Chapter 13: MAGNETIC EFFECT OF ELECTRIC CURRENT

1. What is north seeking or North Pole?

The end of magnet pointing towards North is called north seeking or North Pole.

2. What is south seeking or South Pole?

The end of magnet pointing towards South is called north seeking or South Pole.

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

A compass gets deflected due to the forces acting on its poles due to the magnetic field of the bar magnet.

4. What is magnetic field?

The region surrounding a magnet, in which the force of the magnet can be experienced is called magnetic field.

5. What are magnetic field lines?

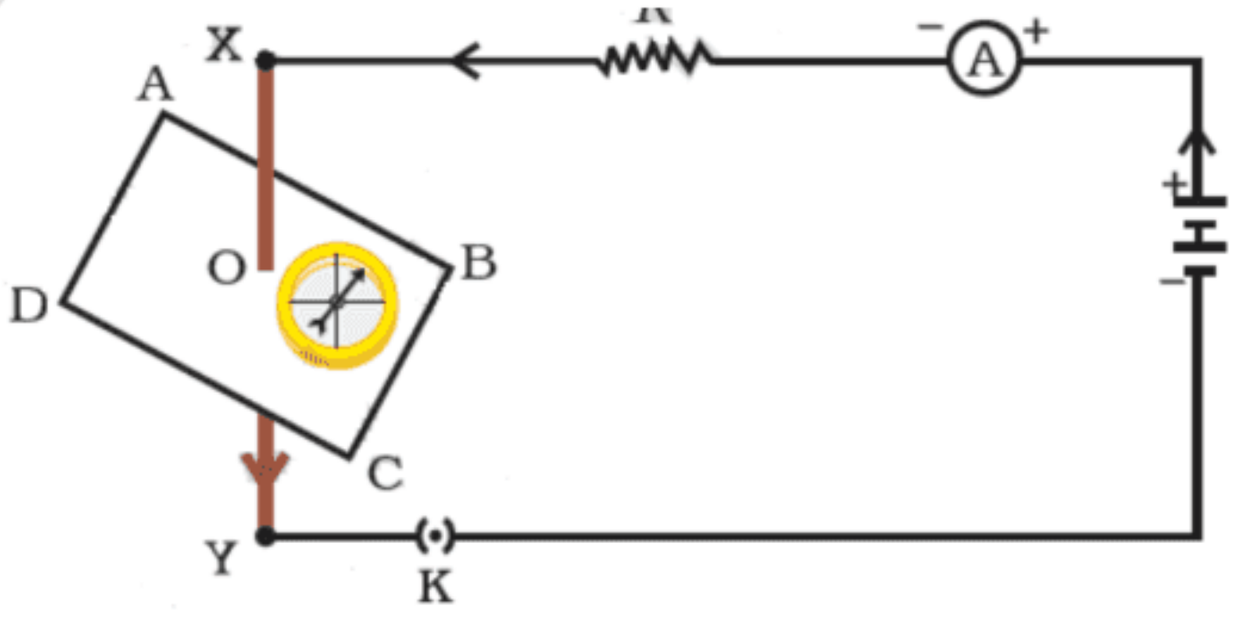
The lines along which the iron filings align themselves are called magnetic field lines.

6. Why do iron filings arrange themselves in a pattern?

The magnet exerts its influence in the region surrounding it. Therefore the iron filings experience a force. The force thus exerted makes iron filings to arrange in a pattern.

7. How can it be shown with the help of an activity that a magnetic field is produced around a current carrying wire?

Take a straight thick copper wire and place it between the points X and Y in an electric circuit, as shown in figure. The wire XY is kept perpendicular to the plane of paper. Horizontally place a small compass near to this copper wire.



As we pass the current through the copper wire XY, the compass needle gets deflected from its position of rest. Since the magnetic needle can be deflected only by a magnetic field, so the current carrying wire produces a magnetic field around it or it behaves like a magnet.

8. List the properties of magnetic lines of force.

a) A magnetic field lines originate from North Pole and end at its south pole.

b) A magnetic field line is a closed and continuous curve.

c) The magnetic field lines are closer near the poles of a magnet where the magnetic field is strong and farther apart where the magnetic field is weak.

d) The magnetic field lines never intersect each other.

e) A uniform magnetic field is represented by parallel and equidistant field lines.

9. Is magnetic field a scalar or vector quantity?

Magnetic field has both direction and magnitude hence it is a vector quantity.

10. Why are the magnetic field lines closed curves?

The direction of field lines is from its south pole to its north pole. So the magnetic field lines closed curves.

11. Can magnetic line of force intersect? Justify.

OR

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

No, if two magnetic lines of force intersect, then there will be two tangents and hence two directions of the magnetic field at the point of intersection. This is not possible.

12. Magnetic lines of force are endless. Why?

The magnetic lines of force are always continuous closed loops, so they are endless.

13. What is the direction of magnetic field lines inside a bar magnet and outside of it?

The direction of the magnetic field lines is from North Pole to South Pole outside the magnet and from South Pole to North Pole.

14. How does the degree of closeness of the field lines represent?

The degree of closeness of the field lines gives a measure of the strength of the magnetic field.

