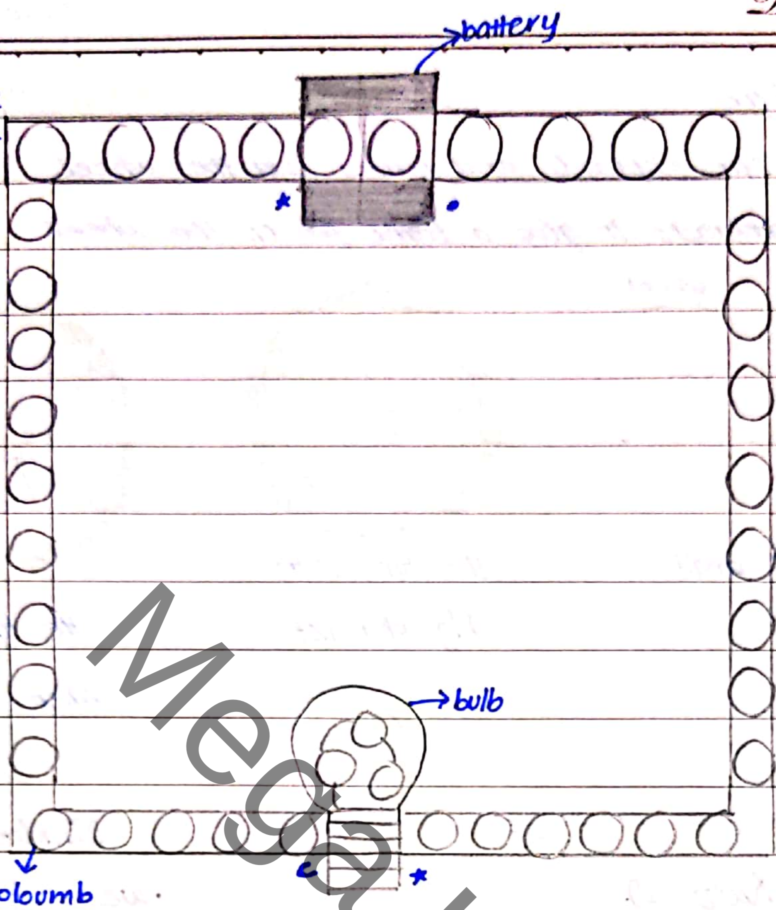
Date:

a voltmeter will measure the difference in volts b/w two points e.x/ * & • c & *
↳ in other words potential difference

Current is the number of coloumbs passing in one second

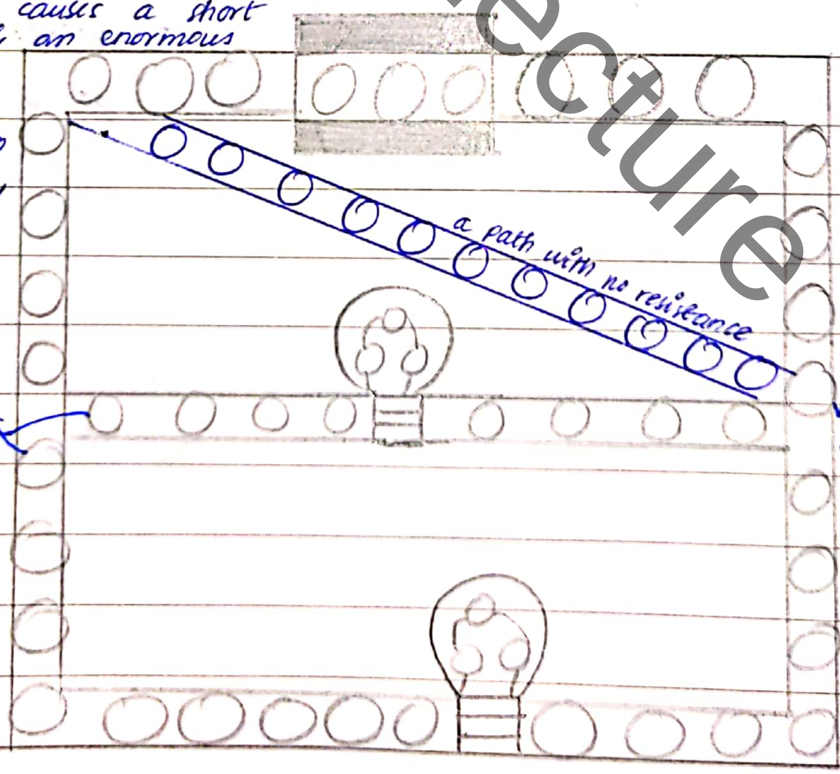


voltage is the energy provided by the battery to each coloumb

which is why:

* current remains same in series
* voltage divides b/w the components

—: this connection causes a short circuit b/c there is an enormous current accumulating in the wire/ not being used up
↳ why we need earth connections/ fuses etc.



