Date: 25/9/2021

Q1. What constitutes the field of a magnet?

Or

What is magnetic field?

Q2. What is the direction of magnetic field at a given point?

Q3. Name the two factors that completely define a magnetic field at a point.

Q4. How can a magnetic field be represented graphically?

Q5. What are magnetic field lines?

Q6. At what place of the magnet are the magnetic field lines denser?

Q7. What is the direction of magnetic field lines of a magnet?

Q8. State the observation made by Oersted on the basis of his experiment with current-carrying conductors?

Q9. How can it be shown that a magnetic field exists around a wire through which a direct electric current is passing?

Q10. State the conclusion that can be drawn from the observation that a current-carrying wire deflects a magnetic needle placed near it.

Q11. State the rule to determine the direction of magnetic field around a current-carrying wire.

Q12. How is the strength of the magnetic field at a point near a wire related to the strength of the electric current flowing in the wire?

Q13. What happens to the magnetic field lines due to a current-carrying conductor when the current is reversed?

Or

How will the magnetic field around a current-carrying straight conductor be affected on changing the direction of flow of current in the conductor?

Q14. How will the magnetic field around a straight current-carrying conductor be affected on increasing the current in the conductor?

Q15. Where will be the value of magnetic field maximum due to current-carrying circular conductor?

Q16. What kind of magnetic field is produced by a solenoid?

Q17. Mention the region of a current-carrying solenoid where field lines are parallel straight lines.

Q18. What is the shape of a current-carrying conductor whose magnetic field pattern resembles that of a bar magnet?

Q19. A current-carrying solenoid coil is suspended freely. In which direction will it settle? Why?

Q20. Name the physical quantities which are indicated by the direction of thumb and forefinger in the Fleming's right-rule.

Q21. What happens when a current-carrying conductor is placed in a magnetic field?

Q22. On what factors does the magnitude of force experienced by a current-carrying conductor placed normally in a magnetic field depend?

Q23. Under what condition is the force by a current-carrying conductor placed in a magnetic field maximum?

Or

Mention the angle between a current-carrying conductor and magnetic field for which the force experienced by the current-carrying conductor is largest.

Q24. A stationary charge is placed in a magnetic field. Will it experience a force? Give reason to justify your answer.

Q25. An electron is moving along *X*-axis and the magnetic field is along *Y*-axis. What is the direction of magnetic force on the electron?

Q26. State the direction of magnetic field in the following diagram (see figure).

Q27. Why does a current-carrying conductor experiences a force when it is placed in a magnetic field?

Q28. What is electromagnetic induction?

Q29. Define the term 'induced current'.

Q30. Which law gives the direction of induced current produced due to electromagnetic induction phenomenon?

Q31. How is the induced current in a secondary coil related to current in a primary coil?

Q32. Give one application of electromagnetic induction.

Q33. What is an electric generator?

Q34. Name one device which provides an alternating current.

Q35. What type of current is given by a cell?

Q36. What type of current is used in household supply?

Q37. In one complete cycle of a.c., how many times the direction of current changes?

Q38. What is the frequency of a.c. being supplied in our houses?

Q39. An alternating electric current has a frequency of 50 Hz. How many times does it change its direction in one second?

Q40. What will be the frequency of an alternating current, if its direction changes after every 0.01 s?

Q41. Write one advantage of a.c. over d.c.

Q42. What are the commonly used colours for insulations of live, neutral and earth wires used in domestic supply?

Q43. What potential difference is maintained between the live wire and neutral wire in our domestic electric supply circuit?

Q44. Name the device used to prevent damage to the electrical appliances and the domestic circuit due to overloading.

Q45. To which wire do you connect fuse wire in a household circuit.

Q46. What is the function of a fuse in the domestic electric circuit?

Q47. Is on/off switch provided with live wire or with neutral or earth wire?

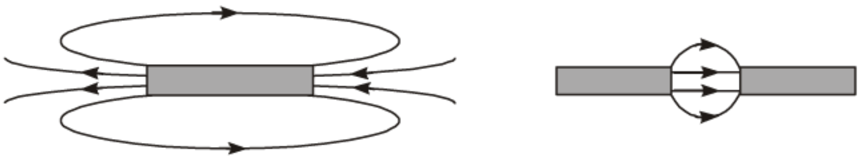
Q48. Why do we connect earth wire in a house? Give two reasons.

Q49. What is short-citcuiting of a circuit?

Q50. What is the advantage of the third wire of earth connection in domestic electric appliances?

Q51. Describe an activity to show that a magnetic field exists near a bar magnet.

Q52. Identify the poles of the magnet in the given figure (a) and (b).



(a) (b)

Q53. Define a magnetic field of a magnet. What is its direction?

Q54. What are magnetic field lines? State their significance.

Q55. In figure, identify the poles marked P and Q as north or south pole. Give reason.

Q56. Draw a diagram to show the magnetic field lines around a bar magnet. List any two properties of magnetic field lines.

Q57. (a) What is the direction of magnetic field lines inside a bar magnet and outside of it?

(b) What does the degree of closeness of the field lines represent?

Q58. Describe an activity to draw a magnetic field line outside a bar magnet from one pole to another pole.

Q59. What is magnetic force? How will you find its direction?

Q60. 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?

Q61. What are the factors on which magnetic field produced by a current-carrying straight conductor depends?

Q62. Write the rule which determines the direction of magnetic field developed around a straight conductor, when current is passed through the conductor.

Q63. Describe an activity to show that an electric current-carrying wire behaves like a magnet.

Q64. What is meant by the term 'magnetic field'? Why does a compass needle show deflection when brought near a bar magnet?

Q65. How will the magnetic field around a current-carrying straight conductor be affected on

(a) increasing the current through the conductor?

(b) changing the direction of flow of current in the conductor?

Q66. Draw the magnetic field lines through and around a single loop of wire carrying electric current.

Q67. A student performs an experiment to study the magnetic effect of current around a current-carrying straight conductor with the help of a magnetic compass. He reports that:

(a) the degree of deflection of the magnetic compass increases when the compass is moved away from the conductor.

(b) the degree of deflection of the magnetic compass increases when the current through the conductor is increased.

Which of the above observations of student appears to be wrong and why?

Q68. How does the strength of the magnetic field at the centre of a circular coil of a wire depend on (a) radius of the coil, (b) number of turns of wire in the coil?

Q69. A straight current-carrying conductor produces a magnetic field around it. Is there as similar magnetic field produced aroud a thin beam of moving (a) alpha particles, (b) neutrons? Also give reason for your answer.

Q70. List four factors on which the magnitude of magnetic force acting on a current-carrying conductor in a magnetic field depend?

Q71. State two ways by which the strength of an electromagnet can be increased.

Q72. What is an electromagnet? How is it different from a permanent magnet? State two uses of an electromagnet.

Q73. What are permanent magnet and electromagnet? Give two uses of each.

Q74. What is an electromagnet? Draw a circuit diagram to show how a soft iron piece can be transformed into an electromagnet?

Q75. Describe an activity to show how you can make an electromagnet in your school laboratory.

Q76. Mention two ways to increase the strength of the magnetic field of a solenoid.

Q77. Describe an activity to show the magnetic field lines formed by a current-carrying circular coil.

Q78. What is a solenoid? Draw the pattern of magnetic field lines of a solenoid through which a steady current flows.

Q79. When is the force experrienced by a current-carrying conductor placed in a magnetic field (a) maximum, (b) minimum?

Q80. A coil insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its south pole towards one face of the coil is:

(a) moved quickly toward it?

(b) moved quickly away from it?

(c) placed near its once face?

(d) name the phenomena involved.

Q81. What is electromagnetic induction?

Q82. An electron enters a magnetic field at right angles to it as shown in figure. In which direction will this electron move? State the principle applied by you in finding the direction of motion of the electron.

Q83. What does the given diagram (see figure) show? What does it indicate?

Q84. 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 coil *B*? Give reason.

Q85. Mention the provision of two different current ratings in our domestic circuits. Explain, with reason, the advantage of such a provision.

Q86. Distinguish between a direct current (d.c.) and an alternating current (a.c).

Q87. List in tabular form two major differences between an electric motor and a generator.

Q88. (a) Insulation cover of which colour is conventionally used for earth wire?
(b) Why is an earth wire connected to metallic parts of appliances?

Q89. What is the usual colour code followed for connecting live, neutral and earth wires? Why is it important?

Q90. What is the role of fuse, used in series with any electrical appliance? Why should a fuse with defined rating not be replaced by one with a larger rating?

