CBSE Class 10 Science

Important Questions

Chapter 13

Magnetic Effects of Electric Current

1 Marks Questions

1. Magnetic field lines determine

(a) The shape of magnetic field

(b) Only the direction of magnetic field

(c) Only the relative strength of the magnetic field

(d) Both the direction and the relative strength of magnetic field

Ans. (d) Both the direction and the relative strength of magnetic field

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2. A device for producing electric current is called a

(a) Galvanometer

(b) Motor

(c) Generator

(d)Ammeter

Ans. (c) Generator

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

(a) vary continuously

(b) reduced considerably

(c) increases heavily

(d) does not change

Ans. (c) increases heavily

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4. Figure shows the magnetic field lines between the two faces A and B of two magnets.

(a) Both faces A and B of two bar magnets are North pole.

(b) Both faces A and B of two bar magnets are South pole.

(c) Face A is south pole while face B is north pole.

(d) None of the above.

Ans. (d) None of the above.

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5. The magnetic field near a long straight wire is described by

(a) Straight field lines parallel to the wire.

(b) Straight field lines perpendicular to the wire.

(c) Connective circle centered on the wire.

(d) Radial field lines starting from the wire.

Ans. (c) Connective circle centered on the wire.

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6. A current carrying conductor placed in magnetic field experiences a force. The displacement of the conductor in magnetic field can be increased by

(a)Decreasing the magnetic field.

(b) Decreasing the current in the conductor.

(c) Increasing the magnetic field.

(d) None of the above.

Ans. (c) Increasing the magnetic field.

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7. A positively charged particle say an alpha particle projected towards west is deflected toward north by a magnetic field. The direction of the magnetic field is

(a) Upward

(b) downward

(c) towards south

(d) towards east.

Ans. (d) towards east.

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8. Which of the following properties of a proton can change when it moves freely in a magnetic field

(a) mass

(b) speed

(c) velocity

(d) momentum

Ans. (c) velocity

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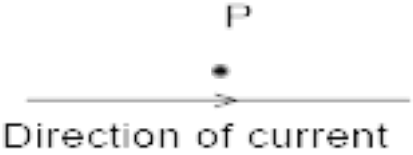
9. The direction of the magnetic field at a point P above the wire carrying current as shown in the figure is



(a) Down the page

(b) up the page

(c) into the page

(d) out of the page

Ans. (c) velocity

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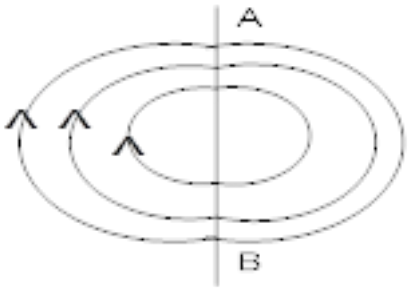
10. Concentric circles with arrows centered at the wire AB are shown in figure.



(a) No current in AB

(b) current flows from B to A

(c) current – flows from A to B

(d) none of these

Ans. (b) current flows from B to A

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11. Electric motor converts

(a) Mechanical energy into electrical energy

(b) Mechanical energy into heat energy

(c) Electrical energy into heat energy

(d) Electrical energy into mechanical energy

Ans. (d) Electrical energy into mechanical energy

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12. Potential difference between a live wire and a neutral wire is

(a) 200 volt

(b) 150 volt

(c) 210 volt

(d) 220 volt

Ans. (d) 220 volt.

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13. The most important safety device method used for protecting electrical appliances from short circuiting or overloading is

(a) Earthing

(b) use of stabilizer

(c) use of electric meter

(d) fuse

Ans. (d) fuse

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14. Forces acting on a stationery charge of in the magnetic field B is

(a) BQ v

(b) BQ/v

(c) Bv/Q

(d) zero

Ans. (d) zero

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15. The rectangular coil of copper wires is rotated in a magnetic field. The direction of induced current change once in each

(a) one revolution

(b) one fourth revolution

(c) half revolution

(d) two revolutions

Ans. (b) one fourth revolution

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16. Choose the correct option:

(a) The magnetic field inside a long straight solenoid-carrying current Is zero.

(b)Decrease as we move towards its end.

(c)Increase as we move towards it end.

(d)Is the same all points.

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

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17. Which of the following property of a proton can change while it moves freely in a magnetic field?

(a) mass

(b) speed

(c) velocity

(d) momentum

Ans. (c), (d) Velocity as well as momentum will change.

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18. 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. (d) the direction of magnetic field is vertically upward.

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19. Name some sources of direct current.

Ans. Some sources of direct current are a cell, a battery and a D.C. generator.

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20. Choose the correct option:

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

(a) two revolutions

(b) one revolution

(c) half revolution

(d) one-fourth revolution

Ans. (c) half-rotation.

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21. Which one 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. (d) The field consists of concentric circles centered on the wire.

22.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 at an electric motor.

Ans. (c) producing induced current in a coil due to relative motion between a magnet and the coil.

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23. The device used for producing electric current is called

(a) generator

(b) galvanometer

(c) ammeter

(d) motor

Ans. (a) generator

24.The essential difference between A.C. generator and a D.C. generator is that

(a) A.C. generator has an electromagnet while a D.C. generator has permanent magnet.

(b) D.C. generator will generate a higher voltage

(c) A.C. generator will generate a higher voltage

(d) A.C. generator has slip rings while the D.C. generator has commentator.

Ans. (d) A.C. generator has slip rings while the D.C. generator has commentator.

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25. At the time of short circuit, the current in the circuit:

(a) reduce substantially

(b) does not change

(c) increase heavily

(d) vary continuously

Ans. (c) increase heavily

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26. In which position the force on conductor is maximum when it uniform magnetic field? is placed in

Ans. When conductor is Perpendicular to field

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27. How can it be shown that magnetic field exist around a wire carrying current?

Ans. By using magnetic compass which, shows deflection.

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28. How can a solenoid be used to magnet a steel bar.