15. Identify the poles of the magnet in the given figures.

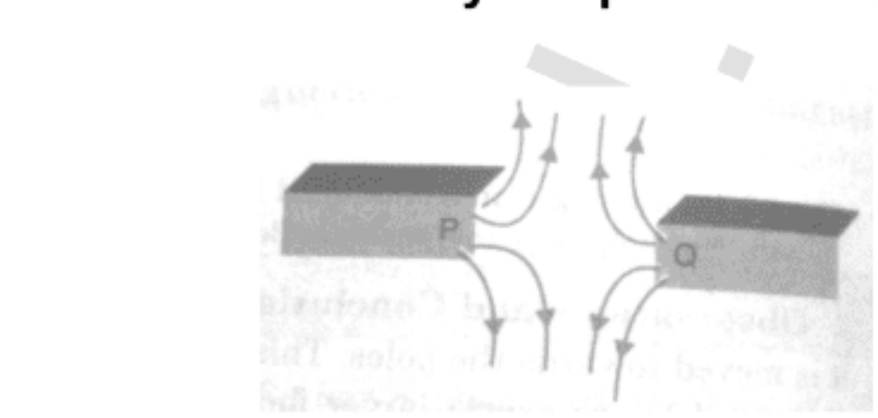


Fig 1

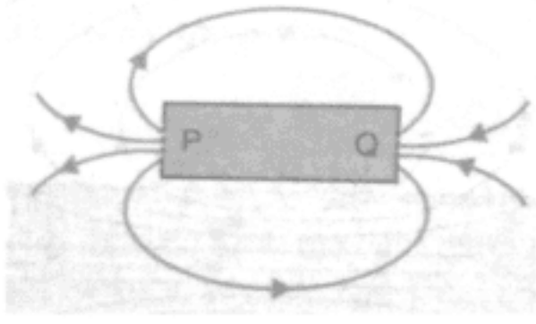


Fig 2

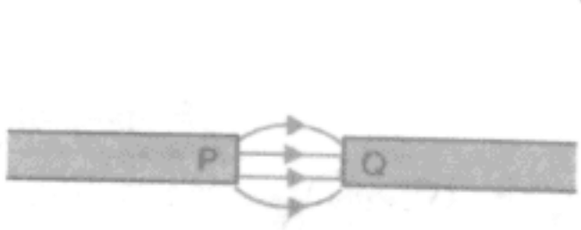


Fig 3

In fig 1, both P and Q are North poles as filed lines are coming out from the two poles.

In fig 2, P is North Pole and Q is South Pole.

In fig 3, P is North Pole and Q is South Pole.

16. Draw magnetic field lines around a bar magnet.

17. How can it be shown that a magnetic field exists around a wire through which direct electric current is passing?

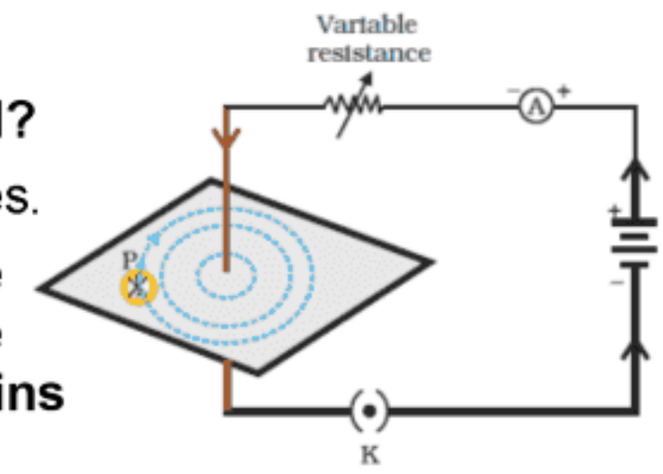
A magnetic needle bought close to a straight current carrying wire aligns itself perpendicular to the wire, reversing the direction of current reverses the direction of deflections. This shows that the current carrying wire is associated with a magnetic field.

18. Draw a neat diagram showing the field lines of magnetic field around a straight conductor.

19. In the figure, what happens to the deflection of the compass needle when the current is increased?

If the current is increased, the deflection also increases.

20. In the figure, what happens to the deflection of the compass needle if the compass is moved from the copper wire but the current through the wire remains same?



The deflection in the needle decreases as the distance from it increases.

21. List three sources of magnetic field.

a) Magnetic field due to a bar magnet.

b) Magnetic field due to a current-carrying conductor.

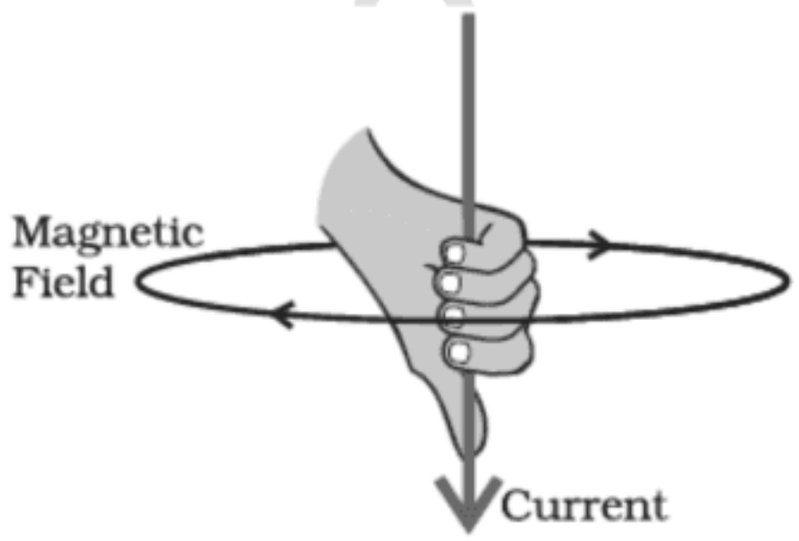
c) Magnetic field due to current carrying circular loop.