Q91. What happens if a domestic electric circuit is short-circuited?

Q92. What is short-circuiting? What is its possible cause?

Q93. What are magnetic field lines? How is the direction of a magnetic field at a point determined? Mention two important properties of magnetic field lines.

Q94. Describe an activity to know the direction of magnetic field produced by a current-carrying straight conductor. Also show that direction of magnetic field is reversed on reversing the direction of current.

Q95. What happens to the deflection of the compass needle placed at a point near a current-carrying straight conductor
(a) if the current is increased?
(b) if the direction of current in the conductor is reversed?
(c) if compass needle is moved away from the conductor?

Q96. Describe an activity with a neat diagram to show that a magnetic field is generated around a straight current-carrying wire.

Q97. Draw a diagram to show how a magnetic needle deflects when it is placed above or below a straight conductor carrying current depending on the direction of the current in the conductor.

Q98. How would the strength of magnetic field due to a current-carrying loop be affected, if:
(a) the radius of the loop is reduced to half of its original value, and
(b) the strength of the current through the loop is doubled? Give reason for your answer.

Q99. How will the magnetic field produced in a current-carrying circular coil change if we (a) increase the value of current, (b) increase the distance from the coil, (c) increase the number of turns of the coil?

Q100 Draw the magnetic field lines (including field directions) of the magnetic field due to a circular coil of current. Name any two factors on which the magnitude of the magnetic field due to this coil depends.

Q101 What is a solenoid? Draw magnetic field lines due to a current-carrying solenoid. Write three important features of the magnetic field obtained.

Q102 State the rule to determine the direction of force experienced by a current-carrying conductor in a magnetic field. How will this force get affected on: (a) doubling the magnitude of current? (b) reversing the direction of current flow?

Q103 A metallic conductor is suspended perpendicular to the magnetic field of a horse-shoe magnet. The conductor gets displaced towards left when a currrent is passed through it. What will happen to the displacement of the conductor if the:
(a) current through it is increased?
(b) horse-shoe magnet is replaced by another horse-shoe magnet?
(c) direction of current through it is reversed?

Q104 State important characteristics of magnetic force experienced by charge moving in a magnetic field (or a current-carrying conductor placed in a magnetic field)

Q105 Draw the magnetic field lines (including field directions) of the magnetic field due to a long straight solenoid. Name any two factors on which the magnitude of the magnetic field due to this solenoid depends.

Q106 Why is alternating current preferred over direct current? List any three reasons.

Q107 Explain why fuse should be joined with the live wire and not with the neutral wire in a domestic circuit.

Q108 Distinguish between overloading and short-circuiting in a domestic circuit.

Q109 Describe four important features of domestic electric supply lines.

Q110 What is an electric fuse? Briefly describe its function.

Or

What is the role of fuse used in series with any electrical appliance?

Q111 Describe an activity to explain how a moving magnet can be used to generate electric current in a coil.

Or

A coil of insulated copper wire is connected to a galvanometer. What will happen to the deflection of the galvanometer if a bar magnet is pushed into the coil and then pulled out of it? Give reason for your answer and name the phenomenon involved.

Q112 With the help of a diagram describe an experiment to show that a change in current flowing through a coil induces an electric current in a neighbouring coil.

Or

Draw a schematic diagram showing electromagnetic induction by using two coils and explain the observations.

Q113 A student fixes a sheet of white paper on a drawing board. He places a bar magnet in the centre of it. he sprinkles some iron filings uniformly around the bar magnet. Then he taps the board gently and observes that the iron filings arrange themselves in a particular pattern.

(a) Why do iron fillings arrange in a pattern?

(b) What does the crowding of iron filings at the end of the magnet indicate?

(c) What does the lines, along which the iron filings align, represent?

(d) Draw a neat diagram to show the magnetic field lines around a bar magnet.

(e) Write any two properties of magnetic field lines.

Q114 (a) What is a magnetic field? How can the direction of magnetic field lines at a place be determined?

(b) State the rule for the direction of the magnetic field produced around a current-carrying conductor. Draw a sketch of the pattern of field lines due to a current flowing through a straight conductor.

Q115 (a) What is a solenoid? Draw a sketch of the pattern of field lines of the magnetic field through and around a current-carrying solenoid.

(b) 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 fine out the direction of the magnetic field inside and outside the loop.

Q116 (a) What is meant by a magnetic field?

(b) How is the direction of magnetic field at a point determined?

(c) Describe an activity to demonstrate the direction of the magnetic field generated around a current-carrying conductor.

(d) What is the direction of magnetic field at the centre of a current-carrying circular loop?

Q117(a) What is a solenoid? Draw the magnetic field pattern through and around a current-carrying solenoid.

(b) What does the pattern of field lines inside the solenoid indicate? How can this field be utilised to magnetise a piece of soft iron?

Q118(a) Which rule helps to find the direction of force on a current-carrying conductor in a magnetic field?

(b) State the rule.

(c) Name the three factors on which the force on the current-carrying conductor depend.

Q119 Describe an experiment in detail to demonstrate the force acting on a current-carrying conductor due to a magnetic field. Also show the effect of change indirection of magnetic field and change in direction of current.

Or

Explain an activity to show that a current-carrying conductor experiences a force when placed in a magnetic field.

Q120(a) A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is: (*i*) pushed into the coil, its north pole entering first? (*ii*) withdrawn from inside the coil? (*iii*) held stationary inside the coil?

(b) Name the above phenomenon and mention the name of scientist who discovered it.

(c) State the rule used to find the direction of induced current.

Q121(a) What is electromagnetic induction?

(b) Explain the various methods of producing induced current.

(c) State the rule which gives the direction of induced current.

(d) Name two devices which work on the principle of electromagnetic induction.

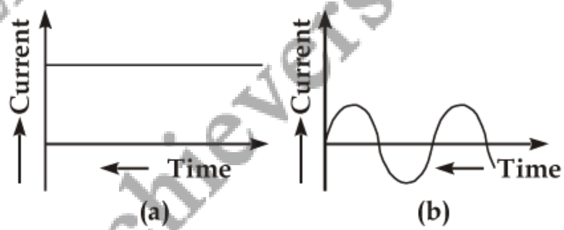
Q122 In our daily life we use two types of electric current whose current-time graphs are given in figure.

(a) Name the type of current in two cases.

(b) Identify any one source for each type of current.

(c) What is the frequency of current in case (b) in our country?

(d) On the basis of these graphs list two differences between the two currents.



(e) Out of the two which one is used in transmitting electric power over long distances and why?

Q123(a) Draw a schematic labelled diagram of domestic wiring circuit which includes (*i*) a main fuse, (*ii*) a power meter, (*iii*) one light point, and (*iv*) a power plug.

(b) Why is it necessary to connect an earth wire to electric appliances having metallic covers?

Q124(a) Which effect of the electric current is utilised in the working of an electrical fuse?

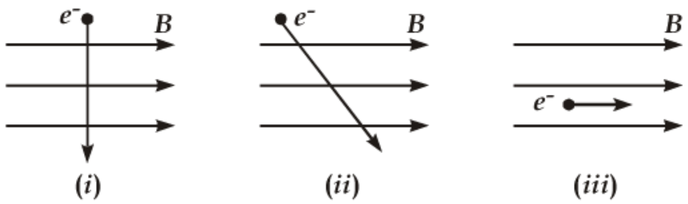
(b) A fuse is connected in series or in parallel in household circuit?

(c) Draw a schematic labelled diagram of a domestic circuit which has a provision of a main fuse, meter, one light bulb and a switch/socket.

Q125(a) State the rule you would use to find the force acting on a current-carrying conductor placed in a magnetic field.

(b) Name two devices based on interaction between magnetic field and current-carrying conductor.

(c) Given below are three diagrams showing entry of an electron in a magnetic field. Identify the case in which the force on electron will be maximum and minimum respectively. Give reason for your answer. Find the direction of maximum force acting on electron.



Q126 What is an electric motor? Name and state the principle on which electric motor works. List two factors on which the direction of motion/force depends. State the condition under which the force experienced by a current-carrying conductor placed in a magnetic field is maximum.

Q127(a) What is an electromagnet?

(b) List any of its two uses.

(c) Draw a labelled diagram to show how an electromagnet is made.

(d) What is the purpose of soft iron core used in making an electromagnet?

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S1. A region around the magnet in which force due to magnet can be felt.

S2. The direction in which N-pole of a small compass needle placed at that point sets itself.

