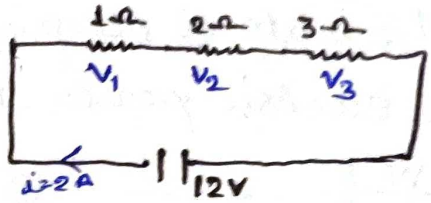


IInd law → According to this law, In any close phase the sum of the Product of all the Resistance to corresponding current is equal to total Emf (Electro magnetic force) or voltage of phase

$$\Sigma iR = \Sigma E$$

Ques → 1 →

(i) Potential



$R = R_1 + R_2 + R_3$

$R = 1 + 2 + 3 = 06\ \Omega$

$i = \frac{V}{R} = \frac{12}{06} = 02$ Amp

$V_1 = iR_1 = 02 \times 1 = 02$ ~~Volt~~ ~~Potential~~

$V_2 = iR_2 = 02 \times 02 = 04$ ~~Volt~~

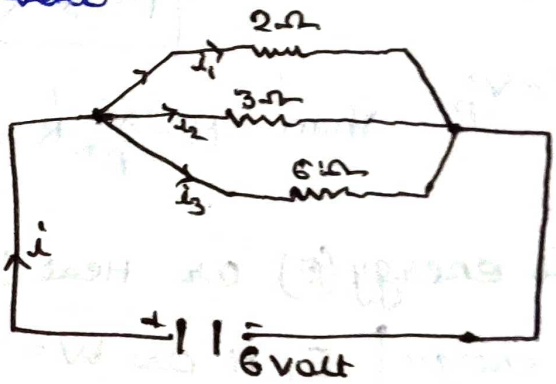
$V_3 = iR_3 = 03 \times 02 = 06$ ~~Volt~~

Ques. 2 →

1 → Equivalent Resistance

2 → Current on each Resistance

3 → Voltage on each Resistance



(i) → Equivalent resistance $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{3+2+1}{6} = \frac{6}{6} = \frac{1}{1}$

$\boxed{R = 1\ \Omega}$

(ii) Current on each Resistance →

In Parallel Form $V = 6$ volt $(V = iR)$

$i = V/R$

$i_1 = \frac{V}{R_1} = \frac{6}{2} = 3$ Amp

$i_2 = \frac{V}{R_2} = \frac{6}{3} = 2$ Amp

$i_3 = \frac{V}{R_3} = \frac{6}{6} = 1$ Amp

(iii) Voltage on each Resistance →

~~V = V1 = V~~ $\boxed{V = 6 \text{ volt}}$ in each Resistance

The electronic motor

" A motor is a device which converts electrical energy into mechanical energy.

Principle of motor →

When a rectangular coil is placed in a magnetic field and current is passed through it, a force act on the coil which rotates it continuously.

