

SCIENCE
WORKSHEET_110725
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. What is the phenomenon called when electric current flowing through a conductor produces a magnetic field around it?
- (a) Heating effect of electric current (b) Magnetic effect of electric current
(c) Chemical effect of electric current (d) Physical effect of electric current

Ans. (b) Magnetic effect of electric current

The phenomenon where electric current creates a magnetic field is called the magnetic effect of electric current. This discovery was made by Hans Christian Oersted.

2. A student observes that a cylindrical coil of insulated wire connected to a cell behaves like a magnet. What is this current-carrying coil known as?
- (a) A permanent magnet (b) A solenoid
(c) An electromagnet (d) A circuit breaker

Ans. (c) An electromagnet

An electromagnet is a magnet that is created by passing electric current through a coil of wire, often wrapped around a soft iron core. It is a temporary magnet whose magnetic field can be turned on and off.

3. Which of the following would make an electromagnet with the greatest strength?
- (a) A coil with a few turns and a single cell.
(b) A coil with a large number of turns and a battery of 2 cells.
(c) A coil with a few turns and a battery of 2 cells.
(d) A coil with a large number of turns and a single cell.

Ans. (b) A coil with a large number of turns and a battery of 2 cells.

The strength of an electromagnet is directly proportional to both the number of turns in the coil and the magnitude of the current. A battery with more cells (e.g., 2 cells) provides a higher current than a single cell. Therefore, using a large number of turns with a multi-cell battery will create the strongest magnetic field.

4. The first battery was invented after a scientist discovered that electric current was generated by the combination of metals and a liquid. Who was this scientist?
- (a) Luigi Galvani (b) Hans Christian Oersted (c) Thomas Edison (d) Alessandro Volta

Ans. (d) Alessandro Volta

The text mentions that Alessandro Volta was the one who proved that the electric current in Galvani's experiment was due to the combination of metals and liquid, and not the frog's legs, leading to his invention of the first battery.

5. An electric kettle works on the principle of:

- (a) Magnetic effect of electric current (b) Chemical effect of electric current
(c) Heating effect of electric current (d) Light effect of electric current

Ans. (c) Heating effect of electric current

An electric kettle works by heating water. It contains a heating element that heats up when current flows through it, converting electrical energy into heat energy, which is the heating effect of electric current.

6. What is the main difference between a dry cell and a Voltaic cell?

- (a) A dry cell uses a liquid electrolyte, while a Voltaic cell uses a paste-like electrolyte.
(b) A dry cell is rechargeable, while a Voltaic cell is not.
(c) A dry cell is more portable because its electrolyte is a moist paste, not a liquid.
(d) A dry cell contains two electrodes, while a Voltaic cell has only one.

Ans. (c) A dry cell is more portable because its electrolyte is a moist paste, not a liquid.

The key difference between a dry cell and a Voltaic cell is the state of their electrolyte. A Voltaic cell uses a liquid electrolyte, making it less portable. A dry cell uses a moist, paste-like electrolyte, making it easier to handle and more portable.

7. Which of the following is NOT an application of the magnetic effect of electric current?

- (a) Electric fan (b) Loudspeaker (c) Electric bell (d) Electric stove

Ans. (d) Electric stove

An electric stove uses the heating effect of electric current to produce heat. The other options, such as an electric fan, loudspeaker, and electric bell, all work on the magnetic effect of electric current.

8. What is a key advantage of rechargeable batteries over single-use cells?

- (a) They are made of more common materials.
(b) They prevent wastage and save money over time.
(c) They are much safer to dispose of in regular garbage.
(d) They can only be used in large devices like cars.

Ans. (b) They prevent wastage and save money over time.

Rechargeable batteries can be used multiple times, unlike single-use cells. This means they do not need to be replaced as often, which saves money and reduces waste.

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):** When a Voltaic cell is used for a long time, it becomes 'dead'.

Reason (R): The chemical substances inside the cell get used up over time.

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

Assertion (A) is true; a cell is said to be 'dead' when it stops working. Reason (R) is also true and correctly explains A. The chemical substances that produce electricity inside the cell get consumed over time, causing the cell to stop functioning.