22. State the law that helps to determine the direction of magnetic field around a straight current carrying conductor.

OR

State right-hand thumb rule or Maxwell's corkscrew rule.

Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of current, then the fingers that wrap around the conductor in the direction of the field lines of the magnetic field.



23. A current through a horizontal power line flows in east to west direction. What is the direction of magnetic field at a point directly below it and at a point directly above it?

The current is in the east-west direction. Applying the right-hand thumb rule, we get that the magnetic field (at any point below or above the wire) turns clockwise in a plane perpendicular to the wire, when viewed from the east end, and anti-clockwise, when viewed from the west end.

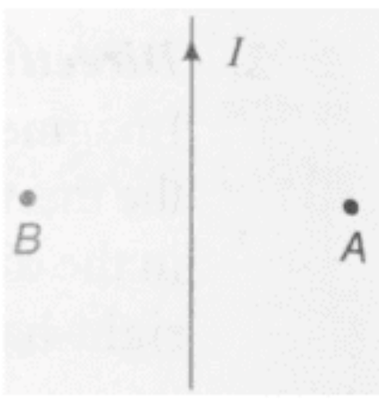
24. How does the magnitude of the magnetic field produced by straight current carrying conductor vary?

The magnitude of the magnetic field produced at a given point is:

a) Directly proportional to the current passing through the wire.

b) Inversely proportional to the distance of that point from the wire.

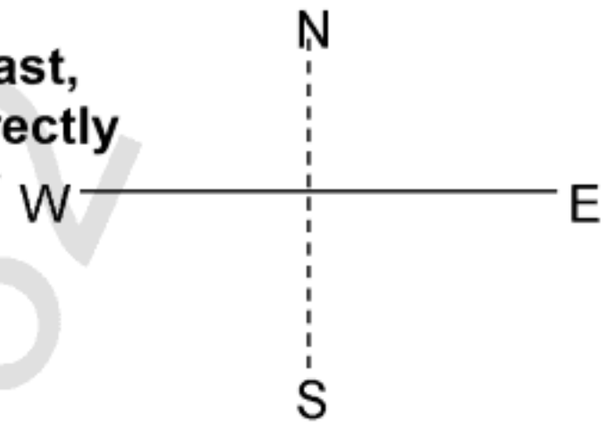
25. A current I passes through a horizontal line as shown in the figure. What is the direction of magnetic field at A and B?



Using right hand rule,
at point A magnetic field is inwards.

At point B magnetic field is outwards.

26. In the diagram, a wire carries current from West to East, what is the direction of magnetic field i) at a point directly above the wire? ii) at a point directly below the wire?



i) Towards South

ii) Towards North

27. What is the direction of magnetic lines a) inside the bar magnet b) outside the bar magnet?

a) South pole to North pole.

b) North pole to South pole.

28. What changes in the deflection of the compass needle placed at a point near current carrying straight conductor is observed if
a) Current through the conductor is increased
b) Direction of current in the conductor is reversed.
c) Compass is moved away from the conductor?

a) The deflection of the compass needle increases because of the increase in the strength of the magnetic field.

b) The direction of deflection of the compass needle is reversed because the direction of magnetic field is reversed.

c) The deflection of the compass needle decreases because of the decrease in the strength of the magnetic field.

29. Draw the magnetic field lines of the field produced by a current carrying circular loop.

30. How does the strength of the magnetic field at the centre of a circular coil of wire depend on a) the radius of the coil, b) the number of turns of wire on the coil and c) the strength of current flowing in the coil?

The magnetic field produced at the centre of circular coil carrying current depends on:

a) It is inversely proportional to the radius of the coil.

b) It is directly proportional to the number of turns of the coil.

c) It is directly proportional to the strength of current passing through the coil.

31. What is a solenoid?

A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called solenoid.

32. Draw the field lines of magnetic field through and round a current carrying solenoid.

33. Compare the magnetic behaviour of a straight solenoid with that of a bar magnet.

The magnetic field produced by a solenoid is very much similar to that of a bar magnet. Like a bar magnet, one end of the solenoid has N-polarity while the other end has S-polarity.

The magnetic field of a solenoid and that of a bar magnet is identical.

