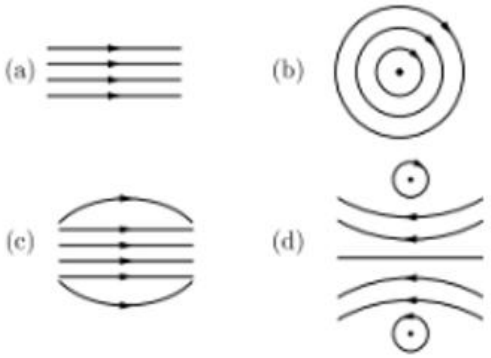
INDIAN SCHOOL AL WADI AL KABIR		
CLASS: X	DEPARTMENT OF SCIENCE -2025-26 SUBJECT: PHYSICS	DATE:28/10/2025
WORKSHEET NO. 4 WITH ANSWERS	TOPIC: MAGNETIC EFFECTS OF ELECTRIC CURRENT	A4 FILE FORMAT (PORTFOLIO)
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

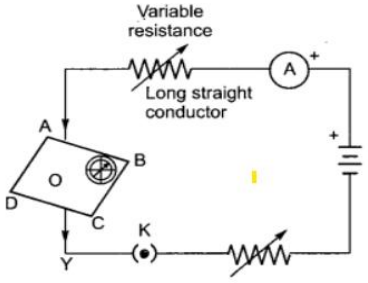
OBJECTIVE TYPE QUESTIONS

1. The pattern of the magnetic field produced inside a current carrying solenoid is



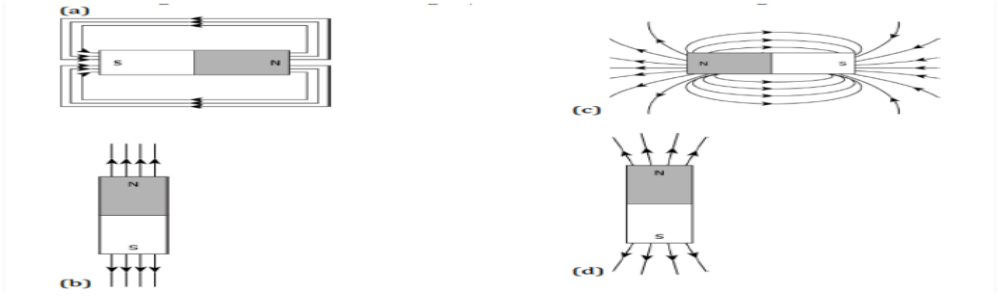
(a) a (b) b (c) c (d) d

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

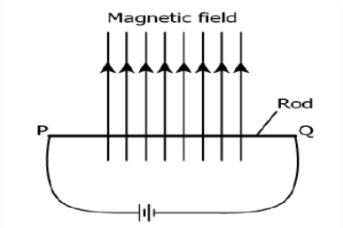


(a) Concentric circles
(b) elliptical in shape
(c) straight lines parallel to each other (Due to earth's magnetic field)
(d) concentric circles near the point O but of elliptical shapes as we go away from it.

3. 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 magnetize 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.
4. 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
5. Magnetic field lines around a straight conductor forms a pattern of
   (a) concentric circles
   (b) concentric ellipse
   (c) straight line
   (d) square shape.
6. The most suitable material for making the core of an electromagnet is :
   a) Steel
   b) Iron
   c) Soft iron
   d) Aluminium
7. Which of the following is not attracted by a magnet?
   (a) Steel
   (b) Cobalt
   (c) Brass
   (d) Nickel
8. A student learns that magnetic field strength around a bar magnet is different at every point. Which diagram shows the correct magnetic field lines around a bar magnet?



9. A metal rod PQ is placed in the magnetic field. The ends of the rod are connected to a battery using wires.



Where will the rod move?

(a) Upwards

(b) Downwards

(c) Into the field

(d) Out of the field

10. An alpha particle is diverted towards west is deflected towards north by a field. The field is magnetic. What will be the direction of field?