10. **Assertion (A):** Nichrome wire is used as a heating element in many electrical appliances.

Reason (R): Nichrome offers high resistance and converts a significant amount of electrical energy into heat energy.

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

Assertion (A) is true; nichrome wire is widely used as a heating element. Reason (R) is also true and provides the correct explanation for A. The high resistance of nichrome allows it to efficiently convert electrical energy into heat, which is the desired effect for heating appliances.

SECTION – B

Questions 11 to 14 carry 2 marks each.

- 11.** Why does a current-carrying wire get warm? Explain the underlying principle.

Ans. A current-carrying wire gets warm due to the heating effect of electric current. This happens because a conductor offers some opposition or resistance to the flow of electric current. This resistance converts some of the electrical energy into heat energy, causing the wire to warm up.

- 12.** What are the two ways to change the strength of an electromagnet?

Ans. The strength of an electromagnet can be changed by:

- Changing the amount of electric current flowing through the coil.
- Changing the number of turns of the coil.

- 13.** How are electromagnets used in scrap yards and factories?

Ans. Lifting electromagnets are widely used in factories and scrap yards. The crane operator turns the current ON to lift iron/steel objects, and then turns the current OFF to release them, making the process of moving, lifting, and sorting heavy metal items efficient.

- 14.** What is a Voltaic cell? Who are the two scientists after whom it is named, and what were their contributions?

Ans. A Voltaic cell is a type of electric cell that contains two different metal plates (electrodes) and a liquid (electrolyte) which react chemically to produce electricity. It is named after two Italian scientists, Alessandro Volta and Luigi Galvani. Galvani noticed a dead frog's leg kicked when touched with two different metals, while Volta proved that the electricity came from the combination of metals and liquid, not the frog.

SECTION – C

Questions 15 to 17 carry 3 marks each.

- 15.** Why is it said that "the Earth itself behaves like a giant magnet"? What is the cause of this phenomenon?

Ans. The Earth behaves like a giant magnet because deep inside its core, the movement of liquid iron creates electric currents. These electric currents, in turn, generate a magnetic field. This magnetic field is used by migratory birds and animals to navigate, and it also acts as a shield protecting the Earth from harmful particles from space.

- 16.** Describe the key components of a dry cell and state its main disadvantage.

Ans. A dry cell consists of a zinc container that acts as the negative terminal and a central carbon rod with a metal cap that acts as the positive terminal. The carbon rod is surrounded by a thick, moist paste-like electrolyte. The main disadvantage of a dry cell is that it is a single-use cell and must be disposed of once the chemicals inside are used up.

- 17.** Explain the safety measures related to the heating effect of electric current in household circuits.

Ans. To prevent overheating, fires, and damage to plugs and sockets, safety devices are placed in household circuits. Additionally, it is important to use appropriate wires, plugs, and sockets that are rated for the specified electric current to prevent unnecessary heating.

SECTION – D

Questions 18 carry 5 marks each.

- 18.** Describe an experiment to demonstrate the magnetic effect of electric current. Explain your observations and conclusion.

Ans. To demonstrate the magnetic effect of electric current, you can perform an experiment using a magnetic compass and a wire connected to an electric cell and a switch. Place the magnetic compass beneath the wire. When the switch is in the 'OFF' position, the compass needle points in its original direction, typically North. When the switch is moved to the 'ON' position, allowing current to flow through the wire, the compass needle deflects from its original direction. When the switch is turned 'OFF' again, the needle returns to its original position.

Observation: The compass needle deflects only when the electric current is flowing through the wire. When the current stops, the needle returns to its original position.

