Step-by-Step Solutions & Marking Scheme

CBSE Class 8 Science (Curiosity) — Chapter 4: Electricity: Magnetic and Heating Effects

Quick answer key — Section A: 1-(c) 2-(b) 3-(b) 4-(b) 5-(d) 6-(b) 7-(A) 8-(C)

SECTION A — Multiple Choice Questions

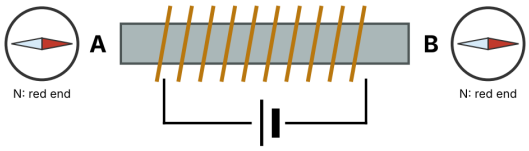
1. Discovery of the magnetic effect → **(c) Hans Christian Oersted**

Oersted (1820) noticed that a compass needle deflected whenever a circuit was closed or opened and showed that an electric current produces a magnetic field. Volta and Galvani worked on cells; Edison is known for inventions such as the electric lamp.

Marking: 1 mark.

2. Fig. 1 → **(b) End A is a south pole and end B is a north pole.**

Fig. 1: Electromagnet with two compasses (current flowing)



Step 1: Unlike poles attract. Near A, the *north* (red) end of the compass points towards A, so A must be a **south** pole.

Step 2: Near B, the *south* end of the needle points towards B, so B attracts a south pole; B is a **north** pole.

Step 3: The two ends of an electromagnet have opposite polarity → (b).

Marking: 1 mark.

3. Fig. 2 → **(b) A battery with more cells makes a stronger electromagnet.**

Step 1: P and Q have the same coil and iron nail; only the number of cells differs (1 and 2).

Step 2: Q attracts 7 clips and P only 3. More cells → larger current → stronger magnetic field → (b).

Step 3: Comparing P and R (iron nail vs no nail) would show the effect of the iron core: it makes the magnet stronger, so (c) is wrong. The turns are the same in P and Q, so (a) cannot be concluded.

Marking: 1 mark.

4. (b) The nichrome wire gets hotter because it offers more resistance to the current.

A nichrome wire has higher resistance than a copper wire of the same size and length, so more electrical energy is converted into heat in it.

Marking: 1 mark.

5. (d) Electric fan

The iron, immersion rod and kettle work on the heating effect. Electric fans, motors, bells and loudspeakers work on the magnetic effect of electric current.

Marking: 1 mark.

6. (b)

In a dry cell the zinc container is the negative terminal and the carbon rod with a metal cap is the positive terminal. Its electrolyte is a thick moist paste (not a liquid), and it is a single-use cell (not rechargeable).

Marking: 1 mark.

7. Assertion–Reason → **(A)**

Step 1: A: nichrome is used for heating elements — true.

Step 2: R: nichrome has higher resistance than copper of the same size and length — true.

Step 3: Higher resistance converts more electrical energy into heat, so R explains A → (A).

Marking: 1 mark.

8. Assertion–Reason → **(C) A is true but R is false.**

Step 1: A is true: with an iron core the coil becomes a stronger magnet.

Step 2: R is false: the nail is not a permanent magnet; it behaves like a magnet only while current flows in the coil.

Step 3: A true, R false → (C).

Marking: 1 mark.

SECTION B — Short Answer Questions

9. Lemon cell (Fig. 3)

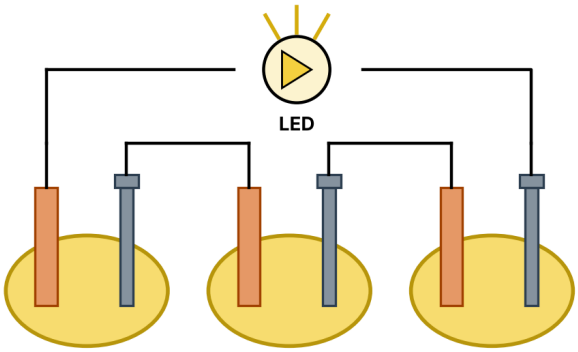


Fig. 3: Cell made using three lemons

(a) Electrodes: the copper strips and the iron nails. Electrolyte: the lemon juice.

(b) The chemicals in the cell get used up over time, so the cell can no longer produce electric current (it becomes ‘dead’).

Marking: (a) ½ + ½; (b) 1.

10. Nichrome wire (Fig. 4)

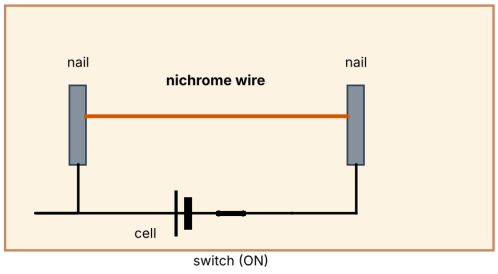


Fig. 4: Circuit with a nichrome wire

(a) The wire offers resistance to the flow of current, and some of the electrical energy is converted into heat energy (heating effect of electric current).

(b) Warmer. Two cells send a larger current, and the heat produced depends on the magnitude of the current.

Marking: 1 mark for each part.

11. Dry cell

(a) Positive terminal: carbon rod (with a metal cap). Negative terminal: zinc container.

(b) It is called ‘dry’ because its electrolyte is a thick, moist paste and not a liquid.

Marking: (a) ½ + ½; (b) 1.

