PRACTICE PAPER (2026–27)

Chapter 12: Magnetic Effects of Electric Current

CLASS: X **SUBJECT: SCIENCE** **DURATION: 1½ hrs** **MAX. MARKS: 40**

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections: **A**, **B**, **C**, **D**, and **E**.
3. **Section A** comprises 10 Multiple Choice Questions (including Assertion-Reason) of 1 mark each.
4. **Section B** comprises 4 questions of 2 marks each.
5. **Section C** comprises 3 questions of 3 marks each.
6. **Section D** comprises 1 question of 5 marks (with internal choice).
7. **Section E** comprises 2 Case Study Based Questions of 4 marks each.
8. Use of calculators is strictly prohibited.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The magnetic field lines inside a long current-carrying straight solenoid are:

   (a) Circular and concentric (b) Parallel straight lines

   (c) Elliptical loops (d) Radially outward lines

2. A positively charged particle (alpha particle) projected towards the west is deflected towards the north by a magnetic field. The direction of the magnetic field is:

   (a) Towards south (b) Towards east

   (c) Downward (d) Upward

3. The strength of the magnetic field around a straight current-carrying conductor:

   (a) Increases with distance from the wire (b) Decreases with distance from the wire

   (c) Is independent of distance from the wire (d) Is uniform at all points in space

4. Which of the following correctly describes the magnetic field lines near a long straight wire?

   (a) Straight lines perpendicular to wire (b) Straight lines parallel to wire

   (c) Radial lines originating from wire (d) Concentric circles centred on wire

5. A commercial electric motor uses which of the following to enhance its output power?

   (I) An electromagnet in place of a permanent magnet

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

   (III) A large number of turns of conducting wire in current-carrying coil

   (a) (I) and (II) only (b) (II) and (III) only

   (c) (I) and (III) only (d) (I), (II) and (III)

6. At the time of a short circuit, the current in the domestic circuit:

   (a) Reduces substantially (b) Does not change

   (c) Increases heavily (d) Fluctuates continuously

7. In Fleming's Left-Hand Rule, the forefinger points in the direction of:

   (a) Force on the conductor (b) Magnetic field

   (c) Induced current (d) Electric current

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

(a) AC generator has an electromagnet while DC has permanent magnet

(b) DC generator will generate higher voltage

(c) AC generator will generate higher voltage

(d) AC generator has slip rings while DC generator has a split-ring commutator

Directions for Q9 and Q10: In each question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Mark the correct choice as:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

9. **Assertion (A):** Two magnetic field lines never intersect each other at any point.
   Reason (R): If two field lines were to intersect, a magnetic compass placed at that point would point in two different directions simultaneously, which is physically impossible.

10. **Assertion (A):** The metallic body of appliances like an electric iron or refrigerator is connected to the earth wire.
    Reason (R): The earth wire provides a very high resistance path for leakage current to prevent fires.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. State any two important properties of magnetic field lines.

12. State the Right-Hand Thumb Rule. How is it used to find the direction of magnetic field lines around a straight current-carrying wire?

13. Why is a soft iron core placed inside a current-carrying solenoid used to make an electromagnet, rather than using steel?

14. What is the function of an earth wire in domestic electrical circuits? Why is it essential to earth metallic appliances?

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. State Fleming's Left-Hand Rule. Name any two common electrical devices whose functioning is based on the force experienced by a current-carrying conductor in a magnetic field.

16. A current-carrying straight conductor is placed in a uniform magnetic field.
    a. Under what condition is the force experienced by the conductor maximum?
    b. Under what condition is the force experienced by the conductor zero?
    c. What happens to the direction of force if both the direction of current and the direction of magnetic field are reversed simultaneously?

17. Distinguish between short-circuiting and overloading in domestic electrical circuits. State any two preventive safety measures used to protect household circuits against them.

SECTION – D

Question 18 carries 5 marks.

18. a. What is an electric motor? State its underlying working principle.
    b. Draw a neat, labelled schematic diagram of a simple DC electric motor.

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c. Explain the function of:
(i) Split-ring commutator (ii) Carbon brushes.

OR

a. What is a solenoid? Draw the magnetic field lines inside and outside a current-carrying solenoid.

b. How does the magnetic field inside a long current-carrying solenoid compare with that of a bar magnet? State two differences between an electromagnet and a permanent magnet.

c. Mention two practical methods by which the magnetic field strength of a solenoid can be increased.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. **Read the passage given below and answer the questions that follow:**

> *In 1820, Danish physicist Hans Christian Oersted accidentally discovered that a compass needle placed near a wire experienced deflection whenever electric current flowed through the circuit. When the direction of current was reversed, the direction of needle deflection was also reversed. This landmark experiment provided the first concrete proof of the relationship between electricity and magnetism, giving birth to electromagnetism. The magnetic field produced around a straight conductor consists of concentric circular loops whose intensity is directly proportional to current strength and inversely proportional to distance from the wire.*

a. What does the deflection of a magnetic compass needle near a current-carrying wire indicate? **[1 Mark]**

b. A horizontal wire carries a current from east to west. In what direction will the magnetic field point at a point directly below the wire? **[1 Mark]**

c. A compass needle is kept at a fixed distance from a straight current-carrying conductor.
(i) What change is observed in the deflection if current through the wire is doubled?
(ii) What happens if the compass is moved farther away from the wire? **[2 Marks]**

OR

c. Describe an activity using cardboard, iron filings, and a straight vertical copper wire connected to a battery to map the pattern of magnetic field lines around a straight current-carrying wire. **[2 Marks]**

20. **Read the passage given below and answer the questions that follow:**

> *In our homes, electrical power is supplied through the main distribution board via three distinct insulated wires: the live wire (usually red or brown insulation) at a potential of 220 V, the neutral wire (black or blue insulation) maintained near zero potential, and the earth wire (green or yellow-green insulation) connected to a metal plate buried deep in the ground. The potential difference across the live and neutral wires in India is 220 V with an AC frequency of 50 Hz. To protect appliances and avoid hazardous fires, safety devices such as fuses and miniature circuit breakers (MCBs) are connected in series along the live line.*

a. What is the potential difference between the live wire and the neutral wire in standard domestic power supply in India? **[1 Mark]**

b. What is meant by the statement that the domestic AC supply in India has a frequency of 50 Hz? **[1 Mark]**

c. Two electrical appliances—an electric bulb rated 60 W and an electric heater rated 2000 W—are to be used in a house.
(i) Which ratings of domestic circuits (5 A or 15 A) should each appliance be connected to?
(ii) Why should appliances with high power ratings never be operated on a 5 A line? **[2 Marks]**

OR

c. State what happens when a live wire comes into direct physical contact with a neutral wire. Explain how a safety fuse mitigates this hazard. **[2 Marks]**

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