(i) Intensity of magnetisation (I):

It is defined as the magnetic moment developed per unit volume of a magnetic substance due to a magnetising field. If M is the magnetic moment and V is the volume then $I = \frac{M}{V}$.

For a bar magnet of pole strength m, lenght 2l and area of cross-section A

$$V = 2lA \text{ and } M = 2ml$$

$$\therefore I = \frac{2ml}{2lA} = \frac{m}{A}$$

(a) I is a vector quantity having direction along the direction of M.

(b) It's unit is Am^{-1}

(c) I gives the measure of the extent to which the specimen is magnetised.

(ii) Permeability (μ):

The ratio of magnetic induction B produced in a magnetic material to the magnetising field intensity H is called permeability of the material.

$$\therefore \mu = \frac{B}{H}$$

(a) Unit of μ is Tesla ampere^{-1} metre.
(b) It is scalar quantity.
(c) μ measures the power of a material to conduct magnetic lines of force.

(iii) Susceptibility (λ_m):

It is defined as the ratio of intensi[ty] of magnetisation (I) to the strength of magnetising field (H)

$$\therefore \lambda_m = \frac{I}{H}$$

(a) λ_m is a measure of ease with which the substance can be magnetised.

(b) λ_m is a dimensionless scalar quantity. It can have either +ve or -ve value.
In vacuum I becomes zero $\therefore \lambda_m = 0$

λ_m of a substance generally decreases with rise of temperature.

1) Hysteresis : The phenomemmon of lagging of magnetic induction B behind magnetising field intensity H in a magnetic material is called hysteresis

Let us consider a ferromagnetic material be placed in a magnetising field ~~has~~ intensity H. so that it is magnetised by induction. As H is varied. flux density B in the material does not very linearly with H. in other words

permebility μ of material is not constant but varies with H.

The fig. shows variation in B with H. The Point O represents an ~~and~~ initially unmagnetised specimen and a zero magnetic intensity. As H is incresed B also increases but not uniformly and a point such as a' is reached.

If H is now decreased B also decreases but following a path ab. Thus B lags behind H. When H becomes zero B still has a value equal to ob (=Br). This magnetic flux density Br remaining in the magnitic

specimen in the absence of any external field is called residual magnetism. This property of a magnetic substance to retain its magnetism is called its retentivity or remanence.
If H is reversed then B becomes zero when H has a ~~it called~~ value equal to OC (=Hc). Hc is called coercive force or coercivity of the specimen thus coercivity is a measure of the magnetic intensity required to destory the residual magnetism.

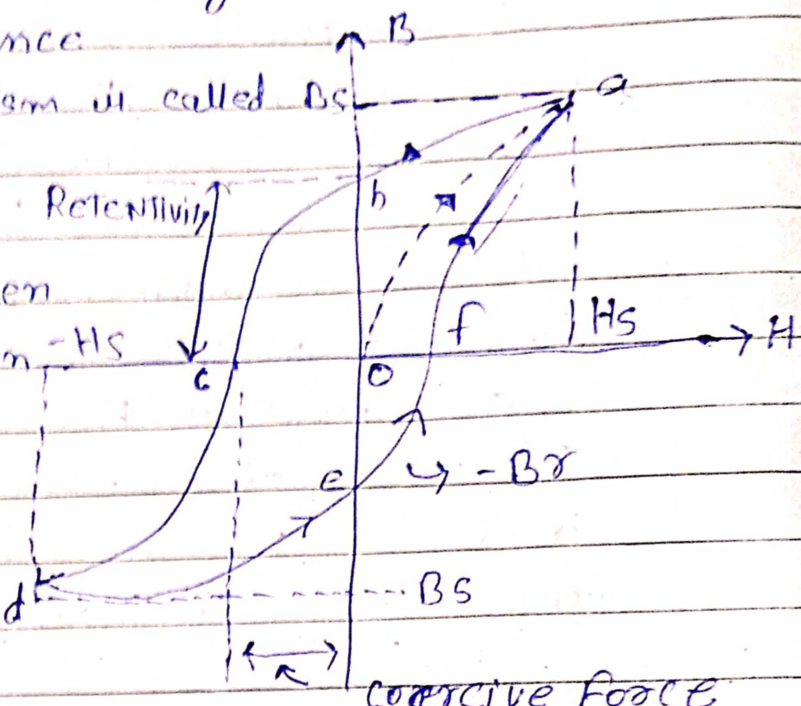

Fig-1

As H is increased (in -ve direction) beyond OC. the specimen is increcasingly magnetised in incereasingly magneotised in opposite direction and a point such as d is reach. By taking H back from its value -Hs to original positive maximum value Hs a similar curve d e f a is obtained. Now if H is along a b c d e f a but it never goes to O. Thus B always lags behind H showing the property of

hysteresis. The close curve a b c d e f a is called a hysteresis loop.
We get a similar curve when variation in intensity of magnetisation I is plotted against H.