Ans. By inserting the steel bar inside the solenoid and switching on electric current.

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29. Why can't two magnetic field lines ever intersect?

Ans. If so then at the point of intersection there will be two different directions of magnetic field which is not possible.

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30. Can 5A fuse be used in wire carrying 15 A current? Why?

Ans. because both of them would then be ineffective in controlling the amount of current flowing.

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31. Give the factors that affect strength of magnetic field at a point due to a straight conductor carrying current.

Ans. Magnitude of electric content, perpendicular distance between that point and conductor.

32. Where do we connect a fuse: with live wire or with neutral wire?

Ans. It is always connected with live wire.

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33. Name any two devices which use permanent magnets.

Ans. Loudspeakers, (Galvanometer, voltmeter).

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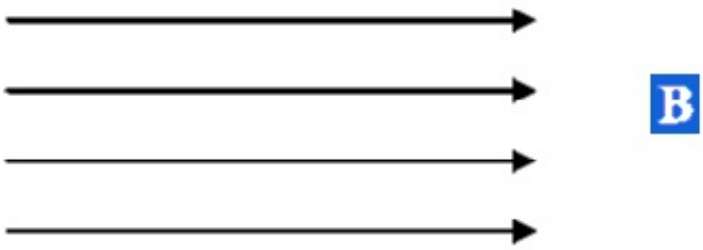
34. Draw the magnetic field lines representing uniform magnetic field.

Ans.



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35. If the frequency of A.C. is 50 Hz. Then how many times it is changing its direction in 1 second?

Ans. 100 Times.

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36. What is the pattern of the magnetic field lines around a straight conductor carrying current?

Ans. Concentric circles

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37. If the current is flowing in the direction of advancement of screw, then what is the direction of magnetic field lines?

Ans. In the direction of rotation or screw.

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38. How can you say that the magnetic field is uniform inside the solenoid.

Ans. Because field lines are parallel inside the solenoid.

39. Which property of a proton will change while it moves freely in a magnetic field?

Ans. Momentum or Velocity.

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40. According to Flemings right hand rule, which part of right hand indicate the movement of conductor?

Ans. Thumb

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41. If the no. of turns of a circular current carrying coil are doubled, then how will the magnetic field produced by it changes?

Ans. Doubled

2 Marks Questions

1. State two properties of magnetic lines of force?

Ans. (i) Magnetic lines of force are closed continuous curves.

(ii) The tangent at any point on the magnetic line of force which gives the direction of magnetic field at that point.

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

Ans. Compass needle experience a force is the magnetic field of a bar magnet due to which it deflects.

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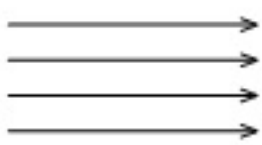
3. The magnetic field lines in a given region is uniform. Draw a diagram to represent.

Ans.



4. Write two ways to induce current in a coil?

Ans. (i) By moving a bar magnet toward or away from the coil.

(ii) By placing a coil near another coil connected across a battery.

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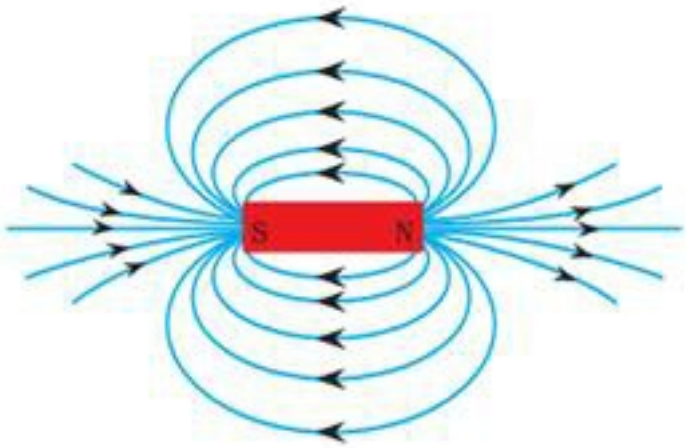
5. Draw magnetic field lines around a bar magnet? Give one point of difference between uniform and non- uniform magnetic field.



Ans. The space or region where field is same everywhere is known as Uniform magnetic field. The magnetic field which is unequal in magnitude and direction at every point in the space is called non- uniform magnetic field.

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6. Why do not two magnetic field lines intersect each other?

Ans. The two magnetic field lines never intersect each other because at the point of intersection there will be two directions of magnetic field, which is not possible.

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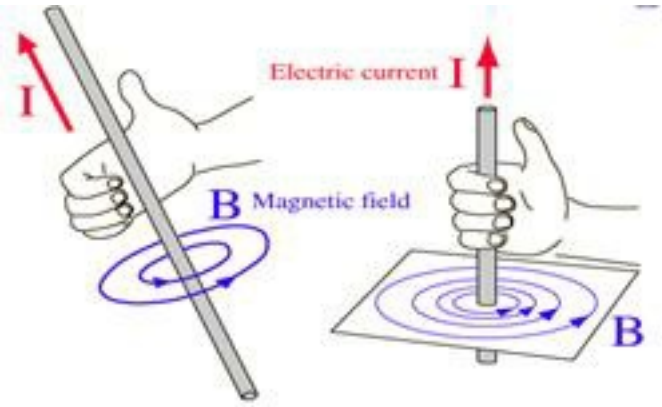
7. Name and state rule used to determine the direction of magnetic field produced around a straight conductor carrying current?

Ans. The rule is known as right hand thumb rule if a current carrying conductor is held in our right hand such that thumb points in the direction of current, then the curled fingers of the hand indicate the direction of magnetic field.



8. What is electric fuse? Where it is connected in a circuit?

Ans. An electric fuse is a safety device which is made up of a wire made of copper or aluminum or a tin lead alloy. An electric fuse must be connected in the path of the circuit so that overloading which can cause fire due to short circuit can be avoided.