S3. The strength and the direction of magnetic field at the given point.

S4. By drawing magnetic field lines.

S5. A magnetic field line around a magnet is the path along which north pole of a magnetic compass needle points. A magnetic field line gives the direction of magnetic field at a point.

S6. Near the poles of the magnet.

S7. From N-pole towards S-pole outside the magnet, and from S-pole towards N-pole inside a magnet.

S8. Every current-carrying conductor has a magnetic field around it.

S9. A magnetic compass needle placed near a wire gets deflected from its equilibrium position when a direct electric current is passed through the wire.

S10. A magnetic field is produced around a current-carrying conductor.

S11. The direction of magnetic field associated with a current-carrying wire can be easily found by applying the 'right-hand thumb rule". According to this rule, hold the current-carrying wire in your right-hand such that the thumb is stretched along the direction of current, then the fingers will wrap around the wire in the direction of the magnetic field.

S12. Strength of magnetic field is directly proportional to the strength of current flowing in the wire.

S13. The direction of magnetic field (and magnetic field lines) gets reversed on changing the direction of flow of current in a straigtht conductor.

S14. The strength of magnetic field increases on increasing the current flowing through the conductor.

S15. At the centre of current-carrying circular loop.

S16. A uniform magnetic field along the axis of the solenoid.

S17. Along the axis of the solenoid.

S18. A solenoid coil.

S19. In north-south direction because it behaves as bar magnet.

S20. Thumb indicates the direction of motion of the conductor and forefinger indicates the direction of magnetic field.

S21. The current-carrying conductor experiences a force when placed in a magnetic field.

S22. The force depends on (*i*) current flowing in the conductor, (*ii*) length of the conductor, (*iii*) strength of magnetic field and (*iv*) orientation of the conductor.

S23. The force acting on a current-carrying conductor placed in a magnetic field is maximum when the direction of current is at right angles to the direction of the magnetic field.

S24. No, a magnetic field exerts a force only on a moving charge.

S25. Applying Fleming's left-hand rule we find that the electron experiences a force along negative Z-axis.

S26. As per Fleming's left-hand rule the magnetic field is directed out of the paper.

S27. A current-carrying conductor produces a magnetic field around it. This magnetic field interacts with the externally applied magnetic field and as a result the conductor experiences a force.

S28. Electromagnetic induction is the phenomenon of producing induced current in a closed circuit (coil) by changing magnetic field near it or by moving the coil in the magnetic field.

S29. Electric current set up in a closed coil/circuit, whenever magnetic field near it is changing, is called an ***induce current***.

S30. Fleming's right-hand rule.

S31. Magnitude of induced current in a secondary coil is directly proportional to the rate of change of current in a primary coil.

S32. An electric generator.

S33. A device to convert mechanical energy into electrical energy.

S34. An electric generator.

S35. Direct current (d.c.).

S36. An alternating current (a.c.).

S37. Two times, *i.e.*, direction of current changes after each half cycle of a.c.

S38. 50 Hz.

S39. $50 \times 2 = 100$ times.

S40. Time of one a.c. cycle = 2 0.01 s = 0.02 s.

$$\therefore \qquad \text{Frequency of a.c.} = \frac{1}{0.02\ \text{s}} = 50\ \text{Hz}.$$

S41. Electric power in a.c. can be easily transmitted over long distance without much loss of energy.

S42. Red for live wire insulation, black for neutral wire insulation and green for earth wire insulation.

S43. 220 V.

S44. Electric fuse.

S45. With live wire.

S46. A fuse (or fuse wire) is used to protect the electric circuit in case of short-circuiting of circuit or in case of overloading of the circuit.

S47. With live wire.

S48. As a safety measure for the user. User will not get a severe electric shock even in case of leakage, if proper earth wire has been installed.

S49. Short-circuiting means that the live and neutral wires of an electric circuit have come in contact with each other.

S50. It provides a safety measure to the user and saves him from a severe shock even when there is leakage of current.

S51. Take a bar magnet and place it on a cardboard. Sprinkle some iron-filings around the magnet and gently tap the cardboard. The iron-filings are seen to arrange themselves as shown in figure under the influence of the magnetic field. It shows that a magnetic field exists near a bar magnet.

S52. North and south poles of two magnets are being shown in the figure (a) and (b).

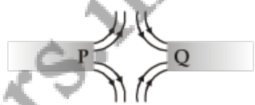
(a) (b)

S53. The magnetic field of a magnet is the region surrounding the magnet in which the force of the magnet can be detected. Magnetic field is a quantity that has both magnitude and direction. The direction of the magnetic field is the direction in which a north pole of the compass needle moves inside it.

S54. The magnetic field lines is the path along which north pole of a small compass moves.

Magnetic field lines are used to represent a magnetic field. The relative strength of the magnetic field is shown by the degree of closeness of the field lines.

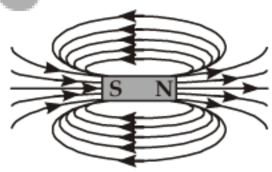
S55. The pole marked *P* is the north pole because magnetic field lines are strating from it. Again the pole marked *Q* is the south pole because magnetic field lines are ending there.



S56. Field lines around a bar magnet are shown in fugure. Two properties of magnetic field lines are as follows:

(a) In air field lines start from N-pole and end at S-pole.

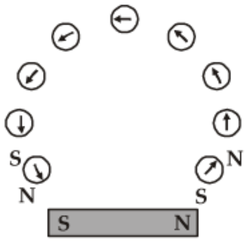
(b) No, two magnetic field lines can ever intersect at any one point.



S57. (a) Outside a bar magnet magnetic field lines move from north pole to south pole. Inside a bar magnet the magnetic field lines are from south to north pole.

(b) The degree of closeness of the magnetic field lines represent the strength of magnetic field. More close field lines represent a stronger magnetic field.

S58. Take a bar magnet and place it on a sheet of white paper fixed on a drawing sheet. Mark the boundary of magnet. Take a small compass and place it near the north pole of the magnet. Mark the position of two ends of compass needle. Move the needle to a new position so that its south pole occupies the position previously occupied by its north pole. In this way proceed step by step till we reach the south pole of magnet. Join the points marked on the paper by a smooth curve This curve represents a magnetic field line as shown in figure.



S59. Force experienced by a current-carrying wire when placed in a magnetic field or the force experienced by a charged particle moving in a magnetic field is known as the magnetic force. Direction of magnetic force is given by Fleming's left-hand rule.

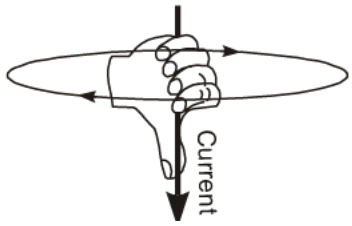
S60. In present problem, the electric current is flowing horizontally in east to west direction. Applying right-hand thumb rule, we find that

(a) the direction of magnetic field at a point directly below the wire is from north to south.

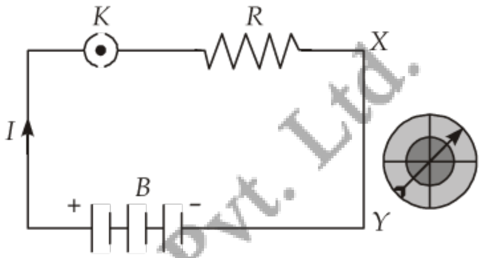
(b) the direction of magnetic field at a point directly above the wire is from south to north.

S61. The magnitude of the magnetic field produced at a given point near a current-carrying straight conductor is directly proportional to the current passing in the conductor. Moreover, magnetic field decreases as the distance of the point from the conducting wire increases.

S62. The direction of magnetic field around a straight current-carrying conductor is given by "right-hand thumb rule". According to the rule, imagine holding the current-carrying straight conductor in you right-hand such that the thumb points towards the direction of current. Then the fingers of right-hand wrap around the conductor in the direction of the field lines of the magnetic field as shown in figure.



S63. Take a straight, thick copper wire XY and connect it in an electric circuit consisting of a battery, key and a resistor (see figure). Place a small compass near the copper wire and observe its direction. Now put the plug in key K so that electric circuit is completed and a current begins to flow. The compass needle is deflected. It shows that the current-carrying copper wire is behaving like a magnet, due to which compass needle shows a deflection.