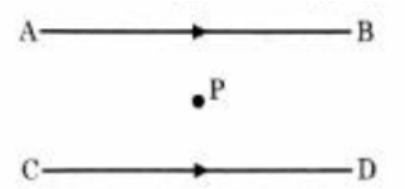
(a) Towards south

(b) towards east

(c) downward

(d) upward

11. The resultant magnetic field at point 'P' situated midway between two parallel wires (placed horizontally) each carrying a steady current I is (2024-25)



(a) in the same direction as the current in the wires.

(b) in the vertically upward direction.

(c) zero

(d) in the vertically downward direction.

ASSERTION REASON QUESTIONS

In the following Questions, the Assertion and Reason have been put forward. Read the statements carefully and choose the correct alternative from the following:

(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.

(b) The Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) The statement of the Assertion is false but the Reason is true.

12. Assertion: Electro magnet is a temporary magnet.

Reason: A current carrying solenoid acts as a magnet.

13. Assertion: When electric current is passed through a copper wire, magnetic needle kept near to wire shows deflection.

    Reason: the electric current through copper wire has produced magnetic field.

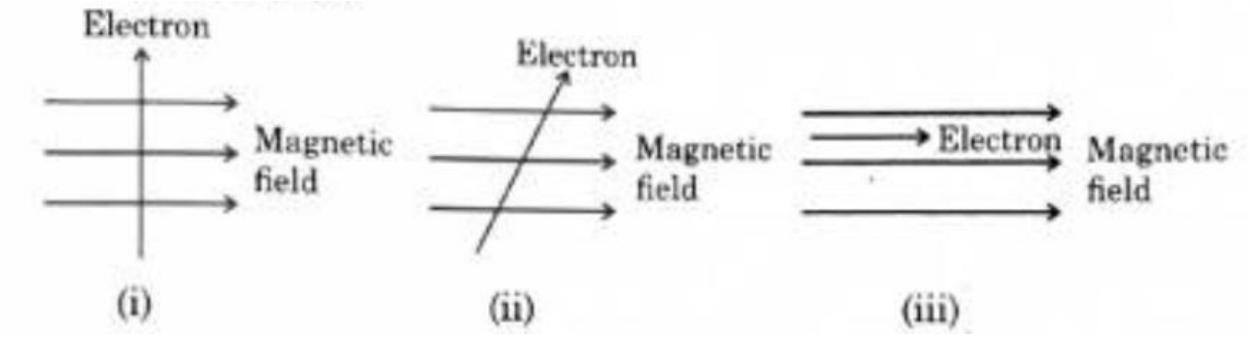
14. Assertion (A): On changing the direction of flow of current through a straight conductor, the direction of a magnetic field around the conductor is reversed.
    Reason (R) : The direction of magnetic field around a conductor can be given in accordance with left hand thumb rule.

SHORT ANSWER TYPE QUESTIONS (2 marks)

15. Define a solenoid. Compare the magnetic field produced by a solenoid with that of a bar magnet?
16. Give two important advantages of AC over DC.
17. State and define S.I unit of magnetic field.
18. Distinguish between a bar magnet and an electromagnet.
19. Give two reasons why different electrical appliances in a domestic circuit are connected in parallel.
20. Why is a fuse wire made of a tin-lead alloy and not copper?
21. What is solenoid? Draw the pattern of magnetic field lines of (3 marks)
    (i) a current carrying solenoid and
    (ii) a bar magnet.

    List two distinguishing features between the two fields. (Delhi 2019)
22. Draw the magnetic field lines through and around a single loop of wire carrying electric current. (Board Term I, 2016)
23. State whether an alpha particle will experience any force in a magnetic field if (alpha particles are positively charged particles)
    (i) it is placed in the field at rest.
    (ii) it moves in the magnetic field parallel to field lines.
    (iii) it moves in the magnetic field perpendicular to field lines.
    Justify your answer in each case. (Board Term I, 2016)
24. What is meant by earthing? Why should electrical appliances be earthed?
25. Explain what is short-circuiting and overloading in an electric supply.
26. (a) (i) State the rule used to find the force acting on a current carrying conductor placed in a magnetic field. (2024-25)

    (ii) Given below are three diagrams showing entry of an electron in a magnetic field. Identify the case in which the force will be (1) maximum and (2) minimum respectively. Give reason for your answer.