however, the energy carried by each coloumb is not affected by the division so voltage remains same

the current has to split so it divides into two *electricity in our homes is

Date:

CURRENT ELECTRICITY & D.C CIRCUITS

current : rate of flow of charge
amount of charge passing per unit time
measured in amperes

$I = \frac{Q}{t}$ current = $\frac{\text{charge}}{\text{time}}$

• conventional current is current due to flow of +ve charge only
• electronic current is current due to flow of -ve charge only

* If 1 coloumb charge passes through a conductor in one second then the current flowing is 1 Amperes

voltage : energy supplied per unit charge or work done per unit charge
measured in Volts

voltage = $\frac{\text{energy}}{\text{charge}} = \frac{\text{work}}{\text{charge}}$

* energy & work done is measured in Joules, charge in coloumb

resistance : {when electrons pass through a conductor, they collide with the vibrating atoms of conductor and their flow is disturbed}
hindrance / opposition offered by the conductor to the flow of charge
↳ causes heat

resistance = $\frac{\text{potential difference}}{\text{current}} = \frac{\text{voltage}}{\text{current}}$

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

$\Omega = V/A$

Date:

Factors affecting resistance

1. Temperature

↑ temperature = ↑ vigorous vibration = ↑ collisions = ↑ resistance

2. Length of wire

↑ length = ↑ resistance

3. Cross-sectional area of wire

↑ area = ↓ resistance

OHM'S LAW

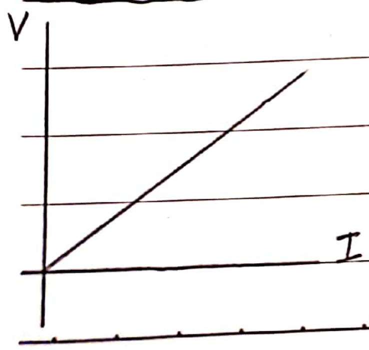
→ the current passing through a wire is directly proportional to the potential difference across the wire, if the temperature is kept constant

