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NCERT Solutions

*Class 8 Science (Curiosity), step-by-step solutions
for the 2026-27 NCERT (Latest Edition)*

Chapter 4: Electricity: Magnetic and Heating Effects

This chapter connects three ideas: electric current produces a magnetic field, current can heat a conductor, and cells make current through chemical reactions. These solutions explain electromagnets, nichrome heating, Voltaic cells, dry cells, rechargeable batteries, and safe battery use in simple Class 8 language.

Keep the Curiosity Alive

Q 4.1 Fill in the blanks:

(i) The solution used in a Voltaic cell is called _____.

(ii) A current carrying coil behaves like a

SOLUTION

Concept used. A Voltaic cell uses two electrodes and an electrolyte. An electrolyte is a liquid or paste that helps chemical reactions produce electric current. A current carrying coil produces a magnetic field, so it behaves like a magnet.

Recall

The chapter uses the word **electrolyte** for the liquid in a Voltaic cell. It uses **electromagnet** for a coil that behaves like a magnet while current flows.

Step 1. In a Voltaic cell, the rods are electrodes and the liquid is the electrolyte.

Step 2. So blank (i) is filled by **electrolyte**.

Step 3. A coil carrying current behaves like a magnet.

Step 4. So blank (ii) is filled by **magnet**.

Final Answer: (i) electrolyte; (ii) magnet.

Quick reading. Both blanks come from definitions. The first is about the liquid inside a cell. The second is about the magnetic behaviour of a coil.

Step 1. A Voltaic cell has two metal rods placed in an electrolyte.

Step 2. The electrolyte allows the chemical reaction to help current flow.

Step 3. A current carrying coil behaves as a magnet and is called an electromagnet.

The wording of the second blank asks for the simpler word, so “magnet” fits the sentence best.

Final Answer: The answers are electrolyte and magnet.

Q 4.2 Choose the correct option:

(i) Dry cells are less portable compared to Voltaic cells. (True/False)

(ii) A coil becomes an electromagnet only when electric current flows through it.

(True/False)

(iii) An electromagnet, using a single cell, attracts more iron paper clips than the same electromagnet with a battery of 2 cells.

(True/False)

SOLUTION

Concept used. Portability means ease of carrying and using. A dry cell is sealed and compact. An electromagnet needs current. A larger current makes an electromagnet stronger.

Comparison tip

For True or False questions, check the direction of the comparison. “More cells” means a stronger current, not a weaker one.

Step 1. Statement (i) is **False**. Dry cells are more portable than Voltaic cells because they use a moist paste and can be sealed.

Step 2. Statement (ii) is **True**. A coil behaves as an electromagnet only while current flows through it.

Step 3. Statement (iii) is **False**. A battery of 2 cells gives more current than one cell,

so it usually attracts more clips.

Final Answer: (i) False; (ii) True; (iii) False.

EXPERT'S SOLUTION : *Rohit Nair, B.Tech
Engineering Physics, IIT Bombay*

Structural observation. Each statement tests one chapter idea: cell design, current controlled magnetism, and electromagnet strength.

Step 1. A dry cell is designed for daily portable use, so it is not less portable.

Step 2. No current means no magnetic field in the coil, so the coil is not working as an electromagnet.

Step 3. Two cells increase current. Increased current strengthens the magnetic field and helps lift more clips.

Thus the middle statement is the only true one.

Final Answer: False, True, False.

nichrome wire for a short time.

(i) The wire becomes warm.

(ii) A magnetic compass placed below the wire is deflected.

Choose the correct option:

(a) Only (i) is correct

(b) Only (ii) is correct

(c) Both (i) and (ii) are correct

(d) Both (i) and (ii) are not correct

SOLUTION

Concept used. A current carrying conductor produces a magnetic field around it. A conductor also gets heated because it offers resistance to current. Nichrome has high resistance, so heating is easy to notice.

Two effects together

The heating effect and magnetic effect happen at the same time. The question is not asking us to choose only one effect.

Step 1. Current flows through the nichrome wire.

Step 2. Because nichrome offers resistance, some electrical energy becomes heat. The wire becomes warm.

Step 3. The same current also produces a

magnetic field around the wire.

Step 4. A nearby magnetic compass responds to this field, so it deflects.

