

Magnetic Effects of Electric Current

Intext Questions Page No. 224

Question 1.

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

Answer:

A compass needle get deflected when brought near a bar magnet because a compass needle is in fact, a small bar magnet. The ends of the compass needle point approximately towards north and south directions.

Intext Questions Page No. 228

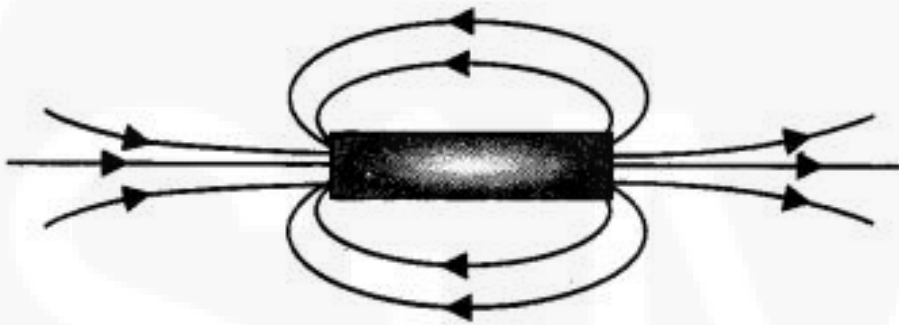
Question 1.

Draw magnetic field lines around a bar magnet.

Answer:

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.



Question 2.

List the properties of magnetic field lines.

Answer:

The properties are:

- They travel from north pole to south pole outside the magnet and south pole to north pole inside the magnet.
- They are closed and continuous curves.
- Two magnetic field lines never intersect each other. If the lines intersect, then at the point of intersection there would be two directions [the needle would point towards two directions] for the same magnetic fields which is not possible.
- The number of field lines per unit area is the measure of the strength of magnetic field, which is maximum at poles. The magnetic field is strong, where the field lines are close together and weak where the lines are far apart.

Question 3.

Why don't two magnetic field lines intersect each other?

Answer:

Two magnetic fields lines of force never intersect each other. If the lines intersect, then at [the point of intersection there would be two directions [the needle would point towards two directions] for the same magnetic field, which is not possible.

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Intext Questions Page No. 229, 230

Question 1.

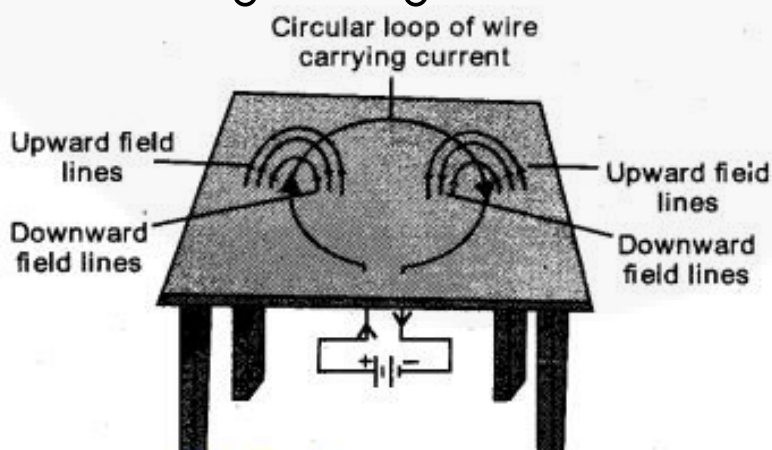
Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

Answer:

Inside the loop = Pierce inside the table.

Outside the loop = Appear to emerge out from the table.

For 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 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.



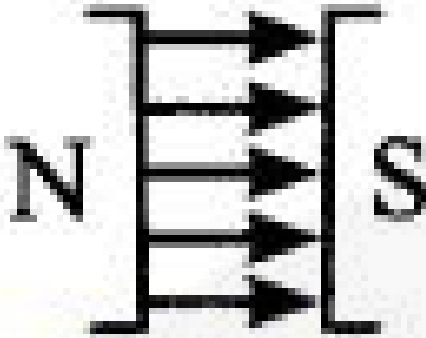
Current flowing in a circular loop.

Question 2.

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

Answer:

The magnetic field lines are parallel and equidistant.



Question 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

Answer:

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

Intext Questions Page No. 231, 232

Question 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

Answer:

- (c) velocity
- (d) momentum.

Question 2.

In Activity 13.7, how do we think the displacement of rod AB will be affected if

1. current in rod AB is increased;
2. a stronger horse-shoe magnet is used; and
3. length of the rod AB is increased?

Answer:

1. displacement of A is increased.
2. If a stronger horse-shoe magnet is used magnetic field is increasing.
3. current flows is more.

Question 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

Answer:

(d) upward.