OR

(a) (i) draw the pattern of magnetic field lines of
(1) A current carrying solenoid
(2) A bar magnet
(ii) List two distinguishing features between the two fields

LONG ANSWER TYPE QUESTIONS

27. (a) Draw magnetic field lines produced around a current carrying straight conductor passing through cardboard.

(b) How will the strength of the magnetic field change, when the point where magnetic field is to be determined, is moved away from the straight wire carrying constant current? Justify your answer.

28. (a) Describe an activity to show with the help of a compass that magnetic field is strongest near poles of a bar magnet.
(b) Mention the direction of magnetic field lines (i) inside a bar magnet and (ii) outside a bar magnet. (2013)

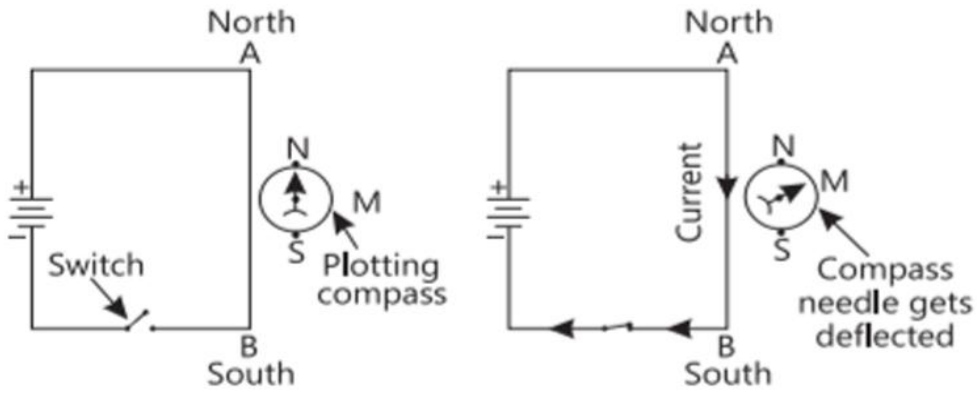
29.a) When is the force experienced by a current-carrying conductor placed in magnetic field largest?

b) Why is the earth pin thicker and longer than the live and the neutral pins?

c) Why don‘t two magnetic lines of force intersect each other?

CASE STUDY BASED QUESTIONS

30. Oersted, one of the leading scientists of the 19th century discovered that a compass needle got deflected when an electric current is passed through a metallic wire placed nearby. The following experiment is shown by a teacher to describe Oersted's experiment to his students.



Read the above passage carefully and give the answer of the following questions:

Q1. Which effect was explained by Oersted's experiment?

Q2. By which instrument the presence of magnetic field at a point can be detected?

Q3. Which rule is used to find the direction of magnetic field around a current carrying conductor? State it.

OR

Q3. How can you find the direction of magnetic field from a magnetic field line? Also draw the pattern of magnetic field around a current carrying conductor.

PREVIOUS YEAR BOARD QUESTIONS

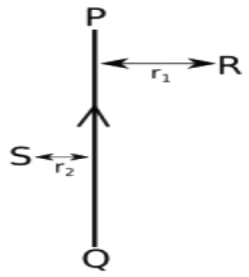
31)

i. Two magnets are lying side by side as shown below. Draw magnetic field lines between Poles P and Q

(CBSE-2021)

ii. Write any four properties of magnetic field lines

32) PQ is a current carrying conductor in the plane of the paper as shown in the figure below. (CBSE 2019)



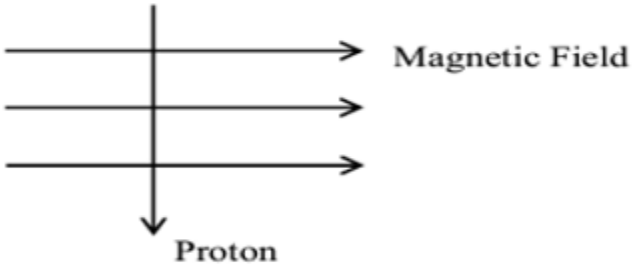
(i) Find the directions of the magnetic fields produced by it at points R and S?
(ii) Given r1> r2, where will the strength of the magnetic field be larger? Give reasons.
(iii) If the polarity of the battery connected to the wire is reversed, how would the direction of the magnetic field be changed?
(iv) Explain the rule that is used to find the direction of the magnetic field for a straight current carrying conductor.

