CHAPTER 3

Current Electricity

TRY YOURSELF

ANSWERS

1. When potential difference is applied across the ends of a conductor, the electrons are pushed towards the positive end. Hence, drifted velocity gets superposed on their thermal velocity or random motion and they get drifted towards the positive end of the conductor and hence constitute electric current.

2. Current is known as the rate of flow of charges that is electrons. While the electrons move through the wire, the number of positive charges is equal to the number of negative charges formed due to motion. Therefore, a wire carrying currents is electrically neutral.

3. Current is kept continuos inside a conductor by maintaining a potential difference across the ends of conductor.

4. The electrical conductivity of a metallic wire is defined as the ratio of the current density to the electric field it creates.

It is reciprocal of resistivity (ρ).

Electrical conductivity, $(\sigma) = \frac{1}{\rho} = \frac{j}{E}$

S.I. unit = mho m^{-1} or $(\text{ohm m})^{-1}$ or S m^{-1}

5. If the temperature of a metallic conductor is increased, the drift velocity of electrons in the conductor decreases.

6. The electrical conductivity of semiconductor increases with increasing temperature because with increase in temperature number of electrons from the valence band can jump to the conduction band in semiconductor.

7. The value of α is more for metals than the alloys.

8. The material can be nichrome. Nichrome is used in heating element of electrical devices.

9. If a battery is short-circuited by a heavy wire, large amount of current will pass through the wire, although copper is good conductor it has some resistance, so heat is created in the wire. This is why copper wire temperature rises.

10. When a cell is being charged the potential drop across it is given by

$V = e + I \times R_{int} = 2 + 0.1 \times 5$ volts $= 2 + 0.5 = 2.5$ volts

The positive terminal of the battery is connected to the positive terminal of the charger. Hence, inside the battery, the direction of current is from positive to negative terminal of battery.

11. The voltage reduces slightly because of the internal resistance of the cell. The terminal voltage of the cell is the potential difference across the terminals of the cell when it is connected to a circuit. This is why the terminal voltage is always less than the EMF of the same voltage source of cell.

12. It is a kind of defect but it can't be declared a defect as it is the nature of the cell.

13. Applications of Kirchhoff's law.

Kirchhoff's law is used to find :

The values of current, voltage and internal resistance in *DC* circuits. By applying this law we can also find the unknown resistance in the circuit.

Wheatstone bridge is an important application of Kirchhoff's law. It is used in mesh and node analysis.

14. Kirchhoff's junction rule states that the total current into a junction is equal to total current the junction. This is a statement of conservation of charge. It is also sometimes called Kirchhoff's first law, Kirchhoff's current law, the junction rule, or the node rule.

15. (b) : Kirchhoff's junction law is reflection of law of conservation of charge.

16. Wheatstone bridge is said to be more sensitive when its voltmeter will show zero deflection, means it will be in a balanced condition. *i.e.*, all the four arms are nearly of same order of magnitude.

17. Wheatstone bridge is an electrical circuit and as the name suggests, it is in a shape of a bridge, the bridge is a galvanometer. It is named after Sir Charles Wheatstone who has popularized this. Wheatstone bridge helps to find unknown resistance, value of a resistor. This bridge is also called post office box.

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