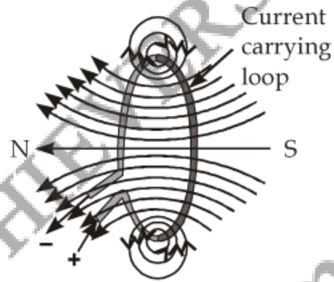


S64. The magnetic field of a magnet is the region surrounding the magnet in which the force of the magnet can be detected. Magnetic field is a quantity that has both magnitude and direction. Compass needle shows deflection when brought near a bar magnet due to force experienced by it due to bar magnet.

S65. (a) The magnetic field at a point near a current-carrying straight conductor increases on increasing the current flowing through the conductor.

(b) On changing the direction of flow of current in the condutor, the direction of the magnetic field is reversed but strength of magnetic field remains unchanged.

S66. Magnetic field lines have been shown in the following figure.



S67. The observation (a) of the student is wrong because on moving a compass away from a current-carrying conductor the strength of magnetic field decreases. So degree of deflection in the magnetic compass must decrease.

S68. Magnetic field is developed around a current-carrying circular wire loop. It is found that the magnetic field at the centre of wire loop is proportional to the value of current and inversely proportional to the radius of loop. Moreover if we have a circular coil on n turns, the magnetic field will be n times of the magnetic field due to a single current loop.

S69. Magnetic field is produced aroud a beam of moving charges.

(a) As alpha particles are charged particles hence a magnetic field is produced around a thin beam of alpha particles.

(b) No magnetic field is produced due to neutron beam because it has no charge.

S70. The magnitude of the magnetic force depends on

(a) the strength of current

(b) the strength of magnetic field,

(c) the length of current-carrying conductor, and

(d) orientation of the conductor in the magnetic field.

S71. The strength of an electromagnet can be increased by

(a) increasing the number of turns of windings of the solenoid coil wrapped around the electromagnet, or

(b) increasing the amount of electric current flowing through the coil.

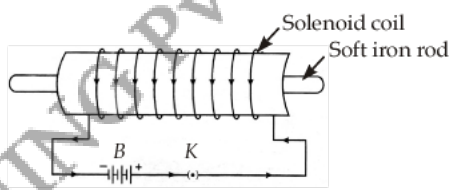
S72. Materials behaving as magnet only when a current is passed through a coil wound around the material are called ***electromagnet***. Electromagnets are used in electric bell, transformer, electric cranes etc.

Magnets having a constant magnetic field around them (*e.g.*, a bar magnet) are called ***permanent magnets***. Permanent magnets are used in electric generators, speakers, refrigerator door etc.

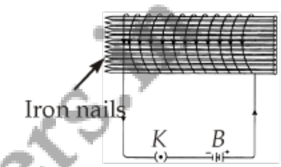
S73. Magnets having a constant magnetic field around them (*e.g.*, a bar magnet) are called ***permanent magnets***. Permanent magnets are used in electric generators, speakers, refrigerator door etc.

Materials behaving as magnet only when a current is passed through a coil wound around the material are called ***electromagnet***. Electromagnets are used in electric bell, transformer, electric cranes etc.

S74. An electromagnet is a rod of magnetic material (say soft iron) placed inside a solenoid coil. On passing current in solenoid coil, iron rod begins to behave as a magnet. On stopping the current flow, magnetisation of iron is lost. Thus, a soft iron piece behaves as an electromagnet.



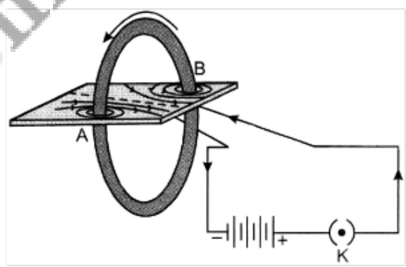
S75. Make a bunch of 8-10 long iron nails. Wrap a coil of insulated copper wire on it. We pass current through the coil by using a battery. On passing current the bunch of nails is magnetised and attracts small pieces of iron and steel. On stopping flow of current, the magnetisation of the nails vanishes.



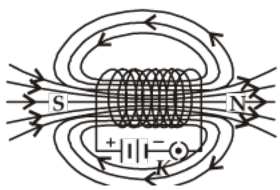
S76. The strength of magnetic field of a solenoid can be increased by (a) increasing the current flowing through solenoid coil, (b) increasing the number of turns per unit length of the solenoid coil.

S77. Take a rectangular cardboard sheet. Make two holes in it at a suitable distance. Insert a circular coil having large number of turns of insulated copper wire passing through these holes so that the coil is normal to the plane of cardboard.

Complete the electric circuit (see figure) by joining ends of the coil with a battery and a key K. Sprinkle iron-filings uniformly on the cardboard. Plug the key and gently tap the cardboard. The iron-filings arrange themselves along the magnetic field lines. The pattern of iron-filings gives the magnetic field lines due to current-carrying circular coil.



S78. A solenoid is a coil of large number of circular turns of wire wrapped in the shape of a cylinder. On passing electric current, a magnetic field is developed. Magnetic field lines are drawn below. The field is along the axis of solenoid such that one end of solenoid behaves as north pole and the other south pole. Thus, field of a solenoid is similar to that of a bar magnet.



S79. The force experienced by a current-carrying conductor placed in a magnetic field is

(a) maximum when direction of current is at right angles to the direction of magnetic field, and

(b) minimum (zero) when direction of current is parallel or antiparallel to the direction of mgnetic field.

S80. (a) We get a momentary deflection in galvanometer.

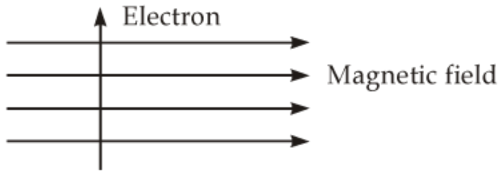
(b) We again get a momentary deflection in galvanometer but in the reverse direction.

(c) There is no deflection in galvanometer.

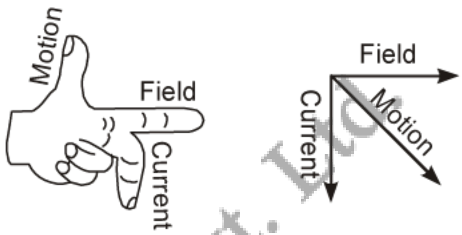
(d) The phenomenon of electromagnetic induction is responsible for deflection in the galvanometer.

S81. Electromagnetic induction is the phenomenon due to which an induced current is set up in a closed coil whenever magnetic field around it is changing. Induced current lasts so long as the change in magnetic field continues. The direction of induced current is given by Fleming's right-hand rule.

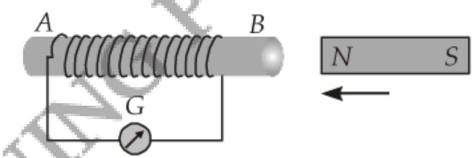
S82. Here, motion of electron in the given direction is equivalent to a current in the opposite direction. Now, by the use of Fleming's left-hand rule, we find that the force acting on the electron is directed perpendicular to plane of paper directed outward and hence the electron will move in that direction.



Fleming's left-hand rule states that stretch the forefinger, the central finger and the thumb of our left-hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor (*i.e.*, the thumb will point in the direction of force *F*).



S83. The given diagram shows that when the magnet NS is brought towards a coil, magnetic field in and around the coil increased. As a result a current is set up in the coil and consequently galvanometer shows deflection. It indicates the phenomenon of electromagnetic induction.



S84. Yes, a current is set up in coil *B* when current flowing in coil *A* is changed. When current flowing in coil *A* is changed, magnetic field around coil *A* will change. As coil *B* is very close to coil *A*, magnetic field in and around the coil *B* will also change. As a result an induced current is induced in coil *B*.

S85. In our domestic circuits provision is made for two different current ratings:

(a) a rating of 5 A for bulbs, tubes, CFL's and fans etc.

(b) a rating of 15 A for electric iron, geyser, refrigerator etc.

Advantage of this provision is that we may use fitting and live wire of appropriate power rating for appliances.

S86.

Direct current (d.c.)	Alternating current (a.c)
1. Direct current always flows in one direction only.	1. Alternating current reverses its direction periodically.
2. The magnitude of current may or may not remain constant.	2. Magnitude of current continuously changes with time.
3. Current obtained from a battery and d.c. generator is d.c.	3. Current obtained from an a.c. generator and current in our domestic circuit are a.c.

S87.

Electric motor	Electric generator
1. Electric motor is a device which converts electrical energy into mechanical energy.	1. Electric generator is a device which converts mechanical energy into electrical energy.
2. It works on the principle of Fleming's left-hand rule.	2. It works on the principle of Fleming's right-hand rule.

