ELECTRIC CURRENT

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Introduction

STATIC CURRENT

The study of charges which are at rest is called static current.

CURRENT

The study of charges which are in the motion is called current.

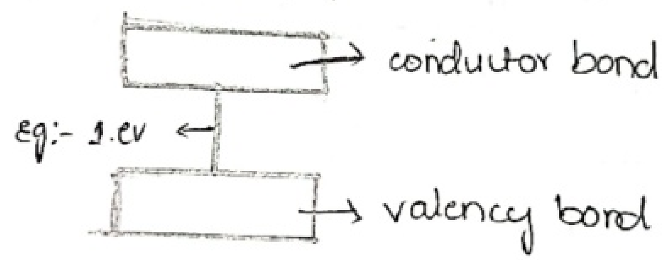
⇒ In this lesson we are going to study only about current electricity.

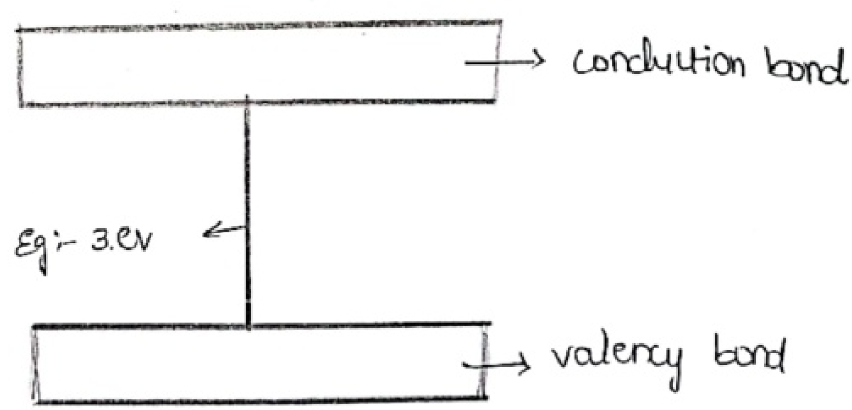
The substances are classified into 3 types :-

i. Insulators
ii. conductors
iii. Semi conductors.

Drude ⇑

Insulators	conductors	semi conductors.
⇒ The substances which will not allows electricity to pass through them.	substances which can pass electricity through them.	The substance which can pass electricity partially through them.
⇒ Eg:- Rubber, plastic, wood, etc.	eg:- all the metals, human body.	eg:- silicon graphate (pencil led) germanium.
⇒ The free electrons density is very less ($10^7/m^3$)	The free electron density is more ($10^{27}/m^3$)	The free electrons density is more than insulators. ($10^{19}/m^3$)
⇒ The energy is very more (more than 3e.v)	The energy gap is very less [0]	The energy gap is more than conductors [1e.v]



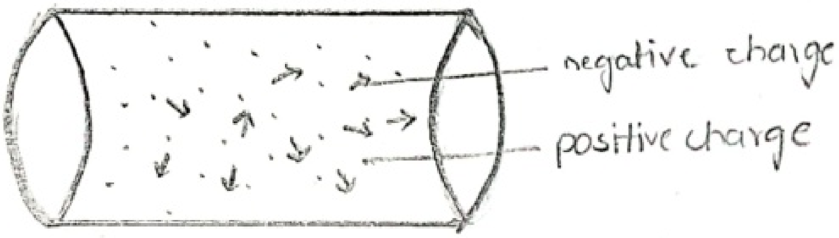


⇒ Drude Lorentz theory.

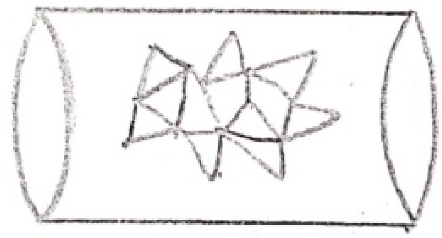
He explained the motion of free electrons in a conductor in 19th century.

Theory

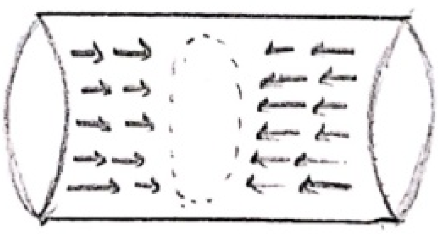
1. The conductors contains large no.of free electrons.
2. These electrons are moving randomly in a conductor where as positive ions are fixed in their locations. but negative electrons move randomly



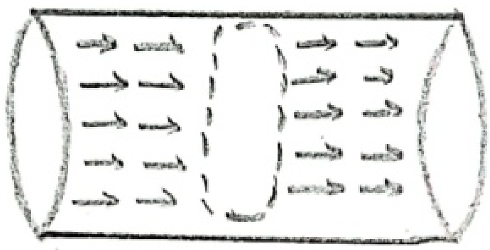
Lattice
3. The arrangement of positively charged particles is called lattice



4. At any cross section in a conductor having many electrons moving left to right that many electrons. moving from right to left.so, net charge is zero.



5. If we connect a battery to a conductor all the electrons move in specified direction. so, at any cross section the net is there. so, the current will pass.



⇒ **Current :-**

The net charge flowing through a cross section of a conductor in a unit time is called current.

Formula

$\boxed{i = q/t}$ (or) $\boxed{i = ne/t}$

units

$e = 1.602 \times 10^{-19}\,c$

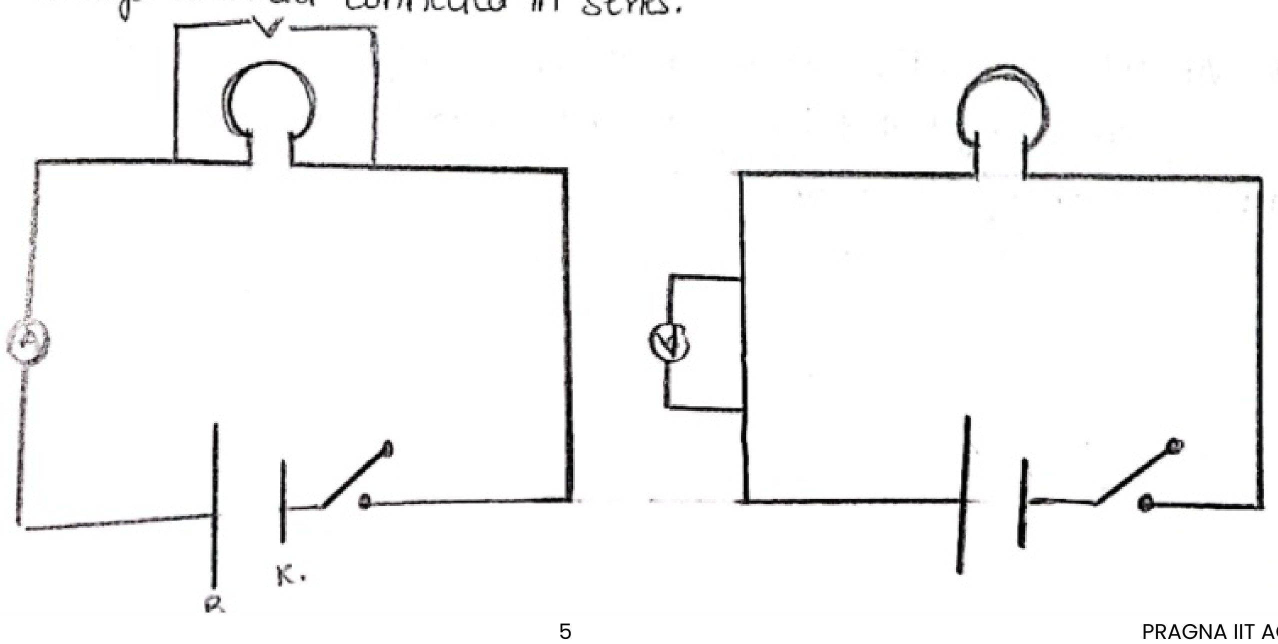
(or)

c/sec = Amper.