Final Answer: Option (c), both (i) and (ii) are correct.

EXPERT'S SOLUTION : Aditi Rao, M.Sc Physics, IIT Kanpur

Strategic angle. Think of current as causing two observable changes in a wire: warmth due to resistance and compass deflection due to magnetism.

Step 1. Statement (i) follows from the heating effect of electric current.

Step 2. Statement (ii) follows from the magnetic effect of electric current.

Step 3. Nichrome is named because its heating effect is clear, but the magnetic effect is still present.

So both statements can be true for the same wire at the same time.

Final Answer: The correct option is (c).

Q 4.4 Match the items in Column A with

those in Column B.

Column A

(i) Voltaic cell

(ii) Electric iron

(iii) Nichrome
wire(iv)
Electromagnet**Column B**(a) Best suited for
electric heater(b) Works on magnetic
effect of electric
current(c) Works on heating
effect of electric
current(d) Generates
electricity by chemical
reactions**SOLUTION**

Concept used. Match each item with its main function. A Voltaic cell generates electricity chemically. An electric iron uses heating. Nichrome is used as a heating wire. An electromagnet works by the magnetic effect of current.

Matching tip

First match the most direct entries:
Voltaic cell with chemical reactions and
electromagnet with magnetic effect. Then
the heating entries are easier.

Step 1. A Voltaic cell generates electricity by chemical reactions, so (i) matches (d).

Step 2. An electric iron works on the heating effect of electric current, so (ii) matches (c).

Step 3. Nichrome wire is best suited for electric heaters, so (iii) matches (a).

Step 4. An electromagnet works on the magnetic effect of electric current, so (iv) matches (b).

Final Answer: (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b).

EXPERT'S SOLUTION : *Kavya Sharma, B.Tech
Electrical Engineering, IIT Delhi*

Structural observation. Column B contains two effects and two uses. Link the device or material to its clearest role.

Step 1. The cell is the source of current, so it belongs with chemical reactions.

Step 2. The iron is an appliance that becomes hot for use.

Step 3. Nichrome is the high resistance material used inside heating elements.

Step 4. The electromagnet is the device made from current controlled magnetism.

This leaves a one to one match with no repeated option.

Final Answer: (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b).

Q 4.5 Nichrome wire is commonly used in electrical heating devices because it

- (i) is a good conductor of electricity.
- (ii) generates more heat for a given current.
- (iii) is cheaper than copper.
- (iv) is an insulator of electricity.

SOLUTION

Concept used. The heating effect depends on resistance. Nichrome offers higher resistance

than a copper wire of the same size and length, so it converts more electrical energy into heat.

X Common trap

Do not choose (iv). Nichrome is not an insulator. Current must pass through it for the heating element to work.

Step 1. Heating devices need a wire that becomes hot when current flows.

Step 2. Nichrome has high resistance compared with copper of the same size.

Step 3. Higher resistance produces more heating for a given current.

Step 4. Therefore option (ii) gives the scientific reason.

Final Answer: Option (ii), nichrome generates more heat for a given current.

EXPERT'S SOLUTION : Pranav Iyer, M.Sc Physics, IIT Madras

Quick reading. A heating element must conduct current and also oppose it enough to become hot.

Step 1. If a wire were an insulator, current

would not flow through it properly.

Step 2. If a wire had very low resistance, it would not heat strongly for the same current.

Step 3. Nichrome gives the useful middle case: it conducts current but has high resistance.

That is why it is chosen for heaters, stoves, and similar appliances.

Final Answer: The correct reason is (ii).

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Q 4.6 Electric heating devices (like an electric heater or a stove) are often considered more convenient than traditional heating methods (like burning firewood or charcoal). Give reason(s) to support this statement considering societal impact.

SOLUTION

Concept used. Electric heating devices use the heating effect of electric current. Societal impact means how a method affects people, homes, time, health, safety, and the environment.

♥ Social link

Convenience is not only about speed. It also includes cleanliness, control, health, and effort.

- Step 1.** Electric heaters and stoves can be switched on and off easily.
- Step 2.** Their heating can often be controlled more neatly than a wood or charcoal fire.
- Step 3.** They do not produce smoke inside the room during use, so indoor air stays cleaner.
- Step 4.** They save the effort of collecting, storing, and lighting firewood or charcoal.
- Step 5.** They reduce direct burning at home, which can improve comfort and health.

