Board – CBSE	Class – 10th	Topic – Magnetic Effects of Electric Current

1. Magnet:

   It is an object that attracts objects made of iron, cobalt & nickel.

   Comes to rest in North-South direction, when suspended freely.

2. Magnets are used:

   (i) In radio & stereo speakers,

   (ii) In refrigerator doors,

   (iii) On audio &video cassettes players,

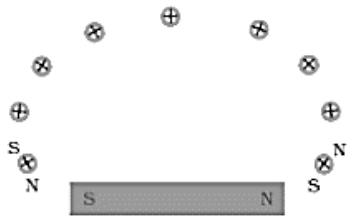
   (iv) On hard discs & floppies of computers

   (v) In children's toys.

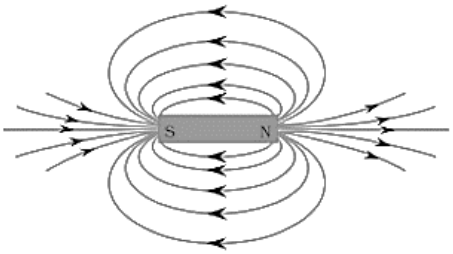
3. Magnetic field:

   The area around a magnet where a magnetic force is experienced is called a magnetic field. It is a quantity that has both direction & magnitude.

   " Magnetic field lines: Magnetic field is represented by field lines. They are lines drawn in a magnetic field along which a north magnetic pole moves. Magnetic field lines are called as



Drawing a magnetic field line with the help of a compass needle



Field lines around a bar magnet

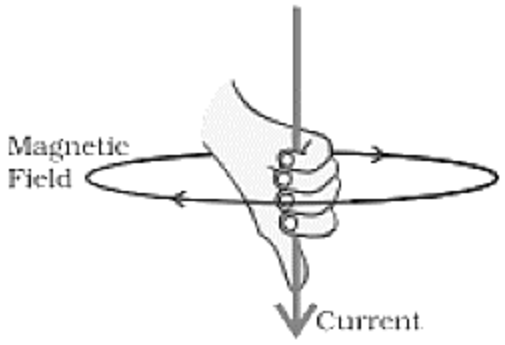
   Magnetic lines of force.

4. Properties of Magnetic field lines:

   (i) They do not intersect each other.

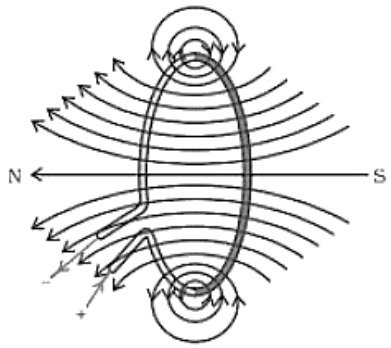
(ii) It is taken by convention that magnetic field lines emerge from the North pole and merge at the South pole. Inside the magnet, their direction is from the South pole to the North pole. Therefore magnetic field lines are closed curves.

5. Magnetic field lines due to a current through a straight conductor (wire)- consist of a series of concentric circles whose direction is given by the Right-hand thumb rule.
6. Right-hand thumb rule: If a current-carrying straight conductor is held in your right hand, the thumb points towards the current direction, then the wrapped fingers show the direction of magnetic field lines.



Right-hand thumb rule

7. Magnetic field lines due to a current through a circular loop



Magnetic field lines of the field produced by a current-carrying circular loop

8. The strength of the magnetic field at the centre of the loop(coil)depends on:

(i) The radius of the coil- The strength of the magnetic field is inversely proportional to the radius of the coil. If the radius increases, the magnetic strength at the centre decreases.

(ii) The number of turns in the coil: As the number of turns increases, the magnetic strength at the centre increases because the current in each circular turn has the same direction. Thus the field due to each turn adds up.

(iii) The strength of the current flowing in the coil: as the strength of the current increases, the strength of the magnetic fields also increases.

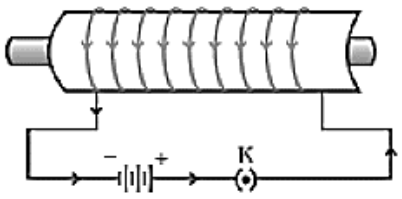
9. Solenoid:

(i) A coil of many turns of insulated copper wire wrapped in the shape of a cylinder is called a Solenoid.

(ii) The magnetic field produced by a Solenoid is similar to a bar magnet.