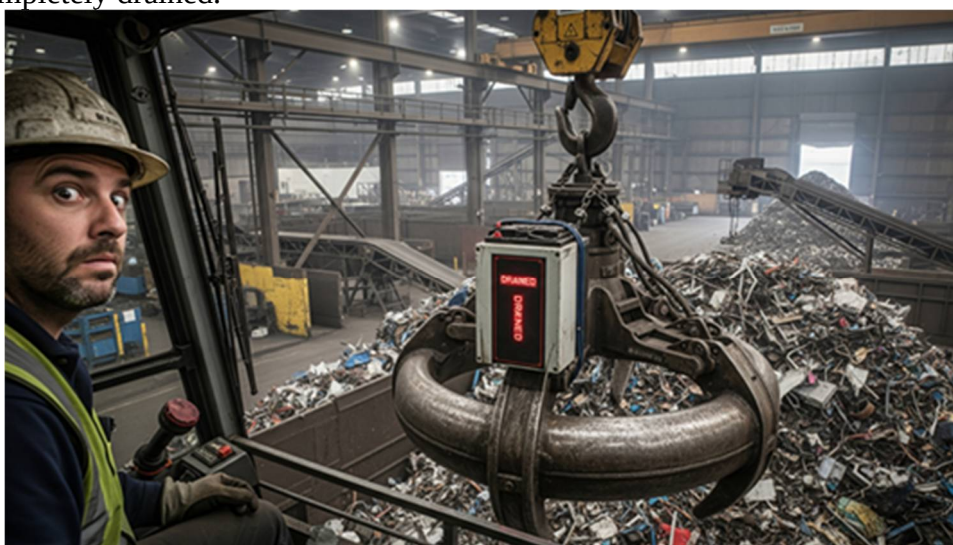
Conclusion: The deflection of the magnetic compass needle indicates that the current-carrying wire has a magnetic effect on the compass needle. This phenomenon, where an electric current produces a magnetic field, is known as the magnetic effect of electric current.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case Study-1: The Metal Recycling Plant

In a large industrial recycling plant, an operator, Rohan, uses a massive crane with an electromagnet to move scrap steel. The crane's electromagnet is connected to a powerful battery. Rohan knows that to lift heavier loads, he needs to increase the strength of the electromagnet. He also knows that changing the direction of the current can reverse the poles of the magnet. On a particular day, the crane operator notices that the electromagnet has stopped working even though the circuit is closed. Upon investigation, he finds that the battery has been overused and has become completely drained.



- (i) What is the relationship between the battery and the strength of the electromagnet? [1]
- (ii) What would happen if Rohan reversed the battery terminals while the electromagnet was working? [1]
- (iii) Why did the electromagnet stop working when the battery became drained? [1]
- (iv) What kind of metals can this electromagnet lift? [1]

Ans. (i) The strength of the electromagnet is directly related to the current supplied by the battery. A more powerful battery (e.g., one with more cells) gives a larger current, which creates a stronger magnetic field and allows the electromagnet to lift more clips or heavier objects.

(ii) If Rohan reversed the battery terminals, the direction of the current would change. This would cause the poles of the electromagnet to be reversed.

(iii) An electromagnet requires a flow of electric current to function as a magnet. When the battery became drained, it could no longer supply electric current to the coil. As a result, the magnetic field disappeared, and the electromagnet stopped lifting the clips.

(iv) The electromagnet can lift only magnetic materials. Since scrap steel is a magnetic material, the electromagnet can lift it.

20. Case Study-2: The Electric Stove Dilemma

Sana is trying to heat water using an electric stove. She notices that the coil on the stove, called the heating element, glows red hot when she switches it on. She has a choice of two different heating elements: one made of copper and another of nichrome, both of the same size and length. She recalls from her science class that both are conductors, but their properties are different. She selects the nichrome element, and the water heats up quickly.



- (i) Why does the heating element glow red hot? [1]
 - (ii) Why is nichrome a better choice for a heating element than copper? [1]
 - (iii) What would happen if Sana used a thinner nichrome wire instead of a thicker one (assuming the length is the same)? [1]
 - (iv) Give one example of an appliance other than a stove that uses a heating element. [1]
- Ans. (i) The heating element glows red hot because the electric current passing through it faces high resistance. This resistance causes the electrical energy to be converted into a large amount of heat energy, which makes the element glow.
- (ii) Nichrome is a better choice than copper for a heating element because it offers higher resistance compared to a copper wire of the same size and length. Higher resistance means more electrical energy is converted into heat, making it more effective for heating appliances.
- (iii) The amount of heat generated in a wire depends on its thickness. A thinner nichrome wire would offer more resistance than a thicker one, and therefore, it would heat up more.
- (iv) An example of another appliance that uses a heating element is an electric room heater or an electric iron.
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