Final Answer: Electric heating devices are convenient because they are cleaner, easier to control, quicker to start, and reduce smoke and fuel handling at home.

EXPERT'S SOLUTION : *Meera Patel, M.Tech Energy Systems, IIT Bombay*

Strategic angle. Compare the whole user experience, not just the heat produced. A family also cares about time, smoke, safety, and regular use.

Step 1. A firewood or charcoal setup needs fuel collection, ignition, ash handling, and ventilation.

Step 2. An electric heater starts with a switch and can be stopped immediately.

Step 3. Less smoke means better indoor air and less discomfort for people nearby.

Step 4. The device can be used in compact homes where open burning is unsafe or impractical.

The societal benefit is strongest when electricity is available reliably and used safely.

Final Answer: They are more convenient because they are cleaner, controllable, time saving, and healthier for indoor spaces.

Q 4.7 Look at the Fig. 4.4a. If the compass placed near the coil deflects: (i) Draw an arrow on the diagram to show the path of the electric current. (ii) Explain why the compass needle moves when current flows. (iii) Predict what would happen to the deflection if you reverse the battery terminals.

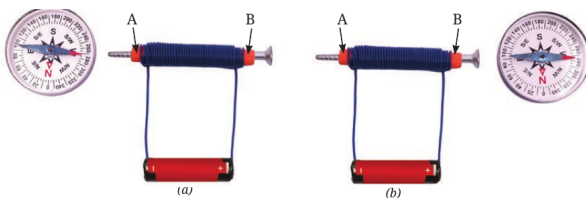


Fig. 4.4: Compass needle near (a) End A; (b) End B of an electromagnet

Fig. 4.4, NCERT Curiosity Class 8 Science, Chapter 4.

SOLUTION

Concept used. Conventional current flows from the positive terminal of a cell through the

outer circuit to the negative terminal. A current carrying coil produces a magnetic field, which acts on a nearby compass needle.

👉 Current path

In Fig. 4.4a, the positive terminal is on the right side of the cell. So the current enters the coil near end B, passes through the coil toward end A, and returns to the negative terminal.

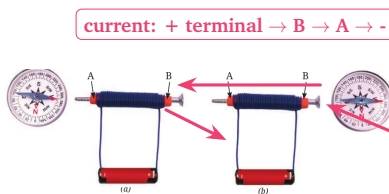


Fig. 4.4: Compass needle near (a) End A; (b) End B of an electromagnet

- Step 1.** Draw arrows from the positive terminal of the cell to end B of the coil.
- Step 2.** Continue the arrow through the coil from B to A.
- Step 3.** Draw the return arrow from end A back to the negative terminal.
- Step 4.** The compass needle moves because the current carrying coil produces a magnetic field.
- Step 5.** If the battery terminals are reversed, the current direction reverses. The

magnetic poles of the coil reverse, so the compass deflects in the opposite direction.

Final Answer: The current path is from the positive terminal to B, through the coil to A, and back to the negative terminal. Reversing the battery reverses the compass deflection.

EXPERT'S SOLUTION : Arjun Menon, M.Sc Applied Physics, IIT Roorkee

Picture-first. The compass is only a detector. It turns because the coil becomes a temporary magnet while current flows.

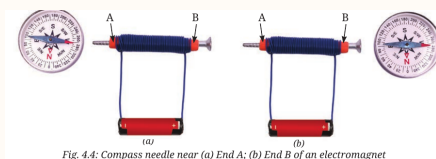


Fig. 4.4: Compass needle near (a) End A; (b) End B of an electromagnet

Fig. 4.4 repeated for the expert explanation.

Step 1. First mark the positive terminal of the cell. It sends conventional current into the outer circuit.

Step 2. In Fig. 4.4a, that path takes the current upward to B, across the coil toward A, and down to the negative

terminal.

Step 3. The coil's magnetic field interacts with the compass needle, which is itself a small magnet.

Step 4. When the cell is reversed, the current direction reverses. The magnetic field direction also reverses.

The compass therefore still deflects, but to the other side.

