NCERT Solutions Class 8 Science (Curiosity)

Chapter 4 Electricity: Magnetic and Heating Effects

Question Answer (InText)

Question 1. Can we use electric current to make a magnet? (Page 49)
Answer: Yes, the magnetic effect of the electric current is used to make a magnet. If an electric current is passed through a long conducting wire coiled around a metal nail or rod, the nail or rod becomes a magnet during the flow of the current. When the electric current flow stops, the nail or the rod does not have a magnetic force.

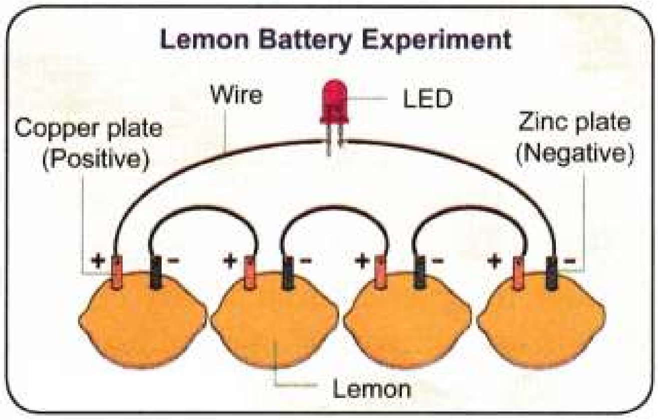
Question 2. Does an electromagnet also have two poles like a bar magnet? (Page 50)
Answer: Electromagnets also have two poles like a bar magnet. When an electric current is passed through a conducting wire coiled around an iron nail, one end of the nail becomes the North pole of the magnet, and the other end of the nail becomes the South pole of the magnet. This can be shown by bringing the North pole of a compass needle near two ends (one by one) of the nail, while current is flowing, and observing its deflection in each case. The property of magnets that 'like poles repel each other' shows that the electromagnets also have two poles like a bar magnet.

Question 3. Are electromagnets also used in real life, for lifting objects? (Page 52)
Answer: Electromagnets are widely used in factories and scrap yards to move, lift, and sort heavy metal items. These electromagnets are hung to the cranes. The crane operator moves the hanging magnet with the crane to heavy metal items and switches ON the current. The magnet lifts all magnetic items from the pile of heavy metal items. The crane operator controls and moves the magnet to the other position where these items are to be released. He then switches OFF the current, and the magnetic field disappears; the items are released.

Question 4. While doing the activity for the electromagnet, did you also notice that the wire ends got warm? Why would that happen? (Page 52)
Answer: The wire ends get warm when current flows through the wires for some time. This happens due to the heating effect of electric current. Depending on the nature of the metals used as conductors, the conductors offer some resistance to the flow of the current.

In the process, a part of the electric energy is converted into heat energy that warms the ends of the wires.

Question 5. Can we also make our Voltaic cell using easily available materials? (Page 56)
Answer: We can make our Voltaic cell using fresh lemon pieces, iron nails, copper wires or thin strips and an LED lamp to check the current of the cell. Five iron nails and five copper strips have to be inserted, one in each lemon piece. The copper strip of the first lemon piece should be connected to the iron nail of the second lemon. The copper strip of the second lemon should be connected to the iron nail of the third lemon, and so on.



The first iron nail is to be connected to the negative terminal of the LED, and the last copper strip to the positive terminal of the LED. The LED will glow to show that the Voltaic cell is ready.

(Exercise): Keep the Curiosity Alive (Pages 58-61)

Question 1. Fill in the blanks.

1. The solution used in a Voltaic cell is called ___________________
2. A current carrying coil behaves like a ___________________

Answer:

1. Electrolyte
2. Magnet

Question 2. Choose the correct option:

1. Dry cells are less portable compared to Voltaic cells. (True/False)
2. A coil becomes an electromagnet only when an electric current flows through it. (True/False)
3. An electromagnet, using a single cell, attracts more iron paper clips than the same electromagnet with a battery of 2 cells. (True/False)

Answer:

1. False (Voltaic cells are less portable due to the liquid electrolyte.)
2. True
3. False (A stronger current of battery current of 2 cells makes the coil a stronger magnet.)

Question 3. An electric current flows through a 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
Answer: (c) Both (i) and (ii) are correct

Question 4. Match the items in Column A with those in Column B.