This is measured in Ammetre.

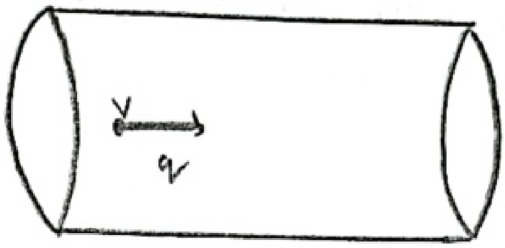
Note :-

Always ammeter connected in series.



⇒ Potential [V]

The work done by a electrical force to move the charge from one point to another point is called potential.



Formula

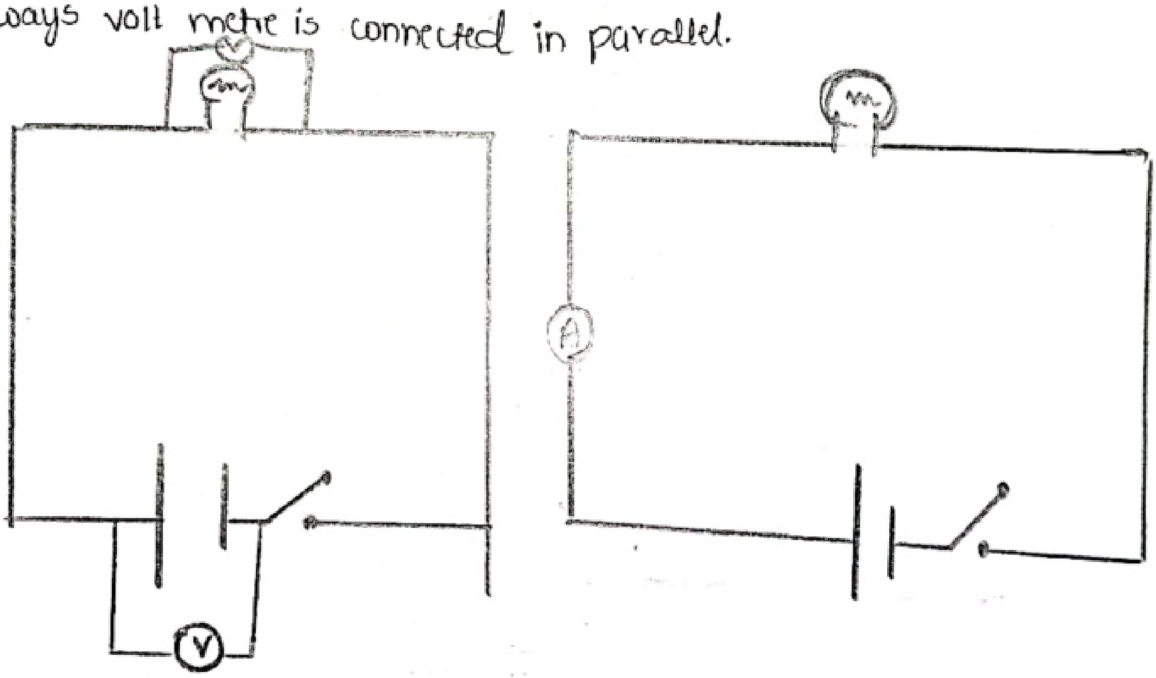
$\boxed{V = \frac{Fe.l}{q}}$ (or) $\boxed{V = \frac{Fe.l}{q}}$ (or) $\boxed{V = \frac{Fe.l}{Ne}}$

Units

Joule/c [or] volt

Note

Always volt metre is connected in parallel.



⇒ Drift speed [Drift velocity] [V_d]

The average velocity of electron in a conductor is called drift velocity.

Formula $\boxed{V_d = I/nq.A}$

* V_d is the drift velocity.
* I is the current.
* nq is the charge

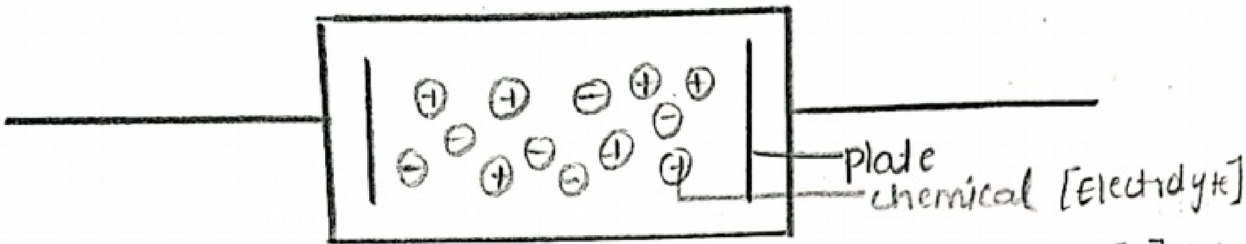
The drift velocity of an electron in a copper

$$V_d = 0.07 \text{ mm/sec.}$$

<u>Density</u> <u>of</u> <u>copper</u> :- $8.5 \times 10^{28}/m^3$.

⇒ Battery

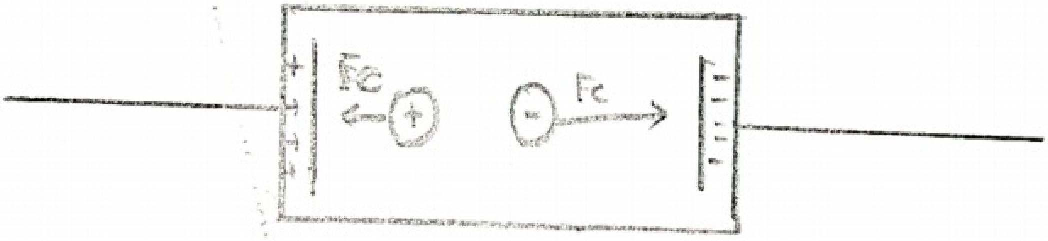
* A battery consists of two metalic plates and one chemical this is called electrolyte. The chemical consists of positive and Negative charges. that chemical exist chemical force.



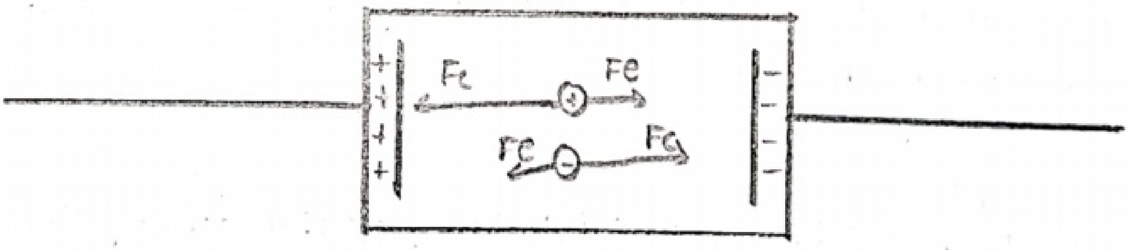
* Due to that chemical force all ions move respective poles [or] plates

* All the positive ions will move towards one plate and accumulate on it. As a result that plate is known as Anode.

