

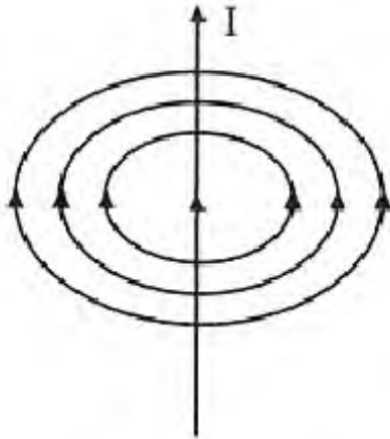
Answer key

CLASS 10

PHYSICS

CHAPTER : Magnetic effect of electric current

Ans-1 The magnetic field lines around a current carrying straight conductor are in the form of concentric circular rings around a conductor.

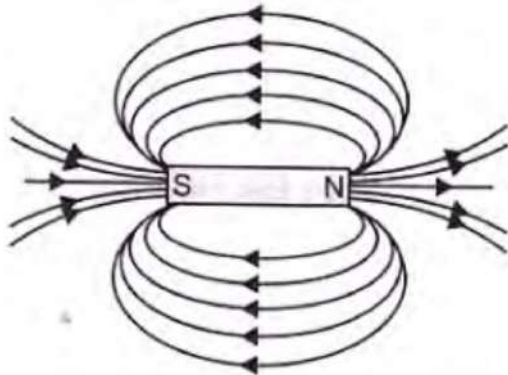


Ans-2 Soft iron core is used in making an electromagnet.

Ans-3 If the magnetic field lines would cross each other then at the same point there would be two directions of magnetic field which is not possible.

Ans-4 In our house we get AC of voltage 220 V and frequency 50 Hz.

Ans-5 Magnetic field lines emerge out from the N-pole of a bar magnet go to the S-pole and inside the magnet field lines goes from S-pole to N-pole thus form the closed curves.



Ans-6 Magnetic field lines are the path traced by north pole in a magnetic field. A tangent drawn to the magnetic field lines gives the direction of magnetic field at that point.

- a. Magnetic field lines emerge out from the N-pole and go to the south pole and from S-pole to N-pole inside the magnet forming the closed curve.
- b. They do not intersect each other.

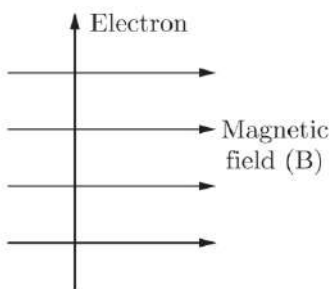
Ans-7 In domestic circuits, all appliances are connected in parallel not in series because

- a. In series combination same current is passed through each appliances whereas they may need different current.
- b. If one appliance fails to work then circuit will be broken and all other appliances will stop to work.
- c. If one appliance is switched off others also will stop working i.e. all appliance will work together whether we require it or not.
- d. In series combination total potential difference is divided among all appliances in proportion to their resistance. So all appliance will not get required voltage to operate efficiently.

Ans-8 Overloading means to draw current more than the permitted maximum current in the circuit which may be due to connecting many appliances in one socket.

In short circuiting, when live wire and neutral wire come in contact with each other then resistance of the circuit becomes minimum consequently the current in the circuit increases abruptly. It may be due to damage of insulation of wire.

Ans-9 As per Fleming's left hand rule the electron will experience a force upward. So it will move perpendicularly outward.