Since the positively charged particle alpha particle projected towards west, so the direction of current is towards west. Now the deflection is towards north, so the force is towards north. Now hold the forefinger, centre finger and thumb of our left - hand at right angles to one another. Let us adjust the hand in such a way that our centre finger points towards west and thumb points towards north. If we look at our forefinger, it will be pointing, upward. Thus, the magnetic field is in the upward direction. So, the correct answer is (d).

Intext Questions Page No. 233

Question 1. State Fleming's left-hand rule.

Answer:

According to this rule, stretch the thumb, forefinger, and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of the Magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

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

Answer:

A current-carrying conductor when placed in a magnetic field experiences a force. This is the principle of an electric motor.

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

Answer:

The split ring reverse the direction of current in the armature coil after every half rotation i.e., it acts as a commutator. The reversal of current reverses, the direction of the forces acting on the two arms of the armature after every half rotation. This allows the armature coil to rotate continuously in the same direction.

Intext Questions Page No. 236

Question 1.

Explain different ways to induce current in a coil.

Answer:

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

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

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

Intext Questions Page No. 237

Question 1. State the principle of an electric generator.

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

Question 2. Name some sources of direct current.

Answer: Some sources of direct current are cell, Dc generator, etc.

Question 3. Which sources produce alternating current?

Answer: AC generators, power plants etc., produce alternating current.

Question 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

Answer:

(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 current in the coil remains the same.

Intext Questions Page No. 238

Question 1.

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

Answer:

1. Electric fuse
2. Earthing wire.

Question 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.

Answer:

$$P = VI$$

$$\text{Here } P = 2 \text{ KW} = 2000 \text{ W}$$

$$V = 220$$

$$I = \frac{P}{V} = \frac{2000}{220} = 9.09 \text{ A}$$

The current drawn by this electric oven is 9 A whereas the fuse in the circuit is (only 5 A capacity. When a high current of 9 A flows through the 5 A fuse, the fuse wire will get heated too much, melt and break, the circuit. Therefore, when a 2 kW power rating electric oven is operated in a circuit having a 5 A fuse will blow off cutting off the power supply in this circuit.

Question 3.

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

Answer:

1. Each appliance has a separate switch to ON/OFF the flow of current through it.
2. The use of an electric fuse prevents the electric circuit and the appliance from possible damage by stopping the flow of unduly high electric current.
3. We should not connect too many appliances to a single socket to prevent overloading.

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NCERT Textbook Exercises

Question 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.

Answer:

(d) The magnetic field lines, produced around a straight current-carrying conductor are concentric circles. Their centres lie on the wire.

Question 2.

The phenomenon of electromagnetic induction is

- (a) the process of charging a body
- (b) the process of generating magnetic field due to a current passing through a coil
- (c) producing induced current in a coil due to relative motion between a magnet and the coil
- (d) the process of rotating a coil of an electric motor.

Answer:

(c) When a straight coil and a magnet are moved relative to each other, a current is induced in the coil. This phenomenon is known as electromagnetic induction.

Question 3.

The device used for producing electric current is called a
(a) generator (b) galvanometer (c) ammeter (d)
motor.

Answer: (a) generator.

Question 4.

The essential difference between an AC generator and a
DC generator is that

(a) AC generator has an electro-magnet while a DC
generator has permanent magnet.

(b) DC generator will generate a higher voltage.

(c) AC generator will generate a higher voltage.

(d) AC generator has slip rings while the DC generator
has a commutator.

Answer: (c) AC generator will generate a higher voltage.

Question 5.

At the time of short circuit, the current in the circuit

(a) reduces substantially. (b) does not change.

(c) increases heavily. (d) vary continuously.

Answer: (c) increases heavily.

Question 6.

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.

Answer:

- (a) False (b) true (c) true (d) False.

Question 7.

List two methods of producing magnetic fields.

Answer:

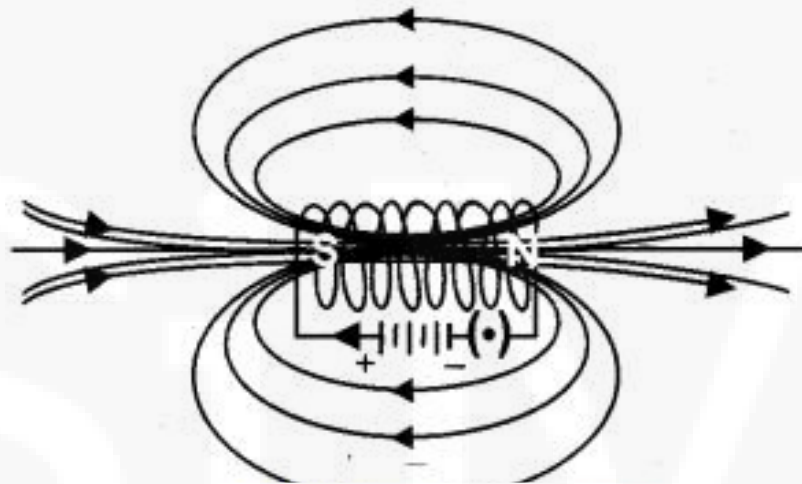
1. Permanent magnet
2. Electromagnet.