Final Answer: Current flows + to B to A to -. Reversing the cell reverses the direction of deflection.

Q 4.8 Suppose Sumana forgets to move the switch of her lifting electromagnet model to OFF position (in introduction story). After some time, the iron nail no longer picks up the iron paper clips, but the wire wrapped around the iron nail is still warm. Why did the lifting electromagnet stop lifting the clips? Give possible reasons.

SOLUTION

Concept used. An electromagnet lifts clips only if enough current flows through the coil. The wire can still become warm because even a weak current produces heating in a conductor.

X Common confusion

Warm wire does not always mean strong magnet. Heating can continue even when the current is too weak to lift clips.

- Step 1.** Sumana left the circuit closed for a long time.
- Step 2.** The cell or battery may have weakened because its chemicals were used up.
- Step 3.** A weak cell gives a smaller current through the coil.
- Step 4.** Smaller current produces a weaker magnetic field.
- Step 5.** The weak field may no longer lift the paper clips.
- Step 6.** The wire can still feel warm because the remaining current heats it.
- Step 7.** Another possible reason is a loose contact or increased heating of the

coil, which can reduce effective current.

Final Answer: The electromagnet likely stopped lifting clips because the cell became weak, so the current and magnetic field became too small. The wire was still warm due to the heating effect of the remaining current.

EXPERT'S SOLUTION : *Rahul Verma, B.Tech
Electrical Engineering, IIT Delhi*

Strategic angle. Lifting needs magnetic force. Magnetic force depends on current. Warmth only tells us that some electrical energy is still turning into heat.

Step 1. With the switch left ON, the cell keeps supplying current and gets drained.

Step 2. As the cell weakens, the current through the coil falls.

Step 3. A lower current means a weaker electromagnet.

Step 4. Once the magnetic force is less than the weight of the clips, the clips fall or stop getting picked up.

Step 5. The coil can still be warm because resistance heating continues while current passes.

So the two observations are not contradictory.

Final Answer: The cell became weak or the circuit current fell. The weak current could still heat the wire, but it could not make a strong enough electromagnet.

Q 4.9 In Fig. 4.12, in which case the LED will glow when the switch is closed?

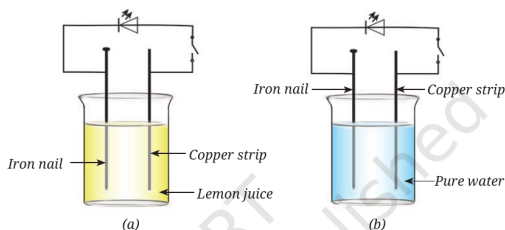


Fig. 4.12

Fig. 4.12, NCERT Curiosity Class 8 Science, Chapter 4.

SOLUTION

Concept used. A simple Voltaic cell needs two different metal electrodes and an electrolyte. Lemon juice acts as an electrolyte because it contains ions. Pure water is a poor conductor and does not support the cell well.

Cell parts

In Fig. 4.12, the iron nail and copper strip are the two electrodes. The liquid decides whether the cell works well.

Step 1. Case (a) has an iron nail, a copper strip, and lemon juice.

Step 2. Lemon juice acts as an electrolyte, so chemical reactions can produce current.

Step 3. If the LED is connected in the correct

direction, current flows and the LED glows.

Step 4. Case (b) uses pure water, which is a poor conductor and does not work well as an electrolyte.

Final Answer: The LED will glow in case (a), the lemon juice cell.

EXPERT'S SOLUTION : Neha Kapoor, M.Sc
Chemistry, IIT Kanpur

Quick reading. The deciding difference is not the metal pair, because both cases use iron and copper. The deciding difference is the liquid.

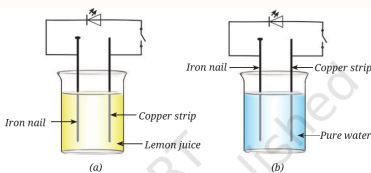


Fig. 4.12 repeated for the expert explanation.

Step 1. Lemon juice contains ions that help charges move inside the cell.

Step 2. This supports the chemical reaction between the two different metals.

Step 3. Pure water has very few ions, so it does not allow enough current for the

LED.

Thus the lemon juice setup is the working one.

