

Chapter 12

Magnetic Effects of Electric Current

In Text Questions-Pg-196

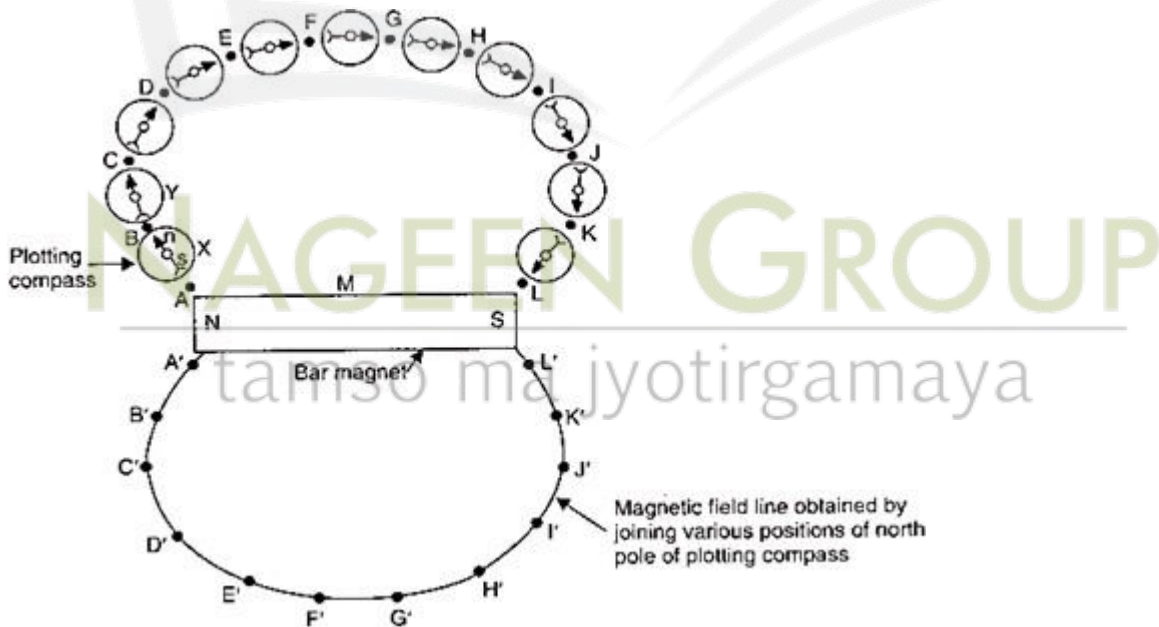
Q.1 Why does a compass needle get deflected when brought near a bar magnet ?

Ans.: A compass needle is a tiny pivoted magnet. It gets deflected when it is brought near a bar magnet because the bar magnet exerts a magnetic force on the compass needle.

In Text Questions-Pg-200

Q.1 Draw magnetic field lines around a bar magnet.

Ans.:



Q.2 List the properties of magnetic lines of force.

Ans.: (i) The magnetic lines of force always originate from north pole and end at the south pole of the magnet.

(ii) The magnetic lines of force are closer to one another near the ends of the poles of the magnet but they are spread away from each other in the middle region of the magnet.

(iii) The magnetic lines of force do not cross with each other.

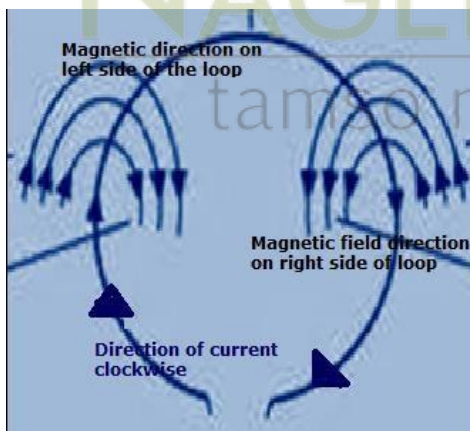
Q.3 Why don't two magnetic lines of force intersect with each other?

Ans.: The two magnetic lines of force do not intersect each other because net force acting at any point on a magnetic line of force will be in one direction only. If the two magnetic lines of force intersect with each other, then the compass needle would point in two directions at the same time at that point, which is not possible at all.

In Text Questions-Pg-201

Q.1 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.:

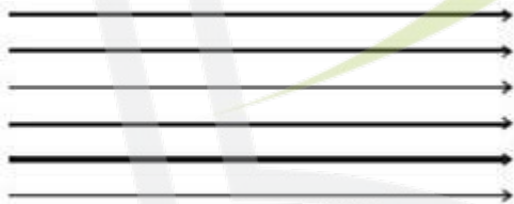


Fleming right-hand rule states that the direction of the magnetic field is perpendicular to the direction of current to flow.