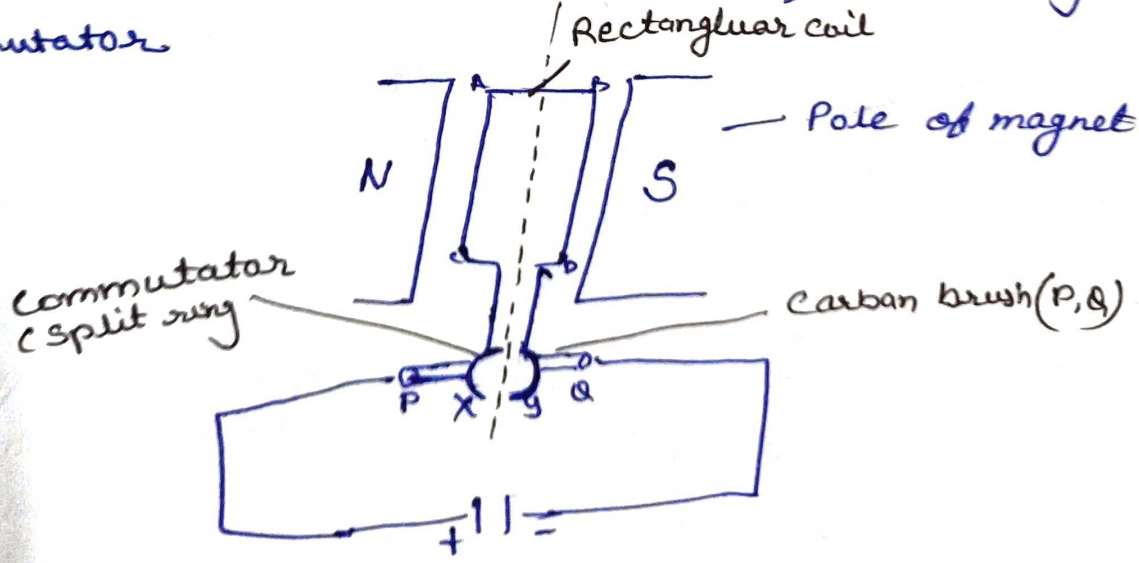
Construction → It has flowing parts :-

(i) **Poles of magnet →** There are two poles N and S.

(ii) **Rectangular coil →** In this, a rectangular coil ABCD which is placed in magnetic field in such a way so that it can rotate freely.

(iii) **Commutator** (Split ring) **→** There are x and y connected to coil The work of commutator is to reverse the direction of current.

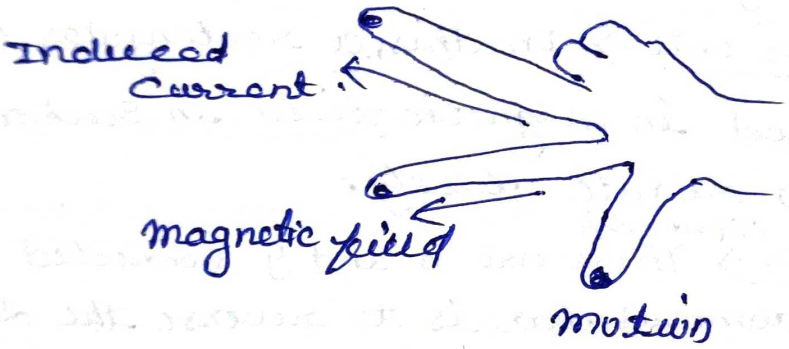
(iv) **Carbon brush →** Two carbon brush P and Q connected to cummutator. which provied current from battery to. cummutator



Working → When current pass in the coil. which is placed in the magnetic field then a magnetic force act on it. due to which coil strate to rotate. whose direction can be found by fleming left hand rule.

Fleming Reight hand rule (Direction of Induced current)

According to this law. if we raised our thumb, for finger and midde finger in such a way. they are rect angle to each other, then our four finger point the direction of magnetic field, thumb. point the direction of motion of Conducter and middle finger give point the direction of induced current in the conducter.



Note → Fleming Right hand rules is used generally to find the direction of Indue current.

AC Generator

This divice is used to convert mechanical energy to electric energy.

Principle → It is based on electro-magnetic Induction.