Question 8.

How does a solenoid behave like a magnet? Can you determine the north and south poles of a current-carrying solenoid with the help of a bar magnet? Explain.

Answer:

A solenoid is a long coil of circular loops of insulated copper wire. Magnetic field lines are produced around the solenoid when a current is allowed to flow through it. The magnetic field produced by it is similar to the magnetic field of a bar magnet. The field lines produced in a current-carrying solenoid is shown in the following figure.



Field lines of the magnetic field through and around a current carrying solenoid.

Fig. 13.4: Field lines of the magnetic field through and around a current carrying solenoid.

In the above figure, when the north pole of a bar magnet is brought near the end connected to the negative terminal of the battery, the solenoid repels the bar magnet. Since like poles repel each other, the end connected to the negative terminal of the battery behaves as the north pole of the solenoid and the other end behaves as a south pole. Hence, one end of the solenoid behaves as a north pole and the other end behaves as a south pole.

Question 9.

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

Answer:

The force experienced by a current -carrying conductor is the maximum when the direction of current is perpendicular to the direction of the magnetic field.

Question 10.

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?

Answer:

According to Fleming's left-hand rule, the magnetic field acts in the vertically downward direction.

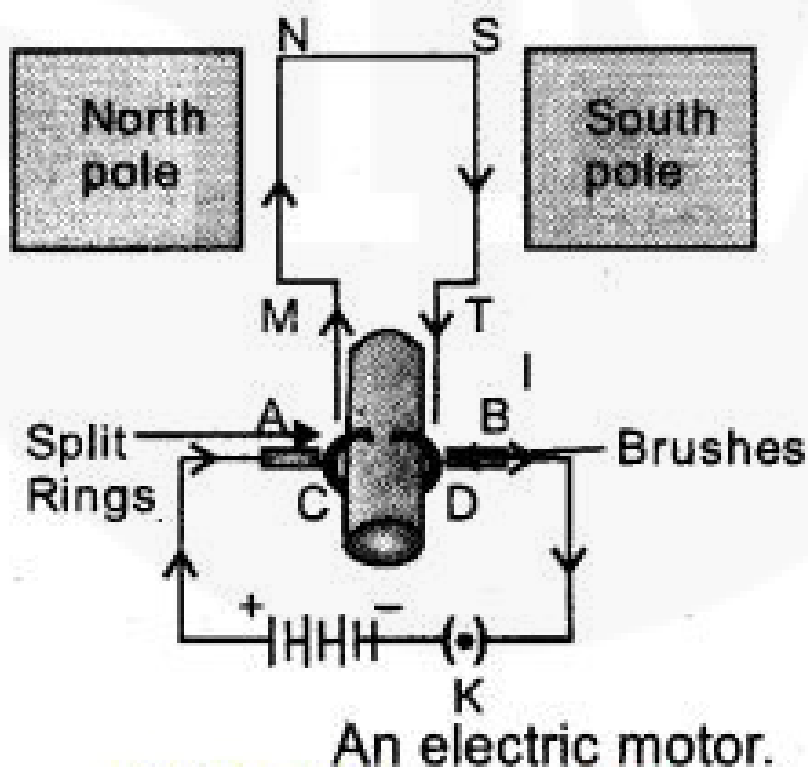
Note that the direction of current will be opposite to that of the electron beam.

Question 11.

Draw a labelled diagram of an electric motor. Explain its principle and working. What is the function of a split ring in an electric motor?

Answer:

An electric motor converts electrical energy into mechanical energy. It works on the principle of the magnetic effect of current. A current-carrying coil rotates in a magnetic field. The following figure shows a simple electric motor. When a current is allowed to flow through the coil MNST by closing the switch, the coil starts rotating anti-clockwise. This happens because a downward force



acts on length MN and at the same time, an upward force acts on length ST. As a result, the coil rotates anti-clockwise.

Current in the length MN flows from M to N and the magnetic field acts from left to right, normal to length MN. Therefore, according to Fleming's left hand rule, a downward force acts on the length MN. Similarly, current in the length ST flows from S to T and the magnetic field acts from left to right, normal to the flow of current. Therefore, an upward force acts on the length ST. These two forces cause the coil to rotate anti-clockwise.