9. State the factors on which strength of magnetic field at a point due to a current carrying conductor depends?

Ans. The factors on which strength of a magnetic field at a point depends.

(1) Amount of current (I) flowing through the conductor

(2) Distance (r) from the current carrying conductor.

$$B = \frac{\mu o}{4\pi}\frac{2I}{r}$$

(1) $B \propto I$ (2) $B \propto \frac{1}{r}$

10. What is an electromagnet? Write two uses of an electromagnet?

Ans. When current is passed through a solenoid it behaves as a magnet and is called as an electromagnet.

The two uses of an electromagnet are-

(1) They are used to lift heavy iron pieces.

(2) They are used in many devices like micro phone, radio sets, electric bell etc.

11. State and define S.I unit of magnetic field?

Ans. The S.I unit of magnetic field is Tesla (T). The magnetic field strength is said to be one Tesla if 1meter long conductor carrying 1 ampere current experiences 1 Newton force, when placed perpendicular to the direction of magnetic field.

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12. A current carrying conductor is placed perpendicular to the uniform magnetic field.

What happens to displacement of the conductor if

(i) strength of current increases

(ii) If horse shoe magnet is replaced by a weak horse shoe magnet.

Ans. The displacement of the conductor

(i)will increase on increasing the current

(ii) Will decrease on using a weak horse shoe magnet.

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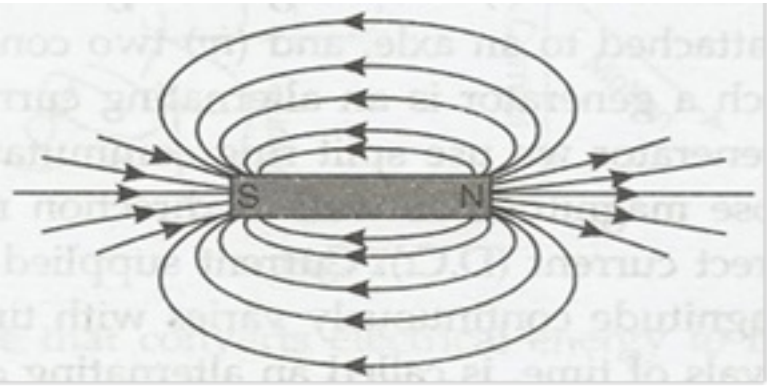
13. Draw magnetic field around a bar magnet.

Ans. Magnetic field lines are as follows:



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

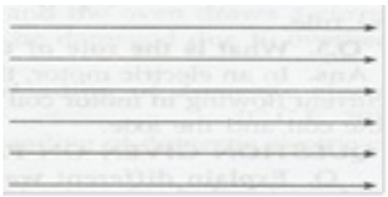
Ans. No, two magnetic field lines can ever intersect each other. If they do, then it would mean that at the point of intersection there are two directions of magnetic field, which is not possible.

15. 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. As per right-hand rule, we find that inside the loop, the magnetic field lines are directed perpendicular to the plane of paper in the inward direction. Outside the loop magnetic field lines are directed out of the plane paper.

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

Ans. The uniform magnetic field is represented by parallel equispaced lines of equal length as follows:



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

Ans. In electric motor, the split ring acts as commutator. Due to its action, the direction of current flowing in motor coil reverses after half turn, giving rise to a continuous rotation of the coil and the axle.

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18. State the principle of an electric generator.

Ans. An electric generator is based on the principle of electromagnetic induction. When a rectangular coil is rotated in a uniform magnetic field, an induced emf is generated between the ends of the coil.

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19. Which sources produce alternating current?

Ans. A.C. generator and common inverter used in houses for emergency power supply produce alternating current.

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

Ans. Two safety measures are:

(a) use of earth wire and proper earthing.

(b) use of fuse.

21. 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 line

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

Ans. (a) False

(b) True

(c) True

(d) False

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

Ans. The force experienced by a current carrying conductor placed in a magnetic field is largest when the conductor is placed with its length in a direction perpendicular to that of magnetic field.

23. Name some devices in which electric motors are used.

Ans. Electric motors are used in all devices where we want to convert electrical energy into Mechanical energy. In our houses, electric motors, coolers, mixer grinders, washing machines, computers etc motor is used.

24.When does an electric short circuit occurs?

Ans. If either the insulation of wires used in an electric circuit is damaged or there is a fault in the appliances, live wire and neutral wire may come in direct contact. As a result, the current in the circuit abruptly rises and short circuiting occurs.

25. Why is the earth pin thicker and longer than the live and the neutral pins?

Ans. it is thicker so that it does not enter into the live or neutral sockets. It is made longer so that it gets connected to the earth terminal earlier than the live and neutral pins. This ensures the safety of the user.

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26. A current-carrying straight conductor is placed in the east-west direction. What will be the direction of the force experienced by this conductor due to earth's magnetic field? How will this force get affected on? (a) reversing the direction of floe of floe of current (b) doubling the magnitude of current.

Ans. The direction of earth's magnetic field is from U-south to 0-north. Let current is from west to east. Therefore, force is vertically upwards.

(a) By reversing the direction of current, the direction of will be reversed i.e. vertically downwards.

(b) The magnitude of the force is doubled.

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27. Give two uses of electromagnets.

Ans. (i) It is used in cranes for lifting heavy loads.

(ii) used in electric bells.

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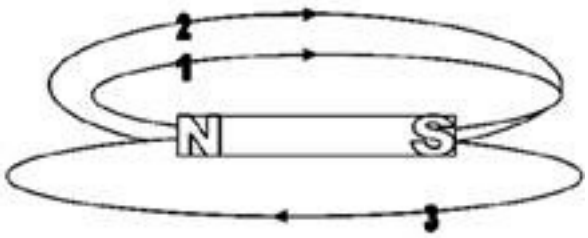
28. A straight wire carrying electric current is moving out of plane of paper and is perpendicular to it. What is the direction and type of induced magnetic field?

Ans. Induced magnetic field will be in the form of concentric circles in the plane of paper.