34. On what factors does the strength of the magnetic field produced by a current carrying solenoid depend?

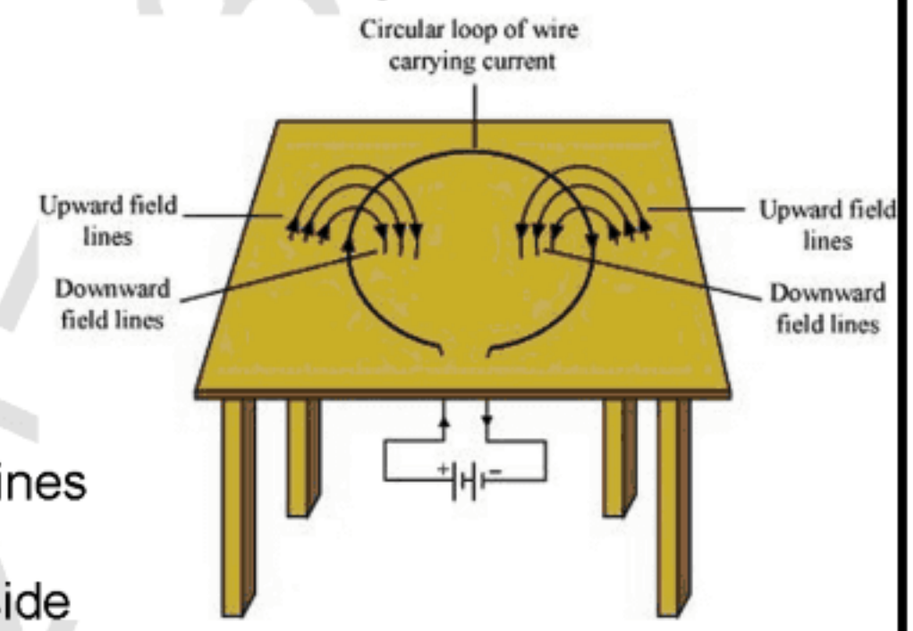
a) Number of turns of the solenoid (n): The larger the number of turns in the solenoid, stronger is the magnetic field produced.

b) Strength of the current (I): Larger the current passed through the solenoid, stronger is the magnetic field produced.

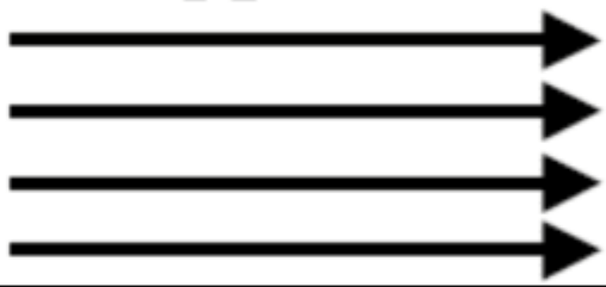
c) Nature of the core material: By winding the coil over a soft iron cylinder, the magnetic field can be increased several times.

35. 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.

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 figure.



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

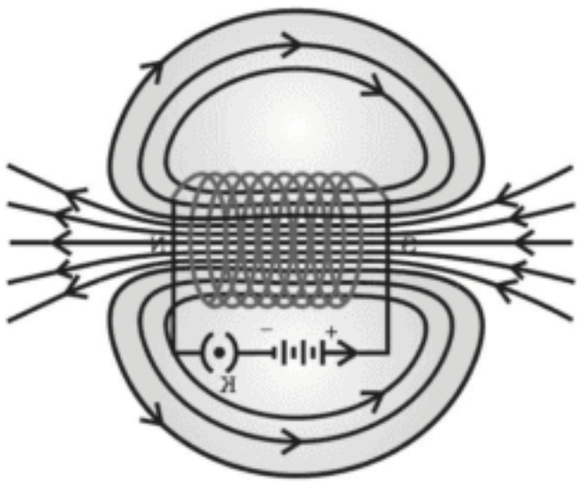


37. Write one use of solenoid.

A solenoid can be used to produce uniform magnetic field in a given region.

38. 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.

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.



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.

39. What is an electromagnet?

An electromagnet is a device in which soft iron core placed inside a solenoid behaves as a powerful magnet when a current is passed through the solenoid.

40. How can we determine the North and South Pole of an electromagnet?

The North Pole and South Pole of an electromagnet can be determined by magnetised iron bar. Suspend a magnetised iron bar freely with a thread at the centre. The north pole of the electromagnet is in the direction of North Pole of the earth.

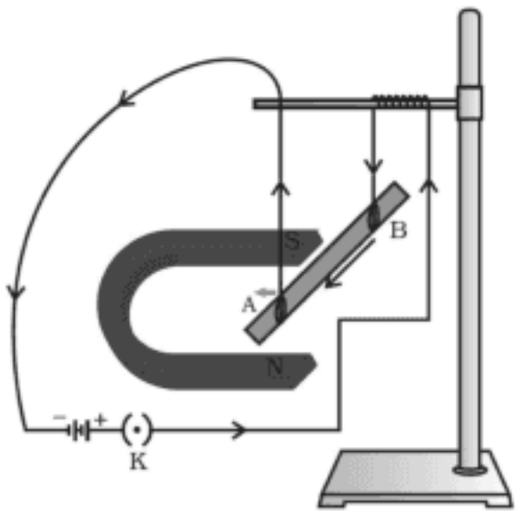
41. Name and state the rule to determine the direction of a force experienced by a straight conductor carrying current placed in a magnetic field is perpendicular to it.

OR

State Fleming's left hand 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 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.

42. In the diagram given, how do you 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?



(i) If the current in the rod AB is increased, force also increases.

(ii) When a stronger horse-shoe magnet is used, magnetic field increases as a result force also increases.