S88. (a) Wire of green insulation cover is conventionally used for earth wires.

(b) When an earth wire is connected to metallic parts of appliances, any leakage of current to the metallic parts is safely conducted to the ground. Thus, severity of shock received by a person on touching the metallic part is very much reduced.

S89. As per usual colour code followed the live wire is of red coloured insulation, neutral wire of black coloured insulation and earth wire of green coloured insulation.

If the colour code is followed then any person would identify the correct connecting wire and would be able to handle them properly.

S90. The fuse is a safety device used to prevent any damage to an electrical appliance either due to short-circuiting or overloading of the electrical circuit.

If a fuse, with defined rating, is replaced by one with a larger rating then the fuse wire will not burn even when a current even greater than safe limit is flowing. As a result the electrical appliances will be damaged.

S91. As a result of short-circuiting, the resistance of the circuit decreases to a very small value and consequently the current increases enormously. It results in heating the live wires and producing a spark at the place of short circuit, which may even cause fire in the building.

S92. Short-circuiting means that the two wires, live and neutral, of the domestic electric circuit have come in contact with each other.

Short-circuiting may take place either due to their insulations having been damaged or due to a fault in the appliance.

S93. Magnetic field lines are used to represent a magnetic field. A field line is the path along which the north pole of a small compass tends to move. The direction of the magnetic field at a point is given by the direction in which north pole of compass placed at that point would take.

Properties of magnetic lines of force (also known as magnetic field lines) are listed below:

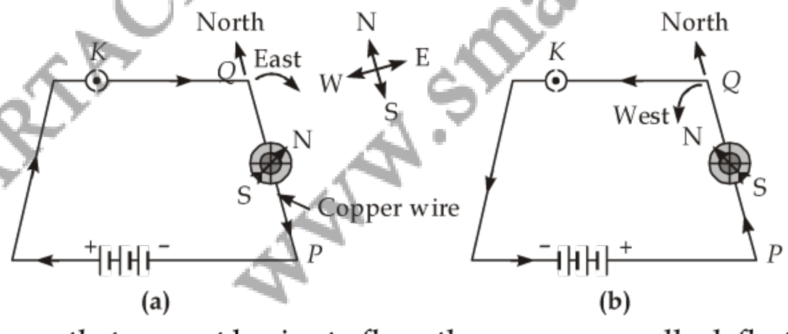
(a) Outside a magnet, the magnetic field lines are directed from N-pole of magnet towards S-pole. However, inside a magnet, the field lines are directed from S-pole to N-pole. Thus, magnetic field lines are closed curves.

(b) The magnetic field line at any point points in the direction of magnetic field at that point.

(c) The relative strength of magnetic field lines is given by degree of closeness of the field lines. The magnetic field is stronger in the region where the field lines are crowded.

(d) No, two magnetic field lines can ever intersect with each other.

S94. To know the direction of magnetic field due to flow of current in a straight conductor let us prepare a series circuit consisting of a long straight copper wire *PQ*, a plug key and a battery of about 6 V voltage (see figure). Place the straight wire over a compass needle and wire parallel to the direction of compass needle.



Apply plug in the key so that current begins to flow, the compass needle deflects due to magnetic field produced due to flow of current in straight conductor. If current in wire flows from north to south [as shown in figure (a)], the north pole of the compass needle is seen moving towards the east. It shows that a magnetic field is produced by a current-carrying straight conductor.

Now, reverse the connections of battery so that current flows in the copper wire from south to north. Again observe the compass needle. We find that north pole of compass is now deflected towards west [figure (b)]. Thus, it is clear that on reversing direction of current, the direction of magnetic field is also reversed.

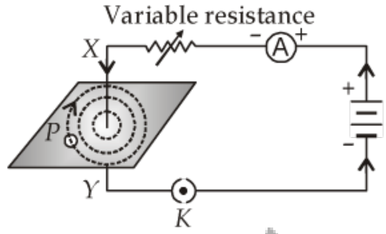
S95. (a) If the current flowing in a straight conductor is increased then the deflection of compass needle (*i.e.*, the magnetic field) increases.

(b) If the direction of current in the conductor is reversed, the direction of deflection of compass needle (and the direction of magnetic field) gets reversed.

(c) If compass needle is moved away from the conductor, deflection of compass needle decreases due to decrease in strength of magnetic field.

S96. Take a long straight thick copper wire and insert it through the centre of a plane cardboard. Cardboard is fixed so that it is perfectly horizontal and does not slide up or down. Moreover, the thick wire should be normal to the plane of board (*i.e.*, in vertical direction).

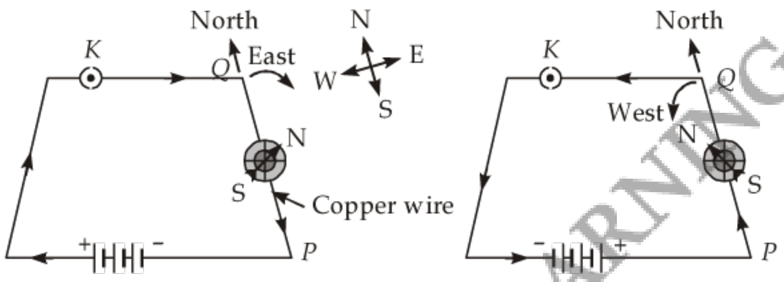
Prepare an electric circuit consisting of a 12 V battery, a variable resistance, an ammeter of 5 A range and a plug key. Connect the copper wire in the circuit between the points X and Y as shown in figure.



Using a salt sprinkler, sprinkle some iron-filings uniformly on the cardboard. Put the plug in key K so that a current flows in the circuit. Note the current I and maintain it constant throughout.

Gently tap the cardboard using themselves forming a pattern of concentric circles around the copper wire. These concentric circles represent the magnetic field lines. Direction of field lines can be determined by the use of a small compass needle. If current is flowing vertically downward then the magnetic field lines are along clockwise direction. On reversing the current direction, the direction of magnetic field is also reversed.

S97.



(a) (b)

S98. (a) If the radius of current loop is reduced to half of its original value, the strength of magnetic field is doubled because magnetic field (B) is inversely proportional to the radius (r) of loop.

$$B \propto \frac{1}{r}.$$

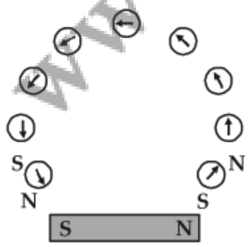
(b) As strength of magnetic field is proportional to current (I) flowing through the loop ($B \propto I$), the magnetic field is doubled if current is doubled.

S99. (a) The magnetic field produced in a current-carrying circular coil increases on increasing the value of current.

(b) On increasing the distance from the coil, the magnetic field strength decreases.

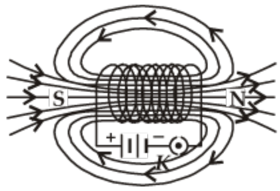
(c) The value of magnetic field increases on increasing the number of turns of the circular coil.

S100 Magnetic field lines (as shown in figure).



The magnetic field depends on (a) amount of current flowing, (b) radius of coil, and (c) number of turns in the given circular coil.

S101 A solenoid is a coil of large number of circular turns of wire wrapped in the shape of a cylinder. On passing electric current, a magnetic field is developed. Magnetic field lines are drawn below. The field is along the axis of solenoid such that one end of solenoid behaves as north pole and the other south pole. Thus, field of a solenoid is similar to that of a bar magnet.



Important features of magnetic field due to a current-carrying solenoid are:

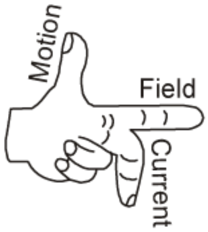
(a) The magnetic field lines inside the solenoid are nearly straight and parallel to its axis. It shows that magnetic field inside a solenoid is uniform.

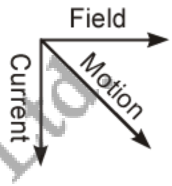
(b) The magnetic field of solenoid is identical to that due to a bar magnet with one end of solenoid behaving as a north pole and other end as a south pole. It shows that a solenoid behaves like a bar magnet.

(c) A current-carrying solenoid exhibits the directive and attractive properties of a bar magnet.

S102 (a) The rule is Fleming's left-hand rule.

Fleming's left-hand rule states that stretch the forefinger, the central finger and the thumb of our left-hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor (*i.e.*, the thumb will point in the direction of force *F*).





