

SCIENCE
WORKSHEET_210526
CHAPTER 04 ELECTRICITY: MAGNETIC AND HEATING EFFECTS
(ANSWERS)

SUBJECT: SCIENCE

CLASS : VIII

MAX. MARKS : 40

DURATION : 1½ hrs

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). **Use of Calculators is not permitted**

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The discovery that electricity and magnetism are linked was made by which scientist?
(a) Alessandro Volta (b) Luigi Galvani (c) Hans Christian Oersted (d) Thomas Edison
Ans. (c) Hans Christian Oersted
Hans Christian Oersted was the first to discover the link between electricity and magnetism by observing that a compass needle deflected when placed near a current-carrying wire.
2. What is a coil of wire with an iron core, which behaves like a magnet when electric current flows through it, known as?
(a) A permanent magnet (b) An insulator (c) An electromagnet (d) A generator
Ans. (c) An electromagnet
An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. It typically consists of a coil of insulated wire wrapped around an iron core.
3. Which of the following describes the key principle behind the working of a Voltaic cell?
(a) Magnetic effect of electric current
(b) Heating effect of electric current
(c) Chemical reactions between electrodes and electrolyte
(d) The use of a dry paste instead of a liquid
Ans. (c) Chemical reactions between electrodes and electrolyte
A Voltaic cell generates electricity through a chemical reaction between its two different metal electrodes and the electrolyte. This reaction drives the flow of electrons, creating a current.
4. What is the purpose of a heating element in an electric stove?
(a) To increase the flow of current. (b) To convert electrical energy into heat energy.
(c) To act as a switch for the circuit. (d) To generate a magnetic field.
Ans. (b) To convert electrical energy into heat energy.
A heating element is specifically designed to have high resistance. When current flows through it, it converts electrical energy into heat energy due to the heating effect of electric current, which is the purpose of the stove.
5. An electromagnet's poles can be reversed by:
(a) Increasing the number of turns of the coil.
(b) Inserting a plastic core instead of an iron core.
(c) Changing the direction of the electric current.
(d) Reducing the voltage of the cell.

Ans. (c) Changing the direction of the electric current.

The polarity (North and South poles) of an electromagnet depends on the direction of the current flowing through its coil. Reversing the direction of the current will reverse the poles.

6. What material is typically used to create a strong electromagnet core for practical applications?

(a) Copper (b) Iron (c) Plastic (d) Wood

Ans. (b) Iron

When an iron nail is inserted into the core of a coil, it makes the coil a much stronger magnet.

For this reason, iron is typically used as the core for powerful electromagnets.

7. Why should you not touch a nichrome wire for an extended period after current has passed through it?

(a) It becomes a strong magnet. (b) It becomes very cold.
(c) It becomes warm due to the heating effect. (d) The magnetic field will cause a shock.

Ans. (c) It becomes warm due to the heating effect.

Nichrome wire has high resistance and gets very hot when a current passes through it due to the heating effect of electric current. It would be dangerous to touch it immediately.

8. A Voltaic cell's electrodes are made of:

(a) Two different metals (b) Plastic and glass
(c) Copper only (d) Nichrome wire

Ans. (a) Two different metals

The Voltaic cell has two metal plates of different materials, also known as electrodes, which are required for the chemical reaction to produce electricity.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (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):** All batteries can be recharged and reused.

Reason (R): Dry cells are a type of rechargeable battery.

Ans. (d) A is false, but R is false.

Both the assertion and the reason are false. Not all batteries can be recharged; dry cells, for example, are single-use. The reason is false because dry cells are not rechargeable batteries.

10. **Assertion (A):** The Earth behaves like a giant magnet.

Reason (R): The magnetic field of the Earth is caused by the movement of liquid iron in its core.

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

Assertion (A) is true; the Earth behaves like a giant magnet. Reason (R) is also true and correctly explains A, as the Earth's magnetic field is a result of the electric currents created by the movement of liquid iron in its core.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. What is the heating effect of electric current? Give one example of an industrial application of this effect.

Ans. The heating effect of electric current is the phenomenon where a conductor gets heated when an electric current passes through it. An industrial application is in high-temperature furnaces used to melt and recycle scrap steel.

12. How does a Voltaic cell become 'dead'?

Ans. A Voltaic cell becomes 'dead' when the chemical substances inside it that are responsible for producing electricity get used up. Once these chemicals are consumed, the cell can no longer supply electric current.

13. Give two reasons why rechargeable batteries are increasingly being used today.

Ans. Two reasons why rechargeable batteries are increasingly being used are:

- They can be recharged and reused multiple times.
- They prevent wastage and save money over time.

14. What happens when a current-carrying wire is placed under a magnetic compass? What does this observation indicate?

Ans. When a current-carrying wire is placed under a magnetic compass, the compass needle deflects from its original direction. This observation indicates that a current-carrying wire produces a magnetic field around it, which is known as the magnetic effect of electric current.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. What is the difference between an electromagnet and a permanent magnet based on the information provided in the chapter?

Ans. An electromagnet is a temporary magnet. It acts as a magnet only when electric current flows through its coil and loses its magnetic effect when the current is stopped. A permanent magnet, in contrast, retains its magnetic properties without the continuous flow of electric current.