After half a rotation, the position of MN and ST interchange. The half-ring D comes in contact with brush A and half-ring C comes in contact with brush B. Hence, the direction of current in the coil MNST gets reversed. The current flows through the coil in the direction TSNM. The reversal of current through the coil MNST repeats after each half rotation. As a result, the coil rotates unidirectionally. The split rings help to reverse the direction of current in the circuit. These are called the commutator.

Question 12.

Name some devices in which electric motors are used.

Answer:

Electric motor is used as an important component in electric fans, refrigerators, mixers, washing machines, computers, MP3 players etc.

Question 13.

A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is

1. pushed into the coil
2. withdrawn from inside the coil
3. held stationary inside the coil?

Answer:

1. There is a momentary deflection in the needle of the galvanometer.
2. Now the galvanometer is deflected towards the left showing that the current is now set up in the direction opposite to the first.
3. When the coil is kept stationary with respect to the magnet, the deflection of the galvanometer drops to zero.

Question 14.

Two circular coils A and B are placed closed to each other. If the current in the coil A is changed, will some current be induced in coil B? Give reason.

Answer:

If the current in the coil A is changed there is a change in its magnetic field. By this electricity is induced in B. This is called Electromagnetic induction.

Question 15.

State the rule to determine the direction of a

1. magnetic field produced around a straight conductor carrying current,
2. force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, and
3. current induced in a coil due to its rotation in a magnetic field.

Answer:

(i) Right-hand thumb rule: If the current-carrying conductor is held in the right hand such that the thumb points in the direction of the current, then the direction of the curl of the fingers will be given the direction of the magnetic field.

(ii) Fleming's left-hand rule: Stretch the forefinger, the central finger of the right hand mutually perpendicular to each other. If the forefinger points in the direction of the magnetic field, the central finger in the direction of the current, then the thumb points in the direction of a force in the conductor.

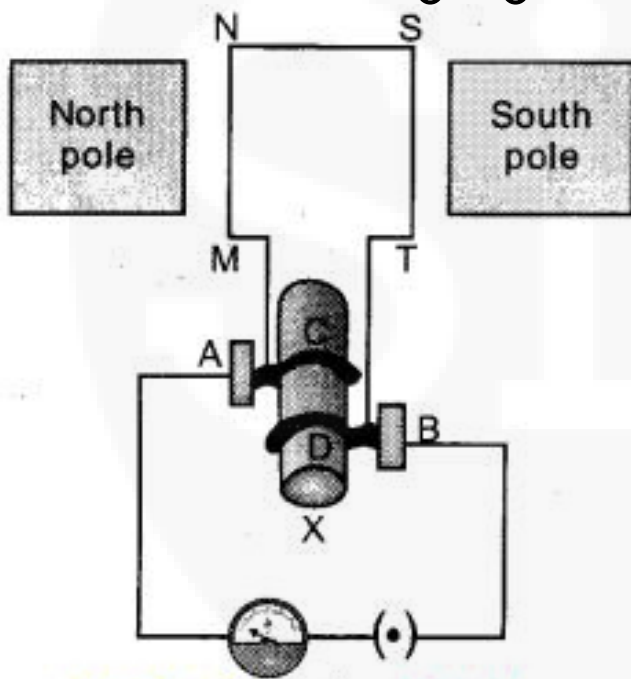
(iii) Fleming's right-hand rule: Stretch the thumb/forefinger and the central finger of the right hand mutually perpendicular to each other. If the forefinger points in the direction of the magnetic field, thumb in the direction conductor, then the central finger points in the direction of current induced in the conductor.

Question 16.

Explain the underlying principle and working of an electric generator by drawing a labelled diagram. What is the function of brushes?

Answer:

An electric generator converts mechanical energy into electrical energy. The principle of working of an electric generator is that when a loop is moved in a magnetic field, an electric current is induced in the coil, it generates electricity by rotating a coil in a magnetic field. The following figure shows a simple AC generator.



Working of a generator.

- MNST → Rectangular coil
- C and D → Two slip rings
- A and B → Brushes
- X → Axle, G → Galvanometer

If axle X is rotated clockwise, then the length MN moves upwards while length ST moves downwards. Since the lengths MN and ST are moving in a magnetic field, a current will be induced in both of them due to electromagnetic induction. Length MN is moving upwards and the magnetic field acts from left to right. Hence, according to Fleming's right hand rule, the direction of induced current will be from M to N. Similarly, the direction of induced current in the length ST will be from S to T.

The direction of current in the coil is MNST. Hence, the galvanometer shows a deflection in a particular direction. After half a rotation, length MN starts moving down whereas length ST starts moving upward. The direction of the induced current in the coil gets reversed as TSNM. As the direction of current gets reversed after each half rotation the produced current is called an alternating current (AC).

