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1. What are the features of a series combination of resistance?

- a. The current flowing through each resistance is always the same.
- b. The voltage of the series combination of a resistor equals the sum of potential difference across each individual resistance.
- c. The net resistance of the combination is equal to the sum of the resistances of individual resistors.

2. Mention the features of the parallel combination of resistors.

- a. Different amounts of current will flow through different registers.
- b. The potential difference across each resistance is equal to the total voltage of the circuit.
- c. Sum of reciprocal of individual resistors is equal to the reciprocal of equivalent resistance of the circuit. [$1/R = (1/R_1 + 1/R_2 + 1/R_3)$]

3. Discuss the cause of heating due to current flow through a conductor.

When a conductor is connected to a cell, the free electron starts to drift with a velocity and collide with the atoms of the conductor. As a result, the kinetic of free electrons is transferred to the atoms. So, the atoms start vibrating. This increasing energy creates heat energy, that's why it becomes hot.

4. Derive the joules law of heating. Or Calculate the amount of heat produced by a conductor.

We know potential difference = work/charge

$$\text{Or, } V = W/q$$

$$\text{Or, } V = W/(I \times t)$$

$$\text{Or, } W = V \times I \times T$$

This work done is equal to the heat energy generated in a conductor.

$$H = V \times I \times T = (I \times R) \times I \times T = I^2 R T$$

This is joules law of heating.

5. What is joules law of heating?

- a. The amount of heat produced in a conductor is directly proportional to the square of electrical current flowing through it.
- b. The produced heat is directly proportional to the resistance of the conductor.
- c. The produced heat is directly proportional to the time for which the electrical current flows through the conductor.

6. Write some applications of joules law of heating And discuss them.

(i) **Electric bulb** - electrical bulb glows when electric current flows through the filament. The filament is made of alloy, which has high resistance, so when electrical current flows through the filament due to the joules heating effect, the bulb glows. This glass envelope of the electrical bulb is filled with inert gases like Nitrogen or argon to increase the durability Of the bulb.

(ii) **Electric fuse** is used for safety purposes in our home. An electrical fuse is made of high resistance and low melting point. This alloy is made of tin and lead. That's why it has higher resistance and a lower melting point. When an excessively large amount of current flows through the fuse wire, heat is generated, and the fuse wire melts.

(iii) **Heating appliance** - Any heating appliance is an excellent example of the joules law of heating. The coil of electrical appliances is made of nichrome which has high resistance. According to joules law of heating, it will produce a very high amount of heat energy.

7. What do you mean by rating a fuse as 5 amperes?

It means the maximum current that can flow through the fuse wire without melting is 5 amperes.

8. What do you mean by electrical power?

Electrical power is defined as the amount of electric energy consumed in a circuit per unit of time.

Electrical power (p) = W/t

Or $P = VI$

Or, it can be written as $P = I^2R = V^2/R$ [Using ohms law]

9. What is the practical unit of electrical power?

The functional unit of power is horsepower.

S.I. unit of electrical power is the watt. The relation between them is one horsepower equal to 746 watts.

10. What is the commercial unit of electrical power? 1Kwh is equal to how much joule?

The commercial unit of electrical power is Kilowatt hour.

i.e. 1 Unit = 1 Kwh = $1000 \times 60 \times 60 = 3.6 \times 10^6$ Joule

That means 1 kilowatt-hour is the amount of electrical energy consumed by 1000-Watt electrical appliances in one hour.

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