(b) If magnitude of current is doubled then force experienced by a current-carrying conductor in a magnetic field is also doubled.

(c) If the direction of current flow is reversed then direction of force experienced by current-carrying conductor is also reversed.

S103 (a) On increasing the current flowing through metallic conductor, the force experienced by it is proportionately increased because $F \propto I$.

(b) On using a stronger horse-shoe magnet the magnetic force increases because $F \propto B$.

(c) On reversing the direction of current the direction of force is reversed and conductor is displaced towards right.

S104 Important characteristics of magnetic force are as given below:

(a) Magnetic force acts only on moving charges (or flowing current) and does not act on stationary charges.

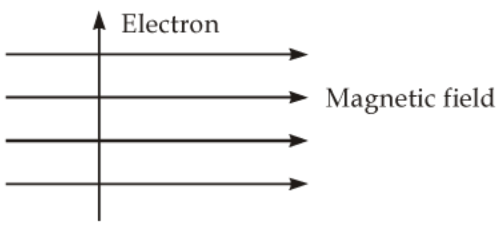
(b) Force acts on moving charge when its motion is not parallel to the direction of magnetic field. Similarly, magnetic force acts when current-carrying conductor is in any direction other than the direction of magnetic field.

(c) Magnitude of magnetic force is maximum when current-carrying conductor is set perpendicular to magnetic field or when charge is moving at right angle to magnetic field.

(d) The direction of force F is given by Fleming's left-hand rule.

(e) The magnetic force depends upon (*i*) the amount of current *I*, (*ii*) the magnetic field *B*, and (c) the length of the conductor *l*. On increasing anyone or all of these factors force increases proportionately.

S105 Magnetic field lines due to a long current-carrying solenoid is given in the figure.



The magnetic field due to the solenoid depends on

(a) number of turns per unit length in solenoid coil, and

(b) amount of electric current.

S106. An alternating current is preferred over direct current due to the following reasons:

(a) a.c. generator is simpler and easy to operate and maintain.

(b) a.c. voltage can be stepped up or stepped down as per convenience.

(c) a.c. can be easily transmitted over long distances.

S107. In a domestic circuit, the phase is always at a potential 220 V higher than the neutral. The neutral is earthed at the substation. The earthed wire is earthed at the permises of the consumer. All the coverings and those parts which should not be at a potential are earthed by joining with the earthed wire. Therefore, no fuse should be joined with the neutral wire because in the event of short-circuit such a fuse will break the system of connections only with the neutral and not with the live wire. It means that for proper functioning the fuse must be joined only with the live wire.

S108.

Short-circuiting	Overloading
1. Short-circuiting occurs due to direct contact of live wire with the neutral wire.	1. Overloading occurs when too many electrical appliances of high power ratings are connected to a single electric circuit and switched on simultaneously. As a result the circuit draws large current beyond its capacity and overloading takes place.
2. A large current flows in the circuit due to extermely small resistance on account of direct contact of live wire with neutral wire.	2. Large current flows on account of the fact that a number of high power appliances are connected and being run simultaneoulsy.

S109. Important features of domestic electric supply lines are as given below:

(a) Different circuits and different appliances in each circuit are connected in parallel.

(b) Each appliance is provided with an independent on/off switch which is always power ratings and another of 5 A for bulbs, tubes, fans etc.

(c) Two separate circuits are used, one of 15 A for appliances with higher power ratings and another of 5 A for bulbs, tubes fans etc.

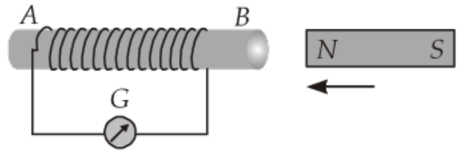
(d) Electric fuses of appropriate capacities are used ahead of each electric circuit as a safety measure. Moreover, proper earthing must be ensured.

S110. An electric fuse is a device which is used ahead and in series of an electric ciruit as a safety device to prevent the damage caused by short-circuiting or overloading of the circuit.

It is a small, thin wire of a material whose melting point is very low. Generally wire of tin or tin-lead alloy or tin-copper alloy is used as a fuse wire. If due to some fault electric circuit gets short-circuited, then a strong current begins to flow. Due to such strong flow of current the fuse wire is heated up and gets melted. As a result, the electric circuit is broken and current flow stops. Thus, possible damage to the circuit and appliances is avoided.

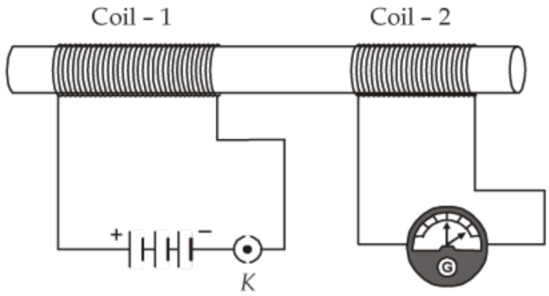
S111. Take a coil *AB* of insulated copper wire having a number of turns (about 20 or more). Connect the ends of coil to a sensitive galvanometer. Now take a bar magnet NS and rapidly bring the magnet towards the end *B* of coil as shown in figure. The galvanometer gives momentary deflection in one direction. Now take the magnet away from the coil, the galvanometer again gives momentary deflection but in the opposite direction. It clearly shows that motion of magnet induces, a current in the coil.

Again keep the magnet fixed and gently move the coil *AB* either towards the magnet or away from the magnet. We get deflection in galvanometer even now. Thus, an induced current is produced in a coil whenever there is relative motion between the coil and the magnet and the phenomenon is known as the electromagnetic induction.



S112. Take two different coils of insulated copper wire having large number of turns. Insert the two coils over a non-conducting cylindrical thick paper roll as shown in figure.

Connect a battery (of 6 V) and a plug key *K* in series of coil-1. With coil-2 connect a sensitive galvanometer. Now put the plug in key *K*. The galvanometer joined with coil-2 also gives a momentary deflection and then the pointer quickly returns to its mean position.



Now, remove the plug from key *K*. The galvanometer in coil-2 again gives a momentary deflection but in the reverse direction.

Moreover, we observe that as soon as current in coil-1 becomes either steady or zero, there is no deflection in galvanometer.

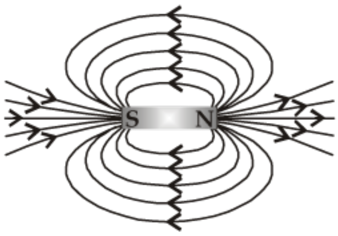
From the above experiment, we conclude that an induced current is produced in coil-2 on account of electromagnetic induction whenever current in coil-1 is changing.

S113. (a) Iron filings arrange in a pattern because a magnetic field exists around a magnet.

(b) The crowding of iron filings at the end of the magnet indicates that the strength of magnetic field is maximum near the poles of magnet.

(c) The lines represent the magnetic field lines.

(d)



(e) Magnetic field lines are listed below:

(*i*) Outside a magnet, the magnetic field lines are directed from N-pole of magnet towards S-pole. However, inside a magnet, the field lines are directed from S-pole to N-pole. Thus, magnetic field lines are closed curves.

(*ii*) The magnetic field line at any point points in the direction of magnetic field at that point.

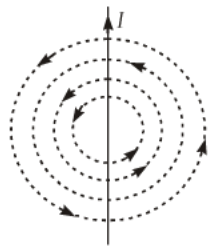
(*iii*) The relative strength of magnetic field lines is given by degree of closeness of the field lines. The magnetic field is stronger in the region where the field lines are crowded.

S114. (a) A magnetic field is the region around a magnet or a current-carrying conductor/coil, in which the magnetic force of attraction/repulsion due to it can be detected.

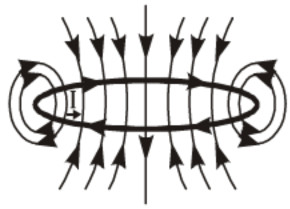
The direction of field lines at a place is determined by placing a magnetic compass needle there. The direction along which the north pole of compass needle points is the direction of magnetic field there.

(b) The direction of the manetic field produced around a current-carrying conductor is found by applying the right-hand thumb rule. As per this rule, hold the current-carrying conductor in your right-hand such that the thumb is stretched along the direction of current, then the fingers will wrap around the conductor in the direction of the magnetic field.

The pattern of field lines due to a current flowing through a straight conductor is as shown in figure.



