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Magnetic Effects of Electric Current — CBSE Class 10 Science Chapter Test

FREE CHAPTER TEST · CLASS X · SCIENCE (086) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	20 (A 10 · B 4 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 20 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–14 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q15–17 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q18 is a long answer (LA) type question, carrying 5 marks.
7. In Section E, Q19–20 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class X Science (086) Sample Question Paper 2026-27, at about half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Magnetic Effects of Electric Current · **Topics:** Magnetic field and field lines · Field of a straight conductor · Field of a circular loop and a solenoid · Force on a current-carrying conductor · Fleming's left-hand rule · Direct and alternating current · Domestic electric circuits

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. The magnetic field lines around a long straight conductor carrying a current are 1

(A) straight lines parallel to the conductor

(B) concentric circles centred on the conductor

(C) straight lines pointing away from the conductor

(D) ellipses with the conductor at one end

2. The magnetic field inside a long current-carrying solenoid 1

(A) is the same at all points, shown by parallel straight lines

(B) is zero

(C) is strongest near the wire and zero along the axis

(D) forms concentric circles around the axis

3. A horizontal wire carrying a current from west to east is placed in a uniform magnetic field directed vertically downwards. The force on the wire is towards the 1

(A) west

(B) south

(C) north

(D) east

4. The frequency of the alternating current supplied to homes in India is 1

(A) 60 Hz

(B) 100 Hz

(C) 220 Hz

(D) 50 Hz

5. In domestic wiring, the earth wire is usually covered with insulation of colour 1

(A) green

(B) red

(C) black

(D) blue

6. The magnetic field at the centre of a circular coil carrying a current becomes stronger if 1

(A) the current is reduced

(B) the coil is made with fewer turns

(C) the direction of the current is reversed

(D) the number of turns is increased

7. The force on a current-carrying conductor placed in a magnetic field is the largest when the conductor is 1

(A) parallel to the magnetic field

(B) perpendicular to the magnetic field

(C) at 45° to the magnetic field

(D) carrying no current

8. Short-circuiting in a domestic circuit happens when 1

(A) too many appliances are switched on in one socket

(B) the earth wire is broken

(C) the live wire and the neutral wire come into direct contact

(D) a fuse of higher rating is used

9. **Assertion (A):** Two magnetic field lines never cross each other. 1

Reason (R): If they crossed, a compass needle placed at that point would have to point in two directions at once, which is not possible.

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** Alternating current is preferred to direct current for supplying electric power over long distances. 1

Reason (R): The direction of a direct current reverses periodically.

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 4 very short answer (VSA) type questions of 2 marks each.

11. (a) State the right-hand thumb rule. A vertical wire passing through a horizontal cardboard carries a current upwards. What is the direction of the magnetic field lines on the cardboard, seen from above? 2

OR

(b) Write three properties of magnetic field lines, and explain how a field-line diagram shows where the field is stronger.

12. A circular coil lies flat on a table, and a current flows through it clockwise as you look down on it. What is the direction of the magnetic field at the centre of the coil? What happens to the field if the current is doubled? 2

13. What is the function of the earth wire in domestic circuits? Why is it necessary to earth appliances with metallic bodies? 2

14. An electric heater rated 2.2 kW is used on the 220 V mains. Find the current it draws. Should it be connected to the 5 A or the 15 A circuit of the house? Give a reason. 2

SECTION C

This section comprises 3 short answer (SA) type questions of 3 marks each.

15. (a) (i) Describe the magnetic field of a current-carrying solenoid. (ii) How is a solenoid used to make an electromagnet? (iii) Give two ways to make the electromagnet stronger. 3

OR

(b) A compass needle placed near a long straight wire is deflected when a current flows through the wire. What happens to the deflection when (i) the direction of the current is reversed, (ii) the current is increased, (iii) the compass is moved farther from the wire?

16. State Fleming's left-hand rule. A beam of electrons moving horizontally from south to north is deflected upwards by a magnetic field. Find the direction of the field. What would happen if the field were reversed? 3

17. (i) Name the three wires that come into a house in the mains supply, and give the colour of insulation of each. (ii) What is the potential difference between the live and the neutral wire? (iii) How are appliances connected to the mains, and why? 3

SECTION D

This section comprises 1 long answer (LA) type questions of 5 marks each.