29. Why does the bulk of iron fillings slick to the ends of a bar magnet and not at its centre?

Ans. Because at the ends magnetic strength is maximum and at canters magnetic strength is least.

30. A student draws three magnetic field lines 1,2 and 3 of a bar magnet with the help of a compass needle as shown in figure.



(a) Is this configuration possible?

(b) If not what is

Ans. (a) No wrong in figure and why?

(b) (i) Two field lines cannot intersect **(ii)** direction of field lines '3' is wrong.

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31. Suppose you are sifting in a room facing one of the wall. An electron beam and is moving horizontally from your back goes towards the wall in front you deflected to our left, what is the direction of magnetic field in the room?

Ans. Vertically upward.

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32. A current through a horizontal power line flows in north to south direction. What is the direction of magnetic directly above it? field (i)at a point directly below it and (ii)at a point

Ans. (i) West to East **(ii)** East to West

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33. Electric appliances like electric -press, toaster, fans etc are connected to electric mains through three-pin plug. Why?

Ans. Electric appliances are connected to three pin plug because heavy appliances require earth wire, so that in case of leakage of any current it goes to earth and user will not get shock

3 Marks Questions

1. What is the function of an earth wire? Why is if necessary to earth metallic casing of electric appliance?

Ans. Earth will acts as a safety device. When live wire touches the metallic appliance then electric current flows through castling to the earth instead of human body and thus we prevent ourselves from getting shock. It is necessary to earth metallic casing of the appliance because it saved electrical appliance from burning and prevent us from electric shock.

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2. We know a current carrying conductor placed in a magnetic field experiences a force due to which the conductor moves. How do we think the rod displaces if-(a) current in rod is increased

(b) a stronger horse shoe is inserted

(c) length of the rod is increased.

Ans. Force acting on current carrying conductor

F=BIL

(a) When I increase, F also increases hence displacement of the rod increases.

(b) When a stronger horse shoe magnet is inserted, magnetic field B increases. So force F increase. Hence displacement increases.

(c) When I increase, force increases and hence displacement increases.

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3. What is the principle of electric motor? State the function of

(i) split ring

(ii) field magnet used in electric motor.

Ans. Electric motor works on the principle that a current carrying conductor placed perpendicular to a magnetic field experiences a force.

(i) Split ring – It reverses the dissection of current in the armature and thus direction of force is also reserved. As a result dc motor continues to rotate in same direction.

(ii) Field magnet – It provided strong magnetic field.

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4. State three factor on which magnetic field produced by a current carrying solenoid depends.

Ans. (1) The strength of the current flowing through the solenoid.

(2) No. of turns of the wire of the solenoid.

(3) Nature of the material inside solenoid.

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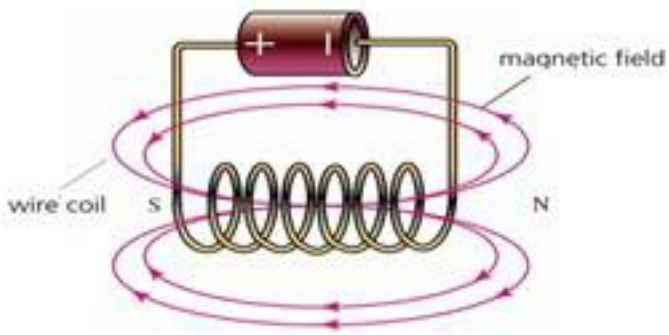
5. What is a solenoid? Draw magnetic field lines showing the magnetic field inside and outside the current carrying solenoid?



Ans. A solenoid is a coil of many turns of insulated copper wire closely wound in the shape of a ring.

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6. (a) Name four appliances wherein an electric motor is used as an important component. In what respect it is different from generator?

(b) Define the terms used in the generator

(i) armature

(ii) slip rings

(iii) brushes

Ans. (a) The four appliances which have electric motor inside them are

(i) Mixers **(ii)** Washing machine **(iii)**Refrigerators **(iv)** Blenders

(b) (i) Armature – Armature is a coil of large number of turns of insulated copper wire wound over a soft iron core.

(ii) Slip rings- Slip Rings one two rings made up of brass which rotates along with the coil.

(iii) Brushes- Brushes are made up of carbon which are pressed against the slip rings and are connected to external circuit where output is obtained.

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7. (a) What is the standard colour code followed for

(i) live

(ii) neutral and

(iii) earth wires used in electric circuits?

(b) Which part of an electric appliance is earthed and why?

Ans. (a) The standard colour code for

Live wire - Red

Neutral - Black

Earth - Green respectively.

(b) The metallic case of an electrical appliance is earthed because metals are good conductors of electricity and in case if current exceeds i.e. live wire touches the metallic case of an appliance and then due to earthing all the excess amount of current flows down to the earth and we prevent ourselves from an electric shock.

8. (a) What is short circuiting?

(b) What is overloading? How can you avoid overloading?

Ans. (a) Short circuiting means when live wire and the neutral wires come in contact with each other. Due to this resistance of the circuit becomes very small and huge amount of current flows through the circuit which is turn produces more heat which can cause fire.

(b) Overloading means large amount of current flows in the circuit. It can happen when many electrical appliances of high power ratings are connected in a single socket. It can be avoided by the following methods:

(i) Not use too many appliance is a single socket

(ii) To apply preventive methods of short circuiting.

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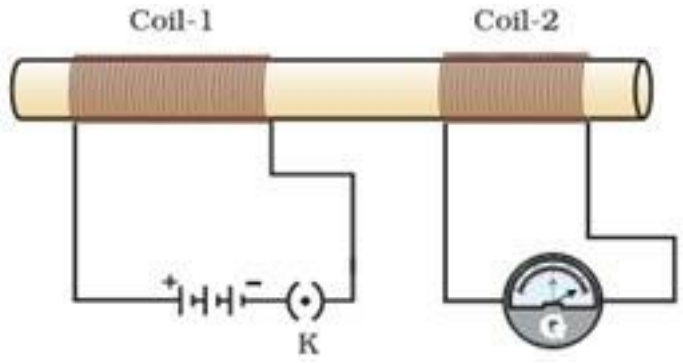
9. Define electromagnetic induction? Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Explain.