$V = kI$

→ resistance is measured in ohms

→ there are 2 types of conductors : 1. Ohmic Conductors
2. Non-Ohmic Conductors

ohmic conductors : a conductor which obeys the ohm's law



for this conductor, the p.d versus current graph is a straight line

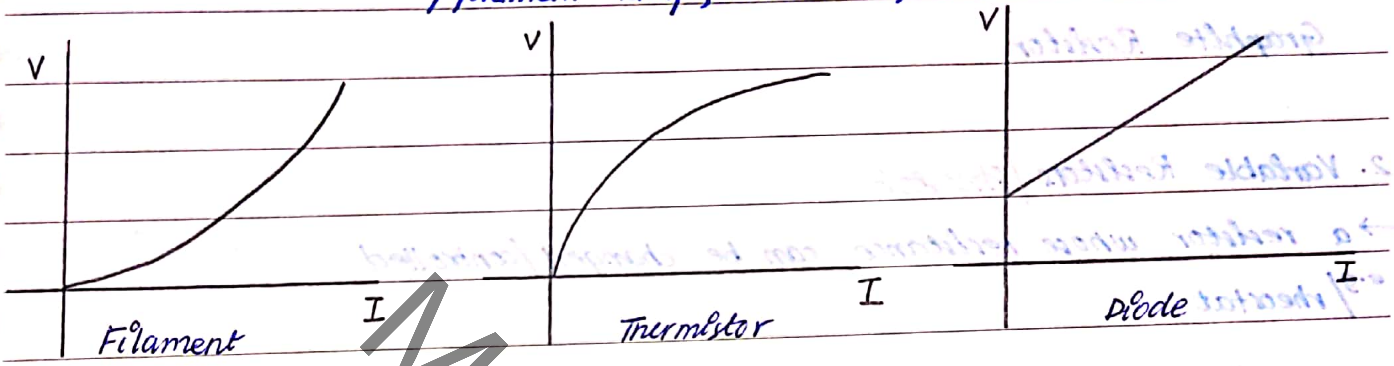
e.g./ carbon resistor

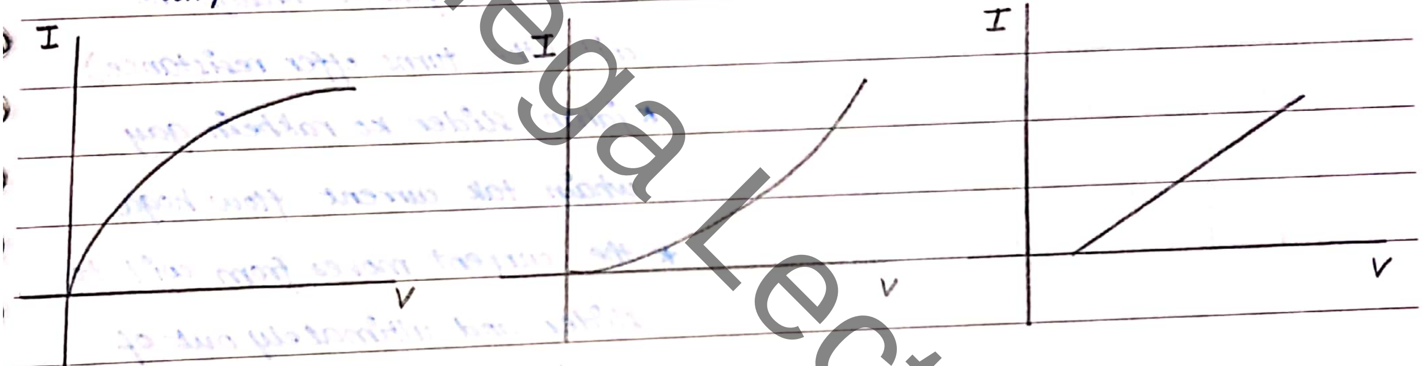
Date:

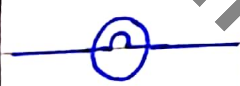
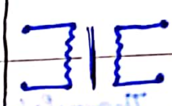
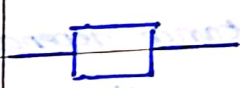
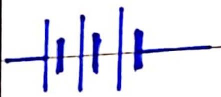
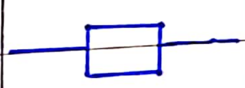
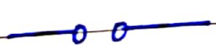
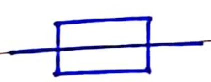
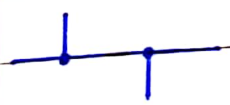
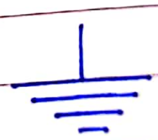
non-ohmic conductors: a conductor that does not obey ohm's law

for this conductor, the p.d against current graph is not a straight line

e.g/ filament lamp, thermistor, diode





DEVICE	SYMBOL	DEVICE	SYMBOL	DEVICE	SYMBOL
Switch		Lamp		Transformer	
Cell		Fixed resistor		Galvanometer	
Battery		Variable resistor		Ammeter	
Power supply		Fuse		Capacitor	
Wires joined		Coil of wire		Earth connection	

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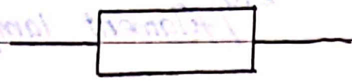
TYPES OF RESISTORS

1. Fixed Resistors

→ a resistor whose resistance remains constant

e.g/ Carbon Film Resistor

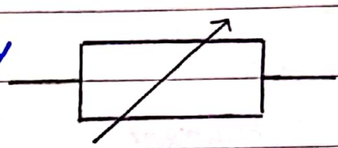
Graphite Resistor

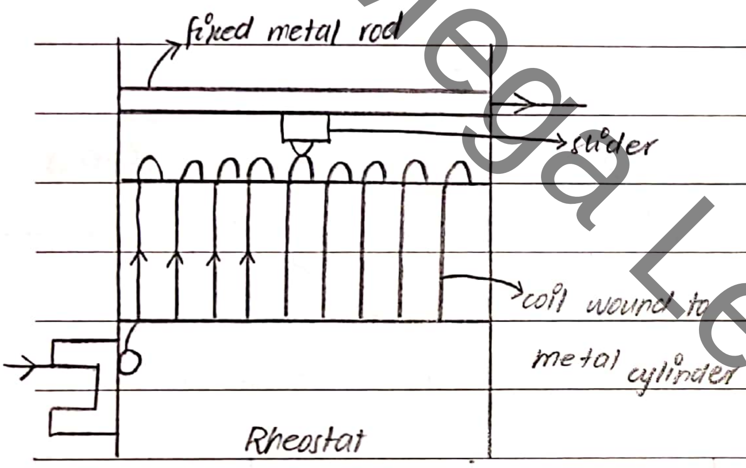


2. Variable Resistors / Rheostat

→ a resistor whose resistance can be changed/controlled

e.g/ rheostat



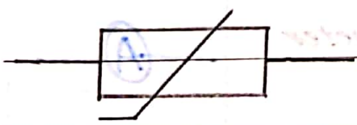


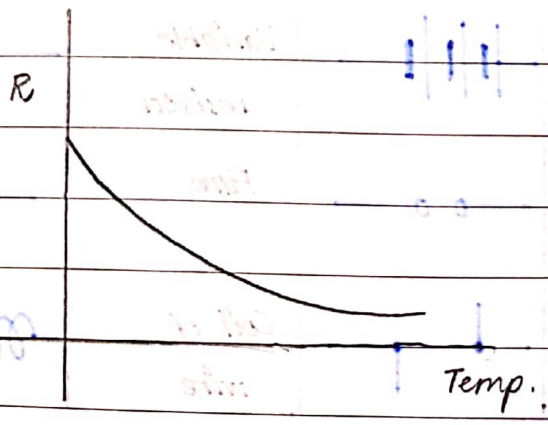
* current is passed through the coil (the turns offer resistance)
* jahan slider ko rakhein gay whain tak current flow hoga
* the current moves from coil to slider and ultimately out of the rheostat

