EFFECT OF MAGNETIC FIELD ON CURRENT CARRYING CONDUCTORS

1) <u>Force on a conductor carrying current and placed in a uniform magnetic field induction.</u>

The force is given by.

$$F = BIL \sin\theta$$

or. $$\vec{F} = I\vec{L} \times \vec{B}$$

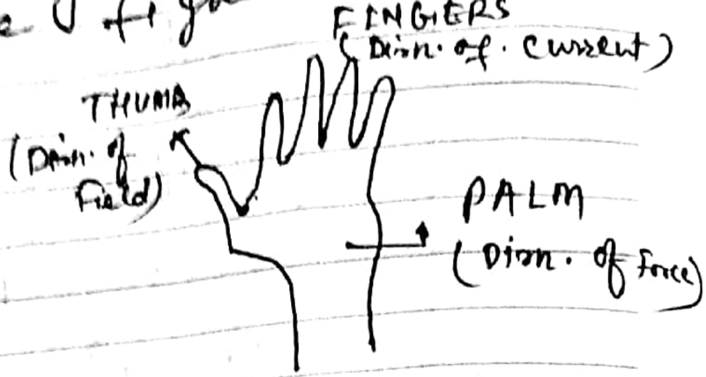
Here, I = current in the conductor.
L = length of the conductor.
B = magnetic field induction around conductor.
and θ = angle between direction of current and direction of magnetic field induction.

2) The direction of the force shall be ⊥r to the plane containing both the conductor and the magnetic field induction. The direction of the force is given by Fleming's left hand rule.

Fleming's Left hand rule is given below.

Fore finger → direction of field
Middle finger → direction of current.
Thumb → Motion.

3) The direction of the force can also be determined by the left hand (special rule) shown in the figure.



LEFT HAND.

Evening

4) We have,

$$F = BIL \sin\theta$$

(a) If $B = 0$;
$F = 0$;

(b) If $I = 0$;
$F = 0$;

(c) If $\theta = 0^\circ$ or 180°
$F = 0$;

(d) If $\theta = 90^\circ$
$F = BIL$

(e) In S.I. unit;

$L \rightarrow$ metre $B \rightarrow$ weber/m^2

$I \rightarrow$ ampere $F \rightarrow$ newton

5) EFFECT OF CURRENT ON CURRENT:

Evening

Two long parallel straight wires attract each other if they carry current in the same direction, and repel each other if the current is in opposite direction. If I_1 and I_2 are the currents in the two long parallel straight wires separated by a distance h; then force per unit length is given by $F = \frac{\mu_0}{4\pi}\left(\frac{2 I_1 I_2}{h}\right)$. Here, I_1 & $I_2 \rightarrow$ amp. $h \rightarrow$ metre, and $F \rightarrow$ N/m. if $I_1 = I_2 = I$, then $F = \frac{\mu_0}{4\pi}\left(\frac{2I^2}{h}\right)$.