Magnetism :- This is the property of magnet in which magnet attract the magnetic substance.

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Chapter - 5
MAGNETISM And MATTER

Q.1 What is magnet. write it's property.
~~Q. 2~~ Ans.)

Magnet :- An object which has capability to producing magnetic field and attracting ~~same pot~~ opposite pole and repelling like (same) poles.

Properties :-

(i) like pole repel each other
(ii) unlike pole attract each other.
(iii) Magnetic force is directly praportional to distance between magnet and magnetic object.

(iv) if we subtend magnet freely in air then it always setup itself in North - south direction of the earth.
(v) Magnet always create magnetic field around itself.
(vi) The molecule of magnet are regular arranged.
(vii) An object is placed in enternal magnetic field then that objects behaves like a magnet for some time.
(viii) The properties of magnet get destroyed when magnet is hammered or heating.

⇒ Effective length = $\frac{5}{6}$ Geometrical length.

Q.2 What is magnet and write its type.

Q.3 Define the following :-

(a) Magnetic pole (north and south pole)
(b) Geometrical length
(c) Effective length
(d) ~~P~~ pole strength → SI unit → Ampere meter
(e) Magnetic dipole
(f) Magnetic Moment → unit :- Am^2
(g) Axis
(h) Geographical Axis
(I) Magnetic Meridian
(J) Geographical Meridian
(K) Angle of Dip
~~(L)~~

Q.4 Why does a magnet loose it's magnetic property on heating hammering? write the

Q.5 Statement of coulomb's inverse square law for magnetism.

Q.6. What is magnetic field and intensity of magnetic field.

Q.7 define magnetic dipole and magnetic moment

Q.8 Define magnetic field lines of force.

North pole → Test pole

→ Distance b/w both pole is called effective length.

Ans.5 Coulomb's inverse square law :-

Magnetic force is directly proportional to product of (both) mass and inversely proportional to square of distance b/w them.

$$F \propto m_1 m_2$$

$$F \propto \frac{1}{r^2}$$

$$\Rightarrow F \propto \frac{m_1 m_2}{r^2}$$

$$\Rightarrow \boxed{F = \mu \frac{m_1 m_2}{r^2}}$$

$\mu = 1$ (C.G.S system)

$\mu = \frac{\mu_0}{4\pi} = 10^{-7}$ (M.K.S system)

$\left\{ \frac{\mu_0}{4\pi}, \text{unit} \rightarrow N/A^2 \right\}$

Ans.6. The force experienced by unit pole (North pole) in magnetic field is called intensity of magnetic field.

Magnetic field :- The space around the magnet in which we experience magnetic force is called magnetic field.

Ans. 7. **Magnetic dipole** :- A magnet is called magnetic dipole.
Small bar magnet is treated like a magnetic dipole.

Magnetic dipole Moment :- **Magnetic Moment** :- The product of pole strength and effective length of the magnet is called Magnetic moment represented by $(\vec{M})$

$$\boxed{\vec{M} = (m)(\vec{2l})}$$

where, $\vec{M}$ → Magnetic moment
m → Pole strength
$\vec{2l}$ → effective length

And, Effective length $(2l) = \frac{5}{6}$ (Geometric length)

$$\boxed{2l = \frac{5}{6} \text{ (Geometric length)}}$$

Element of Earth magnetism :-

(A) Geographical axis
(B) Geographical Meridian
(C) Angle of declination
(d) Horizontal component
(e) Angle of dip / enclination
(f) Vertical component

A) **Geographical axis** :- The line joining of North and South Pole of the earth, this line is called Geographical axis.

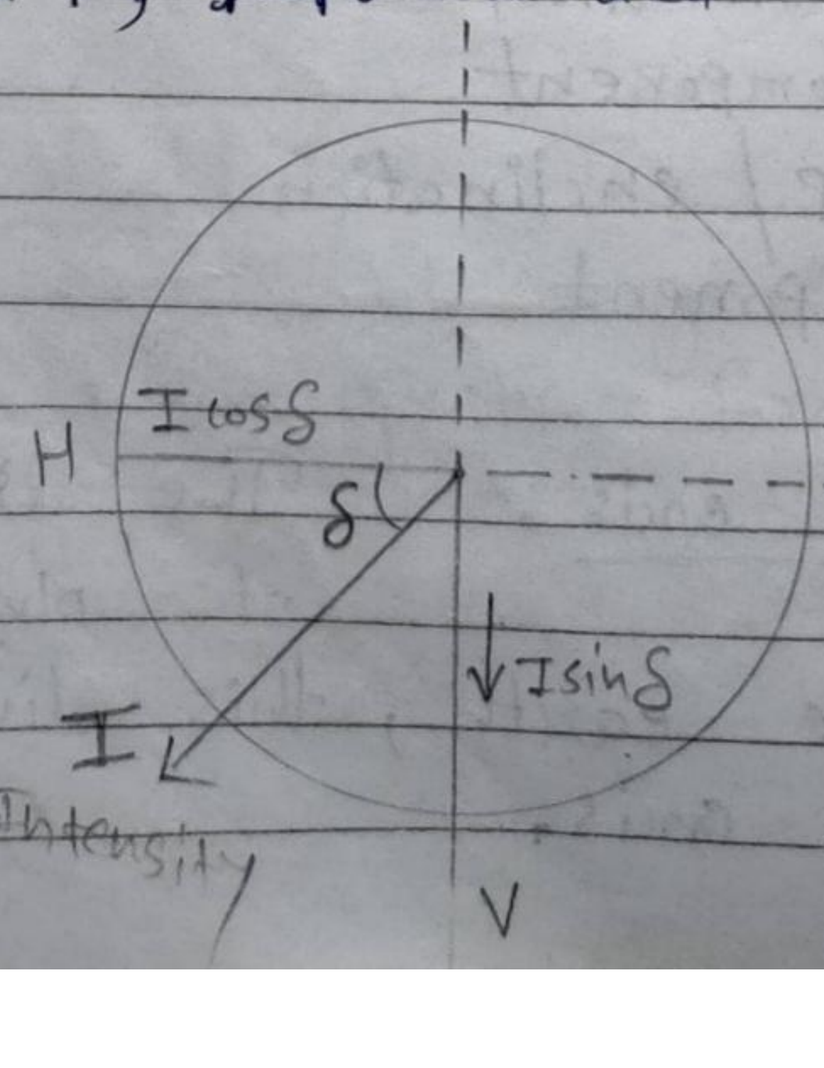
b) Geographical Meridian :- The plane drawn perpendicular to the Geographical axis, ~~is call~~ this plane is called Geographical Meridian.

