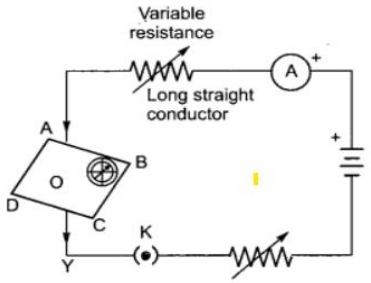
INDIAN SCHOOL AL WADI AL KABIR		
Class: X	DEPARTMENT OF SCIENCE -2022-23 SUBJECT: PHYSICS	DATE OF COMPLETION: 24.11.2022
WORKSHEET NO:4 WITH ANSWERS	TOPIC: MAGNETIC EFFECTS OF ELECTRIC CURRENT	A4 FILE FORMAT (PORTFOLIO)
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

OBJECTIVE TYPE QUESTIONS

1. Choose the incorrect statements from the following regarding magnetic lines of field.
(a) the direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points
(b) magnetic field lines are closed curves
(c) if magnetic field lines are parallel and equidistant, they represent zero field strength
(d) relative strength of magnetic field is shown by the degree of closeness of the field lines.
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 magnetise a piece of magnetic material like soft iron, when placed inside the coil
(c) the pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet
(d) the N- and S-poles exchange position when the direction of current through the solenoid is reversed.

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

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.

8. Assertion: Electro magnet is a temporary magnet.

   Reason: A current carrying solenoid acts as a magnet.

9. 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.

10. 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.

VERY SHORT ANSWER TYPE QUESTIONS

11. Define a solenoid. Compare the magnetic field produced by a solenoid with that of a bar magnet?

12. Give two important advantages of AC over DC

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

SHORT ANSWER TYPE QUESTIONS

14. Distinguish between a bar magnet and an electromagnet.

15. Give two reasons why different electrical appliances in a domestic circuit are connected in parallel.

16. Why is a fuse wire made of a tin-lead alloy and not copper?

17. What is solenoid? Draw the pattern of magnetic field lines of
    (i) a current carrying solenoid and
    (ii) a bar magnet.

    List two distinguishing features between the two fields. (Delhi 2019)

18. Draw the magnetic field lines through and around a single loop of wire carrying electric current. (Board Term I, 2016)

19. 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)

20. What is meant by earthing? Why should electrical appliances be earthed?

21. Explain what is short-circuiting and overloading in an electric supply.

LONG ANSWER TYPE QUESTIONS

22. (a) Draw magnetic field lines produced around a current carrying straight conductor passing through cardboard. How will the strength of the magnetic field change, when the point where magnetic field is to be determined, is moved away from the straight wire carrying constant current? Justify your answer.
    (b) Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Give reason.

23. (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)

24.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?

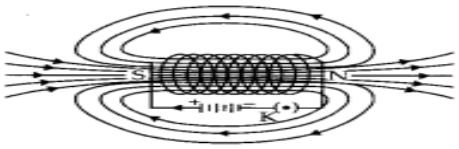
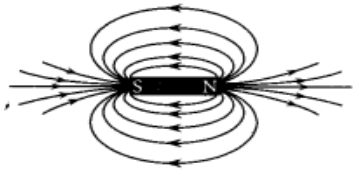
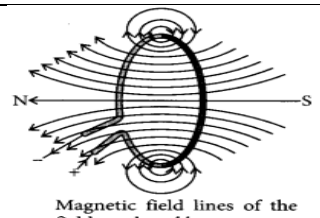
CASE STUDY BASED QUESTIONS

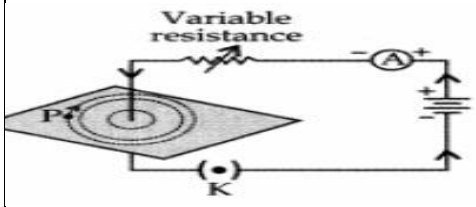
25. Andre Marie Ampere suggested that a magnet must exert an equal and opposite force on a current carrying conductor, which was experimentally found to be true. But we know that current is due to charges in motion. Thus, it is clear that a charge moving in a magnetic field experience a force, except when it is moving in a direction parallel to it. If the direction of motion is perpendicular to the direction of magnetic field, the magnitude of force experienced depends on the charge, velocity (v) , strength of magnetic field (B), and sine of the angle between v and B.

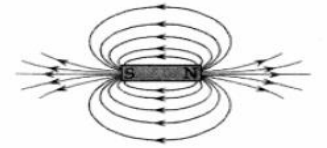
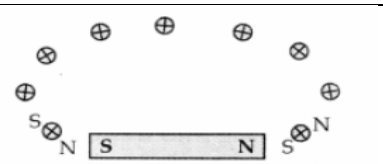
(a) Which rule is given by the direction of magnetic force?

(b) Write the statement of the rule?

Q.no	ANSWER KEY
1	(c) if magnetic field lines are parallel and equidistant, they represent zero field strength
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	(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
9	(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
10	(c) Assertion is true but the Reason is false.
11	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.
12	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.
13	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.
14	**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.
15	(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.
16	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.
17	(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.
18	 Magnetic field lines of the field produced by a current-carrying circular loop.
19	(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.
20	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.
21	**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.
22	(a) (i) The magnetic field lines around a straight conductor carrying resistance current are concentric circles whose centre lies on the wire. (ii) When a point where magnetic field is to be determined is moved away from the straight wire, the strength of the magnetic field decreases because as we move away from a current carrying straight conductor, the concentric circles around it representing magnetic field lines become larger and larger indicating the decreasing strength of magnetic field.  (b) Yes, current is induced in the coil B. Because as the current in the coil A changes, the magnetic field lines around the coil B also change. Therefore, the change in magnetic field lines associated with the coil B is the cause of induced electric current in it.
23	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.
24	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. c) 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
25	a) Fleming's left hand rule. b) It states that if we stretch thumb, forefinger or the index finger and the middle finger in such a way that they are mutually perpendicular to each other then the thumb gives the direction of the motion or the force acting on conductor, index finger gives the direction of magnetic field and the middle finger gives the direction of current.

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