To get a unidirectional current, instead of two slip rings, two split rings are used, as shown in the following figure.

$$= \frac{144000}{1000} \text{ kWh} = 144 \text{ kWh} = 144 \text{ units}$$

Cost of 1 unit = ₹ 3

In this arrangement, brush 'A' always remains in contact with the length of the coil that is moving up whereas brush B always remains in contact with the length that is moving down. The split rings C and D act as a commutator.

The direction of current induced in the coil will be MNST for the first rotation and TSNM in the second half of the rotation. Hence, unidirectional current is produced from the generator called DC generator. The current is called AC current.

Question 17.

When does an electric short circuit occur?

Answer:

If the resistance of an electric circuit becomes very low. Then the current flowing through the circuit becomes very high. This is caused by connecting too many appliances to a single socket or connecting - high power rating appliances to the light circuits. This results in a short circuit when the insulation of live and neutral wires undergoes wear and tear and then touches each other, the current flowing in the circuit increase abruptly. Hence, a short circuit occurs.

Additional Important Questions

Very Short Answer Type Questions

Question 1. What we call the end, where north end of freely hanged magnet stops?

Answer: North pole.

Question 2. Where force of a magnet can be detected?

Answer: Near a magnet, in its magnetic field.

Question 3. How we mark a magnetic force?

Answer: With the help of magnetic field lines.

Question 4. What do closer field lines of a magnet presents?

Answer: Closer lines present stronger magnetic strength.

Question 5. What is reason for different kinds of pattern of a magnetic pattern around a conductor generated magnetic field?

Answer: Shape of conductor.

Question 6. Give some examples of daily use where electro magnet is being used.

Answer: Radio and Television.

Question 7. How an electromagnet is formed?

Answer: Electro magnet is formed by wrapping coil of insulated copper wire over core of soft iron.

Question 8. What is experienced by a current carrying conductor when placed in a magnetic field?

Answer: Force.

Question 9. Who gave the theory of induced electromagnetic induction?

Answer: Michael Faraday.

Question 10. What is a galvanometer?

Answer: An instrument which detects current in a circuit.

Question 11. Give examples of appliances using electric motor.

Answer: Electric pan, mixer, washing machines.

Question 12. Which rule of electromagnetism suits best to express working of an electric motor?

Answer: Fleming's left hand rule.

Question 13. What is the basic principle used in electric generator?

Answer: It is based on electromagnetic induction.

Question 14. What is the permissible value of electricity use in India?

Answer: 220 V, 50Hz.

Question 15. How short-circuit can be prevented?

Answer: By using fuse.

Short Answer Type Questions

Question 1. Write two properties of magnet.

Answer:

1. A magnet always points north or south when suspended freely.
2. Like pole repel each other while opposite pole attract each other.

Question 2. Define magnetism.

Answer: A magnet influence its near by object and attracts towards itself, if magnetic in nature. This phenomenon is called magnetism.

Question 3. Define magnetic field.

Answer: Area under which a magnet can influence other magnetic objects is called its magnetic field.

Question 4. Where we find closer line and what does it indicate?

Answer: Closer lines show high strength of magnetic field while wide lines represents weak strength of magnet.

Question 5. State Right hand thumb rule.

Answer:

Right hand thumb rule is represented by a down thumb fist in which fist represents a magnetic field while thumb represents current movement.

Long Answer Type Questions

Question 1.

An electric heater rated 800 W operates 6h/day. Find the cost of energy to operate it for 30 days at ₹ 3.00 per unit.

Solution:

Power of the heater, $P = 800 \text{ W}$ Time, $t = 6 \text{ hour /day}$

No; of days, $n = 30$ Cost per unit = ₹ 3.00

Total cost of its usage = ? Energy, $E = P \times t$

Consumed in 1 day = $800 \times 6 = 4800 \text{ Wh}$

Energy consumed in 30 days = $4800 \times 30 = 144000 \text{ Wh}$

$$= \frac{144000}{1000} \text{ kWh} = 144 \text{ kWh} = 144 \text{ units}$$

Cost of 1 unit = ₹ 3

Question 2.

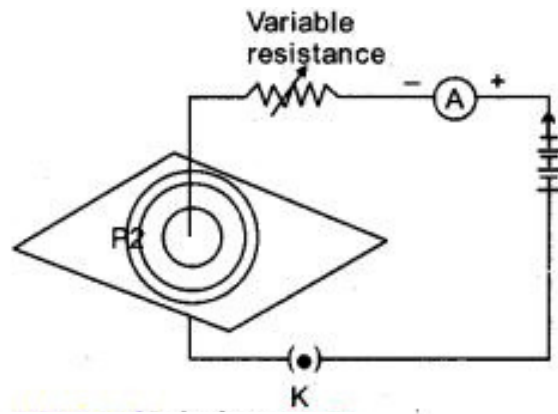
(a) Draw magnetic field lines produced around a current carrying straight conductor passing through cardboard. How will the strength of the magnetic field change, when the point where magnetic field is to be determined, is moved away from the straight wire carrying constant current ? Justify your answer.