33. What is a solenoid? Draw a sketch to show the magnetic field pattern produced by a current carrying solenoid. Name the region of uniform magnetic field. (CBSE 22-23)

34. (a) Draw the pattern of magnetic field lines due to a magnetic field through and around a current carrying circular loop.
(b) Name and state the rule to find out the direction of magnetic field inside and around the loop.

BOARD BASED QUESTIONS-2023-24

(a) State (i) right-hand thumb, and (ii) Fleming's left-hand rule.
(b) Using Fleming's left rule determine the direction of force experienced by a proton, which enters vertically downwards in a uniform magnetic field acting horizontally from west to east as shown in the diagram.

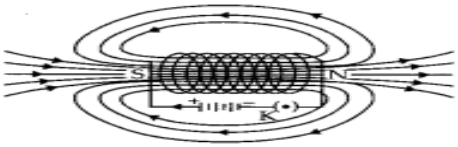
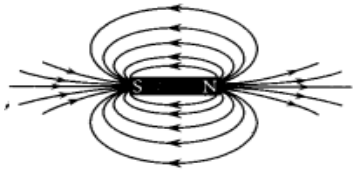


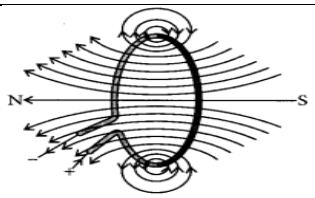
Ans. (b) Force exerted is out of the plane of the paper.

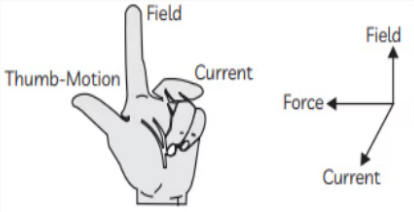
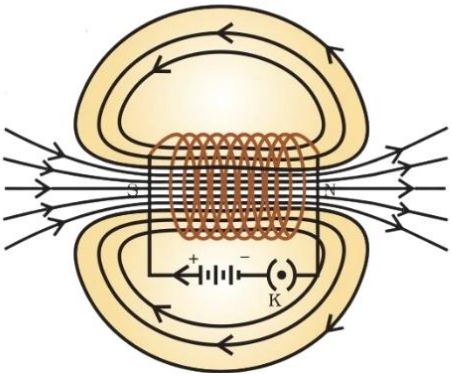
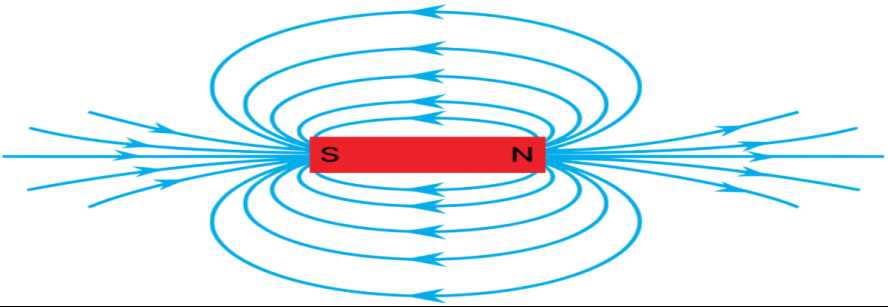
ANSWER KEY

Q.no	Answers
1	(a) if magnetic field lines are parallel and equidistant
2.	(c) straight lines parallel to each other (Due to earth's magnetic field)