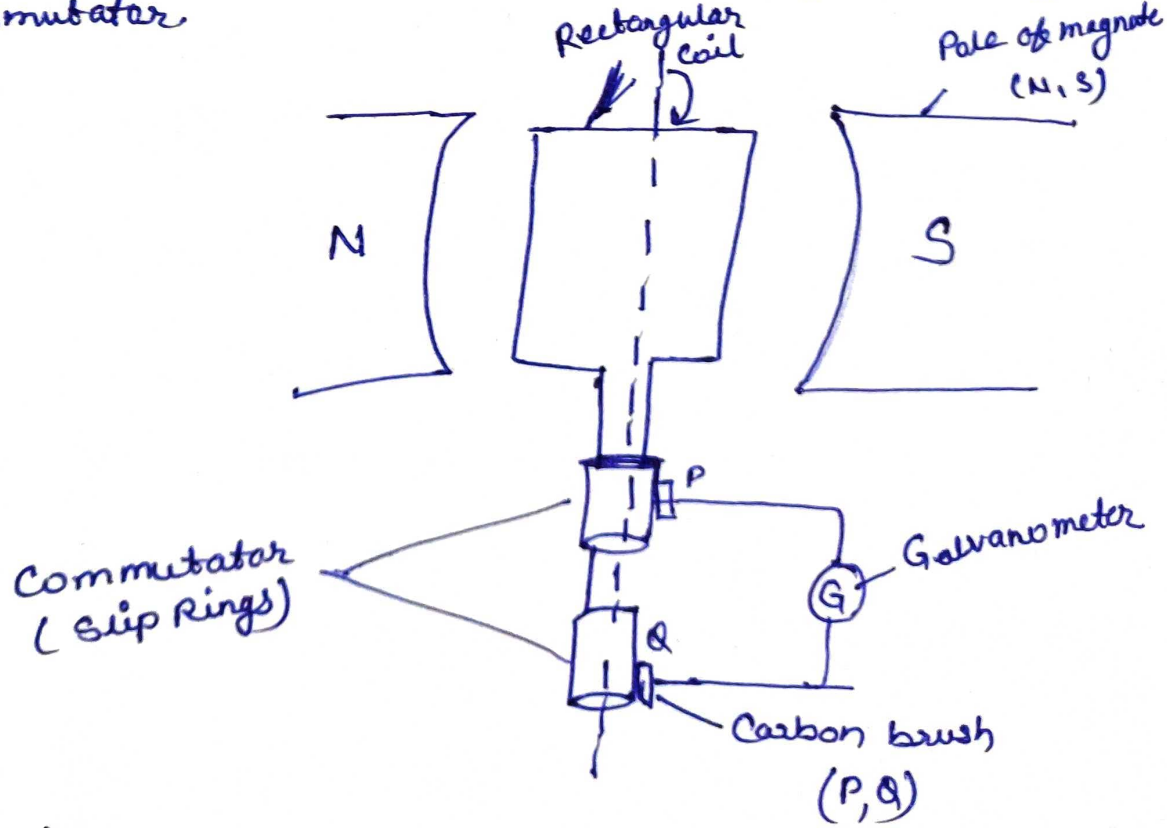
Construction →

(i) **Pole of magnate →** There are two poles N & S (like motor)

(ii) **Rectangular coil →** In this a rectangular coil ABCD placed in magnetic field in such a way. so that it can rotated freely.

(iii) **Slip rings →** There are two circular ring R_1 and R_2 made up of metal connected with two ends of coil.

(iv) **Cabon Brush →** Two carban brush P & Q connected to commutator. which provide current from battery to commutator



Working →

Force and laws of motion

Force → A push or pull on a body is called force. When we applied a force on a body it can change the position of body $\boxed{F = m \times a}$ Newton

Effect of motion

A force can not be seen. It can we may judge only by effect which it can produce it is various body arround it. Its produced the flowing effect.

(i) A force can move a rest body.

(ii) When he hit a ball in ground it started moving.

(iii) A force can stop a moving body.

(iv) A force can change the direction of a moving body.

(v) A force can chang the shape and size of a body.

Balance and unbalanced force

Force are two types

(i) **Balance force** → If the result of all the force acting on a body is zero. This force is called balanced force.

(ii) **Unbalanced force** → If the result of all the forces acting on a body is not zero. the force is called unbalanced force

Newton's ~~first law~~ law of motion

I^st law of motion → According to this law of a body which is in rest will remains in rest or a body which is in uniform motion remain untill no external force is applied on it.. It is also known as law of Ineritia.

Inertia → It is that property of a body which oppose the change in its position or motion.
Its depends on mass or weight.

⇒ A hay body has more inertia campair to lighter object.

Momenthum → It is equal to the product of mass and velocity of the object

momenthum P = mass × velocity

$$\boxed{P = mv} \quad kg \cdot m/s$$

II^nd law of motion - According to this law the rate of change of momenthum of a body is equal to the force applided.

$$\text{Force} = \frac{\text{change of momenthum}}{\text{time}}$$

$$F = \frac{P_2 - P_1}{t} = \frac{mv - mu}{t} = m\left(\frac{v-u}{t}\right)$$

$$\boxed{F = ma} \quad a \rightarrow \text{acceleration}$$

SI unit → Neutron. $\boxed{1N = 10^5 dyne}$

~~Impulse~~ Impulse → It is forced applied for short duration of time
It is represented by I

$$I = F \times t$$ (Newton see)

III^rd law → ~~क्रिया~~ प्रतिक्रिया का नियम

According the electrus.

Human Eye

Defect of Vision

- Cataract
- Hypermetropia (Far Sightedness)
- Myopia (Near Sightedness)
- Presbyopia

Cataract → (मोतिया बिन्द) →

In this defect eye lens become milky and cloudy. It can cause complete or partial loss of vission. This can be corrected by surgical remove of extra growth.

