# SCIENCE

## WORKSHEET_030924

## CHAPTER 04 ELECTRICITY: MAGNETIC AND HEATING EFFECTS

## (ANSWERS)

**SUBJECT: SCIENCE** **MAX. MARKS : 40**

**CLASS : VIII** **DURATION : 1½ hrs**

**General Instructions:**

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** 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.** A student connects a simple circuit with an electric cell and a wire. She places a magnetic compass near the wire. Which of the following observations indicates that electric current is flowing in the wire?

(a) The wire becomes hot.

(b) The magnetic compass needle deflects from its original direction.

(c) The compass needle does not move at all.

(d) The wire attracts small pieces of paper.

Ans. (b) The magnetic compass needle deflects from its original direction.

This observation is a direct consequence of the magnetic effect of electric current. When current flows through a wire, it creates a magnetic field around it. This magnetic field interacts with the compass needle (which is a small magnet), causing it to deflect.

**2.** Which of the following household appliances works on the principle of the heating effect of electric current?

(a) Electric fan (b) Loudspeaker (c) Electric iron (d) Electromagnet

Ans. (c) Electric iron

An electric iron contains a heating element (usually made of nichrome) that gets hot when electric current passes through it. The heat produced is then used to iron clothes. This is a direct application of the heating effect of electric current.

**3.** A student makes an electromagnet by winding a coil of wire around an iron nail and connecting it to a cell. She notices that the electromagnet can only pick up a few paper clips. What is the most effective way to make the electromagnet stronger?

(a) Use a longer iron nail. (b) Use a thinner wire.

(c) Increase the number of turns of the coil. (d) Change the direction of the current.

Ans. (c) Increase the number of turns of the coil.

The strength of an electromagnet can be increased in two main ways: by increasing the number of turns in the coil or by increasing the amount of current. Among the given options, increasing the number of turns is the most effective way to make the electromagnet stronger.

**4.** The Voltaic cell is named after which Italian scientist who believed electricity came from the combination of metals and liquid, not from a dead frog's leg?

(a) Luigi Galvani (b) Hans Christian Oersted

(c) Alessandro Volta (d) Isaac Newton

Ans. (c) Alessandro Volta
The Voltaic cell is named after Alessandro Volta. The chapter mentions that Volta proved that the electric current was generated by the combination of metals and a liquid, not from the frog's leg, as Galvani believed.

**5.** An electromagnet is a temporary magnet. Which of the following conditions must be met for it to function as a magnet?
(a) The circuit must be open.
(b) An electric current must flow through the coil.
(c) A permanent bar magnet must be placed nearby.
(d) The wire must be made of a non-conducting material.
Ans. (b) An electric current must flow through the coil.
An electromagnet is a temporary magnet because its magnetic properties are entirely dependent on the flow of electric current. When the current is turned off, the magnetic field disappears, and it ceases to be a magnet.

**6.** Which of the following statements is true about the heating effect of electric current?
(a) It is always a problem and a source of energy loss.
(b) It forms the basis of devices like an electric stove and an electric kettle.
(c) It is only observed in wires with high resistance.
(d) It is the same as the magnetic effect of electric current.
Ans. (b) It forms the basis of devices like an electric stove and an electric kettle.
The heating effect of electric current is a useful phenomenon. It is intentionally utilized in many appliances to produce heat, such as electric stoves, electric kettles, and electric irons.

**7.** Why do household circuits have safety devices in place?
(a) To increase the magnetic field.
(b) To minimize the heating effect of electric current.
(c) To make the circuit more decorative.
(d) To make the circuit reusable.
Ans. (b) To minimize the heating effect of electric current.
Safety devices like circuit breakers or fuses are designed to interrupt the flow of current when it becomes too high. This prevents excessive heating of the wires, which could lead to fire hazards, thus minimizing the negative effects of the heating effect of electric current.

**8.** What is the function of the electrolyte in a Voltaic cell?
(a) It acts as a negative electrode.
(b) It produces electricity by chemical reaction with the electrodes.
(c) It acts as an insulator.
(d) It holds the two electrodes apart.
Ans. (b) It produces electricity by chemical reaction with the electrodes.
The electrolyte in a Voltaic cell is a liquid or paste that reacts chemically with the two different metal electrodes. This chemical reaction is what generates the flow of electric current.

**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):** A nichrome wire is a good conductor of electricity.
**Reason (R):** Nichrome wire offers higher resistance and generates more heat compared to a copper wire of the same size and length.
Ans. (a) Both A and R are true, and R is the correct explanation of A.

Assertion (A) is true; nichrome is a good conductor of electricity. Reason (R) is also true and is the correct explanation because nichrome's high resistance is what makes it suitable for use as a heating element. The high resistance causes it to generate a significant amount of heat when current flows through it.