(iii)If the length of the rod AB is increased, force also increased.

43. On what factors does the direction of force on the conductor depend?

The direction of the force on the conductor depends upon the direction of current and the direction of the magnetic field.

44. What is an electric motor?

An electric motor is a rotating device which converts electric energy into mechanical energy.

45. What kind of energy transformation takes place in an electric motor? Name two devices which use electric motor as an essential component of working.

In an electric motor, electrical energy is converted into mechanical energy. Electric motor is used in electric fan, washing machine etc.

46. What is the principle of an electric motor?

An electric motor works on the principle that a current carrying conductor placed in a magnetic field experiences a force.

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

Some devices in which electric motors are used are as follows: (a) Water pumps (b) Electric fans (c) Electric mixers (d) Washing machines

48. What are the following parts in an electric motor?

a) Field magnet b) Armature c) Split ring commutator d) brushes

a) Field magnet: It is a strong horse shoe type magnet with concave poles.

b) Armature: It is a rectangular coil having a large number of turns of thin insulated copper wire wound over a soft iron core.

c) Split ring commutator: A device that reverses the direction of flow of current through a circuit.

d) Brushes: It is made of graphite. It maintains a sliding contact with split rings.

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

The function of split ring commutator is to reverse the direction of current in the coil after every half rotation.

50. How can the speed of rotation of the armature coil of an electric motor be increased?

The speed of rotation of the armature coil can be increased by increasing:

a) The strength of the magnetic field.

b) The number of turns in the coil.

c) The current in the coil.

51. Draw a labelled diagram of an electric motor.

52. When is the force experienced by a current carrying conductor placed in a magnetic field a) largest/maximum b) minimum?

a) When direction of current is at right angles to the direction of magnetic field then the force experienced by the conductor is maximum.

b) When the current carrying conductor is held parallel to the direction of the magnetic field, the force exerted on it is minimum or zero.

53. 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?

The direction of magnetic field is given by Fleming's left hand rule. Magnetic field inside the chamber will be perpendicular to the direction of current (opposite to the direction of electron) and direction of deflection/force i.e., either upward or downward. The direction of current is from the front wall to the back wall because negatively charged electrons are moving from back wall to the front wall. The direction of magnetic force is rightward. Hence, using Fleming's left hand rule, it can be concluded that the direction of magnetic field inside the chamber is downward.

54. A metallic conductor is suspended perpendicular to the magnetic field of a horse shoe magnet. The conductor gets displaced towards the left when a current is passed through it. What will happen to the displacement of conductor if a) current through it is increased b) horse shoe magnet is replaced by another stronger horse shoe magnet.
C) direction of current is reversed.

a) Displacement of the conductor towards left increases.

b) Displacement of the conductor towards left increases.

c) The conductor is displaced towards right.

55. 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

Whenever a charged proton moves in a magnetic field, its velocity changes and as a result of this its momentum changes. Thus (c) and (d) are the properties which change when a proton moves freely in a magnetic field.

56. 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

The direction of the motion of proton is the direction of current. The direction of force on the proton is towards north. Applying Fleming's left hand rule, the direction of magnetic field is upward. The correct option is (d).

57. How can you enhance the power of a motor?

The power of a motor can be enhanced by introducing a soft iron core on which the coil is wound.

58. What is electromagnetic induction?

The phenomenon by which the electric current is generated by changing the magnetic field lines is called electromagnetic induction.

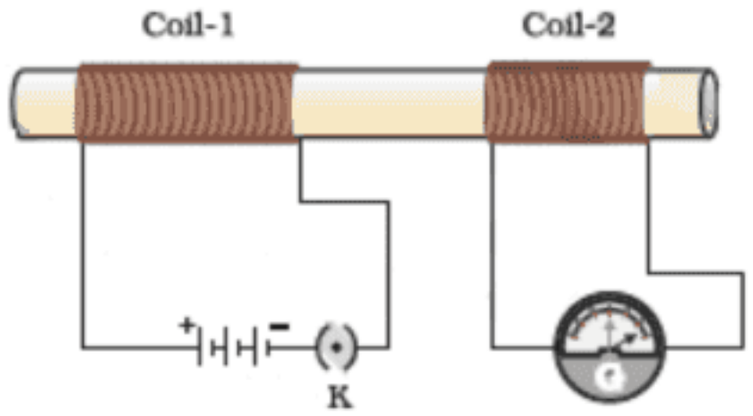
59. What is the cause for the generation of electric current in the coil?

Relative motion between the magnet and the coil is responsible for the generation of electric current in the coil.

60. What change in the galvanometer needle would you observe when a strong bar magnet is a) kept stationary at a distance from the coil b) pushed towards of the coil c) pulled away from the coil. Give reason.

61. Describe an experiment to show that current is induced in the 2nd coil when the current in the 1st coil is changed.

Take two different coils of copper wire having large number of turns (say 50 and 100 turns respectively). Insert them over a non-conducting cylindrical roll, as shown in figure (You may use a thick paper roll for this purpose.)



Connect the coil-1, having larger number of turns, in series with a battery and a plug key. Also connect the other coil-2 with a galvanometer as shown.

Plug in the key. We will observe that the needle of the galvanometer instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil-2.

