ODM EDUCATIONAL GROUP
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ELECTRICITY

CHAPTER NO.12

SUB: PHYSICS

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LEARNING OUTCOMES

- **Students will be able to** :
- Demonstrate heating effect of joules law.
- Define Joules law of heating

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POINTS TO BE COVERED

Heating effect of electric current

Joule's law. .

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Electric Circuit in Parallel

Uses

It is normally used in homes for connecting bulbs and different household appliances

Each appliance has a separate switch which can be turned on or off as required

Advantages

Even if one electrical appliance stops working due to some defect, all other appliances work fine.

Individual appliance can be turned off or on separately

Each electrical appliance gets the same voltage as the power supply line.

Since overall Resistance of Circuit decreases, devices can draw more current to operate

Disadvantages

This method becomes cumbersome to use if thousands of bulbs/appliances are to be switched on or off

It is less safe as more current can pass through the circuit

Electric Circuit in Series

Advantages

- In this case, it is easier to switch on or off all the appliances connected together.
- Also it is safer as less current flows through circuit
- It is used when hundreds or thousands of bulbs are to be used together (So that same current passes through all, and they can switched on and off together.)
- Example-Diwali light decoration

Disadvantage

- If one electrical appliance stops working due to some defect, then all other appliances would stop working.
- All electrical appliances have only one switch due to which they can not be turned on and off separately.
- All the appliances do not get the same voltage as the voltage gets divided in series combination.
- The equivalent resistance increases too much due to which the amount of current flowing becomes very small.

Differentiate between series and parallel combination of resistors.

Series	Parallel
The current is same in all the resistors.	The net current gets divided among individual resistors.
The net voltage gets divided among individual resistors.	The voltage is same across all resistors.
Equivalent resistance is given by $R = R_1 + R_2 + R_3 + \ldots$	Equivalent resistance is given by $1/R = 1/R_1 + 1/R_2 + 1/R_3 + \ldots$

HEATING EFFECT OF ELECTRIC CURRENT

Q. Explain how does the electric bulb glow?

When electricity passes through the tungsten wire of a bulb, then the temperature of the wire increases and it glows.

Joules law of heating: It states that, heat produced in a resistor is

1. Directly proportional to the square of current for a given resistance.
2. Directly proportional to the resistance for a given current.
3. Directly proportional to the time for which the current flows through the resistor.

mathematically **H = I2Rt.**

How is Heat Formula Derived?

We know that

Energy = Power × Time

Thus,

Heat energy due to current = Electric Power × Time

$H = P \times t$

$H = VI \times t$

$\mathbf{H = VIt}$

Also, putting V = IR by Ohm's Law

$H = VIt$

$H = (IR) \times It$

$\mathbf{H = I^2Rt}$

Also, putting $I = \frac{V}{R}$ by Ohm's Law

$H = VIt$

$H = V \times \frac{V}{R} \times It$

$\mathbf{H = \frac{V^2}{R}t}$

THANKING YOU

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