(b) Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Give reason.

Answer:

(a) (i) The magnetic field lines around a straight conductor carrying current are concentric circles whose center lies on the wire.

(ii) When a point where magnetic field is to be determined is moved away from the straight wire, the strength of the magnetic field decreases because as we move away from a current carrying straight conductor, the concentric circles around it representing magnetic field lines become larger and larger indicating the decreasing strength of magnetic field.



A pattern of concentric circles indicating the field lines of a magnetic field a straight conducting wire.

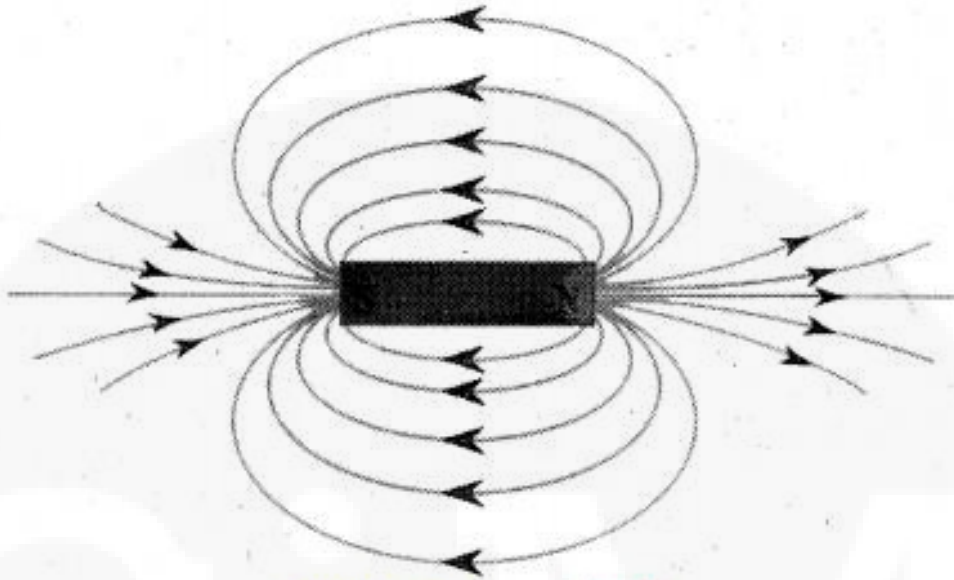
Fig. 13.18: A pattern of concentric circles indicating the field lines of a magnetic field a straight conducting wire.

(b) Yes, current is induced in the coil B. Because as the current in the coil A changes, the magnetic field lines around the coil B also change. Therefore, the change in magnetic field lines associated with the coil B is the cause of induced electric current in it.

Question 3.

- (a) Draw magnetic field lines of a bar magnet. "Two magnetic field lines never intersect each other." Why?
- (b) An electric oven of 1.5 kW is operated in a domestic circuit (220 V) that has a current rating of 5 A. What result do you expect in this case? Explain.

Answer: (a)



Field lines around a bar magnet.

Two magnetic field lines do not intersect one another. The direction of magnetic field lines is always from north pole to south pole. If the two magnetic field lines do intersect, it means at the point of intersection the compass needle is showing two different directions which is not possible.

(b) Power, $P = 1.5 \text{ kW} = 1.5 \times 1,000 = 1,500 \text{ W}$

Voltage, $V = 220 \text{ V}$, $I = ?$

$$P = V \times I \Rightarrow I = P/V = 1,500/220 = 6.8 \text{ A}$$

Now, the current drawn by the oven is 6.8 A which is very high but the fuse in this circuit is only 5 A capacity. When a very high current of 6.8 A flows through 5 A fuse, the fuse wire will get heated too much, melt and break the circuit, cutting off the power supply.

Question 4.

A circuit has a line of 5 A. How many lamps of rating 40W; 220V can simultaneously run on this line safely?

Answer:

$$\begin{aligned} I &= 5 \text{ A} & \text{No. of lamps} &= n \\ \text{Power, } P &= 40 \text{ W} & V &= 220 \text{ V} \\ \text{Power of 1 bulb} &= 40 \text{ W} & \text{Power of } n \text{ bulbs} &= 40 n \text{ watts} \\ P &= V \times I & 40 n &= 220 \times 5 \\ n &= \frac{220 \times 5}{40} = \frac{55}{2} \\ &= 27.5 \\ &\approx \text{around no. of lamps} &= 27 \end{aligned}$$

Question 5.

A bulb is rated at 200 V, 100 W. Calculate its resistance. Five such bulbs burn for 4 hours daily. Calculate the units of electrical energy consumed per day. What would be the cost of using these bulbs per day at the rate of ₹ 4.00 per unit?