3	(c) the pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet
4	(c) same at all points
5	(a) concentric circles
6	c) Soft iron
7	c) brass
8	C
9	c) Out of the field
10	(d)upwards
11	(c) zero
12	(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
13	(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
14.	(c) Assertion is true but the Reason is false.
15	A coil of many circular turns of wire wrapped in the shape of a cylinder, is called a solenoid. The magnetic field lines in a solenoid, through which current is passed, is very similar to that of a bar magnet. One end of the coil acts like a magnetic north pole, while the other acts like a south pole. The magnetic field produced by a long solenoid has all the properties of the field produced by a bar magnet.
16	A.C can be stepped up and stepped down which means that the voltage can be increased or decreased. Hence it can be transmitted to long distances without much loss of energy. So A.C is preferred over D.C.
17	The S.I unit of magnetic field is Tesla (T). The magnetic field strength is said to be one Tesla if 1meter long conductor carrying 1 ampere current experiences 1 Newton force, when placed perpendicular to the direction of magnetic field.
18	**Bar Magnets** The bar magnet is a permanent magnet. It produces a comparatively weak force of attraction. The strength of a bar magnet cannot be changed. The polarity of a bar magnet is fixed and cannot be changed. **Electromagnets** An electromagnet is a temporary magnet. It produces a very strong magnetic force. The strength of an electromagnet can be changed by changing the number of turns in its coil or by changing the current passing through it.

	The polarity of an electromagnet can be changed by changing the direction of current in its coil.
19	(i) If one of the appliances is switched off or gets fused, there is no effect on the other appliances and they keep on operating. (ii) The same voltage of the main line is available for all electrical appliances.
20	A fuse wire is made of tin alloy because it has low melting point, so that it may melt easily, whereas a copper wire cannot be used as a fuse wire because it has a high melting point due to which it will not melt easily when a short circuit takes place.
21	(i) Solenoid: A coil of many circular turns of insulated copper wire wrapped in the shape of cylinder is called solenoid.  Field lines of the magnetic field through and around a current-carrying solenoid The pattern of magnetic field lines inside the solenoid indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid. (ii) Magnetic field lines around a bar magnet.  Following are the distinguishing features between the two fields. (a) A bar magnet is a permanent magnet whereas solenoid is an electromagnet, therefore field produced by solenoid is temporary and stay till current flows through it. (b) Magnetic field produced by solenoid is stronger than magnetic field of a bar magnet.

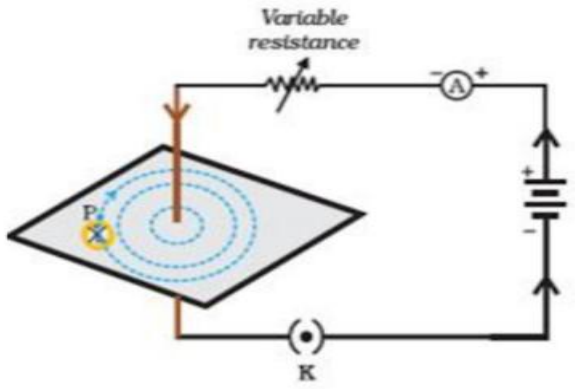
22	 Magnetic field lines of the field produced by a current-carrying circular loop.
23	(i) No, alpha particle will not experience any force if it is at rest, because only moving charge particle can experience force when placed in a magnetic field. (ii) No, alpha particle will not experience any force if it moves in the magnetic field parallel to field lines because charge particle experiences force only when it moves at an angle other than 0° with magnetic field. (iii) Alpha particle will experience a force in the direction perpendicular to the direction of magnetic field and direction of motion of alpha particle.
24	The metal body of appliances like fridge, cooler, mixer etc. are connected to a an earth wire so that any leakage of current to the body of the appliance goes to the earth and does not give electric shock. This is called earthing. It is used as a safety measure in order to prevent electric shocks to the users.
25	**Short circuiting** If the plastic insulation of the live wire and neutral wire gets torn, then the two wires touch each other. This touching of the live wire and neutral wire directly is known as short-circuiting. The current passing through the circuit formed by these wires is very large and consequently a high heating effect is created which may lead to fire. **Overloading** The current flowing in domestic wiring at a particular time depends on the power ratings of the appliances being used. If too many electrical appliances of high power rating are switched on at the same time, they draw an extremely large current from the circuit. This is known as overloading. Due to this large current flowing through them, the copper wires of household wiring get heated to a very high temperature and may lead to fire.