(resistance increases with increase in length of wire)

3. Thermistor

→ a resistor whose resistance depends inversely upon temperature (resistance is inversely proportional to heat here)





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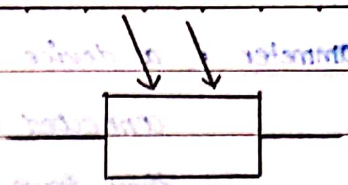
4. Light Dependant Resistor (LDR)



→ resistance inversely depends upon light intensity

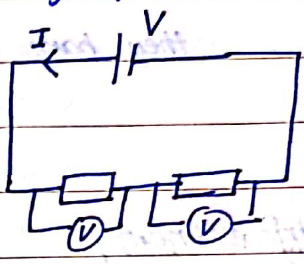
↑ light intensity = ↓ resistance

↓ resistance = ↓ voltage across wire

COMBINATION OF RESISTORS:

1. Series Combination

→ the resistors are connected end to end providing a single path to the current



→ the current in each resistor is the same

$$I_1 = I_2 = I_3 = I$$

→ the sum of potential difference is equal to the p.d provided by the cell or battery

$$V = V_1 + V_2 + V_3$$

→ the combined resistance in series circuit is given by

$$R = R_1 + R_2 + R_3$$

2. Parallel Combination

→ the sum of currents in a parallel circuit is equal to current provided by the cell or battery

$$I_1 + I_2 + I_3 = I$$

→ the potential difference across each resistor is the same

$$V_1 = V_2 = V_3 = V$$

→ the combined resistance is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Date:

ammeter : a device used to measure current in a circuit
connected in series to the circuit
they have different ranges i.e 0 to 1A, 0 to 5A, 0 to 10A. etc.

voltmeter : used to measure emf of battery of p.d across a resistor or component
connected in parallel to given component
they have different ranges i.e 0 to 1V, 0 to 5V, 0 to 10V. etc.

Energy Dissipation

→ the electrical energy is supplied by a cell or battery in a circuit
→ the electrical energy which is lost in the given resistor is called energy dissipation

* the lost energy converts into heat energy

$E = VIt$ or $E = I^2Rt$ or $E = \frac{V^2t}{R}$ or $E = Pt$

→ the unit will be Joules (time in seconds & power in watts)

Power Dissipation

→ the rate at which electrical energy is transmitted is called electrical power
→ rate of loss of energy of charges passing through a conductor is called power dissipation

$P = VI$ or $P = I^2R$ or $P = \frac{V^2}{R}$

Date:

- the unit is Watts

resistivity: constant opposition offered by the material to the flow of current is called resistivity of the material

RESISTANCE	RESISTIVITY
property of an object	→ property of a material
depends upon shape and size of object	→ does not depend on shape and size of the object
does not remain constant	→ remains constant
→ unit is ohms (Ω)	→ unit is ohmmeter (Ωm)
→ symbol is R	→ symbol is ρ
	(the constant in $R \propto L$ & $R \propto A$)

electromotive force: electrical energy provided by the cell to a unit charge is emf of the cell

(Internal circuit) the energy converted by a source in driving the unit charge around a complete circuit

(work done or energy converted from chemical to electrical to move unit coulomb charge flow throughout the circuit)

$$emf = \frac{energy}{charge} = \frac{work\ done}{charge}$$

$$1V = \frac{1J}{1C}$$

 Date:

potential difference : electrical energy taken by the electrical component from a unit charge to convert it into any other form of energy

(External circuit)

the energy required in driving the unit charge through the component

measured in volts

↳ amount of energy converted from electrical to non-electrical forms to move unit Coloumb charge through a component.

$$p.d = \frac{energy}{charge} = \frac{work\ done}{charge}$$

EMF IN SERIES AND PARALLEL CELLS

1. Series

→ the cells are connected end to end, together they supply more energy than a single cell

$$E = E_1 + E_2 + E_3$$

* overall voltage increases
* the current of circuit increases
* no change in time of operation of current

2. Parallel

→ the total emf supplied by the cells is same as provided by a single cell

$$E_1 = E_2 = E_3 = E \text{ (same)}$$

Q. Why use parallel combination?

- if one cell fails, the other continue to work
- they last longer
- they provide less resistance in a circuit
- less energy or heat is lost