18. (a) (i) What is overloading in a domestic circuit? 5
(ii) What is short-circuiting?
(iii) How does a fuse protect the circuit?
(iv) A circuit of a house has a 5 A fuse and works on 220 V. Four 100 W bulbs and a 1 kW electric iron are switched on together. Find the current, and say what happens.
(v) Give two precautions that prevent overloading.

OR

(b) A small aluminium rod is suspended horizontally between the poles of a horseshoe magnet, perpendicular to the field, and a current is passed through it.
(i) What is observed?
(ii) What happens when the direction of the current is reversed?
(iii) What happens when the poles of the magnet are interchanged, with the current as in (i)?
(iv) State the rule that gives the direction of the force.
(v) In which position of the rod relative to the field does no force act on it?

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

19. A thick copper wire is passed vertically through a hole in a horizontal sheet of cardboard, and iron filings are sprinkled on the cardboard. When a current is passed through the wire and the cardboard is tapped gently, the filings arrange themselves in a pattern.

(i) Describe the pattern formed by the iron filings. [1]

(ii) Name the rule used to find the direction of the magnetic field. [1]

(iii) How does the strength of the field at a point change if (1) the current is increased, (2) the point is farther from the wire? [2]

OR

(iii) The current flows downwards through the wire. Find the direction of the magnetic field at a point due east of the wire. [2]

20. Electricity is supplied to homes as alternating current (AC) at 220 V and 50 Hz, while the batteries of a torch and a mobile phone supply direct current (DC).

(i) What is meant by alternating current? [1]

(ii) What does a frequency of 50 Hz mean? [1]

(iii) Give one important advantage of AC over DC, and name one source of DC. [2]

OR

(iii) How does direct current differ from alternating current? Find how long the AC supply takes to complete one cycle. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(B)	(A)	(C)	(D)	(A)	(D)	(B)	(C)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). The field lines form concentric circles in planes perpendicular to the wire, with the wire at the centre.

Q2. Answer (A). The field lines inside a solenoid are parallel straight lines: the field is uniform there.

Q3. Answer (C). Fleming's left-hand rule: first finger down (field), second finger east (current) — the thumb points north.

Q4. Answer (D). In India the AC supply has a frequency of 50 Hz (and a potential difference of 220 V).

Q5. Answer (A). The live wire has red insulation, the neutral wire black and the earth wire green.

Q6. Answer (D). The field is proportional to the current; with n turns the fields of the turns add up, giving n times the field of one turn. Reversing the current only reverses the field.

Q7. Answer (B). The displacement (force) is largest when the current is at right angles to the field; it is zero when they are parallel.

Q8. Answer (C). If the live and neutral wires touch (damaged insulation or a fault in an appliance), the resistance becomes very small and the current very large. Too many appliances at once is overloading.

Q9. Answer (A). Both true, and R explains A. Answer (A).

Q10. Answer (C). A is true: AC can be transmitted over long distances without much loss of energy. R is false: it is alternating current that reverses periodically; direct current always flows in one direction. Answer (C).

Q11. (2 marks) Answer: (a) thumb along current, fingers give field; anticlockwise from above; (b) closed curves N to S outside, never cross; closeness shows strength.
(a) If you hold the current-carrying straight conductor in your right hand so that the thumb points in the direction of the current, your fingers wrap around the conductor in the direction of the magnetic field lines. [1]
Thumb pointing up (towards the viewer above), so the field lines are anticlockwise circles as seen from above. [1]
OR (b) They emerge from the north pole and merge at the south pole (inside the magnet they go from south to north), so they are closed curves; no two field lines cross. [1]
The relative strength of the field is shown by how close the lines are: where they are crowded, the field is stronger. [1]

Q12. (2 marks) Answer: Vertically downwards, into the table; it doubles.
By the right-hand thumb rule, each part of the coil gives a field that goes down through the inside of the loop: at the centre the field points vertically downwards, into the table. [1]
The field is proportional to the current, so it doubles (its direction is unchanged). [1]

Q13. (2 marks) Answer: Low-resistance path to earth; leakage current goes to earth, not through the user.
The earth wire is connected to a metal plate deep in the earth near the house, and provides a low-resistance conducting path for the current. [1]
If current leaks to the metallic body of an appliance (an iron, a toaster, a refrigerator), it flows to the earth, so the body stays at the potential of the earth and the user does not get a severe electric shock. [1]

