Chapter 4: Current Electricity and Magnetism

Question: 1. Write proper words from the following group of words in the blanks and rewrite the completed sentences:
(magnetism, 4.5V, 3.0V gravitational attraction, potential difference, potential, higher, lower, 0V)

(1) Water in the waterfall flows from a higher level to the lower level because of **gravitational attraction.**
(2) In an electric circuit, electrons flow from a point of **lower** potential to the point of **higher** potential.
(3) The difference between the electrostatic potential of the positive end and the negative end of an electric cell is the **potential difference** of the cell.
(5) An electric current flowing in a wire creates **magnetism.**
(4) Three electric cells of potential difference 1.5 V each have been connected as a battery. The potential difference of the battery will be **4.5V**

Question: 2. Rewrite the following statements selecting the correct options:
(1) The potential difference between the two electrodes of the lead-acid cell is nearly **2 V**
(a) 1 V (b) 1.2 V (c) 1.5 V (d) 2 V
(2) The Ni-Cd cell delivers a potential difference of **1.2 V.**
(a) 1 V (b) 1.2 V (c) 1.5 V (d) 2 V
(3) **Electric current** is a scalar quantity.
(a) Force (b) Acceleration (c)Velocity (d) Electric current
(4) The working of an electric bell is based on **the magnetic effect of electric current**
(a) the heating effect of electric current (b) the chemical effect of electric current
(c) the magnetic effect of electric current (d) the optical effect of electric current

Question: 3. State whether the following statements are True or False:
(1) The SI unit of electric potential is the ampere**. False**
(2) In the external circuit, the conventional current flows from the positive terminal of the cell to the negative terminal of the cell. **True**
(3) Very small current flows when lightning occurs**. False**
(4) Sensation is felt by us due to a microscopically small current flowing to the brain**. True**
(5) In a car battery, a current is produced by the flow of both negatively and positively charged particles**. True**

Question: 4. Identify the odd term:
(1) Pressure exerted by a liquid, Electric current, Electric potential difference, Buoyant force.
Answer: Electric current
(2) Electric bulb, Electric heater, Electric bell, Electric iron.
Answer: Electric bell

Question: 5. Answer the following questions in one sentence:
(1) State the relation among the SI units of electric current, electric charge and time.
Answer: I = Q/t, where I is electric current, Q is electric charge, and t is time.
(2) Name the positive terminal of the dry cell.
Answer: The positive terminal of a dry cell is the carbon rod.
(3) What is a solar cell?
Answer: A solar cell converts sunlight directly into electrical energy.
(4) State one characteristic of the Ni-Cd cell.
Answer: A characteristic of the Ni-Cd cell is that it is rechargeable.
(5) Give one example in which the magnetic effect of electric current is used.

Answer: The magnetic effect of electric current is used in an electric bell.

(6) When do we get current electricity?

Answer: We get current electricity when charges flow through a conductor.

Question: 6. Answer the following questions:

(1) Explain the concept of electrostatic potential (electric potential).

Answer: Electrostatic potential, or electric potential, is defined as the amount of work done in bringing a unit positive charge from infinity to a specific point in an electric field without any acceleration. It represents the potential energy per unit charge at that point and is measured in volts (V). The electrostatic potential is a scalar quantity, indicating that it has magnitude but no direction, and it helps determine how much work would be required to move a charge within the field.

(2) What is the SI unit of electric potential?

Answer: The SI unit of electric potential is the volt (V).

(3) What is potential difference?

Answer: Potential difference is the difference in electric potential between two points in a circuit, causing current to flow.

(4) What is electric circuit or electrical circuit?

Answer: An electric circuit is a closed loop or path through which electric current can flow.

(5) What is electric current?

Answer: Electric current is the flow of electric charge through a conductor.

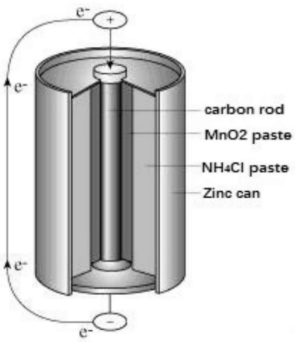
(6) What is one ampere?

Answer: One ampere is the current when one coulomb of charge passes through a point in a circuit per second.

(7) How can we measure water flow emerging from a pipe? We can find it from the amount of water (litres) coming out in a specific time period. How then is the electric current measured? (Think about it. Textbook page 24)

Answer: Electric current is measured by the amount of electric charge (in coulombs) flowing through a conductor in a specific time period (in seconds). The unit of current, the ampere (A), is defined as one coulomb of charge passing through a point in a circuit per second, similar to measuring water flow by the volume (litres) over time.

(8) Describe the construction, working and usefulness of a dry cell, with the help of a diagram.



