SHORT QUESTIONS

14.1 Electric Current

Q.1. Define electric current.

Ans: The rate of flow of electric charge through any cross- sectional area is called, electric current. If the charge Q is passing through an area A in time t second, then the current flowing through it will be I, whereas

Mathematically

$$\text{Current} = \frac{\text{charge}}{\text{time}}$$

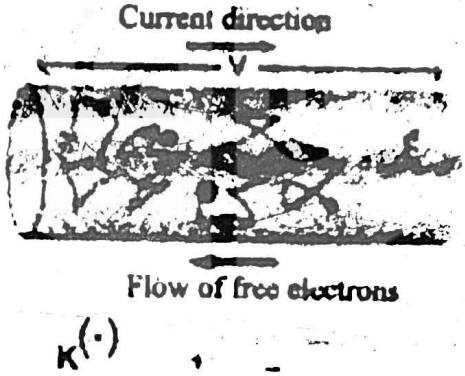
$$I = \frac{Q}{t}$$

Unit

In system International, the unit of current is known as ampere.

Q.2. What is meant by conventional current?

Ans: "A current produced due to flow of negative charges is equivalent to a current due to flow of an equal amount of positive charge in opposite direction. This equivalent current of positive charge is known as conventional current".



Q.3. Which type of charge is responsible for the flow of current in metallic conductors?

Ans: In metals or metallic conductors, the current is due to the flow of free electrons i.e. negative charges. For example, in a copper wire there are large number of free electrons which are in random motion. When we apply potential difference across the wire, these free electrons move through the wire.

Q.4. In electrolyte which charge are responsible for the flow of current?

Ans: The molecules of electrolytes are dissolved among positive and negative ions in a solution. Thus current in electrolytes is due to the flow of both positive and negative charges **as shown in fig.**

Q.5. How energy is obtained due to flow of charges?

Ans: When a positive charge moves from a point of higher potential to the point of lower potential, it gains the energy from the electric field. During flow of electric current, positive charges flow continuously from a high potential to a low potential point. Thus the electric current becomes a continuous source of energy.

14.2 Potentional Difference
14.3 E.M.F

Q.6. How a galvanometer is converted into voltmeter?

Ans: The galvanometer is converted into voltmeter by connecting suitable resistance in series with it. The value of the resistance depends upon the range of the voltmeter. Usually its value is several thousand ohms. Thus the resistance of a voltmeter is very high.

Q.7. How a galvanometer is converted into ammeter?

Ans: Galvanometer can be converted into an ammeter by connecting a small resistance parallel to it. This small resistance is known as "shunt". Shunt provides an alternative path for the current to flow. The major part of the current passes through the shunt and small fraction of it flows through the galvanometer.

Q.8. Why resistance of the ammeter is kept low?

Ans: If the resistance of the ammeter is kept high, then high amount of current flows through the galvanometer. When high amount of current will flow through the galvanometer then galvanometer can be burnt. That is why resistance of the ammeter is kept low

Q.9. Why resistance of the voltmeter is kept high?

Ans: If the resistance of the voltmeter is comparatively low, it will draw more current from the circuit. Due to this the potential difference across the resistance for the measurement, of which the voltmeter was connected, would drop.

Q.10. On what factor reliability of voltmeter depend?

Ans: Higher the resistance of the voltmeter, more reliable would be its readings. Therefore a good voltmeter should have such a high resistance so that no or very little current could pass through it.

Q.11. Differentiate between electromotive force and potential difference.

Ans:

Difference between electromotive force and potential difference.	
Electromotive force	**Potential difference**
The electromotive force of a battery or cell is the total energy supplied in driving one coulomb charge round a complete circuit in which cell is connected. The complete circuit includes the cell and external circuit connected to the terminals.	The potential difference determines the energy between any two points of the circuit which is required in moving a charge from one point to another.

14.4 Ohm's Law
14.5 V-I Characteristics of Ohmic and Non Ohmic Conductor

Q.12. State and explain Ohm's law. Write down its limitations. (16.4)

Ans: "The value of current I passing through a conductor is directly proportional to the potential difference V applied across its ends, provided the temperature and the physical state of the conductor does not change."