16. How is a Voltaic cell constructed using a lemon? What are the key components and their functions in this setup?

Ans. A Voltaic cell can be constructed using a lemon, an iron nail, and a copper strip. The iron nail and copper strip are inserted into the lemon without touching. The lemon juice acts as the electrolyte, and the iron nail and copper strip act as the electrodes. A chemical reaction between the two different metal electrodes and the acidic lemon juice produces electric current.

17. Explain the importance of the Earth's magnetic field for life on Earth.

Ans. The Earth's magnetic field is crucial for life on Earth. It is caused by the movement of liquid iron in the Earth's core. The magnetic field acts as a shield, blocking harmful particles from space and helping protect life. It is also used by many migratory birds, fish, and animals to navigate across continents and oceans.

SECTION – D

Questions 18 carry 5 marks each.

18. Describe the heating effect of electric current. Discuss the factors that influence the amount of heat generated in a conductor and explain how this effect is utilized in common household appliances.

Ans. The heating effect of electric current is the phenomenon where a conductor gets heated when an electric current passes through it. This occurs because the conductor offers some opposition or resistance to the flow of current. This resistance causes some of the electrical energy to be converted into heat energy.

The amount of heat generated in a wire depends on several factors, including the material of the wire, its thickness, its length, and the magnitude of the electric current and the duration for which the current flows. For example, a nichrome wire offers higher resistance than a copper wire of the same size and length, causing it to heat up more.

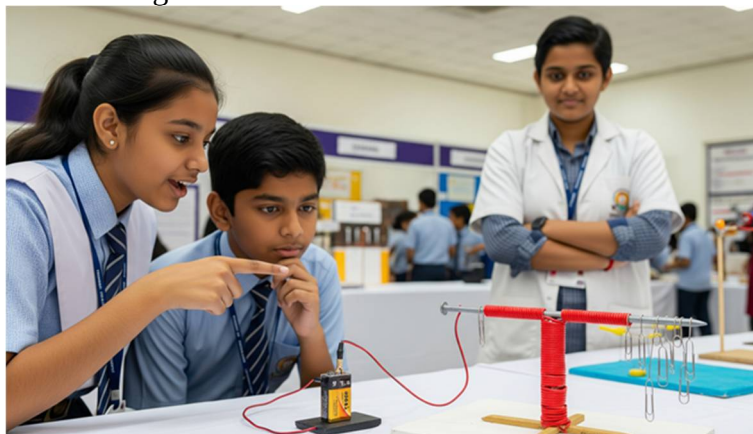
This effect is utilized in many common household appliances that contain a heating element, which is a rod or a coil of wire. Examples include electric room heaters, electric irons, electric stoves, and hair dryers. The heating element in these devices glows red hot when current passes through it, providing the necessary heat.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case Study-1: The Science Fair Project

Mohini and Aakarsh were fascinated by their senior Sumana's lifting electromagnet model at a science exhibition. The model consisted of an iron nail wrapped with an insulated wire connected to a battery. When the circuit was closed, the nail picked up iron paper clips. When the circuit was opened, the clips fell off. They wondered why the nail acted like a magnet only when the current was flowing. They remembered learning that iron is a magnetic material attracted to magnets, but in this model, there was no magnet.



- (i) What scientific principle is being demonstrated by Sumana's model? [1]
- (ii) What is the function of the iron nail in the electromagnet? [1]
- (iii) What would happen if Sumana used a plastic nail instead of an iron one? [1]
- (iv) Why is it important to use an insulated wire for this activity? [1]

Ans. (i) Sumana's model demonstrates the magnetic effect of electric current, which states that an electric current flowing through a conductor produces a magnetic field around it.

(ii) The iron nail acts as the core of the electromagnet. When an iron nail is inserted into the core of the coil, it makes the coil a much stronger magnet.

(iii) If Sumana used a plastic nail, the coil would still behave as a weak electromagnet, but it would not be able to attract and lift the paper clips as the magnetic effect would be much weaker without an iron core.

(iv) It is important to use an insulated wire to prevent the current from short-circuiting and to ensure that the current flows through the length of the coil, not directly from one point to another.

20. Case Study-2: The Dead Battery Mystery

Ankit's remote-controlled car stopped working. He checked the batteries and found that they felt slightly warm, but the car was not moving. He realized that the batteries, which were dry cells, had been used for a long time and were now 'dead.' His friend, Rita, explained that even though they are 'dead,' they should not be thrown in the regular garbage because they can be harmful to the environment. She suggested taking them to a special recycling facility.



(i) Why did the batteries feel warm even though they were 'dead'? [1]

(ii) What is the main reason a dry cell becomes 'dead'? [1]

(iii) Why did Rita suggest not throwing the batteries in regular garbage? [1]

(iv) What kind of materials are found in batteries that make them valuable for recycling? [1]

Ans. (i) The batteries likely felt warm due to the heating effect of electric current. The continuous use of the batteries caused the flow of current, which generated heat due to the resistance within the battery components.

(ii) A dry cell becomes 'dead' because the chemicals inside it get used up over time through the chemical reactions that produce electricity.

(iii) Rita suggested not throwing the batteries in regular garbage because even when 'dead', they can contain harmful materials like acids, lead, cadmium, or lithium, which can cause fires or be harmful to the environment.

(iv) Batteries contain valuable materials like lead, cadmium, nickel, and lithium, which can be recycled and reused.

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