Ans. Electromagnetic induction means the production of induced current in a closed coil due to the change in the magnetic field. When current in coil A is changed, magnetic flux sets up around coil A due to which some magnetic field set up in the coil B thus some induced current flow through coil B due to which galvanometer deflects.



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10. Why does a current carrying conductor kept in a magnetic field experience force? What is the direction of force acting on the conductor?

Ans. A current carrying coil contains charged particles which experiences a force (Bqv). The

total

force experienced by the charged particle is equal to the force experienced by the conductor which is perpendicular to both the magnetic field and the direction of current in the conductor.

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11. (a) Distinguish between A.C and D.C?

(b) Which source produces alternating current?

Ans.

	Alternating current		Direct current
(1)	The magnitude of current is constant and flows in one direction only.	(1)	The magnitude and direction of current reverses periodically.
(2)	The frequency of direct current is zero.	(2)	The frequency of alternating Current is finite.
(3)	Direct current cannot be used for households purposes.	(3)	It is used to run electrical appliances like bulb, heater, iron etc.

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12. (a) Define the term current rating of an electric fuse?

(b) Name the material used to make electric fuse?

(c) Name two safety measure commonly used in electric circuit and appliances?

Ans. (a) The maximum amount of current that can be passed through the fuse wire without melting it.

(b) Copper or alloy of lead acid tin.

(c) Electric fuses and earth wire.

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

Ans. The compass needle is small bar magnet. When a compass needle is brought near a bar magnet then due to repulsive force between unlike poles and attraction between unlike poles, the compass needle is deflected and settle in the direction of net magnetic field.

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14. List the properties of magnetic lines of force.

Ans. Properties of magnetic field lines of force as follows:

a. Outside a magnet, the field lines are directed from N-pole of magnet towards S-pole and inside the magnet lines are directed form S-pole to N-pole.

b. Magnetic field lines are closed curves.

c. No two magnetic field lines intersect each other.

d. Relative strength of magnetic field lines is given by degree of closeness of the filed lines.

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

(i) current is rod AB is increased,

(ii) a stronger horse shoe magnet is used, and

(iii) length of the rod AB is increased?

Ans. (i) O increasing the current in rod AB its displacement will increase.

(ii) If stronger horse-shoe magnet is used then the displacement of rod AB will increase.

(iii) If length of the rod is increased, force acting on it will increase and hence, displacement of the rod increases.

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16. State Fleming's left-hand rule.

Ans. Fleming's left hand rule states that stretch the forefinger, the central finger and the thumb of your left hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and central finger that of the current, then the thumb will point towards the direction of motion of the conductor.

17. What is the principle of an electric motor?

Ans. An electric motor is based on the principle that the current carrying conductor experiences a force when placed in a magnetic field. If the direction of the magnetic field and that of the current are mutually perpendicular, then the direction of the force is given by Fleming's left-hand rule.

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

Ans. Different ways to induce current in a coil are as follows:

(a) If a magnetic field is changed around a coil then an induced current is set up in the coil.

(b) If a coil is moved in magnetic field, then again an induced current is set up in the coil.

(c) If a coil is rotated in a uniform magnetic field

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

Ans. Power rating of electric oven (P) = 2 kW = 2000 W

Current drawn (I) = P/V = 2000/220 = 9.09 A.

As the current rating of domestic electric circuit is only 5A the oven draws a current of 9.09 A. Which is more than the current rating; hence the circuit will be damaged due to overheating/overloading.

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20. What precaution should be taken to avoid the overloading of domestic electric circuit?

Ans. We should take following precaution to avoid the overloading of domestic electric circuit:

(a) Two separate circuits should be used, one of 5A current rating of bulbs, fans, tubes etc. and the other 15 A current rating for appliances with higher current rating such as geysers,

air coolers, electric iron, electric stoves etc.

(b) Too many appliances should never be connected to a single socket.

(c) A fuse of appropriate current rating should be used with the electric circuit.

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21. List three methods of producing magnetic field.

Ans. Three methods of producing magnetic fields are as follows:

(a) Magnetic field can be produced by placing a permanent magnet or a horse-shoe magnet at the place, where magnetic field is required.

(b) Magnetic field is produced around a current carrying straight conductor or a current carrying coil.

(c) A very good method to produce magnetic field is due to flow of current in a solenoid.

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

Ans. When current is passed through a solenoid coil, magnetic field is produced due to presence of turns in same direction. As a result, the resultant magnetic field is very strong and uniform.

Solenoid behaves like a strong bar magnet. We can determine the poles of magnet formed by solenoid. The end of solenoid connected with positive terminal behaves like South Pole and the end connected with negative terminal behaves as North Pole.

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23. Imagine that you are sitting in 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. An electron beam moving horizontally from back wall towards the front wall is equivalent to a current flowing in the opposite direction. The deflection of electron beam as

seen by the observer is to his right side. On applying Fleming's left-hand rule we find that the magnetic field is acting in vertically downward direction.

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

(i) pushed into the coil.

(ii) withdrawn from inside the coil

(iii) held stationary inside the coil?

Ans. (i) When a bar magnet is pushed into the coil of insulated copper wire connected to a galvanometer, galvanometer gives a deflection towards left.

(ii) When the bar magnet is withdrawn from inside the coil, again an induced current is set in coil that deflect the galvanometer towards right.

(iii) If the bar magnet is held stationary inside the coil, then no induced current is set and galvanometer does not show any deflection.

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25. 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.

Ans. Yes, a current is induced in the coil B.

When the current in the coil A is changed, the magnetic field associated with it also changes. As coil B is placed close to A, hence magnetic field lines around this coil also change. Due to change in magnetic field lines associated with coil B, an induced current is also induced in it.