Mathematical form

$V \propto I$ Or $V = IR$ ..... (1)

Limitations of Ohm's Law

Ohm's law is applicable only in case of metallic conductors when their temperature and physical state do not change.

Q.13. Define resistance and its unit.

Ans: "The property of a substance which opposes the flow of current through it is called its resistance."

Mathematically:

$$R = \frac{V}{I}$$

Where R is resistance, V is potential difference and I is current. S.I unit of resistance is Ohm. Which is define as

Ohm

"If a current of one ampere passes through it when a potential difference of one volt is applied across its ends then resistance would be one Ohm. Ohm is usually represented by the Greek letter Ω

Mathematically

$$1\Omega = \frac{IV}{IA}$$

14.6 Specific Resistance (Resistivity) 14.7 and 14.8 Conductors and Insulators

Q.14. What are the factors upon which the resistance of a conductor depends?

Ans: Resistance of the conductor depends upon the following factors:

- Length of the conductor (L)
- Area of cross-section of the conductor (A)
- Nature of the conductor
- Temperature

Q.15. Why does the resistance of a conductor increase with the rise of its temperature?

Ans: When the temperature of the conductor rises, average speed of the random motion of the free electrons increases which enhances the rate of collision of electrons and atoms. This causes an increase in the resistance of the conductor.

Q.16. Why do we always use metal wires for conduction of electricity?

Ans: Because, they are good conductors of electricity and offer less resistance to the flow of current. Metals like silver and copper have excess of free electrons which are not held strongly with any particular atom of metals. These free electrons move randomly in all direction inside metals. When we apply external electric field these electrons can easily move in a specific direction. This movement of free electrons in particular direction under the influence of external field causes flow of current in metal wires.

Q.17. What do you mean by Insulators?

Ans: The substances through which almost no current flow are called Insulators

Examples: The examples of insulators are as followings glass, wood, plastic, fur, silk etc.

14.9 Combination of Resistors
14.10 Electrical Energy and Joule's Law and
14.11 Electric Power

Q.18. State Joule's Law.

Ans: The amount of heat generated in a resistance due to flow of charges is equal to the product of square of current I, resistance R and the time duration t.

Mathematically:

$$W = I^2Rt$$

Where W is work done (Energy), I is current, R is resistance and t is time duration.

Q.19. Define electric power.

Ans: The amount of energy supplied by current in unit time is known as electric power.

Mathematically:

$$\text{Power} = \frac{\text{Work}}{\text{Time}} \quad , \quad P = \frac{QV}{t} = IV = I^2R$$

Q.20. Define kilowatt hour?

Ans: Kilowatt – Hour

The amount of energy delivered by a power of one kilowatt in one hour is called kilowatt – hour.

Mathematically:

One kilowatt – hour 1kwh = 1000 w x 1 hour

= 1000 w x (3600s)

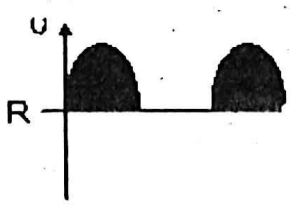
= 36×10^5 J = 3.6 MJ

14.12 Direct Current and Alternating Current
14.13 Hazards of Electricity

Q.21. Differentiate between A.C and D.C.

Ans:

Difference between A.C. and D.C.

Alternating current (A.C.)	Direct current (D.C.)
• The current which changes its direction again and again is called alternating current. • A.C current can transfer electrical energy over the long distances and can provide more power. • The frequency of alternating current is 50Hz. • A.C current is obtained from A.C generators and mains. • **Wave form of A.C**  **AC Current** **Example** Current used in our houses.	• A current which always flows only in one direction is called the direct current. • Voltage of D.C cannot travel very far until it begins to lose energy. • The frequency of the D.C current is zero. • D.C current is obtained from batteries and cells. • **Waveform of D.C**  **DC Current** **Example** Current from dry cells.

Q.22. What are live and neutral wires?

Ans: Electricity is distributed to various houses in a city from a power station by means of two wires.

Neutral wire

One wire is earthed at the power station, so it is at zero potential. This wire is called neutral wire. This wire provide the return path of current. It is a black or blue in colour.

