

## Chapter 13- Magnetic Effects of Electric Current

### KEY POINTS

1. Magnetic field and lines of force: The region in which a magnetic force can be detected is called magnetic field. Field lines are used to represent a magnetic field. A field line is the path along which a free north pole tends to move.
2. The direction of magnetic field at a point is given by the direction which a north pole placed at that point would take.
3. Electro-magnetism: Whenever current is passed through a conductor, it produces a magnetic field around it. This phenomenon was discovered by H.C.Oersted.
4. The magnetic field lines around a current carrying wire is in the form of concentric circles whose direction is given by the right hand thumb rule. The strength of field due to a current carrying conductor depends on the strength of the current and the distance of the conductor to the point considering.
5. Magnetic field due to a circular coil depends on the strength of current, radius of the loop and the no. of turns of the coil.
6. Magnetic field due to a solenoid carrying current is similar to that of a bar magnet.
7. Electro magnet consists of a core of soft iron wrapped around with a coil of insulated copper wire. Hard steel and alloys like nipermag, alnico etc are used for making permanent magnets, while soft iron is used for temporary magnets.
8. A current-carrying conductor placed in a magnetic field will experience a force. The magnitude of this force depends on the length of the conductor, current flowing through it and the strength of magnetic field. The direction of force acting on a current-carrying conductor is given Fleming's left hand rule. An electric motor is a device based on the above principle in which electric energy is converted into mechanical energy.

9. The phenomenon in which an induced current is produced in a coil due to the relative motion between a magnet and the coil is called electro-magnetic induction which was discovered by Michael Faraday. The direction of induced current is given by Fleming's right hand rule. An electric generator is a device based on electro-magnetic induction in which mechanical energy gets converted into electrical energy.
10. In domestic circuits, all appliances are connected in parallel. Fuse is the most important safety device, used for protecting the circuits due to short circuit or overloading.

### Questions from Board Exam Papers and CBSE Sample Papers

1. What is a magnetic field? What are field lines around a magnet?
2. List the characteristic properties of magnetic field lines.
3. Sketch the pattern of magnetic field lines around a bar magnet.
4. Sketch the pattern of magnetic field lines around a current-carrying straight conductor and state the factors on which the strength of magnetic field depends.
5. State right hand thumb rule to find the direction of magnetic field around a current –carrying straight conductor. How will this magnetic field be affected on (a) Increasing the current through the conductor.  
(b) Changing the direction of flow of current in the conductor.
6. A student performs an experiment to study the magnetic effect of current around a current-carrying straight conductor. He reports that (a) The direction of deflection of the north pole of the compass needle kept at a given point near the conductor remains unaffected even when the terminals of the battery sending current in the wire are interchanged. (b) For a give battery, the

degree of deflection of N pole decreases when the compass is kept at a farther away from the conductor. Which of the above observations of the student is incorrect and why?

7. Describe with a neat diagram an activity to show that a straight conductor carrying direct current produces a magnetic field around it. State the rule which determines the direction of magnetic field thus produced.
8. Draw the lines of force (indicating the direction) of magnetic field through and around (a) a single loop of wire carrying direct current. (b) a solenoid carrying direct current.
9. What are the factors on which the magnetic field due to a current-carrying circular coil depends? Also explain the pattern of field lines produced in and around a circular coil.
10. Draw the pattern of magnetic field lines of a current-carrying solenoid. What does the pattern of field lines inside a solenoid indicate? Write one application of magnetic field of current-carrying solenoid.
11. What is an electro-magnet? Draw a diagram showing an electro-magnet.
12. The magnetic field in a given region is uniform. Draw a diagram to represent it.
13. (a) Describe with diagram an experiment to show that a force is exerted on a current-carrying conductor when placed perpendicular in a magnetic field. (b) State the rule to find the direction of the force exerted on a current-carrying conductor in a magnetic field. (c) A current-carrying straight conductor is placed in the East-West direction. What will the direction experienced by the conductor due to earth's magnetic field?

14. Why does a current-carrying conductor kept in a magnetic field experience force? On what factors does the direction of this force depend? Name and state the rule used for determination of direction of this force.
15. With a labeled diagram, describe the construction and working of an electric motor. What is the function of split ring commutator in a motor?
16. What is the use of a commutator? Name the component in an electric motor which acts as a commutator.
17. What is an armature? Mention the alternative methods adopted in commercial motors to enhance their power.
18. Explain the principle of an electric motor. Name some appliances in which the electric motor is used.
19. A positively charged particle projected towards West is deflected towards North by a magnetic field. What is the direction of the magnetic field?
20. Explain the meaning of the word “electro-magnetic” and “induction” in the term electro-magnetic induction. On what factors does the value of induced current produced in a circuit depend? Name and state the rule used for determination of direction of induced current. State one practical application of this phenomenon in everyday life.
21. Why is electro-magnetic induction so called? A coil connected to a sensitive galvanometer is held stationary. A bar magnet with its North Pole facing coil is moving towards the coil at a certain speed. The galvanometer needle shows deflection of 10 divisions towards right of the centre of the scale. How will the reading on the galvanometer scale be affected if the south pole of the bar magnet facing the coil is moved away at the same speed?

22. Describe an activity to demonstrate the phenomenon of electro-magnetic induction.
23. State Fleming's right hand rule. How is this rule useful?
24. Explain different ways to induce current in a coil.
25. (a) With the help of a neat labeled diagram, explain the construction and working of an electric generator. What is the function of brushes? (b) How does a D.C generator differ from that of A.C generator?
26. How does A.C differ from D.C? Which sources produce alternating current? What is the frequency of alternating current in India
27. Draw a schematic labeled diagram of a domestic electric circuit which includes a mains fuse, a power meter, a light point, a fan and a power plug.
28. What do you mean by (a) short circuit and (b) overloading? What are the safety precautions taken to avoid these problems in domestic electric circuits?
29. (a) An electrician put a fuse rating of 5A in that part of domestic electric circuit in which an electric heater of rating 1.5kW, 220V is operating. What is likely to happen in this and why? What change, if any, needs to be made? (b) You are given the following current time graphs from two different sources. (i) Name the type of current in two cases. (ii) Identify any one source for each type of these currents. (iii) What is the frequency of current in case II in India? (iv) Use above graphs to write two differences between the current in two cases.
30. An electrician assembling a household circuit uses a long thick copper wire with green insulation and a short wire made up of copper-tin alloy. What are

the two wires called? Mention the importance of each wire in an electric circuit. How are the two wires connected in the circuit?

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