Q14. (2 marks) Answer: 10 A; the 15 A circuit.
I = P/V = 2200/220 = 10 A. [1]
The 15 A (power) circuit: 10 A is more than the 5 A circuit can safely carry; heavy appliances such as heaters, geysers and air coolers are run on the 15 A circuit. [1]

Q15. (3 marks) Answer: (a) bar-magnet pattern outside, uniform inside; soft iron core; more current, more turns; (b) reverses; increases; decreases.
(a) (i) The field lines outside are like those of a bar magnet, one end behaving as a north pole and the other as a south pole; inside, the lines are parallel straight lines — the field is uniform. [1]
(ii) A piece of soft iron is placed inside the coil; the strong field inside magnetises it, forming an electromagnet. [1]
(iii) Increase the current; increase the number of turns of the coil. [1]
OR (b) (i) The deflection of the needle reverses. [1]
(ii) The deflection increases: the field is stronger for a larger current. [1]
(iii) The deflection decreases: the field is weaker farther from the wire. [1]

Q16. (3 marks) Answer: Rule; field towards east; deflected downwards.
Stretch the thumb, forefinger and middle finger of the left hand mutually perpendicular: if the forefinger points along the field and the middle finger along the current, the thumb points along the force (motion) on the conductor. [1]
Electrons moving north are a current towards the south. Middle finger south, thumb up: the forefinger points east, so the field is towards the east. [1]
If the field were reversed, the beam would be deflected downwards. [1]

Q17. (3 marks) Answer: (i) live red, neutral black, earth green; (ii) 220 V; (iii) in parallel.
(i) Live wire (red), neutral wire (black) and earth wire (green). [1]
(ii) 220 V. [1]
(iii) In parallel, across the live and neutral wires, with a separate switch for each, so that each appliance gets the same potential difference and can be switched on or off independently. [1]

Q18. (5 marks) Answer: (a) overloading, short-circuit, fuse melts; about 6.4 A, the fuse melts; two precautions; (b) moves; opposite; opposite; the rule; zero when parallel.
(a) (i) Overloading is drawing too much current from a circuit, for example by connecting too many appliances to a single socket, or by an accidental hike in the supply voltage. [1]
(ii) Short-circuiting happens when the live wire and the neutral wire come into direct contact; the current in the circuit increases abruptly. [1]
(iii) The fuse wire melts because of the heating effect when an unduly high current flows, breaking the circuit and protecting the appliances and wiring. [1]
(iv) P = 4 × 100 + 1000 = 1400 W; I = 1400/220 ≈ 6.4 A, more than 5 A, so the fuse melts and the circuit is broken. [1]
(v) Do not connect too many appliances to one socket; run heavy appliances on the separate 15 A circuit (and use a fuse of the correct rating). [1]
OR (b) (i) The rod moves (is displaced) — a force acts on it. [1]
(ii) The rod moves in the opposite direction. [1]
(iii) The rod again moves in the opposite direction, because the field is reversed. [1]
(iv) Fleming's left-hand rule: thumb, forefinger and middle finger of the left hand mutually perpendicular; forefinger along the field, middle finger along the current, thumb gives the direction of the force. [1]
(v) No force acts when the current is parallel (or antiparallel) to the field; the force is largest when they are perpendicular. [1]

Q19. (4 marks) Answer: (i) concentric circles; (ii) right-hand thumb rule; (iii)(a) increases; decreases; (b) south.

(i) Concentric circles around the wire. [1]

(ii) The right-hand thumb rule. [1]

(iii)(a) (1) It increases with the current. [1]

(2) It decreases as the distance from the wire increases. [1]

OR (iii)(b) With the thumb pointing down, the fingers curl clockwise as seen from above. [1]

At a point east of the wire the clockwise circle runs towards the south: the field there points south. [1]

Q20. (4 marks) Answer: (i) reverses periodically; (ii) 50 cycles per second; (iii)(a) long-distance transmission with little loss; cell; (b) DC one way; 0.02 s.

(i) An electric current that reverses its direction periodically. [1]

(ii) The current completes 50 cycles each second. [1]

(iii)(a) Electric power can be transmitted over long distances as AC without much loss of energy. [1]

A cell or battery (dry cell, storage battery). [1]

OR (iii)(b) Direct current always flows in one direction; alternating current reverses its direction periodically. [1]

One cycle takes 1/50 s = 0.02 s. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: every direction found with vector products (Fleming's left-hand rule as I × B, the right-hand thumb rule as I × r), unknown fields by trying every direction, and currents and AC timings computed.