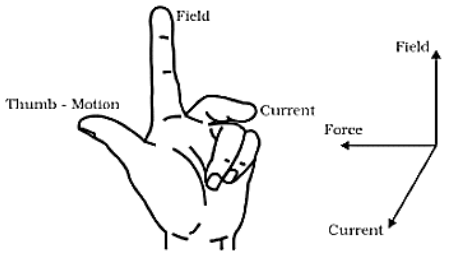
(iii) The strength of the magnetic field is proportional to the number of turns & magnitude of the current.

10. Electromagnet: An electromagnet consists of a long coil of insulated copper wire wrapped on a soft iron core.



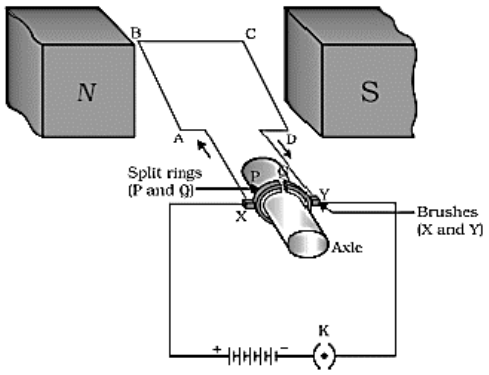
A current-carrying solenoid coil is used to magnetise steel rod inside it – an electromagnet.

11. Fleming's Left-hand rule: Stretch the thumb, forefinger and middle finger of the left hand to be mutually perpendicular. The forefinger points in the direction of the magnetic field and centre finger in the current direction, then the thumb gives the direction of force acting on the conductor.



Fleming's left-hand rule

12. Electric motor: A device that converts electric energy to mechanical energy.

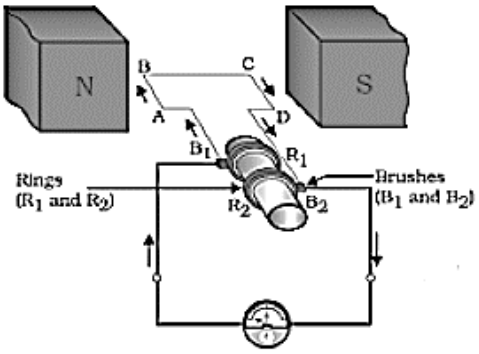


A simple electric motor

13. Principle of Electric motor: When a rectangular coil is placed in a magnetic field, and a current is passed through it, a force acts on the coil, which rotates it continuously. With the rotation of the coil, the shaft attached to it also rotates.
14. Electromagnetic induction: Electricity production as a result of magnetism (induced current) is called Electromagnetic induction.
15. Fleming's Right-hand rule gives the direction of induced current. Stretch the thumb, forefinger and middle finger of the right hand such that they are mutually perpendicular. The forefinger points in the direction of the magnetic field and the centre finger in the direction of induced current, then the thumb gives the direction of motion of the conductor.
16. Electric generator: A device that converts mechanical energy to electric energy. An electric generator is of two types-
    (i) A.C generator

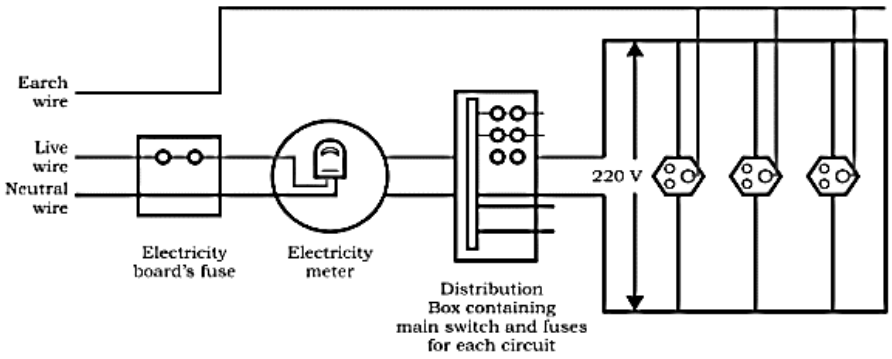
(ii) D. C generator

17. Principle of Electric generator: Electromagnetic induction



Electric Generator

18. Domestic electric circuits:



A schematic diagram of one of the common domestic circuits

We receive electric supply through mains supported through the poles or cables. In our houses, we receive A.C. electric power of 220 V with a frequency of 50 Hz.

The 3 wires are as follows-

(i) Live wire- (Red insulated, Positive)

(ii) Neutral wire- (Black insulated, Negative)

(iii) Earth wire- (Green insulated) for safety measure to ensure that any leakage of current to a metallic body does not give any serious shock to a user.

19. Short circuit: is caused by touching of live wires and neutral wire

20. Fuse: is a protective device used for protecting the circuits from short-circuiting and overloading.