Column A	Column B
(i) Voltaic Cell	(a) Best suited for an electric heater
(ii) Electric iron	(b) Works on magnetic effect of electric current
(iii) Nichrome wire	(c) Works on the heating effect of electric current
(iv) Electromagnet	(d) Generates electricity by chemical reactions

Answer:

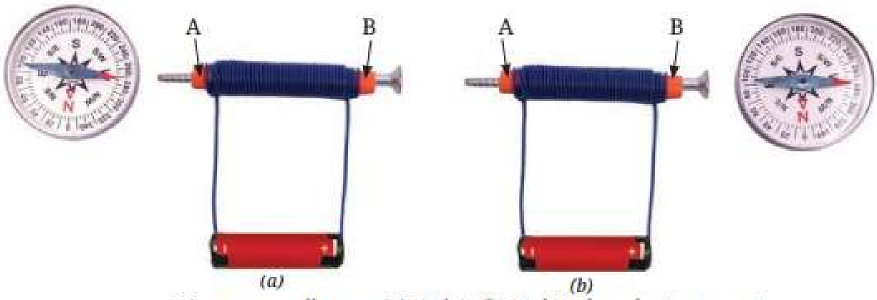
Column A	Column B

(i) Voltaic Cell	(d) Generates electricity by chemical reactions
(ii) Electric iron	(c) Works on the heating effect of electric current
(iii) Nichrome wire	(a) Best suited for an electric heater
(iv) Electromagnet	(b) Works on magnetic effect of electric current

Question 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.
Answer: (ii) Nichrome generates more heat for a given current

Question 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 reasons to support this statement, considering societal impact.
Answer: Traditional methods like burning firewood or charcoal are NOT convenient because:
(i) More space in the household is required to store dry firewood or charcoal.
(ii) The smoke arising from the burning of firewood or charcoal is a health hazard. It gives a burning sensation to the eyes and makes breathing difficult.
(iii) The burning of firewood or charcoal releases harmful gases like carbon dioxide and carbon monoxide. These gases pollute the air we breathe and, therefore, are not good for our environment.
Electric heating devices, like an electric heater or stove, are more convenient as they need less space and do not cause pollution.

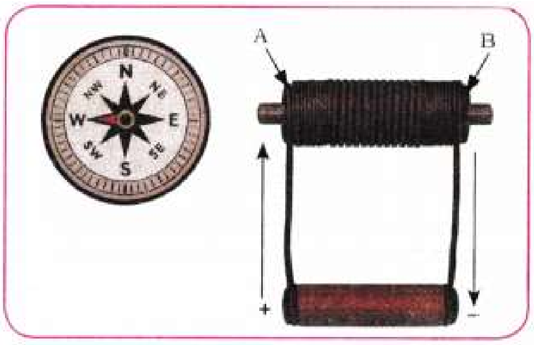
Question 7. Look at the Figure. If the compass is placed near the coil deflects:



Compass needle near (a) End A; (b) End B of an electromagnet

(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.

Answer: (i) The current flows from the positive terminal of the cell to end marked A of the coil, then through the coil to end marked B, and then to the negative terminal of the cell as shown by the red arrows in the Figure.

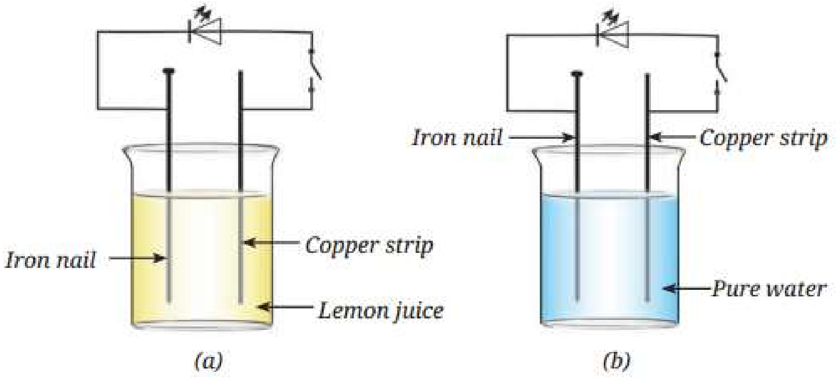


(ii) The compass needle moves as the coil becomes a magnet on passing the current through it, and the compass needle in its magnetic field moves.

(iii) When we reverse the battery terminals, the poles of the coil electromagnet change. Therefore, the deflection in the compass needle also changes accordingly. The pole of the compass needle that was earlier attracted to the coil will move away from it, and the other pole of the compass needle will get attracted towards the coil.

