Magnetic Effect of Current: Exercise Questions

[Page 224]

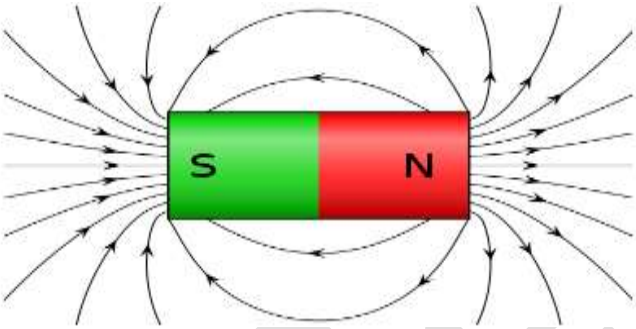
Q.1 Why does a compass needle get deflected when brought near a bar magnet?

Sol. When a compass needle is brought near a bar magnet, the compass needle gets deflected due to interaction between the magnetic fields of the compass needle and the bar magnet.

[Page 228]

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

Sol. The magnetic field line:



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

Sol. The properties of magnetic field lines:

(i) The direction of magnetic field lines from the North Pole to the South Pole.

(b) Magnetic field lines always form close path.

(c) Magnetic field lines do not intersect each other.

(d) Closer the field lines show stronger magnetic field and vice-versa.

(e) Magnetic field lines are closer near the poles which show stronger magnetic field near the poles but they are widely separated at other places.

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

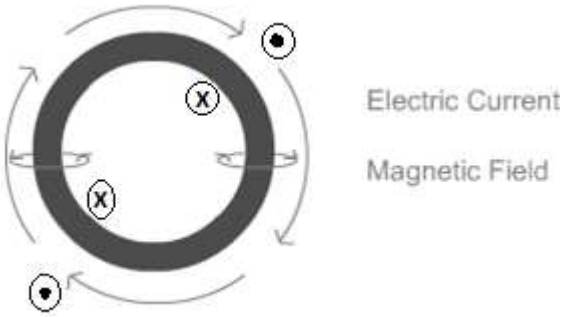
Sol. As we know that, the direction of magnetic field lines is always from the North Pole to the South Pole. If the field lines intersect each other, then the direction of field line at the point of intersection will be along two directions, which is practically impossible. Therefore, two magnetic field lines never intersect each other.

[Page 229]

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.

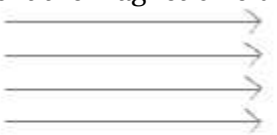
Sol. We consider a circular loop of wire lying in the plane of the table as shown in figure. Current is flowing through a circular loop in clockwise direction. The direction of magnetic field around the loop can be determine by by using the right hand thumb rule.

We find that all the parts of loop produce magnetic field downwards at all points inside the loop while at the outside points, the magnetic field is directed upwards.



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

Sol. The diagram to represent the magnetic field in a given region is uniform.



Lines showing uniform magnetic field

[Page 230]

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.

Sol. (d) is the same at all points.

[Page 231]

Q.1 Which of the following property 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

Sol. (c) and (d),

[Page 232]

Q.2 In Activity 13.7, 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?

Sol. In Activity 13.7, the displacement of rod or force exerted on the rod would vary directly as the strength of current, strength of magnetic field and length of the conductor. Because of this, the displacement of conductor would be increased in all the three cases.

Q.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

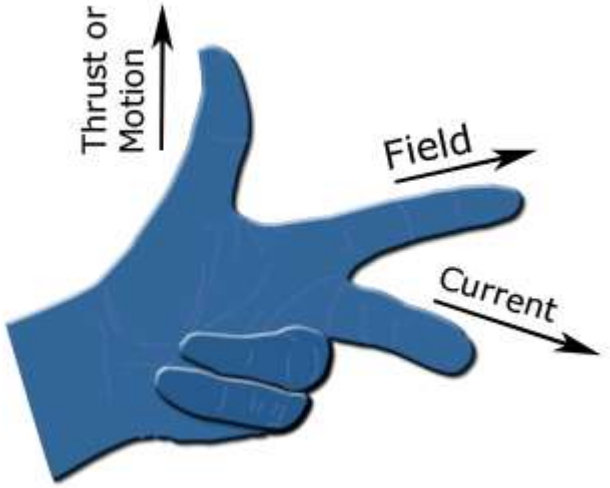
Sol. **(d) Upward**

Explanation: This problem can be solved by using Fleming's Left Hand Rule. We know that the direction of current is opposite to the direction of proton's movement and hence the direction of current is towards west. The deflection of proton is towards north, According to per Fleming's Left Hand Rule, stretch your left hand and arrange your thumb, forefinger and middle finger perpendicular to each other in such a way that the middle finger shows the direction of current, the forefinger shows the direction of magnetic field and the thumb shows the direction of motion. Hence, the direction of magnetic field would be upward.

[Page 233]

Q.1 State Fleming's Left Hand Rule.

Sol. Fleming's Left Hand Rule state that stretch your left hand and arrange your thumb, forefinger and middle finger perpendicular to each other in such a way that the middle finger shows the direction of current, the forefinger shows the direction of magnetic field and the thumb shows the direction of motion.



Q.2 What is the principle of an electric motor?

Sol. The electric motor works on the principle of Magnetic effect of electric current. When a rectangular coil is placed perpendicularly in a magnetic field and current is passed through the coil, it experiences the force and rotates.

Q.3 What is the role of a split ring in an electric motor?

Sol. In an electric motor, split rings or commutators are attached to the coil so that the polarity of the coil changes after every half rotation. This changes the direction of current in the coil and the armature keeps on rotating continuously.

[Page 236]

Q.1 Explain different ways to induce current in a coil.

Sol. To induce current in the coil, coil and the magnet should be in relative motion. This can be done by any of the following two ways:

(a) The coil should be moved within or away from a magnetic field.
(b) The magnet should be moved close or away from coil and coil should be kept static.

[Page 237]

Q.1 State the principle of an electric generator.

Sol. The electric generator works on the principle that when coil is moved inside a magnetic field, a current is induced in the coil.

Q.2 Name some sources of direct current.

Sol. The sources of direct current are Electrochemical cell, DC generator, photovoltaic cell, etc.

Q.3 Which sources produce alternating current?

Sol. AC generator and power plants produce alternating current.

Q.4 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

(d)one-fourth revolution

Sol. (c) Half revolution

[Page 238]

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

Sol. Earth wire and electric fuse are the two safety measures commonly used in electric circuits and appliances.

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

Sol. The current drawn by the electric oven:

$P = VI$

Or, $I = P / V$

Given: $P = 2kW = 2000\ W$ and $V = 220\ V$

So, $I = 2000w / 220V = 9.09A$

From the above result, the oven is drawing 9.09 A current from a 5 ampere source.

It means there would be an overloading on the circuit. This can result in fuse to melt and break the circuit.

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

Sol. The precautions to avoid overloading of domestic electric circuit are:

(a) Use of too many appliances in a single line should be avoided.

(b) Appliances should always be checked and repaired in time.

(c) Do not connect faulty appliances to the circuit.

(c) Proper rated Fuse or MCB should be used.