S115. (a) A solenoid is a coil of insulated copper wire, having a large number of circular turns, wrapped in the shape of a cylinder. When current is passed through the solenoid coil, a magnetic field is present. Within the solenoid field is constant and along the axis solenoid coil.



Pattern of magnetic field lines due to a current-carrying solenoid is shown in figure.

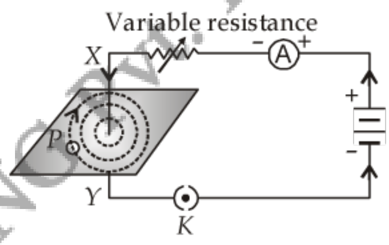
(b) If we consider a circular loop of wire lying in the plane of the table and let the current passes through the loop clockwise, then the magnetic field lines have been shown in figure. As per right-hand rule, we find that inside the loop, the magnetic field lines are directed perpendicular to the plane of paper in the inward direction. Outside the loop magnetic field lines are directed out of the plane of paper.

S116. (a) The region around a magnet, in which the force (influence) of magnet can be detected, is called its ***magnetic field***.

(b) The direction of a magnetic field at a point is the direction in which the north pole of a compass needle points. The magnetic field can be represented by magnetic field lines.

(c) Take a long straight thick copper wire and insert it through the centre of a plane cardboard. Cardboard is fixed so that it is perfectly horizontal and does not slide up or down. Moreover, the thick wire should be normal to the plane of board (*i.e.*, in vertical direction).

Prepare an electric circuit consisting of a 12 V battery, a variable resistance, an ammeter of 5 A range and a plug key. Connect the copper wire in the circuit between the points *X* and *Y* as shown in figure.

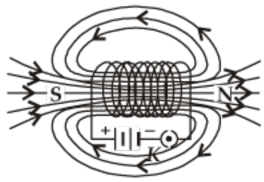


Using a salt sprinkler, sprinkle some iron-filings uniformly on the cardboard. Put the plug in key *K* so that a current flows in the circuit. Note the current I and maintain it constant throughout.

Gently tap the cardboard, iron-filings arrange themselves forming a pattern of concentric circles around the copper wire. These concentric circles represent the magnetic field lines. Direction of field lines can be determined by the use of a small compass needle. If current is flowing vertically downward then the magnetic field lines are along clockwise direction. On reversing the current direction, the direction of magnetic field is also reversed.

(d) At the centre of a current-carrying circular loop the direction of magnet field is a straight line pointing towards normal of the loop given by right-hand rule.

S117. (a) A solenoid is a coil of large number of circular turns of wire wrapped in the shape of a cylinder. On passing electric current, a magnetic field is developed. Magnetic field lines are drawn below. The field is along the axis of solenoid such that one end of solenoid behaves as north pole and the other south pole. Thus, field of a solenoid is similar to that of a bar magnet.

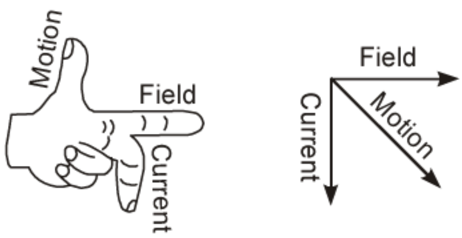


(b) The pattern of field lines inside the solenoid indicates that the solenoid is now behaving as a bar magnet with one end behaving as the north pole and the other end as the south pole of the magnet.

If a piece of soft iron is placed inside the solenoid and a current is passed through the solenoid coil, the iron piece is magnetised and begins to behave as an electromagnet.

S118. (a) Fleming's left-hand rule helps to find the direction of force on a current-carrying conductor in a magnetic field.

(b) Fleming's left-hand rule states that stretch the forefinger, the central finger and the thumb of our left-hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor (*i.e.*, the thumb will point in the direction of force *F*).

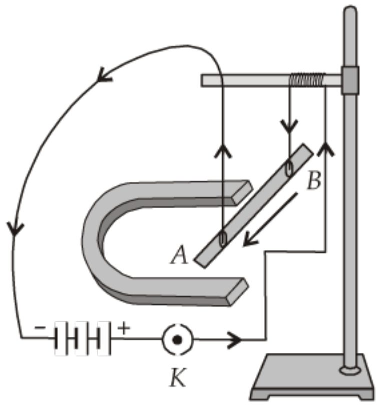


(c) Force on the current-carrying conductor depends on (*i*) amount of current flowing, (*ii*) strength of magnetic field, and (*iii*) orientation of conductor.

S119. A current-carrying conductor experiences a magnetic force due to a magnetic field. The force is maximum when the conductor is placed perpendicular to the direction of magnetic field. To demonstrate the force we perform the following experiment:

Experiment: Take a small sized aluminium rod *AB* of length about 5 cm. Suspend the rod *AB* horizontally from a rigid stand using two connecting wires.

Place a strong horse-shoe magnet NS in such a way that the rod *AB* lies between the poles of the magnet. Let the north pole N of magnet lies below the rod and the south pole S lies above the rod as shown in figure. Thus, a magnetic field directed in vertically upward direction is present.



Complete the electrical circuit of aluminium rod *AB* by connecting it in series with a 6 V battery, key *K* and a variable resistance.

Put the plug in key *K* so that an electric current begins to flow through the aluminium rod from end *B* to end *A*. We observe that on passing current the rod *AB* is displaced towards the left. It shows that the aluminium rod is experiencing a mechanical force due to which it is being deflected. Direction of deflection is given by Fleming's left-hand rule.

Effect of change in direction of current: Reverse the connections of battery so that on applying plug in key *K*, current flows in the aluminium rod from *A* to *B*. We now find that the rod *AB* is deflected towards the right. Thus, by reversing the direction of current, direction of force is also reversed. It is in accordance with Fleming's left-hand rule.

Effect of change in direction of magnetic field: Now, reverse the direction of magnetic field to vertically downward direction. For this suspend, the horse-shoe magnet in such a way that N-pole of magnet lies above the aluminium rod *AB* and S-pole of magnet lies below the rod. If now current in aluminium rod is flown from *B* to *A*, the rod is deflected towards right. If current in the rod is flowing from *A* to *B*, then the rod is deflected towards left. It shows that direction of deflection (or the direction of force) is reversed on reversing the direction of magnetic field.

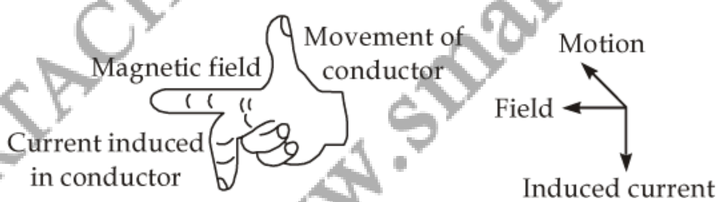
S120. (a) (*i*) When bar magnet is pushed into the coil, the galvanometer shows deflection due to induced current produced in the coil.

(*ii*) When bar magnet is withdrawn from inside the coil, an induced current is set up in the reverse direction and hence galvanometer shows deflection in the reverse direction.

(*iii*) When magnet is held stationary inside the coil, no induced current is produced and so galvanometer shows no deflection.

(b) The phenomenon is known as "electromagnetic induction" and it was discovered by M. Faraday.

(c) Fleming's right-hand rule state that hold the forefinger, the central finger and the thumb of the right-hand mutually perpendicular to each other such that the forefinger indicates the direction of magnetic field and the thumb is in the direction of motion of a conductor. Then the central finger shows the direction of current induced in the conductor.



S121. (a) Electromagnetic induction is the phenomenon due to which an e.m.f. is induced between the ends of a coil whenever magnetic field in and around it is changed.

(b) Different ways to induce current in a coil are as given below:

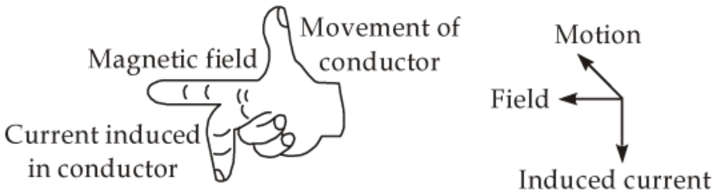
(*i*) If a magnetic field is changed around a coil then an induced current is set up in th coil. It can be done by taking a bar magnet and bringing it closer to the coil or taking it away from the coil.

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

(*iii*) If a coil is rotated in a uniform magnetic field, it may also produce an induced current in the coil.

(*iv*) If we take two coils and insert them over a non-conducting cylindrical roll then on changing current flowing in one coil, an induced current is obtained in the other coil.