c) Angle of declination :- The angle b/w magnetic axis and Geographical axis or angle b/w Geographical meridian and magnetic meridian, this angle is called angle of declination.
(θ)

d) Horizontal Component :- The component related to surface is called horizontal component.
(H)

e) Vertical component :- The component related to height & depth is called vertical component.
(V)

f) Angle of dip / enclination :- The angle b/w Horizontal component and resultant Intensity is called Angle of dip, represented by "δ".
(δ)



~~Pythagoras theorem,~~

$\Rightarrow$ ~~$I^2 = H^2 + V^2$~~

$\Rightarrow$ ~~$I = \sqrt{H^2 + V^2}$~~

$\Rightarrow V = I \sin\delta \longrightarrow (1)$

$\Rightarrow H = I \cos\delta \longrightarrow (2)$

$\Rightarrow$ Adding (i) and (ii)

$\Rightarrow \boxed{H^2 + V^2 = I^2}$

And, diving (i) and (ii),

$\Rightarrow \frac{I \sin\delta}{I \cos\delta} = \frac{H}{V}$

$\Rightarrow \boxed{\tan\delta = \frac{V}{H}}$ → if $H = V$ then Angle is $45°$.

Q.9 Explain the following :-

(a) Magnetising force (intensity of magnetic field)
(b) intensity of magnetization
(c) susceptibility of material
(d) permiability
(e) Magnetic induction

Q.10 Derive the relation b/w permiability and susceptibility of material.

Q.11 Explain Hysterisis curve.

Ans.9) (a) since, $B = \mu_0 H I$

$B = \mu_0 H$ $\{\because H = nI\}$

$\boxed{B_0 = \mu_0 H}$ magnetization force.

(b) Intensity of magnetization :- The magnetic dipole moment (M) per unit volume (V) of the magnetized material.

$$I = \frac{M}{V} = \frac{Am^2}{m^3} = \frac{A}{m} = Am^{-1}$$

(c) susceptebility :- It is a measure of how much a material will become magnetized in an applied magnetic field, represented by "χ" (kai).

$$\boxed{\chi = \frac{I}{H}}$$

(d) Permiability :- The ratio of magnetic intensity (B) and magnetising field (H), represented by "μ".

$$\boxed{\mu = \frac{B}{H}} \quad \text{(or)} \quad \boxed{B = \mu H}$$

unit :- $\boxed{\mu = \frac{T}{Am^{-1}} = TmA^{-1}}$ Tesla meter per Ampere.

(e) Magnetic induction :- The process by which an object is magnetized by an external magnetic field.