Hypermetropia → (दूर दृष्टि दोष) →

In this defect. a person can not be see nearby object clearly. but can see distance object clearly.

Reason → (i) Increase in focal length of eye lens.
(ii) Eye ball has become two small.

Correction → Corrected by convex lens.

Numrical Condition → Use formula → $\frac{1}{F} = \frac{1}{V} - \frac{1}{U}$

where → $U = -25$ cm

$V = -X$ (distance of near point)

Myopia → In this defect a person can see nearby object clearly. but can not see distant object clearly.

Reason → (i) Decrease in focal length of eye lens.
(ii) Eye ball has become too large.

Correction → Corrected by concave lens.

Numrical Conditions → $\frac{1}{F} = \frac{1}{V} - \frac{1}{u}$

where $u = -\infty$

and $V = x$ (Distance of far point)

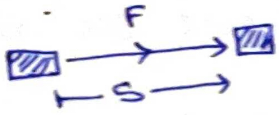
Presbyopia → In old age the power of accommodation of the eye usually decreases. the near point gradully ~~rede~~ recedes away. This defect is known as presbyopia.

Reason → Gradually weakning of cillary muscles.

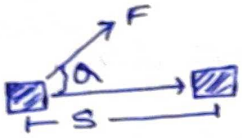
Correction → use bifocal lens.

Work - Power & Energy

Work →

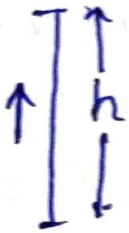


$$W = F \times S$$



$$W = F S \cos\theta$$

Work done agest Gravity →



$W = mgh$

Work done

$W > 0 \quad \theta < 90°$

$W = 0 \quad \theta = 90°, \; S = 0$

$W < 0 \quad \theta > 90°$

SI Unit of work done = Jule

CGS Unit = Erg

$1 \text{ Jule} = 10^7 \text{ Erg}$

Power → $P = W/t$ (the rate of work done)

(Unit - Watt)

Energy → (i) Mechanical energy

- Kinetic Energy
- Potential Energy
  - Gravitational Energy
  - Elastic Energy

Kinetic Energy → Energy due to motion

$$K.E = \frac{1}{2}mv^2$$

P.E → Energy due to its position or shape.

- G.P.E
- E.P.E

Garavitation Potential Energy -

$P.E = mgh$ (Jule)

Elastic Potential Energy → Due to Change in Shape

Exmple → Streatch to Spring

$U = \frac{1}{2} K x^2$

(K = Constant)
(x = in mitre)

Energy Converter →

(1) Electric Heater - Electric engy to Heat Energy

(2) Microphone — Sound Energy to Electric energy.

Conservation law of machanical Energy →

- KE + PE (Fix)
- KE + PE (Fix)
- KE + PE (Fix)

$KE + P.E = Constant$

Sources of Energy

Good Sourse of Energy ⇒

A Good sourse of Energy is. ...

(i) Which would do a large amount of work per unit mass

(ii) Which is easily available

(iii) Which is easy to store and transport

(iv) which is safe to handle and use.

(iv) which does not cause environmental pollution.

Fuels ⇒ The metrials which are burnt to produce heat energy are known as fules.

Example ⇒ Wood, Coal, Cooking Gas (LPG), Kerosene, Diesel and petrol)

Calorific value ⇒

The amount of heat produced by burning 1 gram of a ~~fate~~ fuel completely is called its calorific value.

⇒ Hydrogen gas has the highest calarific value of 150 ~~fate~~ Kilojule/gm.

Fossil Fuels →

A natural fuel formed deep under the earth from the pre historide remains of living organisum (like animals and plants) is called a fossil fuels.

1 → Coal

2 → Petroleum (Petrolium gas)

Alternative sourse of Energy →

1 → Hydro electric Energy →
2 → Wind Energy
(3) - Solar Energy
(4) - Biomass Energy

Nuclear Energy →

(i) Nuclear fission → (नाभिकिय विखण्डन)

$$_{92}U^{235} + {}_{0}n^{1} \xrightarrow{\text{Fission}} {}_{56}Ba^{139} + {}_{36}Kr^{94} + 3\,{}_{0}n^{1} + \text{Energy}.$$

(ii) Nuclear Fussion → (नाभिकिय संलयन)

$$_{1}H^{1} + {}_{1}H^{1} + {}_{1}H^{1} + {}_{1}H^{1} \xrightarrow{\text{Fussion}} {}_{2}He^{4} + 2\,e^{0} + \text{Energy}$$

~~$_{1}H^{1} + {}_{1}H^{2} + {}_{1}H^{2}$~~ " → ——— .