(c) Fleming's right-hand rule state that hold the forefinger, the central finger and the thumb of the right-hand mutually perpendicular to each other such that the forefinger indicates the direction of magnetic field and the thumb is in the direction of motion of a conductor. Then the central finger shows the direction of current induced in the conductor.



(d) Electric generator, transformer etc. work on the principle of electromagnetic induction.

S122. (a) Current shown in figure (a) is direct current (d.c.) but current shown in figure (b) is an alternating current (a.c.).

(b) A cell/battery produces d.c. but an a.c. generator produces a.c.

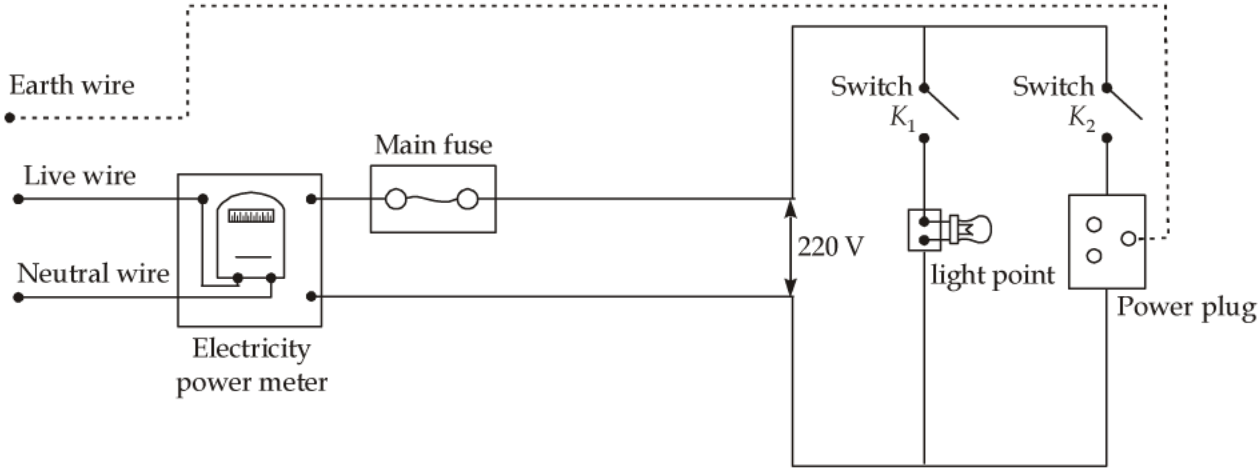
(c) In India frequency of a.c. is 50 Hz.

(d)

Direct current (d.c.)	Alternating current (a.c)
1. Direct current always flows in one direction only.	1. Alternating current reverses its direction periodically.
2. The magnitude of current may or may not remain constant.	2. Magnitude of current continuously changes with time.
3. Current obtained from a battery and d.c. generator is d.c.	3. Current obtained from an a.c. generator and current in our domestic circuit are a.c.

(e) a.c. is used in transmitting electric power over long distances. It is so because transmission loss of electric power can be minimised for a.c. by employing suitable transformers at generating stations and consuming centres.

S123.(a) Labelled diagram of domestic wiring circuit is given below in figure:

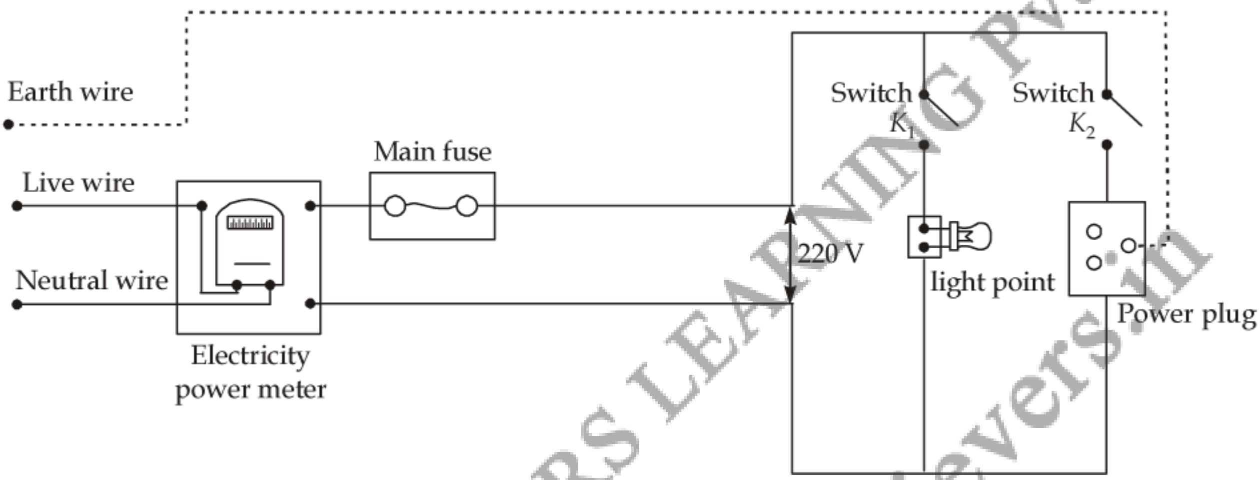


(b) It is necessary to connect an earth wire to electric appliances having metallic covers as a safety measure. The metallic body connected to the earth wire provides a low resistance conducting path for the current.It ensures that any leakage of current to the metallic body of the appliance keeps its potential to that of earth and the person using that appliance will not get a servere electric shock.

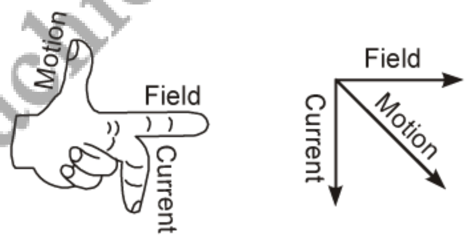
S124.(a) Heating effect of electric current is utilised in the woking of an electric fuse.

(b) A fuse is always connected in series of a household circuit.

(c)



S125.(a) Fleming's left-hand rule states that stretch the forefinger, the central finger and the thumb of our left-hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor (*i.e.*, the thumb will point in the direction of force *F*).



(b) Electric fan, refrigerator, electric mixer, washing machine etc., make use of interaction between magnetic field and a current-carrying conductor.

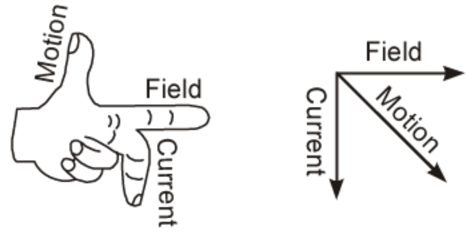
(c) Force on electron is maximum in figure (*i*) because here direction of motion of electron is at right angles to that of magnetic field '*B*'. The force is minimum (or zero) in figure (*iii*) because here electon is moving along the direction magnetic field *B*.

The direction of maximum force acting on electron is perpendicular to the plane of paper and directed into it.

S126. Electric motor is a device that converts electrical energy into mechanical energy.

An electric motor works on the principle that a coil carrying-current, when placed in a uniform magnetic field, experiences a force whose direction is given by Fleming's left-hand rule.

Fleming's left-hand rule states that stretch the forefinger, the central finger and the thumb of our left-hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor (*i.e.*, the thumb will point in the direction of force *F*).



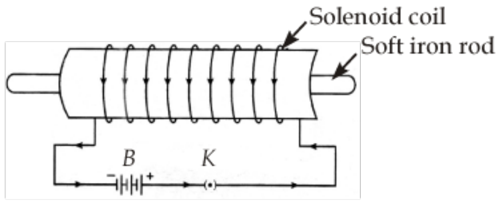
The direction of motion/force depends on the direction of magnetic field and the direction of flow of current through the conductor.

The force experienced by a current-carrying conductor is maximum when it is at right angles to the magnetic field in which it is placed.

S127. (a) An electromagnet is a rod of magnetic material (say soft iron) placed inside a solenoid coil. On passing current in solenoid coil, iron rod begins to behave as a magnet. On stopping the current flow, magnetisation of iron is lost. Thus, a soft iron piece behaves as an electromagnet.

(b) An electromagnet is used in electric bells, telegraph system and telephone receivers. Electromagnets are used in cranes to lift heavy iron and steel objects. Electromagnets are also used in electrical brakes.

(c)



(d) Soft iron core is used to increase the strength/power of the electromagnet.