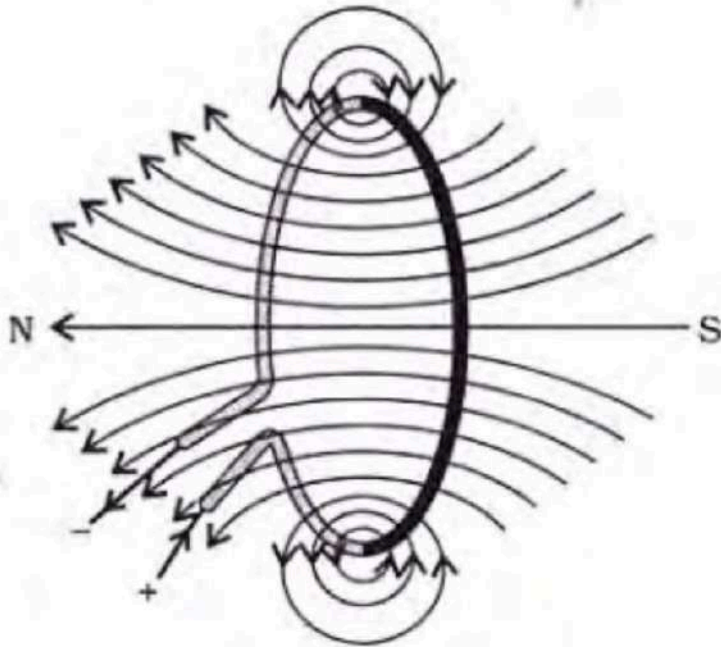


Ans-10 Fleming's left hand rule -stretch the forefinger, The middle finger and the thumb of the left hand Mutually perpendicular to each other in such a way That forefinger points the direction of magnetic field, Middle finger points the direction of current (opposite to the flow of electrons) then the thumb will point the direction of force on the conductor (charge).

- a. Magnetic field is the space around a magnet or a Current carrying conductor in which its magnetic force can be experienced.

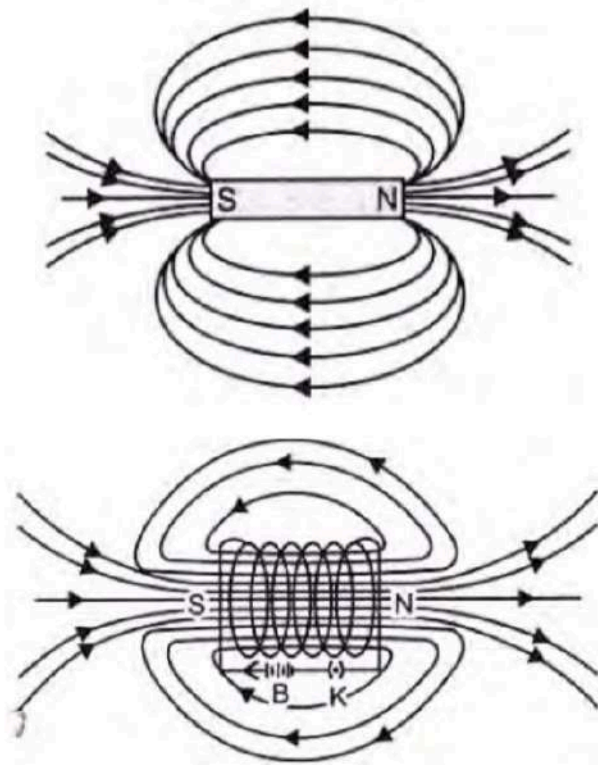
- b. A magnetic compass is used to demonstrate the direction of the magnetic field generated around a current carrying conductor.
- c. Fix a cardboard and insert a wire to pass through its centre normal to the plane of the card board. sprinkle iron filings on card board uniformly. Pass the current in the wire. Tap the cardboard gently. You will find that iron filings align themselves in the concentric circles around the wire. These circles represents magnetic field lines around the conductor.

d.

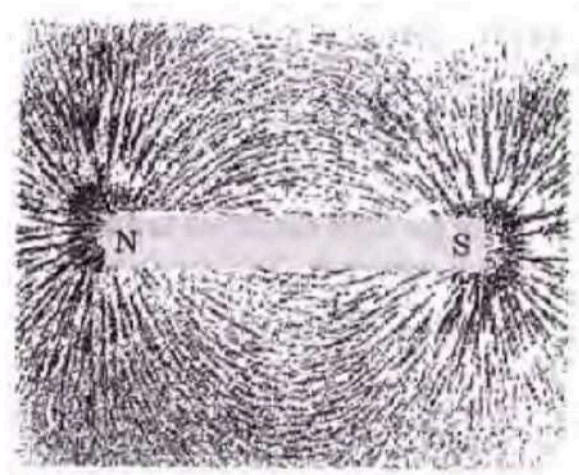


At the centre of circular loop, the magnetic field lines are straight.