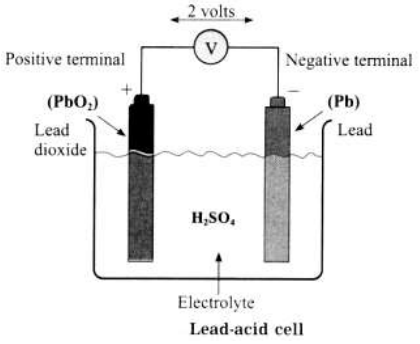
Answer:

Construction: A dry cell consists of a cylindrical container that contains a paste of electrolyte (usually ammonium chloride), a carbon rod (the positive electrode), and a zinc casing (the negative electrode).

Working: When the cell is connected to a circuit, a chemical reaction occurs between the electrolyte and the electrodes, causing electrons to flow from the zinc casing to the carbon rod, generating electric current.

Usefulness: Dry cells are widely used in portable devices such as flashlights, remote controls, and toys due to their compact size and ease of use.

(9) Draw a neat labelled diagram to show the design of the lead-acid cell and explain its principle of working.



Lead-acid cell

Answer:

Design: A lead-acid cell consists of lead dioxide (PbO_2) as the positive electrode, spongy lead (Pb) as the negative electrode, and a dilute sulfuric acid (H_2SO_4) solution as the electrolyte. The electrodes are immersed in the electrolyte within a plastic container.

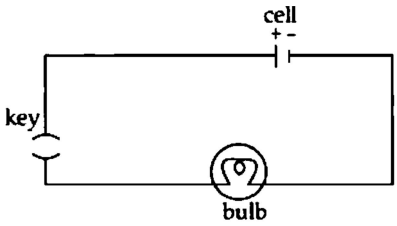
Principle of Working: When the cell discharges, the lead dioxide and spongy lead react with the sulfuric acid to produce lead sulfate ($PbSO_4$) and water. This chemical reaction releases electrical energy. When charging, the process is reversed, restoring the electrodes and the electrolyte.

(10) What is the potential difference delivered by the Ni-Cd cell?

Answer: The potential difference delivered by a Ni-Cd (Nickel-Cadmium) cell is typically **1.2 volts (V).**

(11) Draw a neat labelled diagram of a simple electric circuit containing a cell, an electric bulb and a plug key. What happens when the key is (i) open (ii) closed?

Answer:



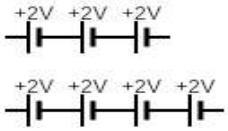
What Happens When the Key is:

(i) Open: When the plug key is open, the circuit is incomplete, and no current flows; the bulb remains off.

(ii) Closed: When the plug key is closed, the circuit is complete, allowing current to flow, and the bulb lights up.

(12) Electric cells having potential difference 2V each have been connected in the form of a battery. What will be the total potential difference of the battery in both cases?

Answer:

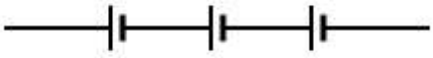


(i) Total potential Difference: 2V + 2V + 2V = 6V

(ii) Total potential Difference: 2V + 2V + 2V + 2V = 8V

(13) A battery is to be formed by joining 3 dry cells with connecting wires. Show how you will connect the wires by drawing a diagram.

Answer:



(14) In an electric circuit, a battery and a bulb have been connected and the battery consists of two cell of equal potential difference. If the bulb is not glowing, then which tests will you perform in order to find out the reason for the bulb not glowing?

Answer:

(a) Make sure the battery is charged and working by testing its voltage with a multimeter.

(b) Look for loose or disconnected wires in the circuit.

(c) Replace the bulb with a new one to see if the original bulb is burned out.

(d) Use a multimeter to check for breaks in the wiring.

(e) Ensure there are no faulty connections that might bypass the bulb.

(15) You must have seen the car battery available in the market. It is called a battery and not a cell. Why?

(Use your brain power! Textbook page)

Answer: A car battery is called a battery and not just a cell because it consists of multiple individual cells connected together to provide a higher voltage. Each cell typically produces a potential difference of 2 volts, and when several cells are connected in series, they form a battery that provides the necessary voltage (usually 12 volts) to start the car. The term "battery" refers to the complete assembly of these interconnected cells, while a "cell" refers to a single electrochemical unit.

(16) What is an electromagnet? State its applications.

Answer: An electromagnet is a type of magnet that is created by passing an electric current through a coil of wire wrapped around a ferromagnetic core, such as iron. When the current flows, the coil generates a magnetic field, magnetizing the core.

Applications of Electromagnets:

(a) Electric Bells (b) Magnetic Locks (c) Electric Motors (d) Magnetic Cranes (e) Transformers

(17) Describe the construction and working of an electric bell with the help of a diagram.

Answer:

Construction: An electric bell consists of:

- A coil of wire (electromagnet) wound around a metal core.
- A hammer made of metal that strikes a bell or chime.
- A battery or power source to provide electric current.
- A switch or key to control the flow of current.

Working:

When the switch is pressed, electric current flows through the coil, creating a magnetic field and turning the coil into an electromagnet.

The electromagnet attracts the metal hammer, causing it to strike the bell, producing a sound.

When the hammer moves, it breaks the circuit, stopping the current and the magnetic field.

The hammer returns to its original position, closing the circuit again, and the process repeats, producing a ringing sound until the switch is released.