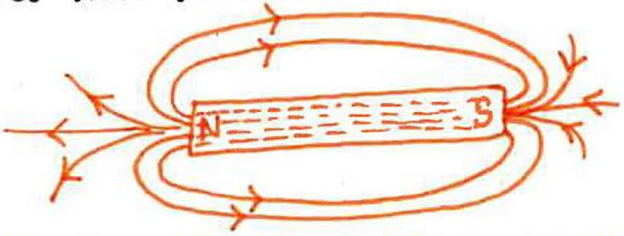
Magnetic Effects of Electric Current

Magnetic Field : The space surrounding a bar magnet in which its influence in the form of magnetic force can be detected, is called a magnetic field.

Magnetic Field Lines: The path along which a free magnetic north pole will move in a magnetic field, is called a magnetic field line.

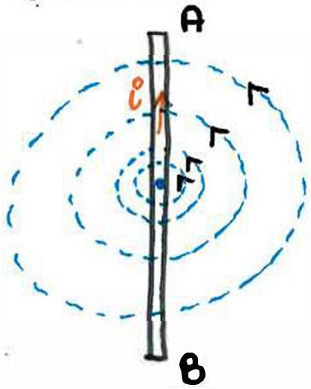
Properties of Magnetic Field Lines:

1. Outside the magnet, the direction is from North to South.
2. Inside the magnet, the direction is from South to North.
3. Magnetic field lines form closed loops.
4. No two magnetic field lines can intersect each other.
5. Closer the magnetic field lines, stronger is the magnetic field and vice versa.



Magnetic field due to straight current carrying conductor:

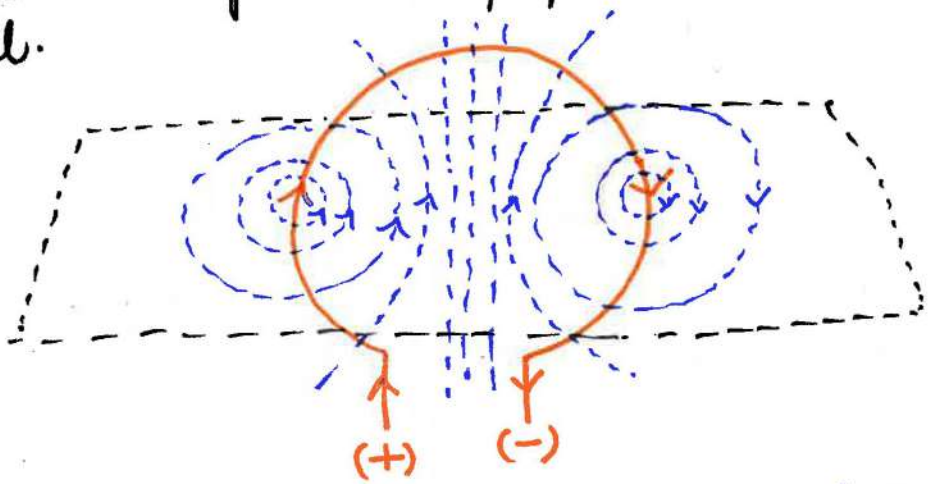
When current is passed through a straight current carrying conductor, a magnetic field is produced around it. Using the iron filings, we can observe that they align themselves in concentric circles around the conductor.



- The direction of the magnetic field through a straight current carrying conductor can be represented using Right Hand Thumb Rule.
- With increase in current, the strength of magnetic field is increased and vice versa.