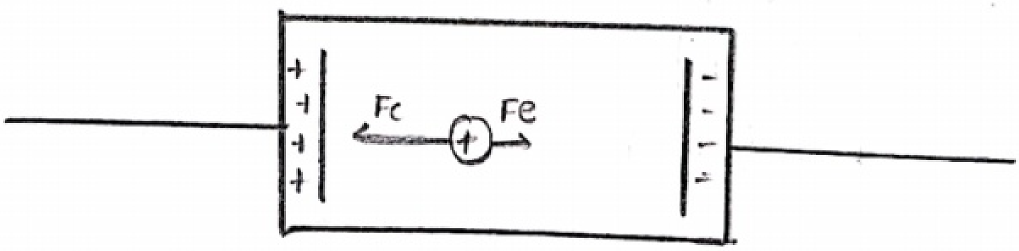
* All the negative ions will move towards one plate and accumulate on it as a result that plate is called as cathode.



* Due to transfer of electrons when these plates are sufficiently charged it can create an electrical force.



* This force can send the positive (+) towards negative (-) and (-) negative towards positive (+) at a certain time



⇒ ELECTRO MOTIVE FORCE [E.M.F]

The work done by a chemical force to move the positive electron from plate to negative pole is called E.M.F.

$$\boxed{E = W/q}$$

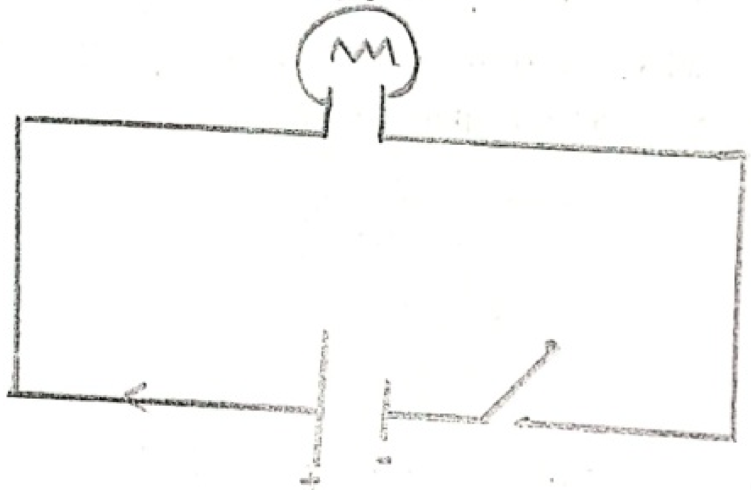
$$\boxed{E = Fe.\,d/q}$$

units

Volts.

Note

E.M.F is measured with volt metre.



Note

Always current travels from positive to negative this is called conventional current direction

$\oplus \longrightarrow \ominus$

* The current travels high potential to low potential at positive more potential at negative less. so, the current travels from left to right.

⇒ OHM'S LAW

Principle:-

At a constant temperature the potential difference is directly proportional to the current in a conductor is called Ohm's law.

$V \propto i$

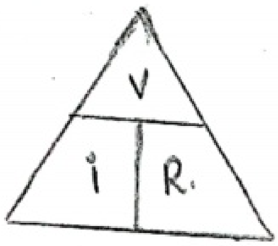
$\boxed{V = iR}$

(R = Resistance)

Note:-

When potential increases current also increases.

⇒ Magical triangle



Resistance does not depend on (Potential and current)

$V = iR$

$i = V/R$

$R = V/i$

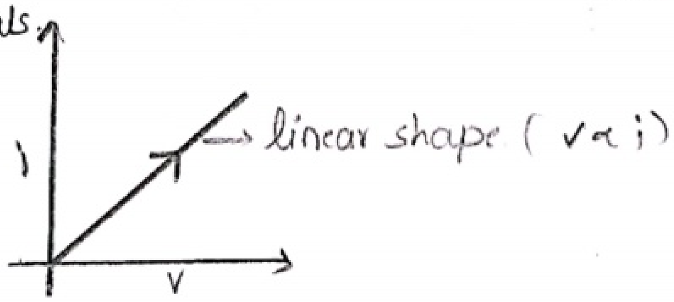
⇒ Types of conductors

1. Ohmic conductors

The conductors which obey the ohm's are called ohmic conductors. These are also called as linear conductor.

Ex:- All the metals.

Graph:-

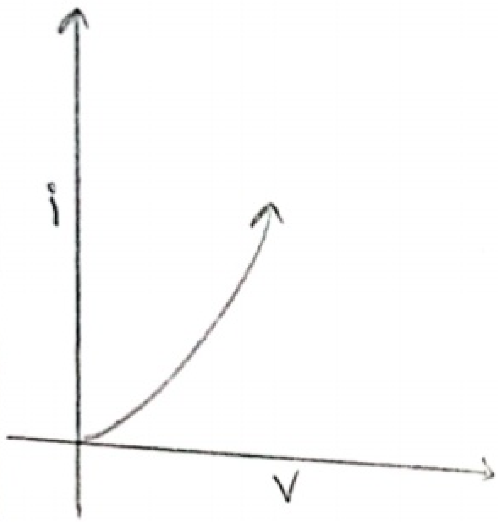


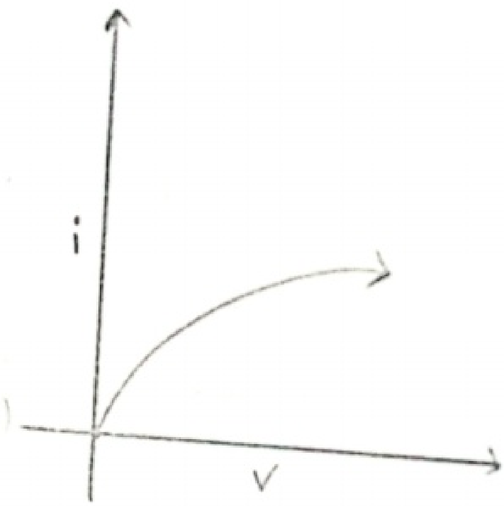
2. Non-ohmic conductors

The conductors which does not obey the ohm's law are called non-ohmic conductors. These are called non-linear conductors.

Ex:- semi conductors, si, Ge, graphite electrolyte, L E D. etc.

Graph





Limitations

1. It is not applicable for semi conductors.
2. It is not applicable for gas conductors.
3. It is not applicable for every more temperature and low temperature.

⟹ Experiment - 1.

Aim :- verification of ohm's law

[or]

show that V/I is constant

[or]

prove that current is proportinal to potential.