Ques → An electric bulb draws a current of 0.25A for 20 mint. Calculate the amount of electric charge that flows through the circuit.

Ans → $i = .25A$

$t = 20 \text{ mint} = 20 \times 60 = 1200 \text{ sec}$

$q = ?$ $\quad i = q/t \Rightarrow q = it$

$= .25 (1200)$

$= \frac{25}{100} \times 1200 = 300 C$

Ques → The P.d across a lamp is 12V. How many Joules of electrical energy are changed into heat and light when (a) a charge of 1C passes through it?

(b) a charge of 5c passes through it

(c) a current of 2A flows through it for 10s.?

Solution → $V = 12 \text{ Volt}$

$W = E = ?$

(a) → $q = 1C$

$V = \frac{W}{q} \Rightarrow W = Vq = 12 \times 1 = 12 \text{ (Watt) Jule}$

(b) → $q = 25C \Rightarrow W = Vq = 12 \times 5 = 60 \text{ (Watt) (Jule)}$

(c) ⇒ $i = 2A$, $t = 10 \text{ sec}$

$W = Vq = V \times it = 12 \times 2 \times 10 = 240 \text{ (Watt) Jules}$

Ques → In 10 sec, a charge of 25 coulamb leaves a battery and 200J of energy are dilivered to an outside circuit as a result. $t = 10 \text{ sec}$ $q = 25 \text{ coulamb}$ $W = 200J$

(a). What is the P.d across the battery.

$V = W/q = \frac{200}{25} = 08 \text{ Volt}$.

(b) What current flow from the battery.

$i = ?$ $\quad q = it$

$25 = i (10 \text{ sec})$

$i = 25/10 = 5/2 = 2.5 A$

heating. filament → ~~nicro~~ nichrome

Ques → An electric iron draws a current of 3.4 A from the 220 V supply line. what current will this electric iron draw when connected to 110 V supply line.

Solution → $i = 3.4\ A$ $\quad V = i R$

$V = 220\ V$ $\quad R = V/i = \frac{220}{3.4} = \frac{1100}{17} = 64.7\ \Omega$

$R = 64.7\ \Omega$

$V = 110\ V$

$$i = V/R = \frac{110}{64.7} = 1.7\ A$$

Ques → A P.d of 20 volts is applied accross the end of a risistance of 5 ohms. What current will flow in the risistance?

Sol → $V = 20\ V$ $\quad i = ?$

$R = 5\ \Omega$

$V = iR$ $\quad i = V/R = \frac{20}{5} = 4\ A$

Ques → Keeping the P.d constant, the risistance of a circuit is doubled. By how much does the current change.?

Sol → $V =$ Constant $\quad$ Risistance $= R$

$$i = \frac{V}{R} \quad --①$$

If $R = 2R$

$$i_1 = \frac{V}{2R} = \frac{1}{2}(V/R) \quad --②$$

Put the value of i, from equation ① to equation ②

$$i_1 = \frac{1}{2}(i)$$

Constanee P.d. If resistanee is take double electric current become $1/2$.

Ques → A electric room heater draws a current of 2.4A from the 120V supply line. What current will this room heater draw when connected to 240V supply line

Sol → $i = 2.4$ Amp. $V = 120V$

$$V = iR$$

$$R = V/i = \frac{120}{2.4} = \frac{1200}{24} = 50\ \Omega$$

$V_1 = 240V \quad i_1 = ?$

$$V_1 = i_1 R$$

$$i_1 = V_1/R$$

$$= \frac{240}{50} = 4.8 \text{ Amp}$$

Ques → 33 → A. P.d of 10 volt is needed to make a current of 0.02A flow through a wire. What P.d is needed to make a current of 250 mA flow through the same wire.