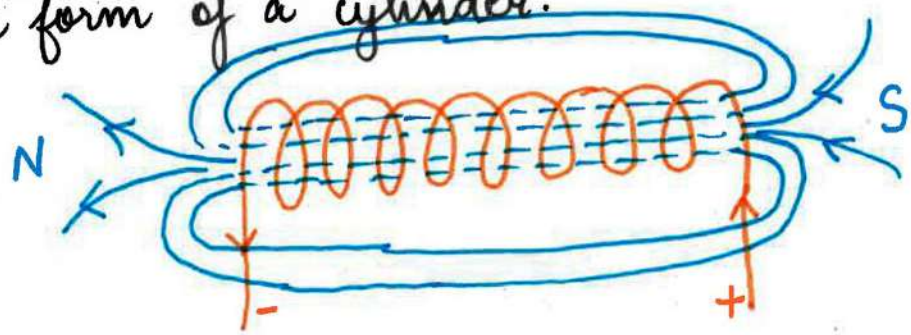
Magnetic field due to current carrying circular loop:

- The magnetic field produced in a circular current carrying conductor is same as that of the magnetic field due to a straight current carrying conductor.
- The magnetic field lines in a current carrying circular loop would be in shape of concentric circles and at the centre of the circular loop, field lines will become straight and perpendicular to the plane of coil.



Magnetic field due to flow of current in a Solenoid:

A solenoid is a tightly wound insulated copper wire in the form of a cylinder.



- The magnetic field produced by the current carrying solenoid is similar to a bar magnet. The magnetic field lines produced inside a solenoid is parallel, One solenoid end behaves as a south pole and other end behaves as a north pole.

Electromagnet: The strong magnetic force produced by a solenoid can be used to magnetize a piece of magnetic material. The magnet so formed is known as electromagnet.

Force on current carrying conductor in a magnetic field:

- A current carrying conductor experience a force when placed in a magnetic field.
- The force is maximum when the direction of current is at right angle to the direction of magnetic field.

Fleming's left Hand rule:

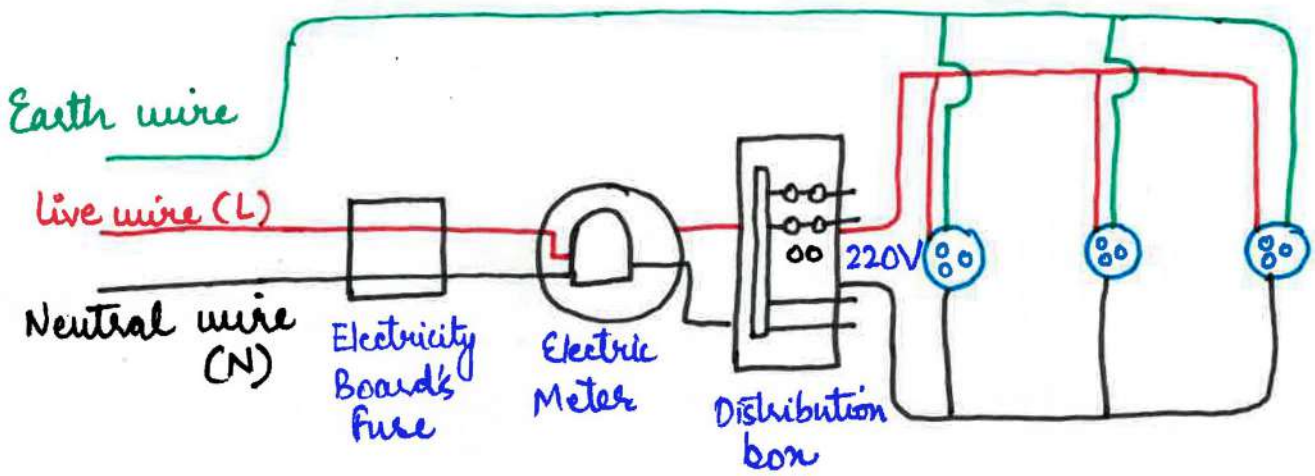
Stretch the thumb, forefinger and middle finger of the left hand such that they are mutually perpendicular. If the forefinger is in the direction of the magnetic field, middle finger in the direction of current, then thumb will point in the direction of force.

Domestic electric circuit:

Three kinds of wires are used in domestic electric circuits:

- Line wire (red in colour)
- Neutral wire (black in colour)
- Earth wire (green in colour)

The potential difference between line and neutral wire in India is 220V.



Electric Fuse :

- It is a safety device to limit the current in an electric circuit.
- It prevents the electrical appliance from damage.
- It is made up of a material which has high resistivity and low melting point.