Solution:

$$\begin{aligned} P &= 100 \text{ W} & V &= 200 \text{ V} \\ R &= ? & P &= \frac{V^2}{R} \\ R &= \frac{V^2}{P} & R &= \frac{(200)^2}{100} \\ R &= \frac{200 \times 200}{100} = 400 \Omega \\ \therefore & & & \\ \text{Given: } P &= 100 \text{ W} = \frac{100}{1000} \text{ kW} = 0.1 \text{ kW} \\ \text{Time } t &= 4 \text{ hours} \end{aligned}$$

Electrical energy consumed, $E = P \times t$

Energy consumed by 1 bulb = $0.1 \times 4 = 0.4 \text{ kWh}$

\therefore Energy consumed by 5 bulb = $5 \times 0.4 = 2 \text{ kWh} = 2 \text{ units}$

Cost of electrical energy:

Cost of 1 unit of electricity = ₹ 4

\therefore Cost of 2 units of electricity = $4 \times 2 = ₹ 8$

Question 6.

- (a) Describe an activity to show with the help of a compass that magnetic field is strongest near poles of a magnet.
- (b) Mention the direction of magnetic field lines (i) inside a bar magnet and (ii) outside a bar magnet.

Answer:

(a) A bar magnet is placed on a sheet of paper and its boundary is marked with a pencil. A magnetic compass is brought near the N-pole of the bar magnet. It is observed that N-pole of magnet repels the N-pole of compass needle due to which the tip of the compass needle moves away from the N-pole. Thus, a magnetic field pattern is obtained around a bar magnet.

(b) Each magnetic field line is directed from the north pole of a magnet to its south pole. The field lines are closest together at the two poles of the bar magnet.

1. Inside a bar magnet, the lines of forces start from south pole and end on north pole.
2. Outside a bar magnet, magnetic lines of forces start from north pole and end on south pole.

Question 7.

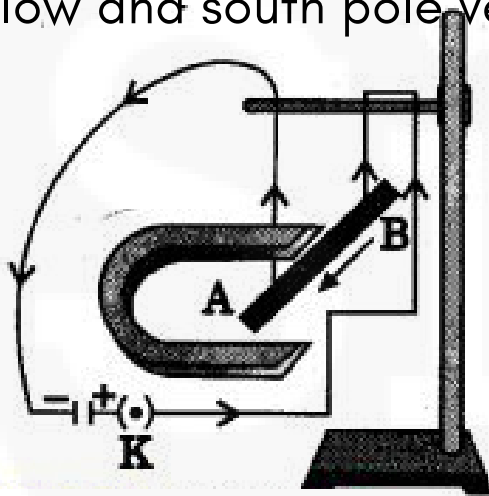
(a) With the help of a labelled diagram, describe an activity to show that a current carrying conductor experiences a force when placed in a magnetic field. Mention the position when this force is maximum.

(b) Name and state the rule which gives the direction of force acting on the conductor.

Answer:

(a) Activity:

- A small aluminium rod (AB) about 5 cm is suspended with two connecting wires horizontally from a stand.
- A strong horse-shoe magnet is placed in such a way that the rod lies between the two poles with the magnetic field directed upwards, the north pole of the magnet vertically below and south pole vertically above the aluminium rod.



A current-carrying conductor experiences force in magnetic field.

- Fig. 13.20: A current-carrying conductor experiences force in magnetic field.
- The aluminium rod is connected in series with a battery, a key and a rheostat.
- When a current is allowed to pass through aluminium rod. From end B to end A, it is observed that the rod is displaced towards the left.
- When the direction of the current is reversed from A to B, it is observed that the direction of displacement- of the rod is towards the right.

This activity shows that when a current carrying conductor is placed in a magnetic field, a mechanical force is exerted on conductor which makes it move.

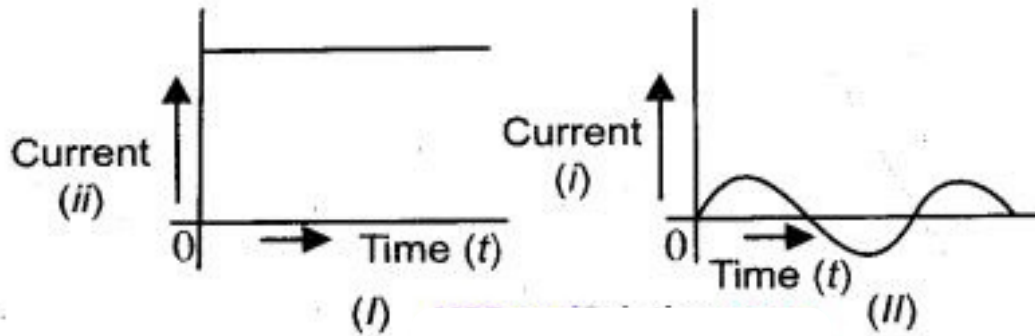
The maximum force is exerted on a current carrying conductor only when it is perpendicular to the-direction of magnetic field.