Disconnect coil-1 from the battery. We will observe that the needle momentarily moves, but to the opposite side. It means that now the current flows in the opposite direction in coil-2.

We observe that a potential difference is induced in the coil-2 whenever the electric current through the coil–1 is changing (starting or stopping).

62. 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 the coil B? Give reason.

Two circular coils A and B are placed closed to each other. When the current in coil A is changed, the magnetic field associated with it also changes. As a result, the magnetic field around coil B also changes. This change in magnetic field lines around coil B induces an electric current in it. This is called electromagnetic induction.

63. When is the induced current in a moving coil highest?

The induced current is highest when the direction of motion of the coil is at right angles to the magnetic field.

64. What is a galvanometer?

A galvanometer is an instrument that can detect the presence of current in the circuit.

65. State Fleming's right hand rule or state the rule which is used to determine the direction of induced current.

Stretch the thumb, forefinger and middle finger of right hand so that they are perpendicular to each other. If the forefinger indicates the direction of the magnetic field and the thumb shows the direction of motion of conductor, then the middle finger will show the direction of induced current.

66. How can the magnitude of induced current in the coil be increased?

a) By increasing the number of turns in the coil.
b) By increasing the strength of magnet.
c) By increasing the speed of rotation of coil.
d) By winding the coil on a soft iron core.

67. What is an electric generator/dynamo?

A generator is a device used to convert mechanical energy into electrical energy.

68. State the principle of an electric generator.

Electric generator works on the principle of electromagnetic induction.

69. Will an induced e.m.f develop in a conductor, when moved in a direction parallel to the magnetic field?

No, magnetic field lines linked with the conductor do not change when it moves parallel to the magnetic field.

70. A coil made of insulated copper wire is connected to a galvanometer. a) What will happen to the deflection of the galvanometer if this coil is moved towards a stationary bar magnet. B) Moved away from it. Give reason for you answer and name the phenomenon involved.

a) When the coil is moved towards the bar magnet, the galvanometer shows deflection in one direction.
When the coil is moved towards the bar magnet, the magnetic flux linked with it increase and a current is induced in it shown by deflection in the galvanometer.

b) When the coil is moved away from the coil, the galvanometer shows deflection in opposite direction.
When the coil is moved away from the magnet, the magnetic flux linked with it decreases and a current is induced in the coil in the opposite direction, shown by deflection in the galvanometer in opposite direction.

71. Explain different ways to induce current in a coil. OR List two different of including current in a coil.

A current can be induced in a coil by
a) moving a magnet towards or away from the coil or vice versa.
b) Changing current in the neighbouring coil.

72. Define alternating current.

If the current changes its direction after equal interval of time is called alternating current.

73. Draw a net labelled diagram of an electric generator.

74. Which sources produce alternating current?

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

75. Define direct current.

A current in which the magnitude and the direction do not change with time is called direct current.

76. Name some sources of direct current.

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

77. What is the meaning of the term 'frequency' of an alternating current? What is its value in India?

The frequency of an alternating current is the number of times the direction of electric current changes in one second. In India, the frequency of A.C is 50Hz.

78. Why is an alternating current considered to be advantageous over direct current for long range transmission of electrical energy?

Only alternating voltage can be stepped up or stepped down by using transformer. This makes AC more suitable than DC for transmission of electric power over long distances without much loss of energy.

79. Why is alternating current preferred over direct current? List any three reasons.

1) The generation of A.C is more economical than D.C
2) Alternating voltage can be easily stepped up or stepped down by using a transformer.
3) The alternating currents can be transmitted to distance places without any significant line loss.

DOMESTIC ELECTRIC CIRCUITS

80. What type of electricity is supplied to our homes? OR For the electricity supplied to our homes, write a) the type of current b) the voltage supplied c) frequency of current supplied.

a) Alternating current (A.C.)
b) 220V
c) 50Hz

81. Why do we use power supply of two different current ratings at our homes?

Different appliances have different power ratings. The 5 Ampere current rating is used for electric bulb, fans, etc.

The 15 Ampere current rating is used for heater, geysers, air conditioners, electric iron box, etc.

82. What is live wire?

The wire which is at 220 V potential is called live wire.

83. What is neutral wire?

The wire which is at 0V potential is called neutral wire.

84. What is earth wire?

A wire which is usually connected to a metal plate deep in the earth near the house is called earth wire.

85. Write the colour code of the wires used in a common domestic circuit.

Live wire – Red; Neutral wire – Black and Earth wire – Green.

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

Earthing of an electrical appliance means connecting the metallic body of the high powered appliance (electric iron, toaster, refrigerator, oven etc.) to the earth through the earth wire of the domestic circuit. The earth wire is green colour.

This prevents any electric shock to the user. That is why earthing of the electrical appliances is necessary.

87. What is an electric shock?

When a person comes in contact with the live wire, electric current passes through the body to the earth. The person gets an electric shock.