Final Answer: Case (a) will make the LED glow, assuming the LED terminals are connected correctly.

Q 4.10 Neha keeps the coil exactly the same as in Activity 4.4 but slides the iron nail out, leaving only the coiled wire. Will the coil still deflect the compass? If yes, will the deflection be more or less than before?

SOLUTION

Concept used. A current carrying coil produces a magnetic field even without an iron core. An iron core makes the electromagnet stronger, so removing it weakens the field.

Key comparison

The coil does not lose all magnetic effect when the nail is removed. It loses the extra strength provided by the iron core.

Step 1. Current still flows through the coiled wire.

- Step 2.** A current carrying coil produces a magnetic field around it.
- Step 3.** Therefore the compass will still deflect.
- Step 4.** The iron nail earlier made the magnetic field stronger.
- Step 5.** After removing the nail, the magnetic field becomes weaker.

Final Answer: Yes, the coil will still deflect the compass, but the deflection will be less than before.

EXPERT'S SOLUTION : *Ishaan Bhat, M.Tech
Applied Physics, IIT Delhi*

Strategic angle. Separate the source of magnetism from the strength booster. Current in the coil creates the field. The iron nail strengthens it.

- Step 1.** The same current in the same coil still gives a magnetic field.
- Step 2.** That field is enough to affect a nearby compass needle.
- Step 3.** The removed iron nail no longer concentrates and strengthens the

magnetic field.

Step 4. So the compass deflection becomes smaller.

This is why practical electromagnets usually have iron cores.

Final Answer: The compass still deflects, but less strongly.

Q 4.11

We have four coils, of similar shape and size, made up from iron, copper, aluminium, and nichrome as shown in Fig. 4.13. When current is passed through the coils, compass needles placed near the coils will show deflection.

- (i) Only in circuit (a)
- (ii) Only in circuits (a) and (b)
- (iii) Only in circuits (a), (b), and (c)
- (iv) In all four circuits

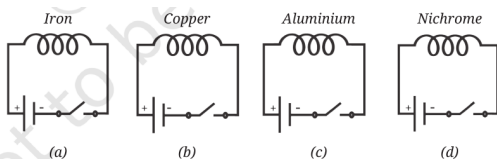


Fig. 4.13

Fig. 4.13, NCERT Curiosity Class 8 Science, Chapter 4.

SOLUTION

Concept used. The magnetic effect of electric current occurs in any current carrying conductor. Iron, copper, aluminium, and nichrome can all conduct electric current in these circuits.

👉 **Do not overfocus on iron**

Iron can make an electromagnet stronger, but copper, aluminium, and nichrome coils also produce magnetic fields when current flows.

Step 1. In circuit (a), current through the iron coil produces a magnetic field.

Step 2. In circuit (b), current through the copper coil also produces a magnetic field.

Step 3. In circuit (c), current through the aluminium coil also produces a magnetic field.

Step 4. In circuit (d), current through the nichrome coil also produces a magnetic field.

Step 5. A compass near each coil can therefore deflect.

Final Answer: Option (iv), in all four circuits.

Structural observation. The question asks about the magnetic effect of current, not about which material makes the strongest electromagnet.

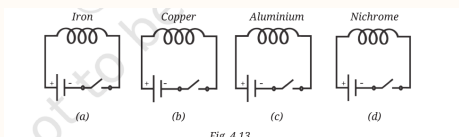


Fig. 4.13

Fig. 4.13 repeated for the expert explanation.

- Step 1.** The common feature in all four circuits is a coil carrying current.
- Step 2.** Every current carrying coil produces a magnetic field.
- Step 3.** The material may change resistance and field strength, but it does not remove the magnetic effect if current flows.
- Step 4.** Hence every nearby compass needle can show deflection.

Iron may give a stronger effect, but the question only asks whether deflection occurs.

Final Answer: The correct option is (iv), in all four circuits.

Key Takeaways

- Current in a wire or coil produces a magnetic field.
- An electromagnet works only while enough current flows through its coil.
- Higher resistance wires such as nichrome are useful in heating devices.
- A Voltaic cell needs electrodes and an electrolyte to generate current.
- Dry cells are portable, while rechargeable batteries can be used many times.

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End of Keep the Curiosity Alive