(b) The direction of force acting on the current carrying conductor can be found out by using Fleming's left-hand rule.

According to Fleming's left-hand rule, hold the fore finger, the center finger and the thumb of your left hand at right angles to one another. If the first finger of your left hand points in the direction of magnetic field and second in the direction of current, then the thumb will point in the direction of motion or the force acting on conductor.

Question 8.

Study the following current-time graphs from two different sources:



1. Use above graphs to list two differences between the current in the two cases.
2. Name the type of current in the two cases.
3. Identify one source each for these currents.
4. What is meant by the statement that “ the frequency of current in India is 50 Hz”?

Answer:

I	II
1. It shows Direct Current (D. C.).	1. It shows Alternating Current (A.C.).
2. The current (I) flows in one direction only. It is called a direct current. The magnitude and direction of flow of current remains the same,	2. The current (II) reverses direction after equal intervals of time. It is called alternating current. The magnitude and direction of current change continuously at definite intervals of time.
3. The magnitude of current in (I) does not become zero with passage of time.	3. The magnitude of (II) becomes zero after a regular time interval.

1. D.C. – Direct Current.
2. A.C.- Alternating Current.
3. Source of D.C. → a cell, battery, solar cell, D.C. generator.
4. Source of A.C. → A.C. Generator.
5. The frequency of current in India is 50 Hz means the direction of current in India changes 50 times in 1 second.

Question 9.

Explain two disadvantages of series arrangement for household circuit.

Answer:

Disadvantages of series circuits for domestic wiring:

1. In series circuit, if one electrical appliance stops working due to some defect then all other appliances also stop working because the whole circuit is broken.
2. In series circuit, all the electrical appliances have only one switch, due to which they cannot be turned off or turned on separately.

Question 10.

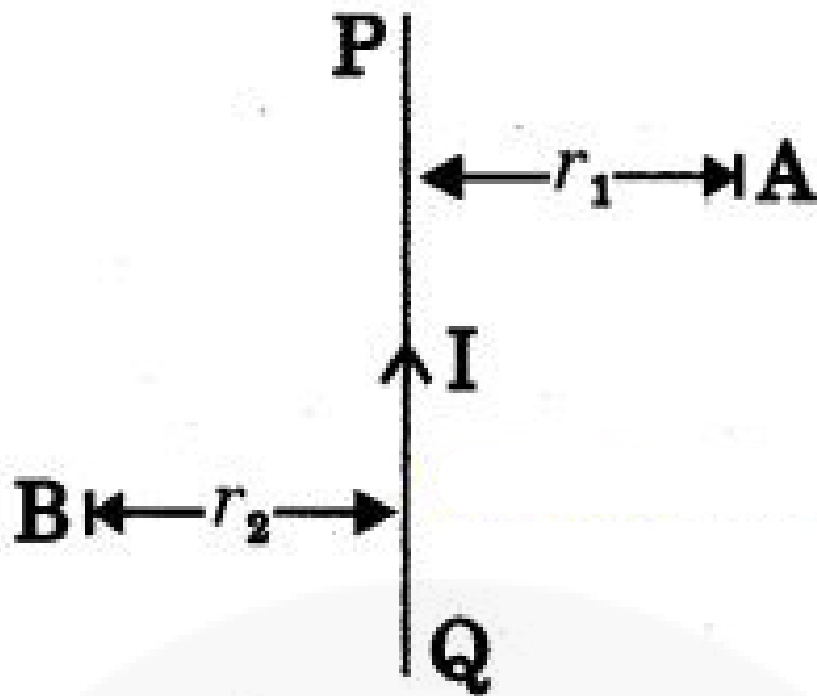
(i) State Maxwell's right-hand thumb rule.

(ii) PQ is a current carrying conductor in the plane of the paper as shown in the figure. Mention the direction of magnetic fields produced by it at points A and B.

Given $r_1 < r_2$ where will the strength of the magnetic field be larger?

Answer:

(i) Maxwell's right hand thumb rule: The direction of the current is given by Maxwell's right hand thumb rule, "If the current carrying conductor is gripped with the right hand in such a way that the thumb gives the direction of the current, then the direction of the fingers gives the direction of the magnetic field produced around the conductor".



(ii) Since the direction of current in the straight conductor is from Q to P , then according to Maxwell's right hand thumb rule, magnetic field at point A is inside the paper and at point B is outside the paper. Since $r_1 < r_2$ the strength of the magnetic field at A is more than at B because greater the distance of a point from the current carrying wire, weaker will be the magnetic field produced at that point.