Ans.10) relationship b/w permiability and susceptebility :-

$\boxed{1 + \chi = \mu}$ where, $\chi \rightarrow$ susceptebility of material

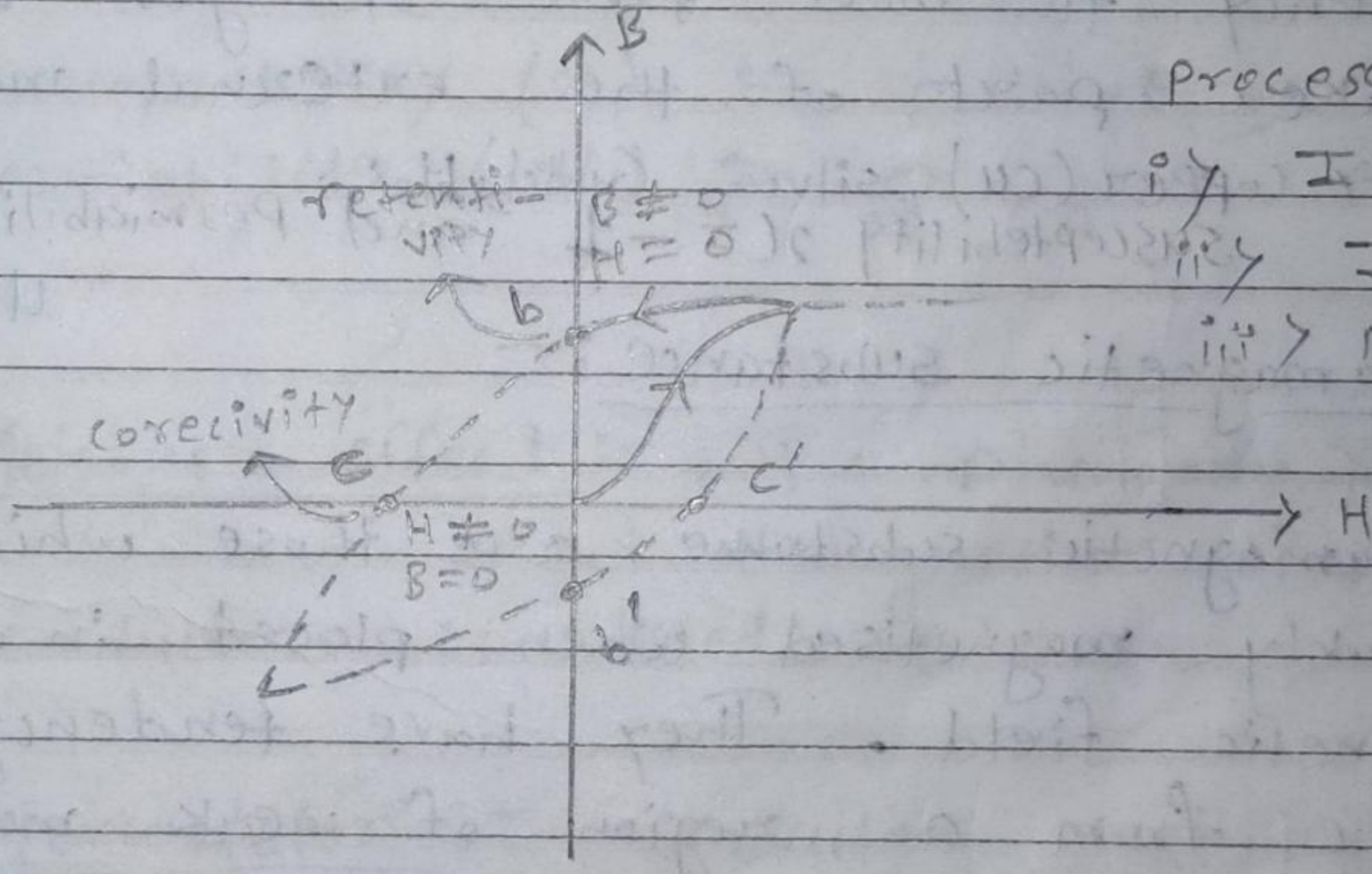
$\mu \rightarrow$ Permiability of material.

Ans. 11 Hysteresis curve :-

Retentivity :- The point where the value of $H = 0$ and value of $B \neq 0$, this point is called retentivity.

where, H → Magnetic field intensity → unit of H → Tesla.
B → Magnetising field

Coercivity :- The point where the value of $B = 0$ and value of $H \neq 0$, this point is called coercivity.



process :-
i) I ↑
ii) I ↓
iii) Make graph

Curies law :- According curies law susceptebility is inversely praportional to the absolute temperature.

⇒ $\chi \propto \frac{1}{T}$ where χ → susceptibility
T → Absolute Tem.

⇒ $\boxed{\chi = \frac{C}{T}}$, C → curies constant.
χ → Kai

Q.12 Explain magnetic substance classification.

(or)

Describe with the suitable example of dimagnetic, para-magnetic and ferromagnetic substance

Ans.12. Three magnetic substance property :-

a) Diamagnetic substance :-

Diamagnetic substances are those which have tendency to move from stronger to the weaker part of the external magnetic field.

Eg.-> copper (Cu), silver, Gold, H_2O,

→ susceptebility $\chi = -1$ and permiability (μ) = 0

μ is also -ve.

b) Paramagnetic substance :-

Paramagnetic substance are those which get weakly magnetised when placed in an external magnetic field. They have tendency to move from a region of weak magnetic field to strong magnetic field, they get weakly attracted to a magnet.

Eg.- Aluminium, Sodium, oxygen, copper chloride

→ permiability (μ) > 0

→ susceptebility (χ) = positive.

c) Ferromagnetic substance :-

Ferromagnetic substance are those which gets strongly magnetised when placed in an external magnetic field. They have strong tendency to move from a region of weak magnetic field to strong magnetic field, they got strongly attracted to a magnet.

→ eg. → iron

→ susceptebility (χ) = positive, $\chi > 1$
→ permiability (μ) ≥ 2

Meissner effect :- The phenomena of perfect diamagnetism in super-conductors is called Meissner effect.

Superconductors :- conducting electricity with no resistance.