Ans-11 A solenoid is a large number of turns of insulated copper wires having shape of a cylinder or helix. Magnetic field are given in following figures.



(a) Fix a white paper sheet on a drawing board with the help of copper pins. Keep a bar magnet in the centre of the paper and sprinkle some iron filings uniformly around the bar magnet. Tap the board gently. Iron filings arrange themselves in a pattern as shown in figure. These iron filings near the bar magnet align themselves along the magnetic field lines.



(b) A current carrying solenoid behaves as a bar magnet one end of the solenoid behaves like a N pole and another end as S pole like two poles in bar magnet, so the field lines of a solenoid and bar magnet appear same in many ways:

i) Magnetic lines of force inside the body is strong and uniform.

ii) In both the cases stronger field exists at the poles compared to the middle part.

Dissimilarities

i) In bar magnet, the poles are not exactly at the ends of the magnet, in solenoid poles can be considered to be lying at the edges.

ii) In bar magnet, magnetism is permanent but in solenoid it exists only till there is a current in solenoid.

Ans-12 (a) Fleming's left hand rule states that if the thumb, forefinger and middle finger are stretched perpendicular to each other in such a way that forefinger indicates the direction of magnetic field, middle finger indicates the direction of current in the conductor then thumb will indicate the direction of force on the conductor.

(b) The principle of electric motor is that when a current carrying coil is placed in a magnetic field it experiences a torque and if the coil is allowed it rotates in the magnetic field.

(c) Function of the parts of an electric motor :

1) Armature: Armature is a large number of turns of the coil on soft iron core which rotates in magnetic field.

(2) Brushes: They allow current to pass from external source to armature.

(3) Split rings: Split rings are of copper, split into two halves and make a connection between armature and brushes.

Ans-13 (a) Direct current is a unidirectional current with constant magnitude. Alternating current is a current which changes its magnitude and direction after a fixed period. AC voltage can be increased or decreased. Where is dc voltage cannot be increased or decreased. AC can be transmitted to long distances with lesser power loss.

(b) Given $P = 2 \text{ kW}$ and $V = 200 \text{ volt}$,

$$\text{Power, } P = VI$$

$$I = P/V$$

$$I = 2000/220$$

$$I = 9.09 \text{ A}$$

The rating of the fuse wire is 10 A which is greater than current drawn by air conditioner so when air conditioner is switched on, fuse will not blow off

Ans-14 No, current carrying solenoid behaves like a bar magnet and will stay only geographical N and S direction. If the direction of current is reversed then the polarity of the magnet will change and hence will rotate through an angle of 180°.

Ans-15

$$\begin{aligned} I &= \frac{\text{Total Power}}{V} = \frac{nP}{V} \\ &= \frac{2 \times 1.1 \text{ kW}}{220 \text{ V}} \\ &= \frac{2 \times 1.1 \times 1000}{220 \text{ V}} \text{ W} = 10 \text{ A} \end{aligned}$$

So a fuse wire of rating must be greater than 10 A.

Ans-16 Permanent Magnet: It has constant magnetic field around it. e.g. generator, loud speaker.

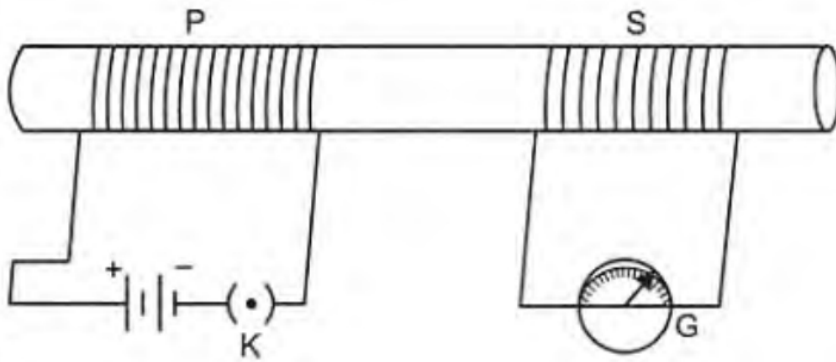
Electromagnet: When a soft iron is placed in a solenoid it gets magnetised till there is current in solenoid, e.g. electric bells, cranes.

