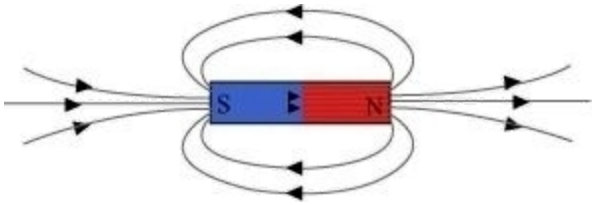
Board – CBSE	Class – 10th	Topic – Magnetic effects of electric current

1. Why does a compass needle get deflected when brought near a bar magnet?

Ans. A compass needle is a small bar magnet. When it is brought near a bar magnet, its magnetic field lines interact with the bar magnet. Hence, a compass needle shows a deflection when brought near the bar magnet.

2. Draw magnetic field lines around a bar magnet.

Ans. Magnetic field lines of a bar magnet emerge from the north pole and terminate at the south pole. Inside the magnet, the field lines emerge from the south pole and terminate at the north pole, as shown in the given figure.



3. List the properties of magnetic lines of force.

Ans. The properties of magnetic lines of force are as follows.

(a) Magnetic field lines emerge from the north pole.

(b) They merge at the south pole.

(c) The direction of field lines inside the magnet is from the south to the north.

(d) Magnetic lines do not intersect with each other.

4. Why don't two magnetic lines of force intersect each other?

Ans. If two field lines of a magnet intersect, then the compass needle points in two different directions at the point of intersection. This is not possible. Hence, two field lines do not intersect each other.

5. Which of the following properties of a proton can change while moving freely in a magnetic field? (There may be more than one correct answer.)

(a) Mass

(b) Speed

(c) Velocity

(d) Momentum

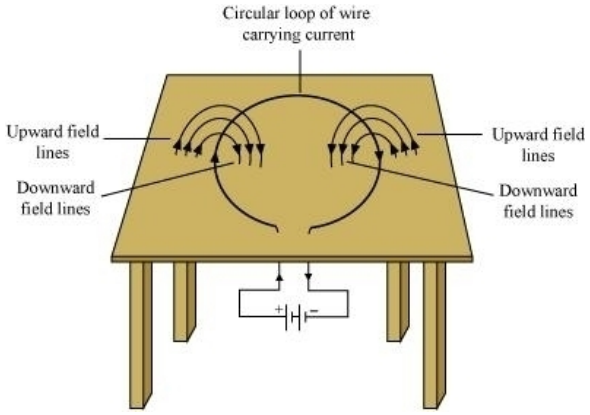
Ans. (c) and (d)

When a proton enters a region of the magnetic field, it experiences a magnetic force. As a result of the force, the path of the proton becomes circular. Hence, its velocity and momentum change.

6. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

Ans. Inside the loop = Pierce inside the table

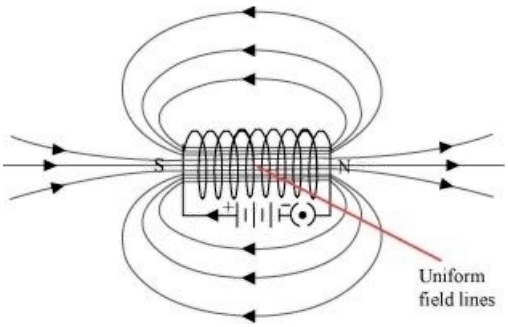
Outside the loop = Appear to emerge out from the table



For the downward direction of current flowing in the circular loop, the direction of magnetic field lines will be as if they are emerging from the table outside the loop and merging in the table inside the loop. Similarly, for the upward direction of current flowing in the circular loop, the direction of magnetic field lines will be as if they are emerging from the table outside the loop and merging in the table inside the loop, as shown in the given figure.

7. The magnetic field in a given region is uniform. Draw a diagram to represent it.

Ans.



The magnetic field lines inside a current-carrying long straight solenoid are uniform.

8. Choose the correct option.

The magnetic field inside a long straight solenoid-carrying current

(a) Is zero

(b) Decreases as we move towards its end

(c) Increases as we move towards its end

(d) It Is the same at all points.

Ans. (d)The magnetic field inside a long, straight, current-carrying solenoid is uniform. It is the same at all points inside the solenoid.