Apparatus :- 1. cells

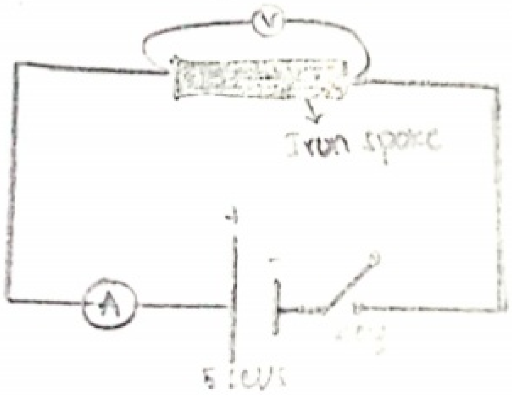
2. Iron spoke

3. current wires

4. Ammetre

5. volt metre

6. switch



Procedure :- i. Arrange the apparatus as shown in the figure.

ii. connect one cells and close the switch and record ammetre and volt metre redustion in a given table.

iii. connect two cells and record the ammeter and volt meter readings in a given table.

iv. Repeat the experiment for 3,4,5 cells and record the ammetre and volt meter readings in the given table.

⇒ Resis

Sl.NO.	Voltage (v)	current (i)	$V/i = R$
1	2	1	$2/1 = 2\ \Omega$
2	4	2	$4/2 = 2\ \Omega$
3	6	3	$6/3 = 2\ \Omega$
4	8	4	$8/4 = 2\ \Omega$
5	10	5	$10/5 = 2\ \Omega$

Observations:- * we observed that potential increases current also increases.

* we observed that R is constant for all cells.

Precautions:- * Always Ammeter should connect in series.

* Always voltmeter should connect in parallel.

conclusion:- Hence ohm's law is verified.

⇒ Resistance [R]

It the property of a conductor which can opose the motion of electrons in a conductor is called Resistance.

* If Resistance is more current is less.
* Resistance can create heat.
* It is denoted with "R" $\quad Q = i^2Rt$
* Symbol is : "—ʌʌʌʌ—"

units :-

Ohm's (Ω)

⇒ Resistance laws (factors)

1. law of nature.
2. law of length.
3. law of area of cross section
4. law of temperature.

1. Law of Nature

The resistance depends upon its nature of conductor.

Ex :-

Silver (Ag) and copper (cu)

the silver has very very less resistance. so, it is called, Good conductor.

2. Law of length

The resistance is directly proportinal to length of conductor.

$R \propto l \Rightarrow Eq(1)$

when length increases the resistance also increases

3. <u>The Law of area of cross section</u>

The resistance inversely proportinal to area of cross section of a conductor.

$$R \propto \frac{1}{A} \Rightarrow (2)$$

When area of cross section increase then resistance discreases.

4. <u>Law of temperature.</u>

The resistance is directly proportinal to temperature

$$R \propto T$$

When temperature increases Resistance also increases.

<u>Note</u> :-

In the case of semi-conductors when temperature increases then resistance decreases.

⇒ <u>Derivation of specific resistance</u>:-

$$\rho = RA/l$$

<u>Proof</u>

from Eq(1) – $R \propto l$

Eq(2) – $R \propto \frac{1}{A}$

from Eq(1) and Eq(2)

$$R \propto \frac{l}{A}$$

$$R = \rho\, l/A$$

$$\boxed{R = \rho\, l/A}$$

(ρ = Specific Resistance)

= Resistivity

$$\rho = RA/l$$

<u>ρ units</u> :- Ω meter.

=> <u>specific</u> <u>Resistance</u>

The resistance of a conductor of unit length and unit area of cross section is called specific cross section.

$$\rho = RA/l$$

$$\rho = R1/1$$

$$\boxed{\rho = R}$$

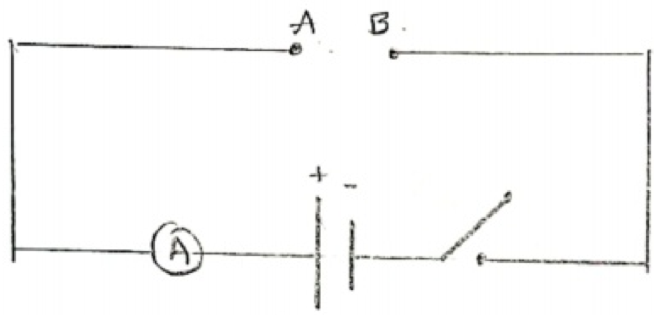
Observ

=> Resistance law Experiments.

Experiment - 1

Aim :- To show that the resistance depends on its nature.

Apparatus :- 1. 5 different nature of conductors of same area of cross section and same length.
2. Ammeter
3. Battery.
4. Switch
5. connecting wires.



Procedure :-
* Arrange the apparatus as shown in the figure
* connect one of the conductor between A and B and close the switch.
* Record the ammeter Readings in a given table.
* Take another nature of conductor between A and B and record the ammeter readings in the given table
* Repeat the experiment for 3, 4, 5, 6 different nature of conductors and record the ammeter readings in the given table

Sl. NO	Nature	Ammeter
1	Fe	
2	Al	
3	Cu	
4	Ag	
5	Au	

Observations :- * I observed that when nature of conductor changes current also changes.

* when nature of conductors changes resistance also changes that's why current also changes.

Conclusion :- I conclude that resistance depends on nature of the conductors

Precautions :- * Ammeter should connected in a series.

* Reading should be taken accurately.

Experiment - 2.

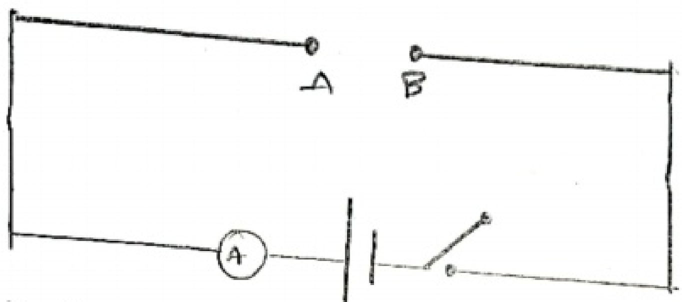
Aim :- to show that the resistance depends upon the length

[or]

show that resistance $\propto$ length

Apparatus :- 1. 5 different length of conductors of same nature and same area of cross section.

2. Ammeter
3. Battery
4. Switch
5. connecting series.



Procedure :-

* Arrange the apparatus as shown in the figure.
* connect one of the conductors between A and B and close the switch.
* Record the ammeter reading in a given table.
* Take another length of condutor between A and B record the ammeter readings in the given table.
* Repeat the experiment for 3,4,5 different conductors and record the ammeter readings in the given table

Sl.NO	length	Ammeter
1	1	5
2	2	3
3	3	1
4	4	0.5
5	5	0.1

Observation :- * we observed that when length increases current decreases.

* when length increases resistance also increases.

Conclusion :- * we conclude that resistance is depends upon the length of conductors.

* we observed that resistance is directly proportinol to length.

Precautions :- * Ammeter should be connected to series.

* Reading should be taken accurately.

$$\boxed{\frac{R_1}{R_2} = \frac{l_1}{l_2}}$$

Experiment -3.

Aim :- To show that resistance is inversely proportinal to the area of cross section

[or]

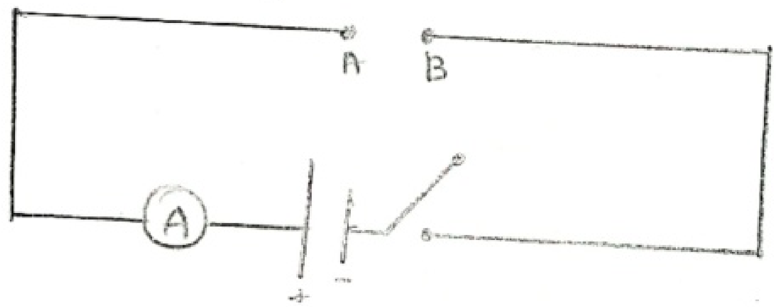
To show that resistance depends upon area of cross section.