Sol → $V = 10$ volt $\quad i = 0.02A \quad\quad V = iR$

$$R = V/i = \frac{10}{.02} = \frac{1000}{2}$$

$$R = 500\ \Omega$$

$V_1 = ? \quad i_1 = 250\ mA = 250 \times 10^{-3} A$

$$V_1 = i_1 R$$

$$V_1 = 250 \times 10^{-3} \times 500$$

$$= 25 \times 5 \times 10^{-3+3}$$

$$\boxed{V_1 = 125 \text{ volt.}}$$

Ques → A copper wire has a diameter of 0.5 mm and resistivity of $1.6 \times 10^{-8}\ \Omega$ m

(a) → What will be the length of the wire to make its $R = 10\ \Omega$.

$$\text{diameter} = 0.5\ mm = \frac{0.5}{10}\ cm = \frac{0.5}{10 \times 100} = 5 \times 10^{-4}\ mtr$$

$$\text{radius} = \frac{5 \times 10^{-4}}{2}\ mtr$$

$$\text{Area of cross section} = \pi r^2 = \frac{22}{7}\left(\frac{5 \times 10^{-4}}{2} \times \frac{5 \times 10^{-4}}{2}\right)$$

$$= \frac{11}{14} \times 25 \times 10^{-8}$$

$$= \frac{275}{14} \times 10^{-8}$$

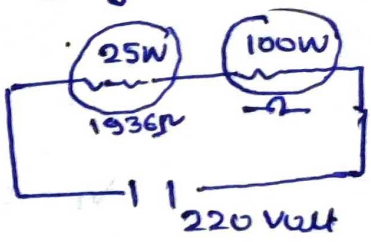
$$= 19.64 \times 10^{-8}\ m^2$$

(a) $\quad R = \rho\left(\frac{l}{A}\right)$

$$10\ \Omega = 1.6 \times 10^{-8}\left(\frac{l}{1.964 \times 10^{-8}}\right)$$

$$l = \frac{10 \times 1.964 \times 10^{-8}}{1.6 \times 10^{-8}} = \frac{491}{4} = 122.7\ m$$

Ques → If two bulb of voltage 25W and 100W, each voltage 220 volt. ~~Calculate the~~ connected in serese. with the supply of 440 volt calculate potential Difference both the bulb connected weathe any bulb fuge.



Solution → $P_1 = 25\,W$

$V_1 = 220$ volt

$P_1 = V_1^2/R \Rightarrow R_1 = V^2/P = \frac{220 \times 220}{25}$

$R_1 = 1936\,\Omega$

44
44
176
176
1936

$P_2 = V_2^2/R_2 = R_2 = V_2^2/P_2 = \frac{220 \times 220}{100} = 484\,\Omega$

R_1 and R_2 in conected in serease than the total Risistone is $R = R_1 + R_2$

$R = 1936 + 484$

$R = 2420\,\Omega$

Voltage become 440volt Current flow in the curcuit is $i = V/R$ $(\because V = iR)$

$i = \frac{440}{2420} = \frac{22}{121}$

$i = \frac{22}{121} = \frac{2}{11}$ Amp

For R_1 Risistone

$V_1 = i \cdot R_1$

$V_1 = \frac{2}{11} \times 1936 = 352$ volt

For Risistonel R_2

$V_2 = \frac{2}{11} \times 484 = 88$ volt

If increase voltage 220V to 440volt. 25 watt bulb become fuged.

Ques → If 300 mA, current passing through to a lamp How many electron is passed in 1 mint.

Sol →

$i = 300\,mA = 300 \times 10^{-3}\,A$

$t = 1\,min = 60\,Sec$

$q = it$

$= 300 \times 60 \times 10^{-3}$

$q = 18\,C$

$q = ne$

$n = q/e = \frac{18}{1.6 \times 10^{-19}} = \frac{180}{16} \times 10^{19}$

$= 11.25 \times 10^{19}$

$\boxed{n = 11.25 \times 10^{19}}$

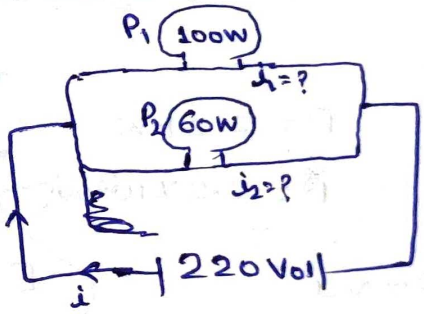
Ques → Two lamp 100W and 60W are joined to parallel and 220 volt supply, Calculate the current in circuit.