To find the direction of the magnetic field we curl our hand in the direction of the current and our thumb will point to the direction of the magnetic field. In the diagram, the current is flowing clockwise. If we apply the process as mentioned above the direction of the magnetic field will point towards inside the table if the current flowing in the circuit is clock-wise

Q.2 The magnetic field in a given region is uniform. Draw a diagram to represent it.

Ans.: Magnetic field is said to be uniform if the magnetic induction has the same magnitude and the same direction at all the points in the region. It is represented by drawing parallel lines, as given below:



Q.3 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) is the same at all points

Solution: The magnetic field inside a long, straight solenoid carrying current is the same at all points. Therefore, option (d) is correct option.

In Text Questions-Pg-203

Q.1 Which of the following property/properties of a proton can change while it moves freely in a magnetic field? (There may be more than one correct answer):

- (a) mass
- (b) speed
- (c) velocity
- (d) momentum

Ans.: A proton when moves in a magnetic field, magnetic force is exerted on it. Due to this force, its velocity can change. And, since momentum is dependent on velocity, momentum can also change. Thus, options (c) and (d) are correct.

Q.2 In Activity 12.7, how do we think the displacement of rod AB will be affected if (i) current in rod AB is increased; (ii) a stronger horse-shoe magnet is used; and (iii) length of the rod AB is increased?

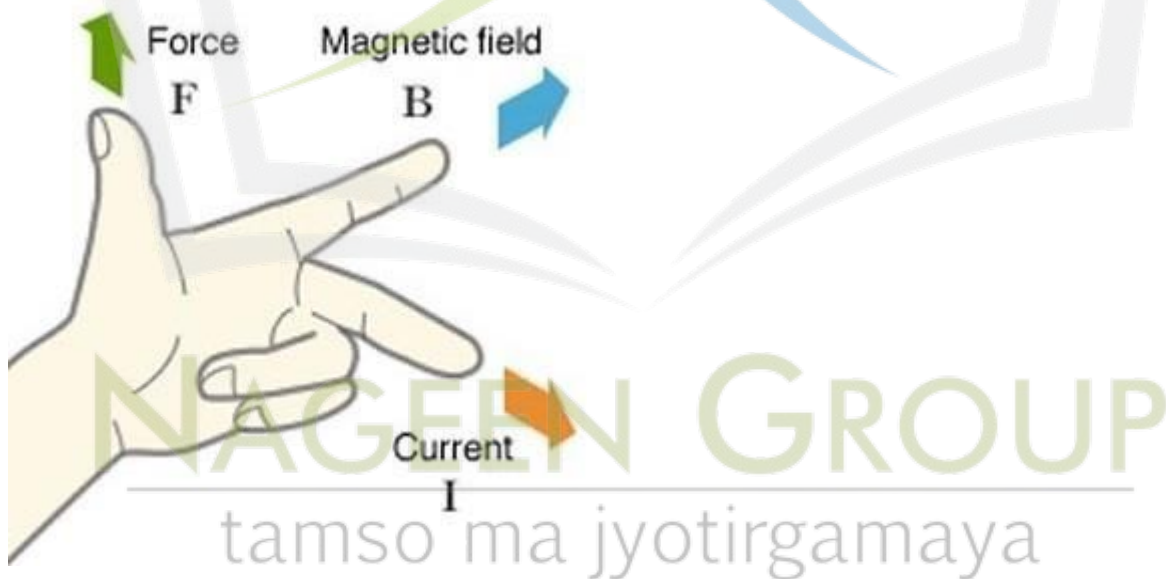
Ans.: A current-carrying conductor placed in a magnetic field experiences a force. The magnitude of force increases with the amount of current, strength of the magnetic field, and the length of the conductor. Hence, the magnetic force exerted on rod AB and its deflection will increase if

- (i) current in rod AB is increased
- (ii) a stronger horse-shoe magnet is used
- (iii) length of rod AB is increased

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

- (a) towards south
- (b) towards east
- (c) downward
- (d) upward

Ans.: We know according to the Question the positively charged particles are moving towards West indicating the direction of current is towards West, as the deflection is towards North we can interpret that the Force is Towards North. Using Fleming's Left-hand thumb rule we adjust our forefinger, center finger and thumb of our left-hand indicating the direction of Magnetic Field, Current and Force/Motion Respectively.



Hence the direction of Magnetic Field is (d) Upward

In Text Questions-Pg-205

Q.1 Name two safety measures commonly use in electric circuits and appliances.

Ans.: The two safety measures that are commonly used in electric circuits

and appliances are:

- a) Make a Provision for electric fuse
- b) Earthing of metal bodies of electrical appliances is must.

