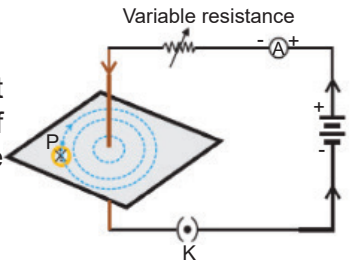
SELF ASSESSMENT TEST SOLUTIONS

1. **Rule :** Maxwell's Right Hand Thumb Rule is used to find the direction of Magnetic field lines. It states that when a current carrying conductor is hold in right hand such that the thumb points in the direction of current. Then your fingers will wrap around the conductor in the direction of the magnetic field lines.

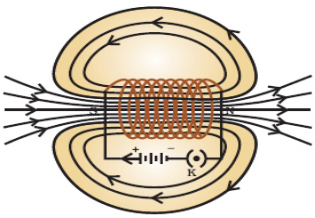


The magnetic field strength decreases with increase of distance from the current carrying conductor.

Reason: There is inverse relation between field strength and distance from current carrying conductor.

2. (a) A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called solenoid.

(b)



It is clear from the field pattern of solenoid that this field is similar to that of a bar magnet.

(c) Magnetic field also reverses.

3. (a) Two magnetic field lines can never cross each other because it would mean that at the point of intersection the compass needle would point towards two directions simultaneously which is not possible.

(b) The magnetic field lines inside a current carrying solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same (uniform) at all points inside the solenoid.

(d) Factors :

(i) Strength of electromagnet

(ii) Large number of coil/turns of the conducting wire.

(iii) A soft iron core on which the coil is wound.

4. (b) Principle of working of electric motor: A coil carrying electric current placed in an external magnetic field experiences a force.

(c) (i) Function of armature: Enhances the power of the motor or induces motion.

(ii) Function of brushes: Helps easy transfer of charge between the coil and the external circuit.

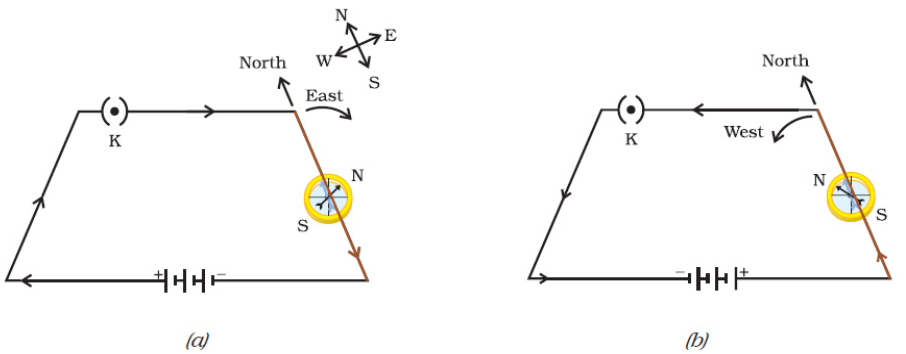
(iii) Function of split rings: Reverses the direction of current after each half rotation of the coil so that the coil can keep rotating continuously.

5. (a) • Take a long straight copper wire, two or three cells of 1.5 V each, and a plug key. Connect all of them in series as shown in Fig. (a). Place the straight wire parallel to and over a compass needle.

• Plug the key in the circuit and observe the direction of deflection of the north pole of the needle. If the current flows from north to south, as shown in Fig. (a), the north pole of the compass needle would move towards the east.

• Replace the cell connections in the circuit as shown in Fig. (b). This would result in the change of the direction of current through the copper wire, that is, from south to north.

• Observe the change in the direction of deflection of the needle. You will see that now the needle moves in opposite direction, that is, towards the west [Fig. (b)]. It means that the direction of magnetic field produced by the electric current is also reversed.



(a) (b)

(b) According to Fleming's left hand rule, if the forefinger points in the direction of the magnetic filed and the central finger points in the direction of current, the thumb gives the direction of force acting on the conductor.

The force will act in the downward direction on the alpha particle.

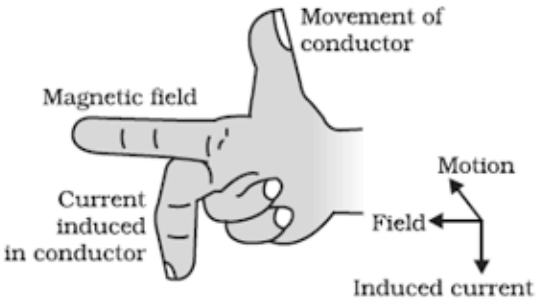
6. (a) Michael Faraday ; Electromagnetic induction.

(b) (i) Galvanometer will show a momentary deflection as the number of magnetic field lines will change around coil 2 due to increase in current through coil - 1 from zero to a maximum value.

(ii) Galvanometer will show momentary deflection in the opposite direction as the number of magnetic field lines will change around the coil 2 as the current in coil 1 falls from maximum to zero.

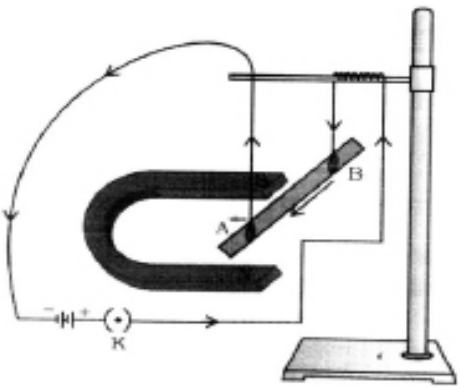
(c) Rule : Fleming's right hand rule.

It states that if we stretch the thumb, fore finger and middle finger of our right hand such that they are perpendicular to each other. If fore finger indicates direction of magnetic field and the thumb shows the direction of motion of conductor, then middle finger will show the direction of induced current.



Application : Electric generator

7. (a) A small aluminium rod suspended horizontally from a stand using two connecting wires. Place a strong horse shoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards. For this put the north pole of the magnet vertically below and south pole vertically above the aluminium rod. Connect the aluminium rod in series with a battery, a key and a rheostat. Pass a current through the aluminium rod from one end to other (B to A). The rod is displaced towards left. When the direction of current flowing through the rod is reversed, the displacement of rod accross towards right.



(c) Perpendicular to the plane of the paper outwards.