[or]

To show that area of cross section increases resistance decreases

Apparatus :- 1. 5 different area of cross section of conductors of same nature and same length.

2. Ammeter
3. Battery
4. switch
5. connecting wires.



Procedure :- * Arrange the apparatus as shown in the figure

* connect one of the conductor between A and B and close the switch

* Record the ammeter reading in a given table.

* Take another area of cross section of conducter between A and B and record the ammeter readings in a given table

* Repeat the experiment for 3,4,5 different areas of cross section conductors and record the ammeter readings in a given table.

Sl.No	Area of cross section	Ammeter
1	1m	1Am
2	2m	2Am
3	3m	3Am
4	4m	4Am
5	5m	5Am

Observations:- * we observed that when area of cross section increases current also increases.

* when area of cross section increases resistance decrease. so current decreases.

Conclusion:- we conclude that the resistance is inversely proporti-nal to the area of crossection.

Precautions:- * Ammeter should be connected in series.

* Reading should be taken accurately.

$$\boxed{\frac{R_1}{R_2} = \frac{A_2}{A_1}}$$

$$\therefore \quad \frac{R_1}{R_1} = \frac{r_2^2}{r_1^2} \qquad r = \text{radius}$$

$$\frac{R_1}{R_2} = \frac{d_2^2}{d_1^2} \qquad d = \text{diametre}$$

Experiment - 6

Aim :- show that the resistance depends upon the temperature

[or]

show that when temperature increases resistance also increase

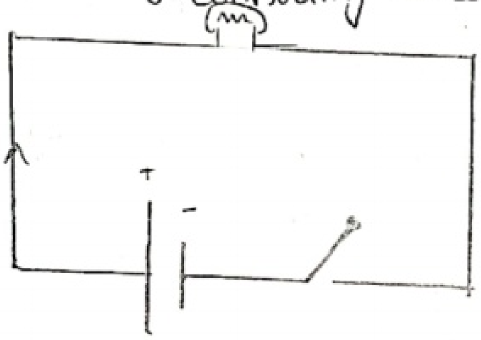
Apparatus :- 1 multi meter

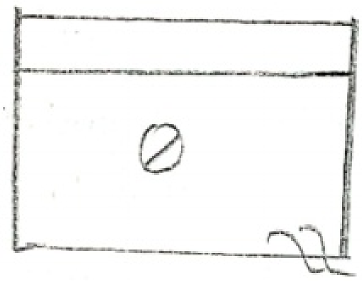
2. Bulb

3 Battery

4. switch

5. connecting wires.





Procedure :- * Arrange the apparatus as shown in the figure

* Measure the resistance of the bulb before start of the experiment

* switch on the circuite measure the resistance of the bulb after 5 minutes and record the resistence in the given table.

* continue the experiment for every 5min and record the resistance in the given table

* This will continue upto half an hour.

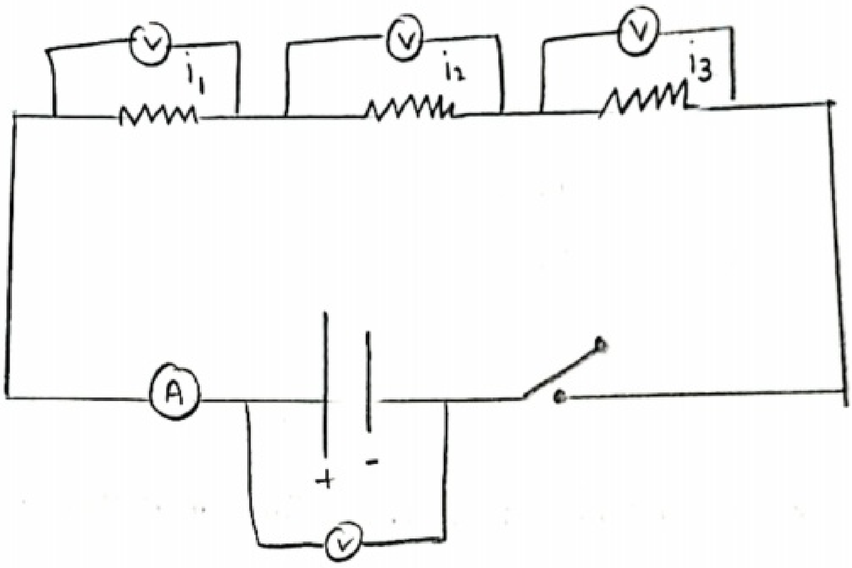
Sl. NO	time	Resistance
1	0m	30 Ω
2	5m	40 Ω
3	10m	50 Ω
4	15m	60 Ω
5	20m	70 Ω
6	25m	80 Ω

Observations :- * we observe that when time increases resistance also increases.

* when the time increases temperature also increases that's why resistance also increases

Conclusion :- we can conclude that resistance depends on temperature

⇒ Resistance [series]



1. R_1, R_2, R_3 resistors are connected in series as shown in figure
2.
3. In series the current is same through all resistance.

$$i = i_1 = i_2 = i_3 \Rightarrow Eq(1)$$

4. But potential is devided among all the resistors.

$$V = V_1 + V_2 + V_3 \Rightarrow (2)$$

5. Accordings to ohm's law $V = iR \Rightarrow (3)$
6. Apply the ohm's law to all the resistors for RI.

Resistors ⟶
$$\left.\begin{aligned} V_1 &= i_1 R_1 \Rightarrow V_1 = iR \\ V_2 &= i_2 R_2 \Rightarrow V_2 = iR_2 \\ V_3 &= i_3 R_3 \Rightarrow V_3 = iR_3 \end{aligned}\right\} Eq(4)$$

From Eq(2), (3) and (4)

$$V = V_1 + V_2 + V_3$$

$$iR = iR_1 + iR_2 + iR_3$$

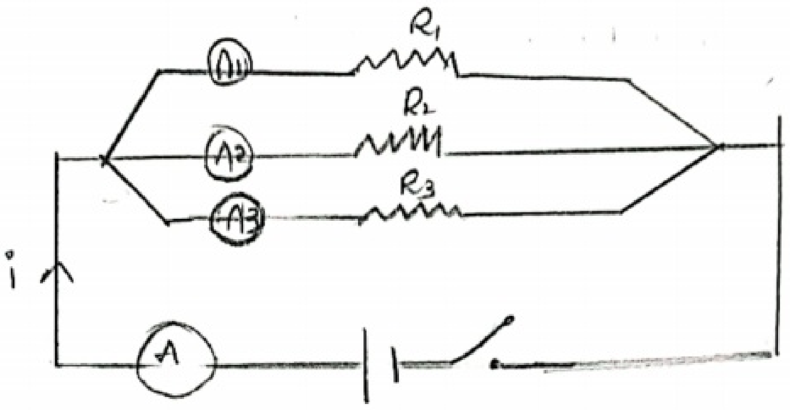
$$\cancel{i}R = \cancel{i}(R_1 + R_2 + R_3)$$

$$R = R_1 + R_2 + R_3$$

If n Resistors of each Resistance R when connect in series the resultant Req

$$\boxed{R_s = nR}$$

Resistance [parallel]