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

Ans.: We will first calculate the Current drawn by the oven,

Given, Power(P) = 2kW

$$= 2 \times 1000 \text{ W}$$

$$= 2000 \text{ W}$$

Voltage(V)= 220V

We know

$$P= V \times I$$

$$\text{Therefore the current drawn (I)} = \frac{2000}{220}$$

= 9 A The Current drawn by the electric oven is 9 Amperes which is high as compared to the fuse in the electric circuit which is of only 5 Amperes as a result the fuse will blow off cutting of the power supply when the electric oven will operate.

Q.3 What precautions should be taken to avoid the overloading of domestic electric circuits?

Ans.: The following precautions should be taken to avoid the overloading of domestic electric circuits:

a) Too many high power rating electrical appliances (such as electric iron, geyser, air conditioner etc.) should not be switched on at the same time when used.

b) Too many electrical appliances should not be operated on a single socket.

Exercise-Pg-207

Q.1 Which of the following correctly describes the magnetic field near a long straight wire?

- A. The field consists of straight lines perpendicular to the wire
- B. The field consists of straight lines parallel to the wire
- C. The field consists of radial lines, originating from the wire
- D. The field consists of concentric circles centered on the wire

Ans.: The magnetic field near a long straight wire consists of concentric circles centered on the wire.

Q.2 At the time of short circuit, the current in the circuit:

- A. reduces substantially
- B. does not change
- C. increases heavily
- D. varies continuously

Ans.: During short circuit, the current in the circuit increases very heavily. Thus, option (c) is the correct option.

Q.3 State whether the following statements are true or false:

- (a) An electric motor converts mechanical energy into electrical energy.
- (b) An electric generator works on the principle of electromagnetic induction
- (c) The field at the centre of a long circular coil carrying current will be parallel straight lines

(d) A wire with a green insulation is usually the live wire of an electric supply

Ans.: An electric generator works on the principle of electromagnetic induction. Thus option (b) is correct.

Q.4 List two methods of producing magnetic fields.

Ans.: Magnetic field can be produced by any of the following methods:

(i) Any magnet-bar magnet, horse-shoe magnet or round magnet can be used.

(ii) A wire carrying current produces a field around it.

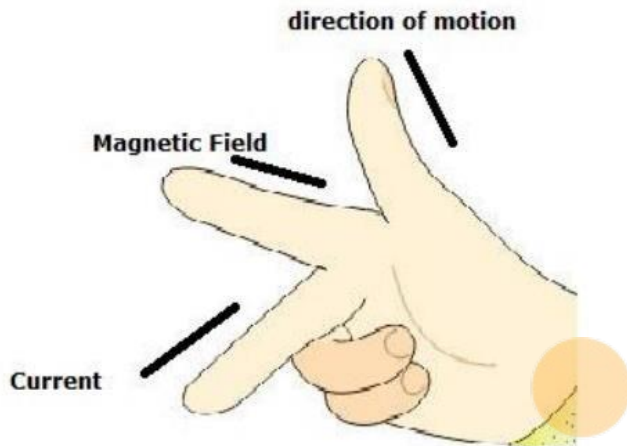
(iii) A loop or solenoid carrying current.

Q.5 When is the force experienced by a current-carrying conductor placed in a magnetic field largest ?

Ans.: The force experienced by a current-carrying conductor placed in a magnetic field is the largest when the current-carrying conductor is perpendicular to the direction of magnetic field.

Q.6 Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall is deflected by a strong magnetic field to your right side. What is the direction of magnetic field?

Ans.: The direction of electric current is from front wall to back wall as it is opposite to the direction of electron. Now, since the direction of force is towards the right side. Hence by applying Fleming's left hand rule, we can conclude that the magnetic field inside the chamber is in downward direction.



Q.7 State the rule to determine the direction of a:

- (i) magnetic field produced around a straight conductor carrying current.
- (ii) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.
- (iii) current induced in a straight conductor moving in a magnetic field. Ans

∴ (i) The direction of magnetic field produced around a straight current-carrying conductor is determined by using Maxwell's right hand thumb rule.

(ii) The direction of force experienced by a current-carrying straight conductor placed in a magnetic field is determined by Fleming's left-hand rule.

(iii) The direction of current induced in a straight conductor moving in a magnetic field is determined by Fleming's right-hand rule.

Q.8 When does an electric short circuit occur?

Ans ∴ An electric short circuit takes place when the live wire and the neutral wire of electricity supply line touch each other directly. This occurs when the plastic insulation of live wire and neutral wire get torn.

Q.9 What is the function of an earth wire? Why is it necessary to earth metallic appliances?

Ans.:The metallic body of electric appliances is connected to the earth by means of earth wire so that any leakage of electric current is transferred to the ground. This prevents any electric shock to the user. That is why earthing of the electrical appliances is necessary.