**10. Assertion (A):** The strength of an electromagnet can be increased by using a battery with more cells.
**Reason (R):** A battery with more cells provides a larger current, which creates a stronger magnetic field.
Ans. (a) Both A and R are true, and R is the correct explanation of A.
Assertion (A) is true because a battery with more cells provides a higher voltage, which leads to a larger current flow in the circuit. Reason (R) is also true and correctly explains A, as the strength of the magnetic field produced by an electromagnet is directly proportional to the magnitude of the current flowing through its coil.

## SECTION – B

**Questions 11 to 14 carry 2 marks each.**

**11.** Why does a compass needle deflect when placed near a current-carrying wire, but return to its original position when the current is stopped?
Ans. When a current flows through the wire, it produces a magnetic field around it due to the magnetic effect of electric current. This magnetic field causes the compass needle, which is a tiny magnet, to deflect. When the current is stopped, the magnetic field disappears, and the needle returns to its original position.

**12.** What is an electromagnet? List two of its practical applications.
Ans. An electromagnet is a current-carrying coil that behaves as a magnet. It is a temporary magnet. Two practical applications of electromagnets are in electric bells and lifting electromagnets used in factories.

**13.** How does the heating effect of electric current cause an incandescent lamp to glow?
Ans. An incandescent lamp has a filament that is made of a special material. When electric current passes through this filament, it faces resistance to its flow. This resistance causes the electrical energy to be converted into heat energy, making the filament get heated and glow.

**14.** Explain why a dry cell is considered a "single use" cell, while a rechargeable battery can be used multiple times.
Ans. A dry cell is a "single use" cell because the chemicals inside it get used up over time and the cell stops working, after which it cannot supply any more electricity. In contrast, rechargeable batteries can be recharged and reused multiple times.

## SECTION – C

**Questions 15 to 17 carry 3 marks each.**

**15.** State the factors that affect the amount of heat generated in a wire due to electric current.
Ans. The amount of heat generated in a wire depends on the following factors:

- The material of the wire.
- The thickness of the wire.
- The length of the wire.
- The magnitude of the electric current flowing through the wire.
- The duration for which the current flows.

**16.** Describe the key components of a Voltaic cell and explain how it generates electricity.

Ans. A Voltaic cell contains two metal plates of different materials called electrodes, and a liquid called an electrolyte. A chemical reaction between the electrodes and the electrolyte produces electricity. When a circuit is connected, the electric current flows from the positive terminal, through the circuit, to the negative terminal.

**17.** A student makes an electromagnet and finds its poles by using a magnetic compass. What would happen to the poles of the electromagnet if the direction of the current flowing through the coil is reversed? Justify your answer.
Ans. If the direction of the current flowing through the coil is reversed, the poles of the electromagnet will also be reversed. This is because the magnetic field produced by the current-carrying coil depends on the direction of the current. Changing the direction of the current changes the orientation of the magnetic field, thus reversing the North and South poles of the electromagnet.

## SECTION – D

**Questions 18 carry 5 marks each.**

**18.** Explain the magnetic effect of electric current. How can the strength of the magnetic field produced by a current-carrying coil be changed? Describe two ways to do this.
Ans. The magnetic effect of electric current is the phenomenon where a magnetic field is produced around a conductor (like a wire) when electric current flows through it. This effect was discovered by Hans Christian Oersted. The presence of this magnetic field can be observed by the deflection of a magnetic compass needle placed near the current-carrying wire.
The strength of the magnetic field produced by a current-carrying coil can be changed in two ways:

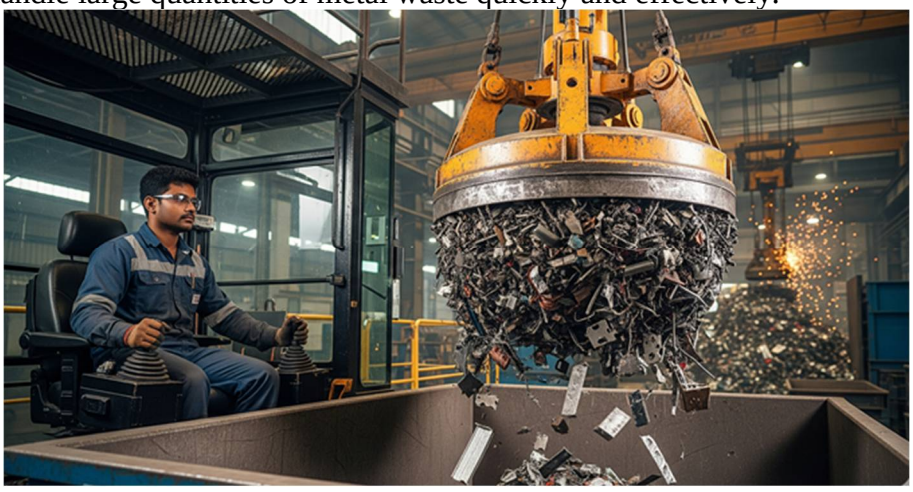
- Changing the amount of electric current: Increasing the electric current flowing through the coil makes the magnetic field stronger.
- Changing the number of turns of the coil: Increasing the number of turns of the coil also makes the magnetic field stronger.