Sol →

$P_1 = 100\,W$ $\quad i_1 = ?$

$V = 220\,Volt$ $\quad i_2 = ?$

$P = Vi$ $\quad i = ?$



$i_1 = P_1/V = \frac{10\cancel{0}}{22\cancel{0}} = \frac{5}{11} =$

$i_1 = .45\,Amp$

$i_2 = P_2/V = \frac{6\cancel{0}}{22\cancel{0}} = \frac{3}{11} = .28\,Amp$

Total current $i = i_1 + i_2$

$i. = 0.45 + 0.28$

$\boxed{i = 0.73\,Amp}$

Ques → A house wiring supplied with 220 volt protected by 6 Amp fuse. calculate the max no. of 60 watt bulb.

Sol →

$V = 220\,volt$ $\quad P = Vi$

$i = 6\,Amp$ $\quad P = 220 \times 6 = 1320\,Watt$

no. of bulb $= \frac{\text{Total Power}}{60\,W} = \frac{132\cancel{0}}{6\cancel{0}} = \underline{22\ bulbs}$

Ques→ How much energy is consume in circuit of 5 Amp. flow through the filament top. Heree the resistance 100 Ω in 2 hours.

Sol→ $E = ?$ $i = 5$ Amp $R = 100\ \Omega$

$t = 2 \times 60 \times 60 = 7200$ sec

$P = vi$
$= i^2Rt$
$E = Pxt$

$E = i^2Rt$

$= (5)^2 \times 100 \times 7200 = 25 \times 72 \times 10^4$

$= 1800 \times 10^4$

$E = 18 \times 10^6$ Jule

Ques→ An electric ketal readit at 220 volt - 2.2 KW burn of 3 hours. the energy consumed 430 day and find the cost of bill. if per unit cost 5 Rupies