88. Why should various appliances be connected parallel to each other in the domestic circuit?

In order that each appliance has equal potential difference, they are connected parallel to each other

89. What is Electric fuse? What is the important of electric fuse?

Electric Fuse consists of a piece of wire made of a metal or an alloy of appropriate melting point, for example aluminium, copper, iron, lead etc. If a current larger than the specified value flows through the circuit, the temperature of the fuse wire increases. This melts the fuse wire and breaks the circuit.
Fuse is the most important safety device, used for protecting the circuits due to short-circuiting or overloading of the circuits. The use of an electric fuse prevents the electric circuit and the appliance from a possible damage by stopping the flow of unduly high electric current. The fuses used for domestic purposes are rated as 1A, 2A, 3A, 5A, 10A, etc.

90. What is the principle of fuse?

The Joule heating that takes place in the fuse melts it to break the electric circuit.

91. When does an electric short circuit occur?

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 increases abruptly. Hence, a short circuit occurs.

92. What is the function of the main switch in domestic circuits?

The main switch is used to switch off the main supply required at the time of repairing or any other emergency.

93. What are the causes for overloading of domestic circuit?

a) Overloading occurs when the insulation of wires is damaged or there is a fault in the appliance.

b) Overloading can also occur due to an accidental hike in the supply voltage.

c) Sometimes overloading is caused by connecting too many appliances to a single socket.

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

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

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

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

95. 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.

Current drawn by the electric oven can be obtained by the expression,

$P=VI$

$I=P/V$

Where, current = I. Power of the oven, P = 2 kW = 2000W

Voltage supplied, V = 220V

2000/220= 9.09A

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

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

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

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

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

(c) Faulty appliances should not be connected in the circuit

(d) Fuse should be connected in the circuit.

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

(i) Maxwell's right hand thumb rule

(ii) Fleming's left hand rule

(iii) Fleming's right hand rule

Multiple Choice Questions

1. **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.

2. **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**

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**

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

5. **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

6. **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

7. **The device used for producing electric current is called a:**

   (a) generator. (b) galvanometer.

   (c) ammeter. (d) motor.

8. **The essential difference between an AC generator and a DC generator is that:**

   (a) AC generator has an electromagnet 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.

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

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

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

10. Choose the incorrect statement from the following regarding magnetic lines of field

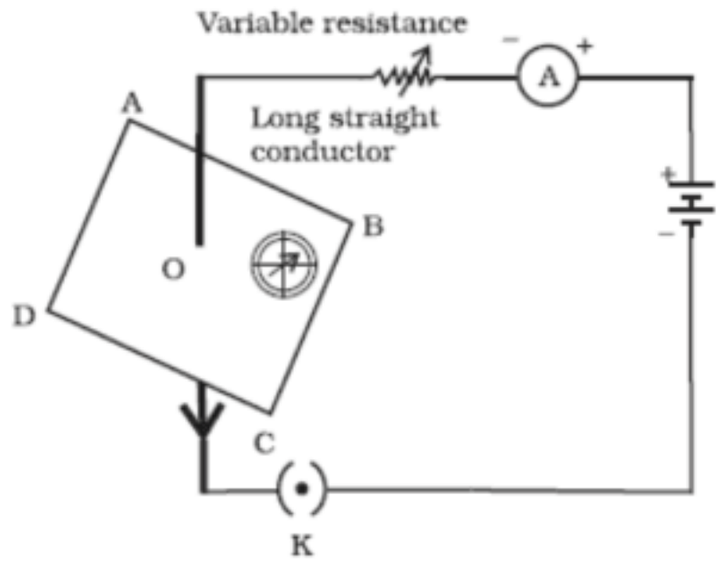
(a) The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points

(b) Magnetic field lines are closed curves

(c) If magnetic field lines are parallel and equidistant, they represent zero field strength

(d) Relative strength of magnetic field is shown by the degree of closeness of the field lines

11. If the key in the arrangement is taken out (the circuit is made open) and magnetic field lines are drawn over the horizontal plane ABCD, the lines are



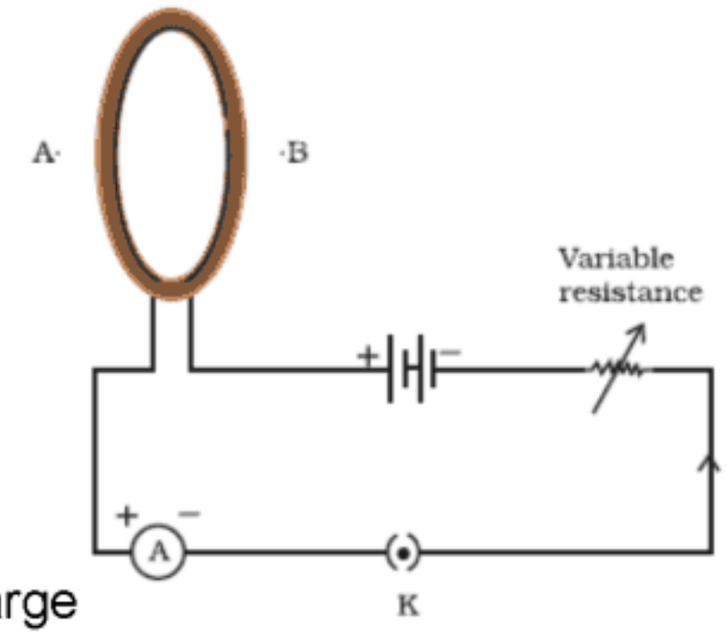
(a) Concentric circles

(b) Elliptical in shape

(c) Straight lines parallel to each other

(d) Concentric circles near the point O but of elliptical shapes as we go away from it