26	**Ans: (A)** Fleming's left-hand rule is used to determine the direction of force experienced by a current carrying conductor placed in a uniform magnetic field. Acc to Fleming's Left Hand Rule: When a current carrying conductor is placed in a magnetic field, it experiences a force, whose direction is given by Fleming's left hand rule, which states that "Stretch the forefinger, the central finger and the thumb of your left hand mutually perpendicular to each other. If the forefinger shows the direction of the field and the central finger that of the current, then the thumb will point towards the direction of motion of the conductor, i.e., force."  **(B)** Force on electron is maximum in (i) case because the electron direction show that it is moving at right angle to the direction of a magnetic field. Force on electron is minimum in (iii) case as the electron shown is moving parallel to the direction of a magnetic field. The direction of maximum force acting on an electron in (i) case which is into the plane of paper in accordance with Fleming's left hand rule.
	OR (1) The pattern of magnetic field lines of a current carrying solenoid is shown below:  (2) The pattern of magnetic field lines of a bar magnet is shown below: 

(ii) Distinguishing features between :

Magnetic field lines of a current carrying solenoid	Magnetic field lines of a bar magnet
If we cut a solenoid into two halves, the magnetic field strength of the halves gets decreased.	When we cut a bar magnet into two halves, the magnetic properties do not change and both act as a magnet.
The poles of a solenoid can be altered and hence the direction of magnetic field lines.	In case of a bar magnet, it is fixed.

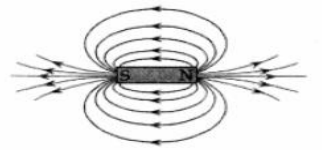
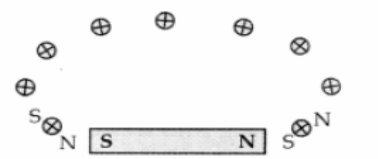
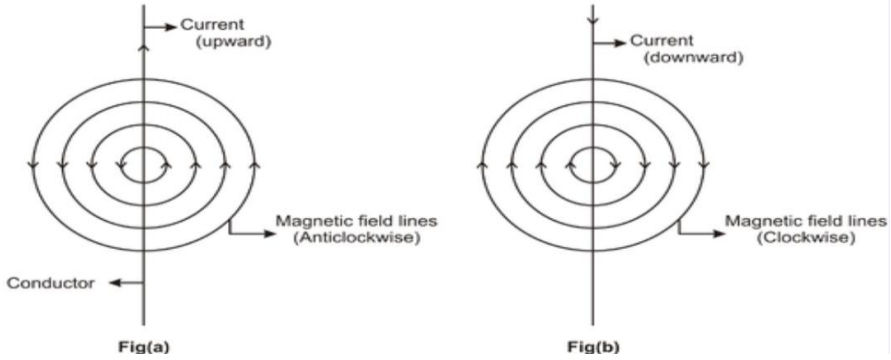
27 a)

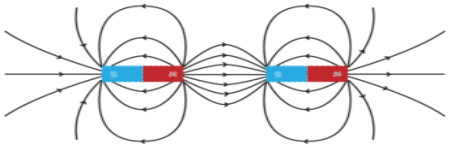
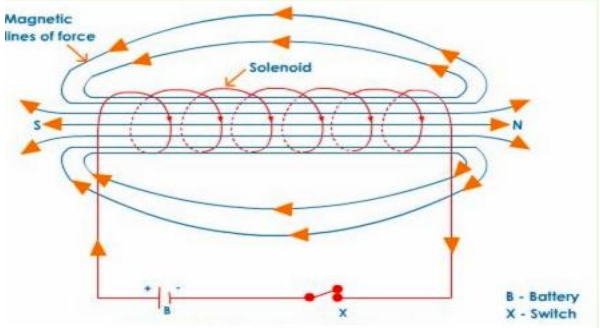


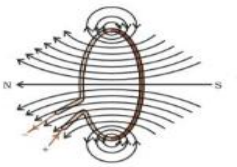
b) The strength of magnetic field due to a current-carrying straight conductor is inversely proportional to the normal distance between the conductor and the point where magnetic field is to be determined. So as the point as moved away the strength of the magnetic field goes on decreasing.

