

Class X Science

PHYSICS

CHAPTER - ELECTRICITY

SUB TOPICS - Ohm's law , resistance and factors affecting resistance.

Resistance

Resistance is a measure of the opposition offered to the current flow in an electric circuit.

Factors affecting Resistance & How they affect

Resistance is:

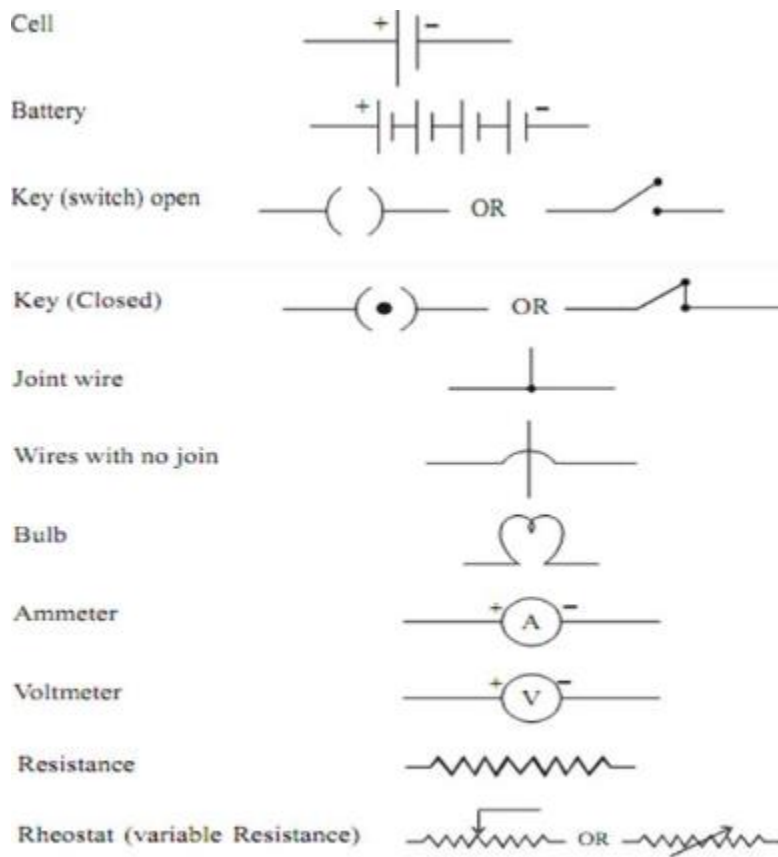
- directly proportional to the length of the conductor.
- directly proportional to nature of the conductor.
- directly proportional to the temperature of the conductor.
- inversely proportional to the cross-sectional area of the conductor.

Resistivity

The electrical resistance offered by a substance of unit length and unit cross-sectional area is called resistivity.

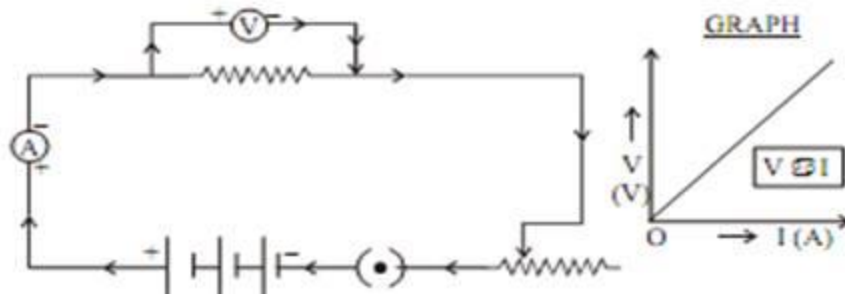
Resistivity is also called specific resistance.

SYMBOLS OF ELECTRIC COMPONENTS



OHM'S LAW

George Simon Ohm found the relationship between the current (I) flowing through a conductor and potential difference (V) across the terminals of a conductor using the circuit diagram. He observed that the potential difference and current varied linearly.



Ohm's Law → He stated that the electric current flowing through a conductor is directly proportional to the potential difference across its ends, under standard temperature and pressure conditions.

$$V \propto I$$

$$V = IR$$

Where "R" is the proportionality constant for the given metal at given temperature and is called resistance. The graph between V and I is always straight line with slope equal to R.

Resistance : It is the property of a conductor that opposes the flow of current. It is represented by 'R' and symbol is Ω

SI unit of resistance is "Ohm".

1 Ohm : The resistance of a conductor is said to be one Ohm, when the potential difference across the conductor is 1V and the current flowing through it is 1A.

$$V = IR$$

$$\therefore R = \frac{V}{I} \quad IR = V$$

Rheostat

As we know that

$$V = IR$$

So to increase or decrease the current accordingly in the circuit a component used is called "Rheostat", that regulates the current without changing potential difference. Represented by "Rh".

Its symbol is OR

If a conductor has less Resistance, then more current will flow through it.

Factors on Which Resistance of a Conductor Depends

1. On its length (L)
2. On its cross sectional area (A)
3. On the nature of material.

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2. Resistance) $R \propto L$ (Directly prop. to length)

$R \propto \frac{L}{A}$ (inversely prop to cross-sectional area)

$$R = \rho \frac{L}{A}$$

Where " ρ " (rho) is a proportionality constant known as resistivity of the material of conductor.

Resistivity (ρ) : The resistance offered by a wire of unit length and unit cross-sectional area is called resistivity.

It

s SI unit is Ωm

$$\text{Since } R = \rho \frac{L}{A}$$

$$\therefore \rho = \frac{R \cdot A}{l} = \frac{\Omega m^2}{m}$$

$$\therefore \text{SI unit of } \rho = \Omega m.$$

For a material irrespective of length and area, the resistivity is a constant.

Resistivity of a Material varies with Temperature

Resistivity is the measure of resistance of a material. In other words, upto what extent will the material resist current flow.

Resistivity of an alloy (homogeneous mixture of metals) is generally higher than of its constituent metals. Example: Constantan (alloy of Cu & Ni)

Alloys have high resistivity and do not oxidise (burn) readily at high temperature, for this reason they are commonly used in electrical heating devices, like electric iron, heater, toasters etc. For example "Tungsten" as filament of electric bulb.

HOME WORK

REFERENCE BOOK :

Pg no : 181

Very short answer questions

Q1 to Q20