SECTION C — Long Answer Questions

12. Magnetic effect of current (Fig. 5)

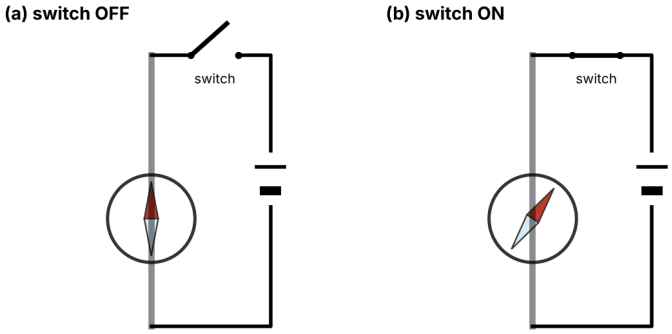


Fig. 5: Compass placed below a wire (wire is parallel to the needle in (a))

(i) In (b) the compass needle is deflected from its original direction; in (a) it is not.

(ii) A wire carrying current produces a magnetic field around it (magnetic effect of electric current).

(iii) Hans Christian Oersted (1820).

(iv) The magnetic effect disappears and the needle returns to its original direction.

Marking: 1 mark for each part.

13. Lifting electromagnet (Fig. 6)

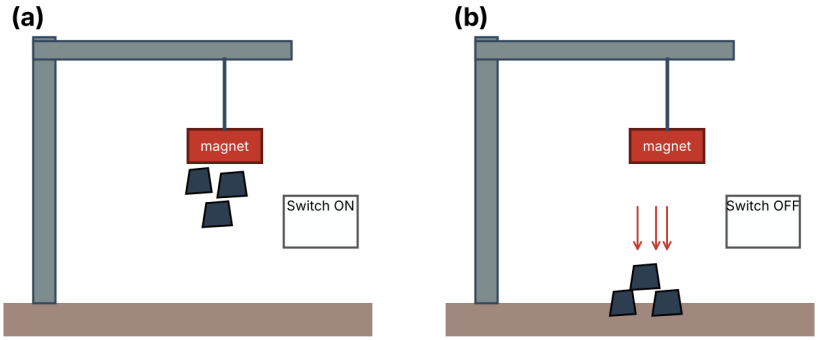


Fig. 6: A crane fitted with a lifting electromagnet, in two situations

(i) When the switch is ON, current flows in the coil, which becomes a strong magnet and attracts the iron scrap.

(ii) When the switch is OFF, the current stops and the magnetic field disappears, so the scrap is no longer held and falls.

(iii) The crane operator can switch an electromagnet ON to pick up and OFF to release the load; a permanent magnet would always hold the iron.

(iv) Any two: increase the current (use more cells / battery); increase the number of turns of the coil; use an iron core.

Marking: 1 mark for each part (½ + ½ in (iv)).

14. Heating effect of electric current

(a) When electric current flows through a conductor, it faces resistance and some electrical energy changes to heat; this heating of the conductor is the heating effect.

(b) Any two: electric room heater, stove, kettle, iron, immersion rod, hair dryer.

(c) Any two: the magnitude of the current, the material of the wire, its thickness, its length, the time for which current flows.

(d) Overheating can damage the plug and socket (plastic parts may melt) and can even cause fires.

Marking: 1 mark for each part.

15. Cells and batteries

(i) Once its chemicals are used up, it cannot be recharged and has to be disposed of.

(ii) They can be recharged and reused many times, which prevents wastage and saves money.

(iii) Used batteries may still contain acids and metals like lead, cadmium, nickel or lithium, which can cause fires or harm the environment; they should go to e-waste recycling facilities.

(iv) Lithium-ion (Li-ion) battery.

Marking: 1 mark for each part.

SECTION D — Case-Based / Practical Questions

16. Electromagnet with different turns (Fig. 7)

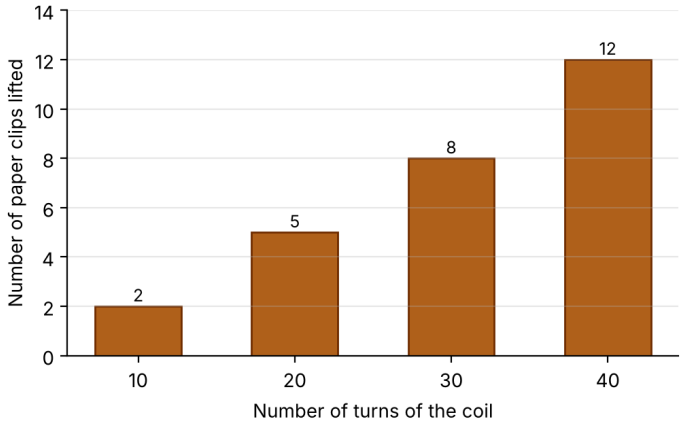


Fig. 7: Clips lifted by electromagnets with different numbers of turns (one cell)

(i) 8 clips (read from the bar for 30 turns).

(ii) As the number of turns increases (10 → 20 → 30 → 40), the number of clips lifted increases (2 → 5 → 8 → 12). More turns give a stronger electromagnet.

(iii) Increase the current (use a battery with more cells).

(iv) The coil becomes weaker, so fewer clips are lifted.

(v) The cell may weaken quickly (and the wire gets warm), so the current should flow only for a few seconds.

Marking: 1 mark for each part.

17. Room heater and safety

(i) The heating effect of electric current.

(ii) Nichrome offers high resistance, so it generates more heat for a given current.

(iii) The large current needed by the heater heated the thin extension board and the old plug, and the heat softened and melted the plastic parts.

(iv) Wires, plugs and sockets rated for the specified current do not get unnecessarily hot, which prevents overheating, damage and fires.

(v) Any two: electric stove, kettle, iron, immersion rod, hair dryer.

Marking: 1 mark for each part (½ + ½ in (v)).

Section	A	B	C	D	Total
Marks	8	6	16	10	40

Note: any other correct and relevant answer should be accepted and awarded full marks.