Using a compass needle we can determine the magnetic field. When we move away from the compass needle from the straight wire, the deflection of the needle decreases which implies the strength of the magnetic field decreases, as the strength of magnetic field produced by a straight wire at any point is inversely proportional to the distance of the point from the wire.

28 A bar magnet is placed on a sheet of paper and its boundary is marked with a pencil. A magnetic compass is brought near the N-pole of the bar magnet. It is observed that N-pole of magnet repels the N-pole of compass needle due to which the tip of the compass needle moves away from the N-pole. Thus a magnetic field pattern is obtained around a bar magnet. Each magnetic field line is directed from the north pole of a magnet to its south pole. The field lines are closest together at the two poles of the

	bar magnet. The strength of magnetic field is indicated by the degree of closeness of the field lines. So the magnetic field is the strongest near the poles.  *Drawing of a magnetic field line with the help of a compass needle*  *Field line around a bar magnet* (b) (i) The direction of magnetic field lines inside a bar magnet is from its south pole to its north pole. (ii) The direction of magnetic field lines outside a bar magnet is from its north pole to its south pole.
29	a) The force experienced by a current carrying conductor placed in a magnetic field is largest when the conductor is placed with its length in a direction perpendicular to that of magnetic field b) It is thicker so that it does not enter into the live or neutral sockets. It is made longer so that it gets connected to the earth terminal earlier than the live and neutral pins. This ensures the safety of the user. No, two magnetic field lines can ever intersect each other. If they do, then it would mean that at the point of intersection there are two directions of magnetic field, which is not possible
30	(i) Magnetic effects of electric current. (ii) Compass needle (iii) Right Hand Thumb rule is used to find the direction of the magnetic field for a straight current carrying conductor. It states that, if we point the thumb of our right hand in the direction of the current, then the direction in which our fingers curl gives the direction of the magnetic field. OR By drawing the tangent at any point of the field line. 
31	i

	 ii. Field lines arise from North Pole and end into South Pole of the magnet. They are closed curves. Field lines never intersect each other
32	(iv) According to right hand thumb rule, the magnetic field lines produced is: Into the plane of the paper in at R Out of it at S (v) Magnetic field strength for a straight current carrying conductor is inversely proportional to the distance from the wire. So, as distance from the conductor decreases, magnetic field strength increases. Since r2 < r1 Magnetic field strength at S will be greater than magnetic field strength at R. (vi) If the polarity of the battery connected to the wire is reversed, then the direction of current through the conductor is also reversed i.e., current will now flow from top to bottom and the direction of magnetic field lines will also be reversed. Now, the magnetic field lines will be: Out of the plane of the paper at R Into the plane of the paper in at S Right Hand Thumb rule is used to find the direction of the magnetic field for a straight current carrying conductor. It states that, if we point the thumb of our right hand in the direction of the current, then the direction in which our fingers curl gives the direction of the magnetic field.
33.	A long cylindrical coil of insulated copper wire of large number of circular turns is called Solenoid. And when a current passed through a solenoid. it produced magnetic field around it. The magnetic field pattern produced by a current carrying Solenoid is similar to the magnetic field produced by a bar magnet.  The field lines inside the solenoid are in the form of parallel straight lines. Which indicates that the magnetic field is the same at all points inside the solenoid. i.e. the field is uniform inside the solenoid.

34	 Name of rule- Right hand thumb rule. When a current carrying straight conductor is held in the right hand in such a way that the thumb points towards the direction of the current, then the fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

Prepared by: *Ms Anu Annie Mathews*	*Checked by:* *HOD Science*