1. R_1, R_2, R_3 resistors are connected in parallel as shown in the figure.
2. Total Resistance is R, total current is i, total potential v.
3. In parallel potential is same for all R resistance

$$V = V_1 = V_2 = V_3 \Rightarrow Eq(1)$$

4. But current is divided among all the resistors.

$$i = i_1 + i_2 + i_3 \Rightarrow (2)$$

5. According to ohm's law

$$V = iR \Rightarrow i = V/R \Rightarrow (3)$$

6. Apply the ohm's law to all the resistors for R_1 resistor.

$$\left.\begin{array}{l} \Rightarrow i_1 = V_1/R_1 \Rightarrow i_1 = V/R_1 \\ \text{for } R_2 \text{ resistor} \Rightarrow i_2 = V_2/R_2 \Rightarrow i_2 = V/R_2 \\ \text{for } R_3 \text{ resistor} \Rightarrow i_3 = V_3/R_3 \Rightarrow i_3 = V/R_3 \end{array}\right\} Eq(4)$$

from Eq(2), Eq(3) and Eq(4)

$$\boxed{1/R = 1/R_1 + 1/R_2 + 1/R_3}$$

7. The resulted resistance is less than all the individual resistance.
8. The resiprocal of resulted resistance is equal to the sum of the reciprocals of individual resistances.

$$\boxed{R_p = R/n}$$

⇒ problems

Q1. 6, 2,4 resistances are connected in series and parallel find the resulted resistance in both?

Ans In series

$V = R_1 + R_3 + R_3$

$V = 6 + 2 + 4$

$V = 12$

In parallel

$1/R = 1/R_1 + 1/R_2 + 1/R_3$

$\frac{1}{R} = 1/6 + 1/2 + 1/4$

$\frac{1}{R} = \frac{2+6+3}{12}$

$\frac{1}{R} = \frac{11}{12}$

$R = \frac{12}{11}$

$R = 1.0\bar{9}$

Q2. 6,4 resistances are connected in series and parallel find the resulted resistance in both?

Ans In series

$V = R_1 + R_2$

$V = 6+4$

$\boxed{V=10}$

In parallel

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

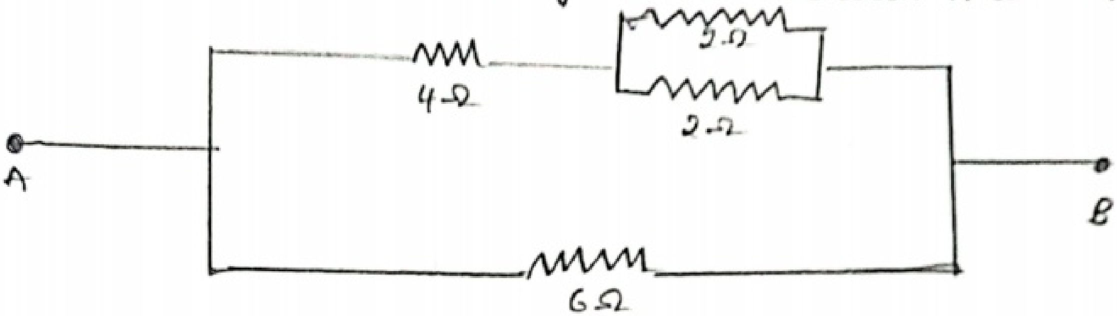
$\frac{1}{R} = \frac{1}{6} + \frac{1}{4}$

$1/R = \frac{2+3}{12}$

$\frac{1}{R} = \frac{5}{12}$

$R = \frac{12}{5} \Rightarrow 2.4$

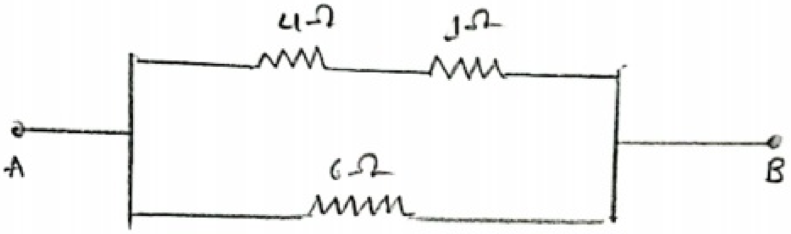
31. Find the resultant resistance from given below between A and B.



I 2,2 are in parallel

$$R_p = \frac{2\times2}{2+2} = \frac{4}{4} = 1\,\Omega$$

II

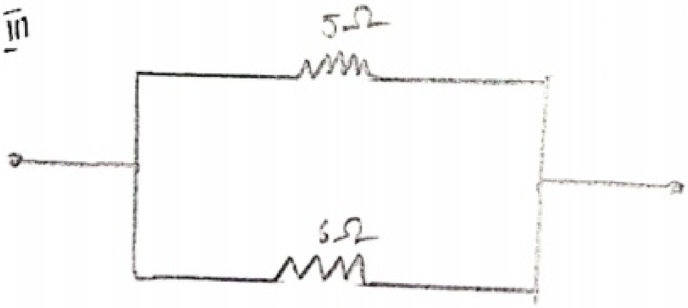


4, 1 are in series

$R = 4+1$

$R = 5\,\Omega$

III



5,6 are in parallel

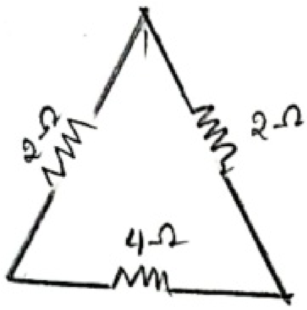
$$R = \frac{5\times6}{11}$$

$$R = \frac{30}{11} = 2.7$$

$R = 2.7\,\Omega$

Q2.