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26. State the rule to determine the direction of a

(i) magnetic field produced around a straight current carrying conductor

(ii) force experienced by a current carrying straight conductor

(iii) current induced in a coil due to its rotation in a magnetic field.

Ans. (i) To know the direction of magnetic field produced around a straight conductor we make use “Right hand thumb Rule”.

(ii) To find the direction of force experienced by a current carrying straight conductor placed in a

magnetic field we make use “Fleming’s left hand rule”.

(iii) For finding the direction of current induced in a coil we use “Fleming’s right hand rule”.

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

Ans. The earth wires functions as a safety measure, especially for those appliances that have a metallic body, like heater, electric, press, room cooler etc. The metallic body of the appliance is connected to the earth wire, which provides a low resistance conducting path for electric current. It ensures that any leakage of current to the metallic body of an appliance keeps it potential same as of earth. As a result, the user would not get severe electric shock, even if he touches the body of appliance.

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

(i) Pushed into the coil?

(ii) Withdrawn from Side the coil?

(iii) Held stationary inside the coil?

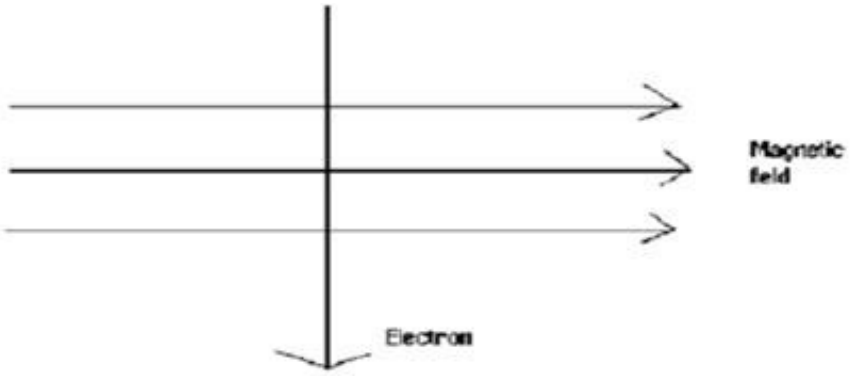
Ans. (i) Due to change in magnetic flux linked with coil, the galvanometer shows deflection (say towards right).

(ii) Due to change in magnetic flux linked with coil, the galvanometer shows deflection (say towards left opposite to that in case one).

(iii) As it is stationary no change in magnetic flux linked with coil, so galvanometer shows no deflection.

29. An electron enters a magnetic field at right angles to it as shown in fig. The direction of the force acting on the electron will be:

(a) to the right (b) to the left (c) out of the page (d) into the page



Ans. When a conductor carrying current is placed perpendicular to the direction of magnetic field, the acting on it is given by Fleming's left hand rule. Since the direction of current is the same as that of the motion of a positive charge, the direction of force acting on it when moving perpendicular to the direction of magnetic field is the same as that acting on a current-carrying conductor placed perpendicular to the direction of magnetic field. Obviously, the force acting on an electron is opposite to that. Therefore, in this case it is into the page.

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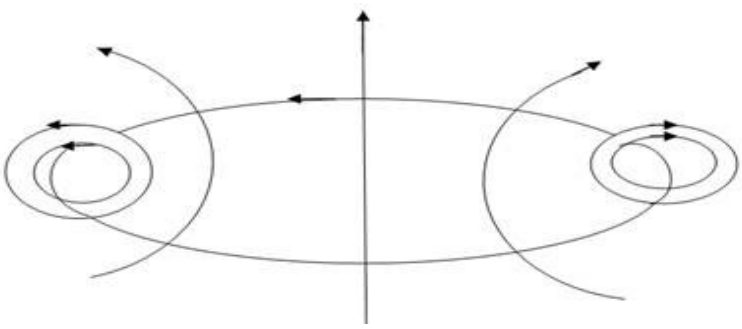
30. Consider a circular wire lying in the plane of the table and the direction current in it is antilock wise.

(i) Draw the magnetic field lines produced around it.
(ii) Why does magnetic field at the center of current carrying circular loop appear straight? Explain with diagram.

Ans. (i)



(ii) Because of large curvature of magnetic field lines at centre.

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31. If we place a compass needle near straight conductor carrying current (a)What happens to the deflection of the compass needle if the direction of current reversed. Is (b)What change will you notice in the compass needle if it is moved away from conductor but the current through the conductor remains the same?

Ans. (a) Direction of deflection will reverse

(b) Deflection will decrease

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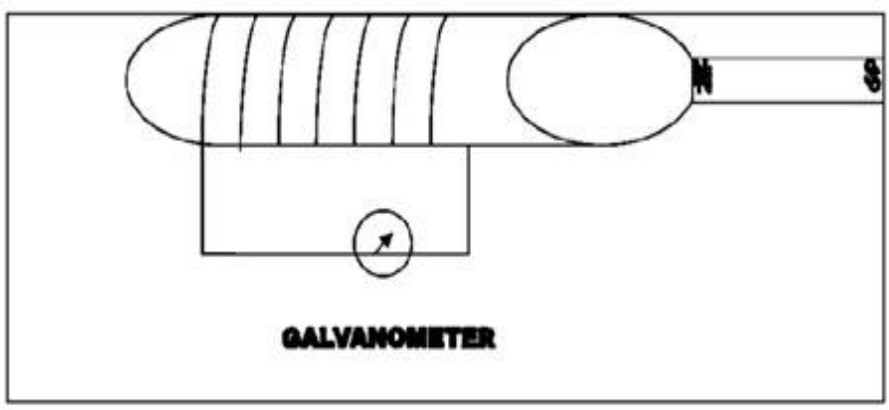
32. A magnet is moving towards a coil as shown in figure.



(1) Which phenomenon is shown in figure.

(2) Which physical quantity is between magnet and coil? set up in the coil when there is a relative motion

(3) What may be the cause of production of that physical quantity?