Ans-17 Fuse wire is safety device to prevent electrical devices due to short circuiting or overloading. The fuse wire is rated for a maximum current which has high resistance and low melting point. When there is short circuiting large current is passed in the circuit. Due to large current in fuse wire heat is produced and by melting fuse wire breaks the circuit to keep other appliances safe.

If a fuse wire is replaced by an ordinary copper wire which has low resistance and high melting point it will not melt and domestic appliance may get damaged due to excessive heat due to short circuiting or overloading.

Ans-18 a) The phenomenon by producing a current in a coil by changing magnetic field associated with it or by changing a current in the neighbouring coil is called electromagnetic induction. Current so produced is called induced current.

b) i) When key K is closed due to increasing current a magnetic field is produced which is changing. In this changing magnetic field coil S is kept so an induced current flows through it, so



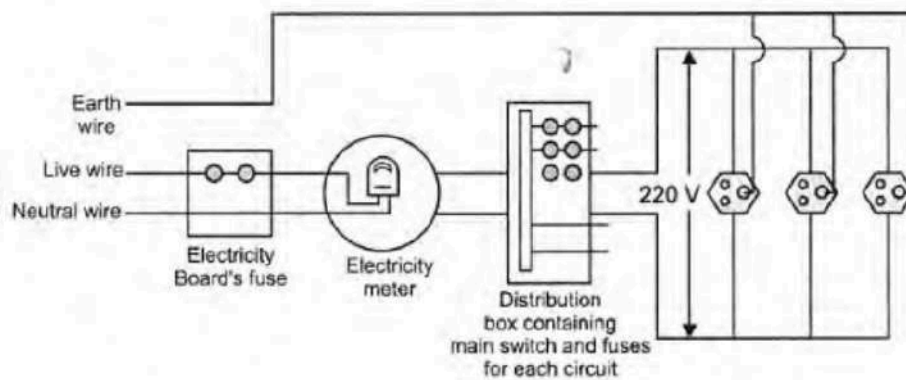
galvanometer shows a deflection.

(ii) After some time current reaches maximum and becomes constant in P coil. There is no change in current so there is no change in magnetic field associated with coil S and hence no induced current in coil S. Deflection in galvanometer becomes zero.

(iii) Current becomes zero from maximum in coil P and hence galvanometer shows a deflection. But now it is in opposite direction.

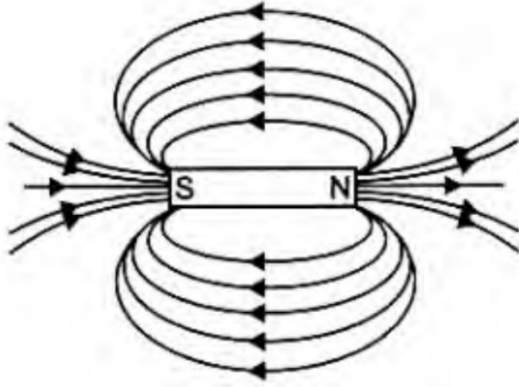
Ans-19

a.



b. The earth wire carries current due to any leakage or defective electric appliance to the earth, keeping human beings safe by preventing any electric shock.

Ans-20 (a) Magnetic field lines around a bar magnet.



If the two magnetic field lines would intersect with each other than at that point there will be two different directions of magnetic field which is not possible.

b) Given Power $P = 1.5 \text{ kW} = 1500 \text{ Watt}$ and $V = 220 \text{ Volts}$.

$$\text{Current drawn } I = P/V = 1500/220$$

$$I = 7 \text{ A (approx)}$$

As the current drawn by the oven is 7 A which is Larger than the rating of the fuse (5A) so fuse will blow off and circuit will be broken.