9. How do we think the displacement of rod AB will be affected if (i) current in rod AB is increased. (ii) a stronger horseshoe magnet is used. And (iii) the length of the rod AB is increased?

Ans. A current-carrying conductor placed in a magnetic field experiences a force. The magnitude of force increases with the amount of current, strength of the magnetic field, and the length of the conductor. Hence, the magnetic force exerted on rod AB and its deflection will increase if

(i) Current in rod AB is increased.

(ii) A stronger horseshoe magnet is used.

(iii) Length of rod AB is increased.

10. A positively-charged particle (alpha-particle) projected towards the west is deflected towards the north by a magnetic field. The direction of the magnetic field is

(a) Towards south (b) Towards east

(c) Download (d) Upward

Ans. (d) Fleming's left-hand rule can determine the direction of the magnetic field. According to this rule, if we arrange the thumb, the centre finger, and the forefinger of the left hand at right angles to each other, then the thumb points towards the direction of the magnetic force, the centre finger gives the direction of current, and the forefinger points in the direction of the magnetic field. Since the direction of a positively charged alpha particle is towards the west, the current direction will be the same, i.e., towards the west. Again, the direction of magnetic force is towards the north. Hence, according to Fleming's left-hand rule, the direction of the magnetic field will be upwards.

11. State Fleming's left-hand rule.

Ans. Fleming's left-hand rule states that if we arrange the thumb, the centre finger, and the forefinger of the left hand at right angles to each other, then the thumb points towards the direction of the magnetic force, the centre finger gives the direction of current, and the forefinger points in the direction of the magnetic field.

12. What is the principle of an electric motor?

Ans. The working principle of an electric motor is based on the magnetic effect of current. A current-carrying loop experiences a force and rotates when placed in a magnetic field. Fleming's left-hand rule gives the direction of rotation of the loop.

13. What is the role of the split ring in an electric motor?

Ans. The split ring in the electric motor acts as a commutator. The commutator reverses the direction of current flowing through the coil after each half rotation of the coil. Due to this reversal of the current, the coil continues to rotate in the same direction.

14. Explain different ways to induce a current in a coil.

Ans. The different ways to induce a current in a coil are as follows.

(a) If a coil is moved rapidly between the two poles of a horseshoe magnet, then an electric current is induced in the coil.

(b) If a magnet is moved relative to a coil, an electric current is induced in the coil.

15. State the principle of an electric generator.

Ans. An electric generator works on the principle of electromagnetic induction. It generates electricity by rotating a coil in a magnetic field.

16. Name some sources of direct current.

Ans. Some sources of direct current are cell, DC generator, etc.

17. Which sources produce alternating current?

Ans. AC generators, power plants, etc., produce alternating currents.

18. Choose the correct option.

A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each

(a) Two revolutions (b) One revolution

(c) Half revolution (c) One–fourth revolution

Ans. (c) When a rectangular coil of copper is rotated in a magnetic field, the direction of the induced current in the coil changes once in each half revolution. As a result, the direction of the current in the coil remains the same.

19. Name two safety measures commonly used in electric circuits and appliances.

Ans. Two safety measures commonly used in electric circuits and appliances are as follows.

(i) Each circuit must be connected with an electric fuse. This prevents the flow of excessive current through the circuit. When the current passing through the wire exceeds the maximum limit of the fuse element, the fuse melts to stop the flow of current through that circuit, hence protecting the appliances connected to the circuit.

(ii) Earthing is a must to prevent electric shocks. Any current leakage in an electric appliance is transferred to the ground, and people do not get the shock.

20. An electric oven of 2 kW is operated in a domestic electric circuit (220 V) with a current rating of 5 A. What result do you expect? Explain.

Ans. The expression can obtain current drawn by the electric oven,

$P = VI$

$I = \frac{P}{V}$

Where,

Current = I

Power of the oven, $P = 2kW = 2000\ W$

Voltage supplied, $V = 220\ V$

$I = \frac{2000}{220} = 9.09\ A$

Hence, the current drawn by the electric oven is 9.09 A, which exceeds the safe limit of the circuit. The fuse element of the electric fuse will melt and break the circuit.

The precautions that should be taken to avoid the overloading of domestic circuits are as follows.

(a) Too many appliances should not be connected to a single socket.

(b) Too many appliances should not be used at the same time.

(c) Faulty appliances should not be connected to the circuit.

(d) Fuse should be connected in the circuit.