$V = 220$ V $t = 3$ hours

$P = 2.2$ KW

$P = 2.2 \times 10^3$ W

$t = 3 \times 60 \times 60$ Se

$P = vi$

$2.2 \times 10^3 = 220 \cdot i$

$i = \frac{2200}{220}$

$i = 10$ Amp

$E = P \times t$

$E = vi \times t$

$E = 220 \times 10 \times 3 \times 60 \times 60$

$E = 22 \times 1 \times 3 \times 36 \times 10^4$

$E = 22 \times 108 \times 10^4$

$E = 2376 \times 10^4$ Jule

$E = \frac{2376 \times 10^4}{1000}$ KW

$E = 23760$ KW

108
x 22
216
216
2376

Unit = $\frac{\text{Watt} \times \text{hour} \times \text{No. of day}}{1000}$

$= \frac{2.2 \times 10^3 \times 3 \times 430}{1000}$

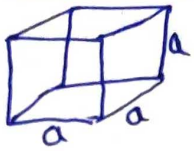
$= 6.6 \times 430 = 66 \times 43$

$= 2838$ KW

66
43
198
264
2838

Per unit Charge = $2838 \times 5 = 14190$ Rs/-

Cube →



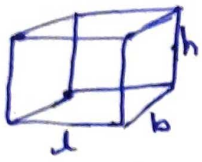
① 4 wall area = $4a^2$

② T.otal area = $6a^2$

③ Volume = a^3

④ digonal = $a\sqrt{3}$

Cuboid →



⇒ 4 Wall area = $2(l+b)h$

Total wall area = $2(lb+bh+hl)$

Volume = $l * b * h$

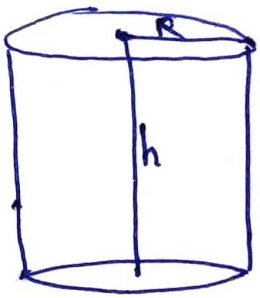
digonal = $\sqrt{l^2+b^2+h^2}$

Cylinder →

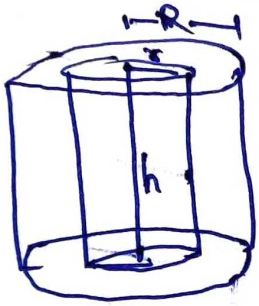
C.S.A = $2\pi rh$

T.S.A = $2\pi r(h+r)$

Volume = $\pi r^2 h$



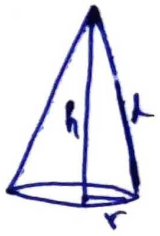
Hollo Cylinder



C.S.A = $2\pi(r+R)h$

T.S.A = $2\pi(r+R)h + \pi(r^2+R^2)$

Volume = $\pi(R^2-r^2)h$



$l = r^2 + h^2$

C.S.A = πrl

T.S.A = $\pi r(l+r)$

Volume = $\frac{1}{3}\pi r^2 h$

Sphere →

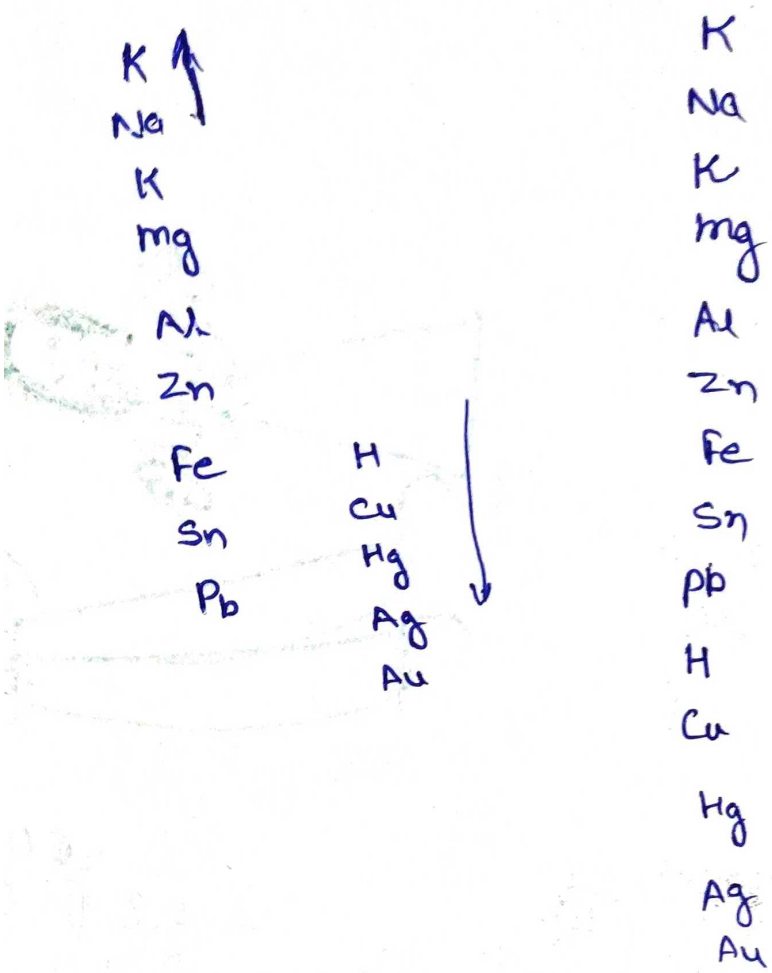
C.S.A = $4\pi r^2$

Volu = $4/3\pi r^3$

C.S.A = $2\pi r^2$

T.S.A = $3\pi r^2$

Volume = $2/3\pi r^3$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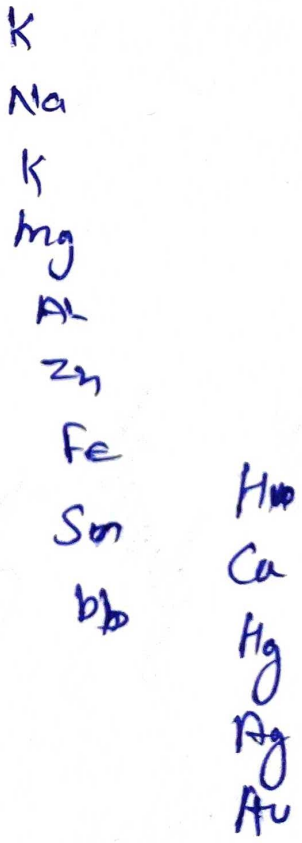
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