Live wire

The other wire on power station is at some certain potential called the live wire. The potential difference between both wire is 220. It is red or brown in colour.

Q.23. How electricity is dangerous for us?

Ans: Our body is a good conductor of electricity through which current can easily pass. Therefore if a person holds live wire, then because of the presence of voltage in it, current will start flowing to ground through the human body which may prove fatal for the person.

14.14 Safe Use of Electricity In Homes

Q.24. What is cable? And how it should be used?

Ans: "An insulated covered wire is known as cable".

Cable should be used keeping the following things in mind:

- **Layer of insulation** in the cable is perfect and is not damaged.
- Sometimes a **heavy current** flow through the wire and it gets so hot that its insulation is burnt out and the wire becomes naked and it becomes dangerous.
- **Constant friction** also removes the insulation from the wire whereas too much moisture also damages the insulation. In such a situation it is advisable to use a cable with two layers of insulation.

Q.25. Define fuse and write down its principle.

Ans: "A small wire connected in series with the live wire is known as fuse wire or fuse".

Principle

A specified amount of current can safely pass through it. When the current following through it exceeds this limit, it gets so hot that it melts.

Q.26. What do you know about Fuse rating?

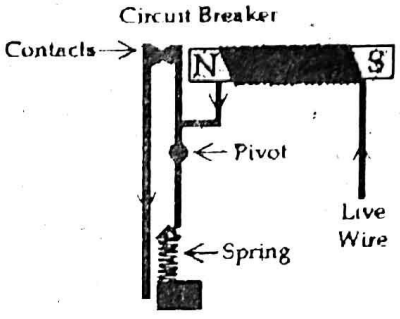
Ans: We can determine the required fuse rating for a circuit. Suppose we want to insert a fuse for an air-conditioner or heater of power 3000W. If voltage supply is of 240V, then according to relation $P = V \times I$, we get $I = 12.5A$. The available fuses in the market are usually of rating 5A, 10A, 13A, 30A etc. Hence, suitable fuse for this circuit would be of 13A.

Q.27. What is Circuit Breaker? Also write down its principle.

Ans: It is a safety device which is used in place of fuse. Due to any fault when the current exceeds the safety limit, then the button of the circuit breaker moves upward. Due to which the circuit breaks and the flow of the current is stopped in it.

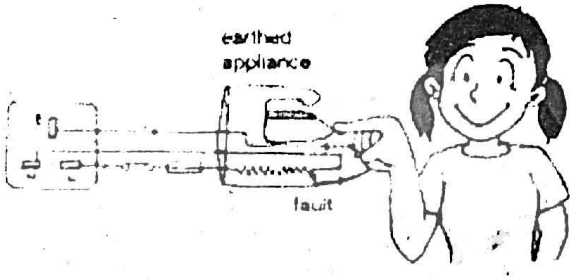
Principle

The current flowing through the electric circuit also flows through the coil of the circuit breaker due to which the coil becomes electromagnet. When the current is within its limits, the contact points of the circuit are connected to each other and the circuit is completed. As soon as the current exceeds the limit, the magnetic force of the electromagnet is so increased that it attracts the iron strip towards it. Hence the contact points are separated and the circuit breaks.



Q.28. What is the working principle of Earth wire?

Ans: Whenever the metal casing of the appliance, due to faulty insulation, gets connected with the live wire, the circuit shorts and a large current would immediately flow to ground through the earth wire and causes the fuse wire to melt or the circuit breaker breaks the circuit. Therefore, the person who is using the appliance is saved.



Q.29. On what principle circuit breaker work?

Ans: The current flowing through the electric circuit also flows through the coil of the circuit breaker due to which the coil becomes electromagnet. When the current is within its limits, the contact points of the circuit are connected to each other and the circuit is completed. As soon as the current exceeds the limit, the magnetic force of the electromagnetic is so increased that it attracts the iron strip towards it. Hence the contact points are separated and the circuit breaks.

Q.30. How earth wire is useful to us?

Ans: Whenever the metal casing of the appliance, due to faulty insulation, gets connected with the live wire, the circuit shorts and a large current would immediately flow to ground through the earth wire and causes the fuse wire to melt or the circuit breaker breaks the circuit. Therefore, the person who is using the appliance is saved.