Ans. (1) Electromagnetic induction

(2) Induced current

(3) Change in magnetic lines of forces through coil

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33. Suppose your science teacher asks you to demonstrate the phenomena of EMI with following materials:

(a)Two different coils land 2 of copper wire having large no. of turns 50 and 100 respectively.

(b) A non conducting cylinder.

(c)A battery

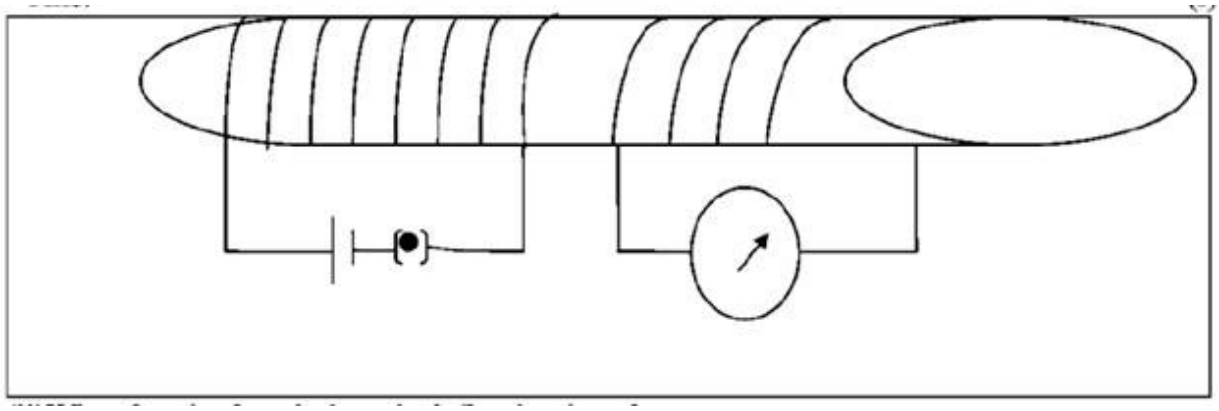
(d) A plug key

(e) A galvanometer

(i) Draw a labeled diagram of your demonstration setup.

(ii)How will you prove the phenomena of EMI.

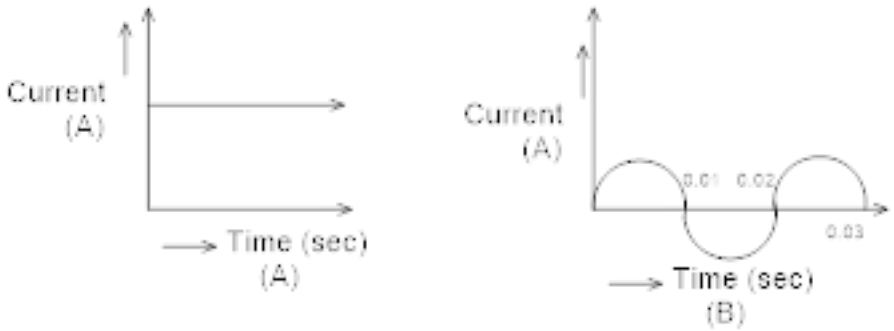
Ans. (i)



(ii) When key is closed, there is deflection in galvanometer.

5 Marks Questions

1. Current- time graph from two different sources are shown in the figure.



(i) Name the type of current shown by graph (A) and (B)?

(ii) Name any one source of shown by (A) and (B)?

(iii) What is frequency of current in case (B)?

(iv) Write two difference between current shown by (A) and (B)?

Ans. (i) Graph A represent D.C. and graph B represent A.C.

(ii) Source of (A) – Dry cell

Source of (B) - A.C. generator

(iii) For graph (B) $f = \frac{I}{T} = \frac{1}{0.02}$

$f = 50Hz$

(iv)

Direct Current	Alternating Current
Its magnitude is constant and flows in one direction only.	Its magnitude and direction reserves periodically.
The frequency of D. C. Zero.	The frequency of A. C. is finite.

2. Explain the principle, construction and working of an electric motor with a help of labeled diagram?

Ans. Principle – it is based on the principal that a current carrying conductor placed perpendicular to the magnetic field experiences a force.

Construction-

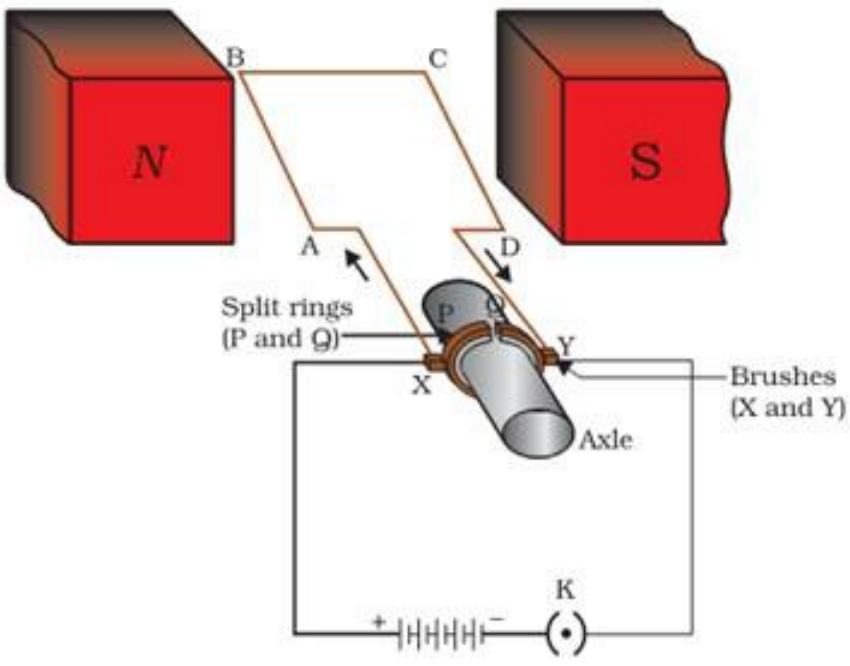
(i) Armature or coil- It consist of an insulated copper wire wound on a soft iron core.