## SECTION – E (Case Study Based Questions)

**Questions 19 to 20 carry 4 marks each.**

**19. Case Study-1: The Recycling Plant Crane**

In a bustling recycling plant, a large crane operator, named Arjun, controls a powerful lifting electromagnet to sort and move heavy metal waste. He uses a switch in his control cabin to turn the magnet on and off. When he turns the switch ON, the electromagnet attracts and lifts huge pieces of scrap metal. As he moves the crane over the correct collection bin, he turns the switch OFF, and the metal pieces fall cleanly into place. This process is highly efficient and safe, allowing the plant to handle large quantities of metal waste quickly and effectively.



(i) What is the function of the switch in Arjun's control cabin? [1]
(ii) Why do the metal pieces fall when Arjun turns the switch OFF? [1]
(iii) Why is an iron core used in lifting electromagnets? [1]

(iv) Can the lifting electromagnet lift a heavy piece of plastic? Justify your answer. [1]

Ans. (i) The switch in Arjun's control cabin controls the flow of electric current to the electromagnet.

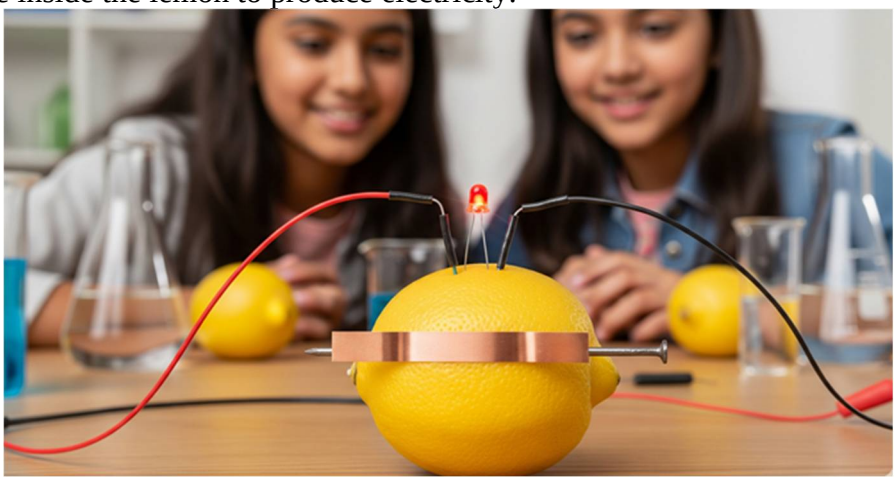
(ii) When Arjun turns the switch OFF, the electric current stops flowing through the electromagnet. This causes the magnetic field to disappear, and as a result, the electromagnet loses its magnetic property and the metal pieces fall.

(iii) Most electromagnets used in practical applications, such as lifting electromagnets, have an iron core because it makes the electromagnet much stronger.

(iv) No, the lifting electromagnet cannot lift a heavy piece of plastic. Electromagnets only attract magnetic materials like iron and steel, and plastic is a non-magnetic material.

**20. Case Study-2: The Lemon Battery Experiment**

Riya and her friends are trying to make a simple electric cell using lemons as part of their science project. They insert a copper strip and an iron nail into a lemon, ensuring the two metals do not touch. They connect the lemon to an LED. The LED glows dimly. Riya is fascinated and realizes that the lemon juice acts as a crucial component of the cell. She notes down that a chemical reaction is taking place inside the lemon to produce electricity.



(i) In the lemon cell, what is the role of the lemon juice? [1]

(ii) What would happen if Riya replaced the lemon juice with pure water? Why? [1]

(iii) Why did the LED glow dimly? [1]

(iv) What components of this lemon cell can be compared to the electrodes and electrolyte of a Voltaic cell? [1]

Ans. (i) The lemon juice acts as the electrolyte in the lemon cell.

(ii) If Riya replaced the lemon juice with pure water, the LED would not glow. The lemon juice acts as an electrolyte (weak acid), which is necessary for the chemical reaction to produce electricity. Pure water is not a good conductor of electricity for this purpose.

(iii) The LED likely glowed dimly because a single lemon cell produces only a small amount of electric current, and the brightness of the LED depends on the magnitude of the current flowing through it.

(iv) In this lemon cell, the copper wire/strip and the iron nail are the metal electrodes, and the lemon juice is the electrolyte.