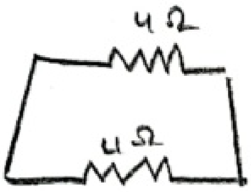
I



2, 2 are in series

$R = 4\Omega$

II



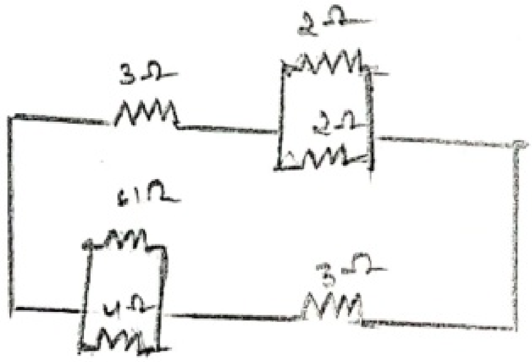
Parallel

$R = \frac{4 \times 4}{4+4} = \frac{16}{8}$

$R = 2\Omega$

Q3

I



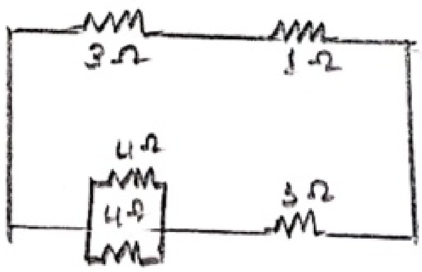
2, 2 are in parallel

$R_p = \frac{2 \times 2}{2+2}$

$= \frac{4}{4}$

$= 1$

II



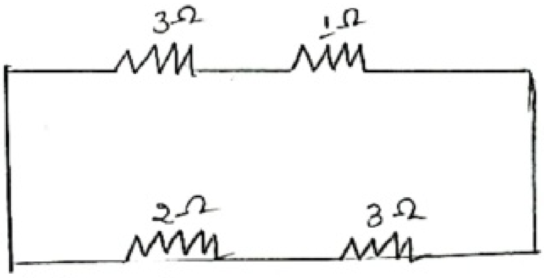
4.4 are in parallel

$$R_p = \frac{4\times4}{4+4}$$

$$= \frac{16}{8}$$

$$= 2\,\Omega$$

III



3,1 are series

$= 3+1$

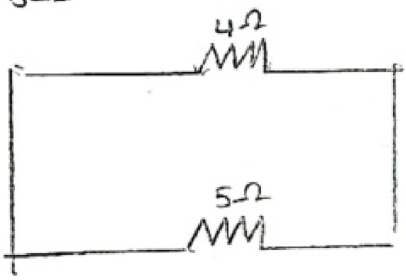
$= 4\ \Omega$

2, 3 are in series

$= 2+3$

$= 5\,\Omega$

IV



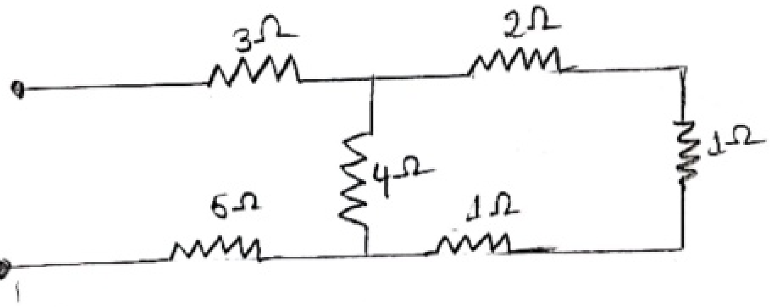
4,5 are in parallel

$$= \frac{4\times5}{9}$$

$$= \frac{20}{9}$$

$R = 2.2\ \Omega$

Q4. I

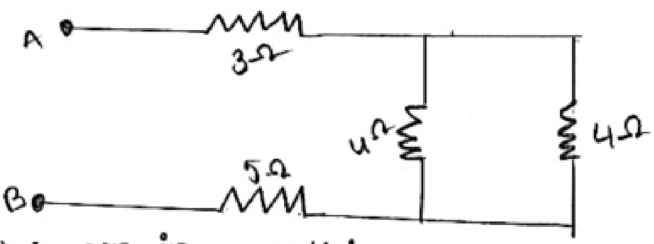


1,2,1 are in series

$= 2+1+1$

$= 4\Omega$

II



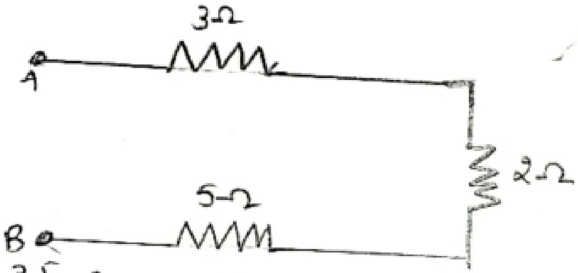
4,4 are in parallel

$= \frac{4\times4}{4+4}$

$= \frac{16}{8}$

$= 2\Omega$

III

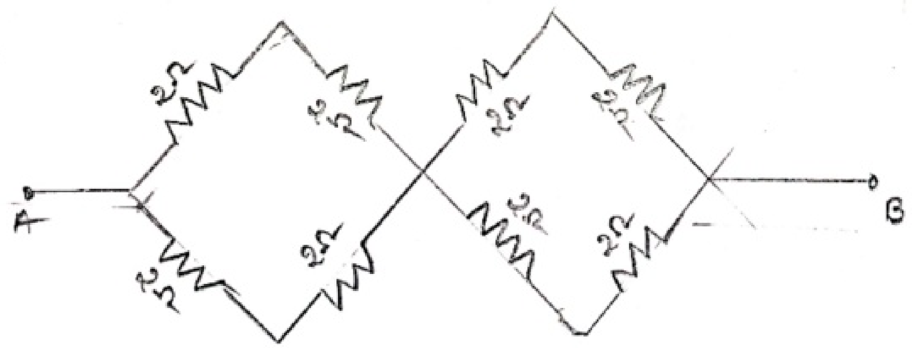


$= 3,5,2$ are in series

$= 3+5+2$

$= 10$

Q5. I

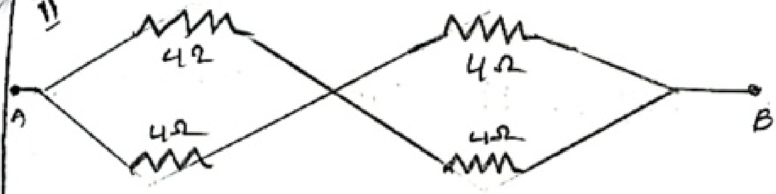


2, 2 are arranged in series

$= 2+2$

$= 4$

ii)



4, 4 are in parallel

$$\Rightarrow \frac{4\times4}{4+4} = \frac{16}{8} = 2.$$

iii)

2, 2 are in series

$2+2=4\Omega$

Page No.

⇒ Kirchoff's law

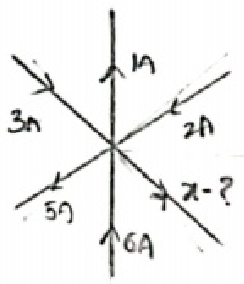
These law's are useful for only D.C [Direct current] currents only.

There are 2 laws

1. Junction law
2. Loop law.

⇒ Junction law

Sum of the currents into the junction is equal to the sum of the currents leaving from the junction.



find x - ?

$$3+2+6 = 1+5+x$$

$$11 = 6+x$$

$$x = 11-6$$

$$\boxed{x=5}$$

⇒ Loop law

The algebraic sum of the potential increased and decreased in a closed loop must be equal to zero.

* Rules to write the loop law

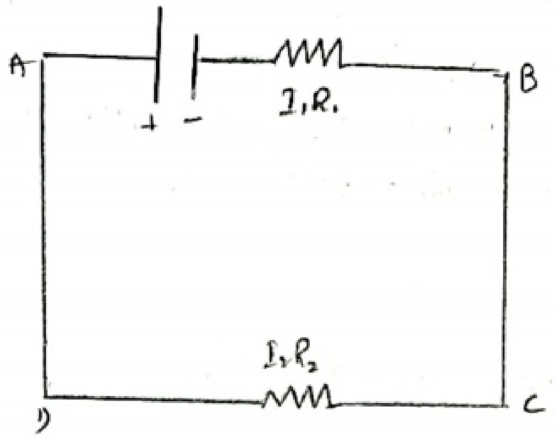
I. In case of batteries

a. If we move from positive to negative then potential is taken as negative (-v)

b. If we move from negative to positive that potential is taken as positive (v) ii in case of Resistors

a. If we move in current direction the resistance × current direction is taken as negative(-)

b. If we move opposite in current direction the resistance × current direction taken as positive(+)



ABCDA

$AB = -V_1 + I_1 + R_1$

$BC =$

$CD = -I_2 R_2 + V_2$

$DA =$

$$\boxed{-V_1 + I_1 R_1 - I_2 R_2 + V_2 = 0}$$

DCFED

$$\boxed{-V_2 + I_2 R_2 + [I_1 + I_2] R_3 = 0}$$

CFEDC

$$\boxed{+(I_1 + I_2) R_3 - V_2 + I_2 R_2 = 0}$$

Questions

series and parallel connection of bulbs

Q. why we connect house appliances in parallel but not in series.

Ans house appliances should be connected in parallel only because when we connect in series. If we switch on one appliance then all the other appliances will damage they never work again. because they get unequal voltages and less than specified voltages.