(ii) Strong field magnet- two pole pieces of a strong magnet provides a strong magnetic field.

(iii) Split ring- it consist of two halves $(R_1 \text{ and } R_2)$ of a metallic ring which reverses the direction of the current in a coil.

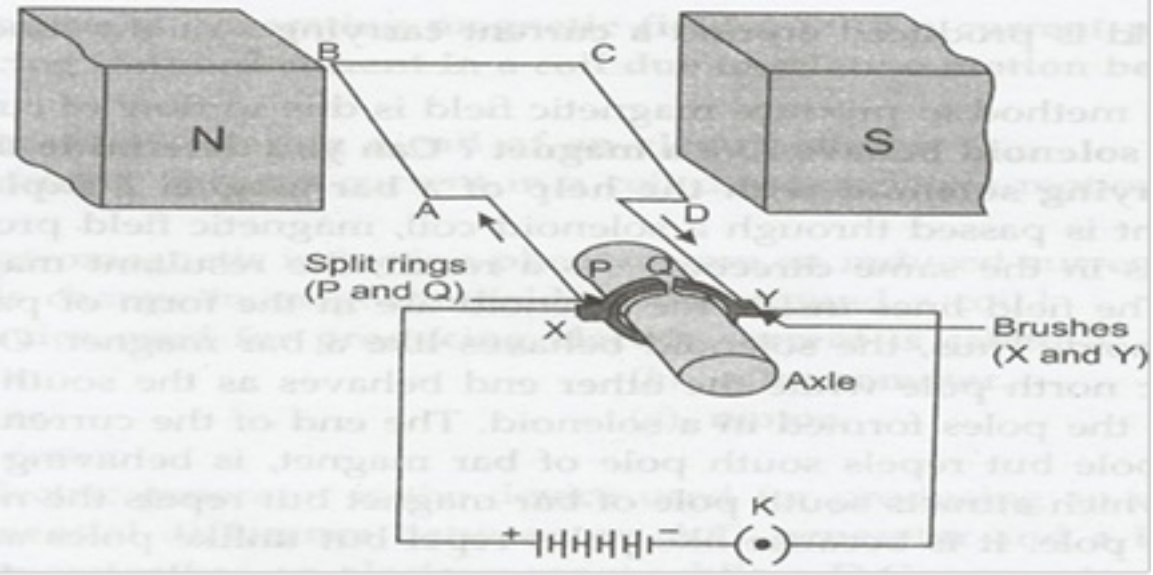
(iv) Brushes- two carbon brushes touch the commutator (split ring).

(v) Battery – a battery is connected across the carbon brushes.



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

Ans. Electric motor labelled diagram of an electric motor is as follows:

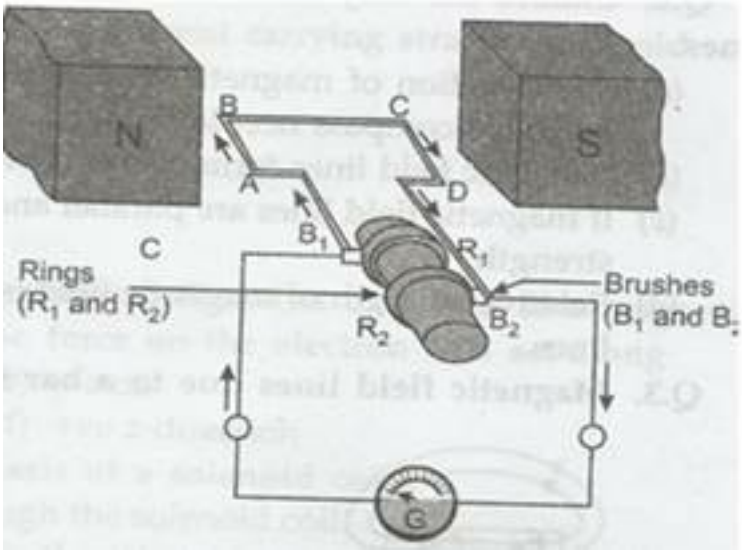


Principle: A current-carrying conductor, when placed in a magnetic field, experiences a force. If the direction of magnetic field and that of current are mutually perpendicular then force acting on the conductor will be perpendicular to both and will be the given by Fleming's left-hand rule. Due to this force the conductor begins to move, if it is free to rotate.

Working: Let the current in the coil ABCD of motor enters from the source battery through the conducting brush X, flow along ABCD and finally flows back to the battery through brush Y. On applying Fleming's left-hand rule we find that force acting on arm AB due to magnetic field pushes it downwards. But the force acting on arm CD pushes it upwards. Thus, the coil and the axle rotate anticlockwise. Due to action of split rings P and Q change their contacts with brushes. Now, P makes contact with Y and Q with X. As a result, Current begins to flow in coil along DCBA. The arms are pushed in opposite direction and coil continues to rotate in same direction.

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

Ans. Electric generator labelled diagram is as follows:



Principle: An electric generator works on the principle of electromagnetic induction.

Working: Let the in the beginnings brushes B_1 *and* B_2 are kept pressed separately on rings R_1 *and* R_2 respectively. Let the axle attached to the rings is rotated such that arm AB of the coil moves up and arm CD moves down in the magnetic field. Due to rotation of arms AB and CD induced current are set up in them. As per Fleming's right hand rule, induced current in these arms along the directions AB and CD respectively and current flows into B_1 *and* B_2.

After half rotation, arm AB moves downward and arms CD upward to change the direction opposite to first case. Thus, after every half rotation current changes its direction and an alternate current is obtained in the generator.

Brushes are kept pressed on the two slip rings separately. Outer ends of the brushes are connected to the galvanometer. Thus, brushes help in transferring current from the coil ABCD to external circuit.