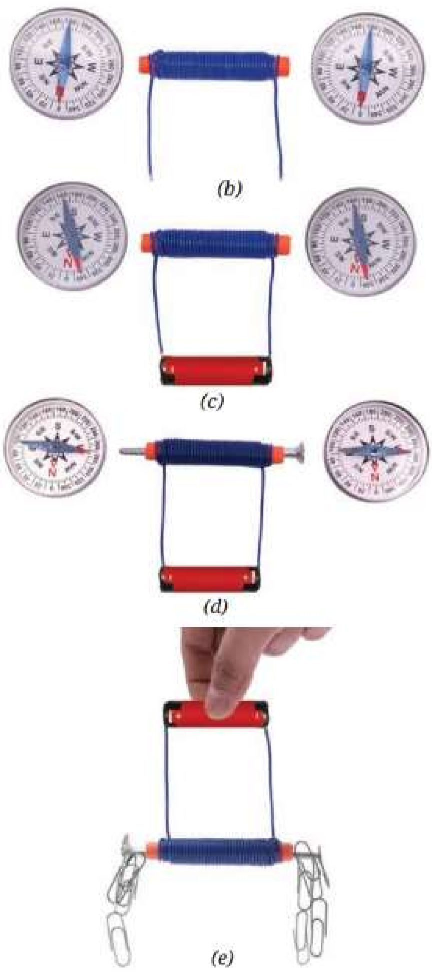
Question 8. Suppose Sumana forgets to move the switch of her lifting electromagnet model to the OFF position (in the introduction story). After some time, the iron nail no longer picks up the iron paper clips, but the wire wrapped around the iron nail is still warm. Why did the lifting electromagnet stop lifting the clips? Give possible reasons.
Answer: A conducting coil becomes a magnet ONLY when the electric current is flowing through it (magnetic effect of electric current). When the flow of electric current is stopped, the coil loses its magnetic effect. The magnetic effect of electric current remains in the conducting wire (coil) during the current flow only. The heating effect of electric current converts a part of the electric energy to heat energy. This heat energy makes the current-carrying wire warm. When the current stops flowing the heating effect of the electric current stops, but the wire that has become warm takes some time before cooling to the normal temperature.

Question 9. In Figure (below), in which case, the LED will glow when the switch is closed?



Answer: The LED will glow when the switch is closed in case of (a). Here, the electrolyte is the lemon juice. Copper and iron plates properly placed in a weak acid or salt solution and connected in a circuit, produce electricity. In case of (b), the liquid used is pure water that does not become an electrolyte.

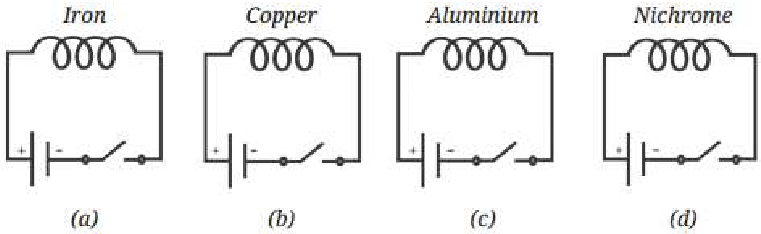
Question 10. Neha keeps the coil the same way as in Activity 4.4 but slides the iron nail out, leaving only the coiled wire. Will the coil still deflect the compass? If yes, will the deflection be more or less than before?



(b) Coil and magnetic compasses; (c) Coil connected to a cell; (d) Coil with iron nail inserted; (e) Coil with iron nail and clips

Answer: Yes, the coil will deflect the compass even after the iron nail has been slid out. The coil **gets** a magnetic force when current flows through it. If iron nail is inserted inside the coil, the strength of the magnet increases. Deflection in the compass will be less when Neha slides the iron nail out, due to less strong electromagnet formed by the coil alone.

Question 11. We have four coils, of similar shape and size, made up from iron, copper, aluminium, and nichrome as shown in the Figure:



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

Answer: The compass needles placed near the coils will show deflection in all the four cases. The deflection however will not be equal in all the four cases. The magnetic strength of the electromagnet depends on the nature of the material used. Some magnetic substances like iron, nickel and cobalt make strong electromagnets, while aluminium and nichrome may be of the same shape and size may not make equally strong magnets. Therefore, the deflection of the compass needles will vary depending on the strength of the electromagnet.