But in parallel individual controls are there in parallel if one appliance will stop working remaining will work.

⟹ Note 1

Street lights, Decoration bulbs are connected in series.

⟹ Note 2

car headlights are connected in parallel because if one will damage other can work.

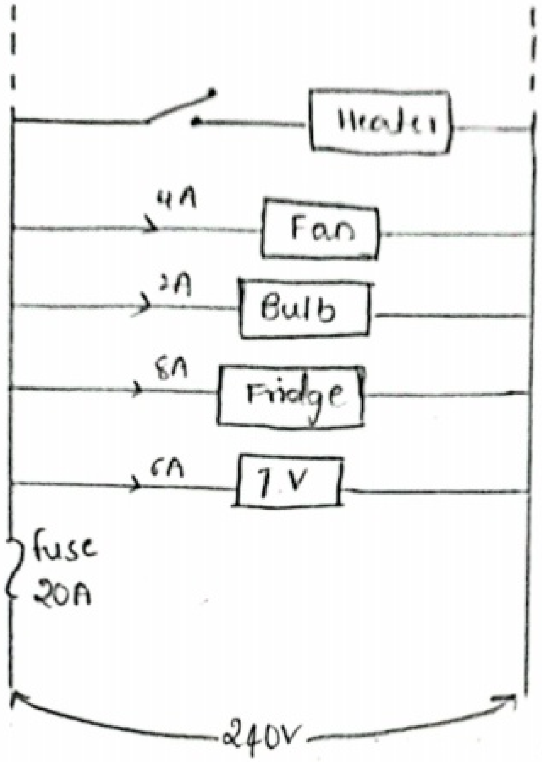
Over load

current limits in our home is 5 to 20 Ampers.

when current in our home is excess than 20 Ampers then it leads to over heat and melt and cause of fire this is called overload.

Explanation

* The current limits in our home is 5 to 20 ampers.
* In our home all the appliances should be connected in parallel.
* In parallel connection the total current is sum of the appliances.
* If the total current is more than 20 Amperes leads to over heat and m and cause fire.
* so, short circuit will occur and more current will pass through the appliances.
* so, all the appliances will damage due to over load.



⟹ Fuse

* Fuse is a thin metalic wire which has more resistance and less melting point.
* Fuse is prepared by lead wire. because, it has low melting point and high resistance.
* Fuse is used to prevent the overload

Resistivity —

Melting point — $200^\circ c$

Question

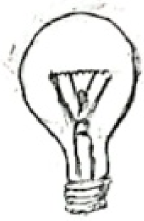
1. Fuse wire if we prepare with connecting wires (copper) it can't Prevent the overload why?

Ans: copper will melt after 20Ω current passes through it at that time remaining wire can melt and cause over load. so, it can't prevent from overload.

Find th

=> Bulb Filament

Bulb filament is prepared with tungsten (W) because tungsten has more resistividy and more melting point.



Melting point :- ——

Resistivity :- ——

* Bulb is invented by "Thomas elva edison."
* In bulbs we are using innert gases.

  Ex:- Argon.

=> Power :- [wattage] [P, W]

The electrical energy used in 1 hour by appliances is called wattage.

Units

$\boxed{Watts}$ (or) $\boxed{Joule/sec}$

$\boxed{P = V \times I} \Rightarrow Eq(1)$

But $V = iR$

$P = iR.i$

$\boxed{= i^2 R} \Rightarrow Eq(2)$

But $I = V/R$

$P = V . V/R$

$\boxed{P = V^2/R} \Rightarrow Eq(3)$

Find the resistance of 100W and 60W both connected to 240V battery?

Sol

$P = \frac{V^2}{R}$

for 100W

$P = 100W$

$V = 240$

$P = \frac{240^2}{R}$

$R = \frac{24\cancel{0} \times 24\cancel{0}}{1\cancel{00}}$

$R = 24 \times 24$

$R = 576\,\Omega$

for 60W

$P = 60W$

$V = 240V$

$P = V^2/R$

$R = \frac{240 \times 24\cancel{0}}{\cancel{6}\cancel{0}}$

$R = 240 \times 4$

$R = 960\,\Omega$

Q. House hold current bills are Kilo watts, Hours [KWH]

Sol $1KWH = \_J$

$= 1000W \times 3600sec$

$= 1000 J/sec \times 3600sec$

$1KWH = 36 \times 10^5 J$

$1KWH = 3.6 \times 10^6 J$

In house hold current:-

1 unit = 1 kw

$\boxed{1 \text{ unit} = 1000W}$

current bill problems

1. A house fitted with 5 tube lights of wattage 40W 2fans of wattage 80W and 1. T.V 60W and one electric heater 1500W. If bulbs are works 10hours daily. and fans 5 hours and T.V 5 hours and heater 1 hour. Find the current bill per one month at the rate of 1unit = 3Rs ?

sol Tube lights wattage $\Rightarrow 10 \times 5 \times 40 = 2000W$

Fans wattage $\Rightarrow 2 \times 5 \times 60 = 800W$

T.V wattage $\Rightarrow 1 \times 5 \times 60 = 300W$

Heater wattage $\Rightarrow 1 \times 1 \times 1500 = 1500W$

Total wattage in 1 day = 4,600W

For one month = 4600×30

$= 138000W$

For units $\begin{bmatrix} 1 \text{ unit} = 1000W \\ 1\text{unit} = 1KWH \end{bmatrix}$

Total wattage

$= \frac{138000}{1000}$ KHW

$= 138$ KHW

$= 138$ units

1units = ₹3

138 units = 3×138

= ₹414.

2. A house has 3 tube lights 2 fans, one T.V each tube light draws 40W fans 80W and T.V 60W and the average of all the tubes are kept on for 5 hours. fans 12 hours and T.V 5 hours. find the electrical bill for one month at the rate of ₹3 per unit ?

Tube light wattage $\Rightarrow 3 \times 40 \times 5 = 600$

Fans wattage $\Rightarrow 2 \times 80 \times 12 = 1920$

T.V wattage $\Rightarrow 1 \times 60 \times 5 = 300$

Total wattage per 1 day = 2820.

Total wattage per 1 month $= 2820 \times 30$

$= 84600W$

for units $\begin{bmatrix} 1 \text{ unit} = 1000W \\ 1 \text{ unit} = 1k \end{bmatrix}$

total wattage = 84600

$= \frac{84600W}{1000}$

$= \frac{846}{10}$ K.W.H

$= 84.6$ K.W.H

$= 84.6 \times 3$

$= 253.8$ ₹.

3. A uniform wires of resistance $100\,\Omega$ is melted and recast into wire of length double that of the original. what would be the resistance of the new wire formed?

Sol

$R_1 = 100\,\Omega$

$A_1 = A$

$l_1 = l$

$R_2 = ?$

$A_2 = A/2$

$l_2 = 2l$

$R_2 = \rho\, l/A$

$R_2 = l/A$

$$R_2 = \frac{l_2}{A_2} = \frac{2l}{A_2}$$

$$= \frac{Al}{A}$$

$$= 4 \times 100$$

$$= 400\Omega$$