12. A circular loop placed in a plane perpendicular to the plane of paper carries a current when the key is ON. The current as seen from points A and B (in the plane of paper and on the axis of the coil) is anti-clockwise and clockwise. The magnetic field lines point from B to A. The N-pole of the resultant magnet is on the face close to



(a) A (b) B

(c) A if the current is small, and B if the current is large

(d) B if the current is small and A if the current is large

13. For a current in a long straight solenoid N- and S-poles are created at the two ends. Among the following statements, the incorrect statement is:

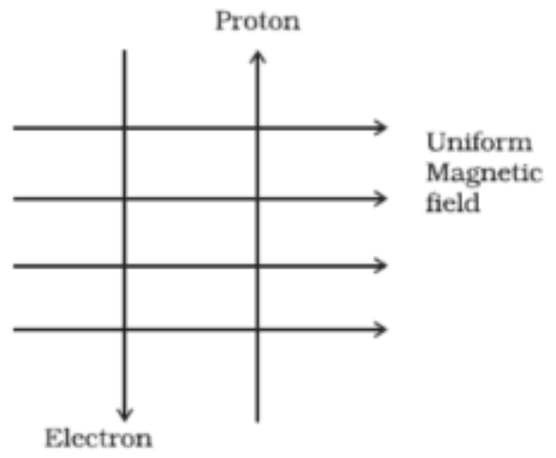
(a) The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid.

(b) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.

(c) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.

(d) The N- and S-poles exchange position when the direction of current through the solenoid is reversed.

14. A uniform magnetic field exists in the plane of paper pointing from left to right as shown. In the field an electron and a proton move as shown. The electron and the proton experience:



(a) Forces both pointing into the plane of paper.

(b) Forces both pointing out of the plane of paper.

(c) Forces pointing into the plane of paper and out of the plane of paper, respectively.

(d) Force pointing opposite and along the direction of the uniform magnetic field respectively.

15. Commercial electric motors do not use

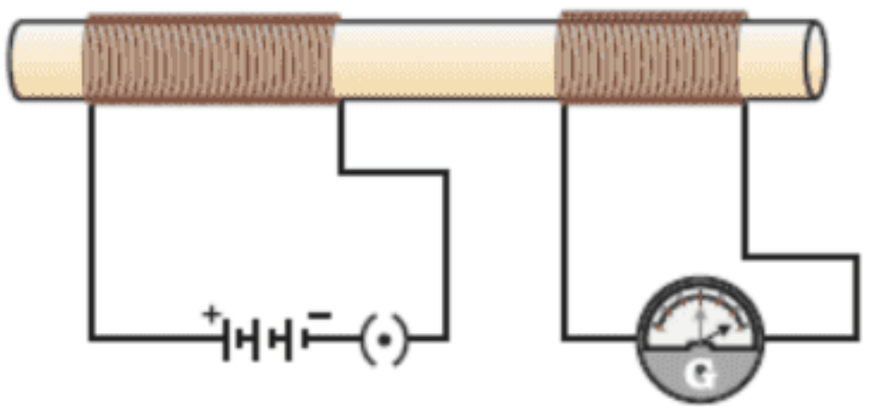
(a) An electromagnet to rotate the armature.

(b) Effectively large number of turns of conducting wire in the current carrying coil.

(c) A permanent magnet to rotate the armature.

(d) A soft iron core on which the coil is wound.

16. In the arrangement shown, there are two coils wound on a non-conducting cylindrical rod. Initially the key is not inserted. Then the key is inserted and later removed. Then



(a) The deflection in the galvanometer remains zero throughout.

(b) There is a momentary deflection in the galvanometer but it dies out shortly and there is no effect when the key is removed.

(c) There are momentary galvanometer deflections that die out shortly; the deflections are in the same direction.

(d) There are momentary galvanometer deflections that die out shortly; the deflections are in opposite directions.

17. Choose the incorrect statement

(a) Fleming's right-hand rule is a simple rule to know the direction of induced current.

(b) The right-hand thumb rule is used to find the direction of magnetic fields due to current carrying conductors.

(c) The difference between the direct and alternating currents is that the direct current always flows in one direction, whereas the alternating current reverses its direction periodically.

(d) In India, the AC changes direction after every 1/50 second.

18. A constant current flows in a horizontal wire in the plane of the paper from east to west as shown in figure. The direction of magnetic field at a point will be North to South:

(a) Directly above the wire.

(b) Directly below the wire.

(c) At a point located in the plane of the paper, on the north side of the wire.

(d) At a point located in the plane of the paper, on the south side of the wire.

19. The strength of magnetic field inside a long current carrying straight solenoid is

(a) More at the ends than at the centre

(b) Minimum in the middle

(c) Same at all points

(d) Found to increase from one end to the other

20. To convert an AC generator into DC generator:

(a) Split-ring type commutator must be used

(b) Slip rings and brushes must be used

(c) A stronger magnetic field has to be used

(d) A rectangular wire loop has to be used

21. The most important safety method used for protecting home appliances from short circuiting or overloading is:

(a) earthing (b) use of fuse (c) use of stabilizers (d) use of electric meter