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chapter no 11

Electricity

- One of the most essential part of life in today's world is electricity it is controllable and conventional form of energy

* Electric charge and current *

- A charge is a physical entity which is defined by excess or deficiency of electrons on a body

- A body is said to be negatively charged if it gains electrons

- A body is said positively charged if it loses electrons

- SI unit of electric ~~current~~ current is coulomb (C) which is equivalent to 1.6×10^{-19}

The total charge acquired by body is an integral multiple of magnetude of charge one a single electrone

Electric current is defined as rate of flow of electric charge through any cross section of a conductor in unit time

$$I = \frac{Q}{T}$$

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I = current
Q = charge
t = time taken

$Q = ne$
Q = charge
n = number of electrons
e = charge of electron (1.6×10^{-19})

SI units of electric current is Ampere (A)

* When 1 coulomb of charge flow through any cross section of a conductor in 1 sec then the electric current flowing through it is said to be 1 Ampere.

$$1 \text{ Ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}} \implies 1A = \frac{1C}{1S}$$

* Some important measurement:

$1mA = 10^{-3}$
mA = miliampere

$1\mu A = 10^{-6}$
$1\mu A$ = microampere.

* In an electric circuit current flow from positive terminal to negative terminal of cell.

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~~Amm~~

* Ammeter.

Electric current is mesured by device called Ammeter it is always connected ~~to~~ ~~se~~ in series

* Electric potential and potential difference

- Electric potential is defined as the amout of work done when a unit positive charge is moved from infinity to a point

if work done in moving a positive charge q from a infinity to a point is W then electric potential V of that point is W then electric potential V is

$$V = \frac{W}{q}$$

V = potential difference
W = work done
q = charge.

SI unit of electric potential difference is ~~volt~~ volt

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- the electric potential difference between two point is defined as work in moving a unit positive charge from one point other poin

- The electrical potential difference between two point in current carrying conductor is said to be 1volt if one joule of work done in moving one coulomb of electric charge from one point to other point

Thus, 1volt = $\frac{1\text{Joule}}{1\text{coulomb}}$

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

- voltmeter
A electric potential difference between two point in a circuit using a device called voltmeter
- always connected in parallel

* Electric circuit
A close and continious path through which electric current flow is known as electric circuit
it has various component including source of current, a switch key, a fuse etc

When key is closed then electric circuit is called closed circuit This means current would flow through the circuit to operate the device

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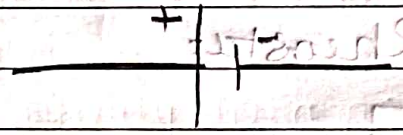
– Circuit diagram

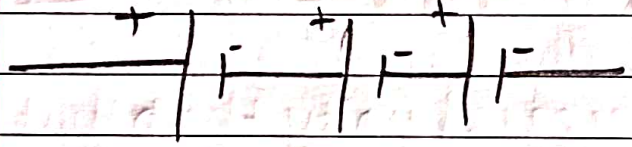
it is a schematic diagram which represent the relative position and connection of various circuit component represented by their symbol.

– Some Important Symbols.

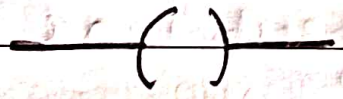
1. A electric cell



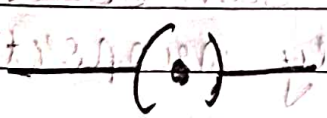
2. A battery or combination of cell.



3. Plug key or switch. (open)

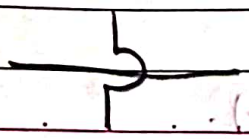


4. plug key or switch (closed)



5 a wire joint

6. wire crossing without joining



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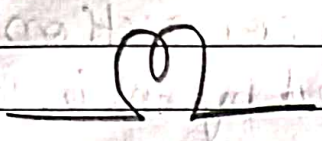
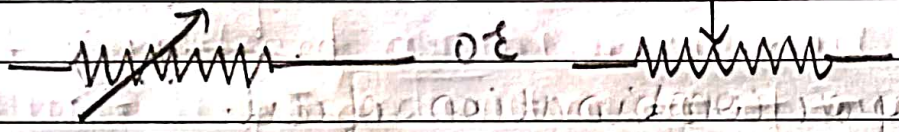
7. A Electric Bulb

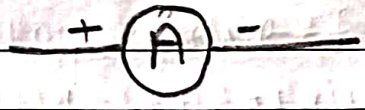


A resistance of R. (resistor)

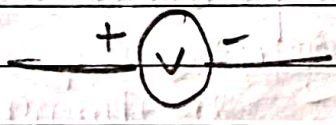
A variable resistance of Rheostat



Ammeter



Voltmeter



* Ohm's Law.
As long as a circuit remain same the potential difference is directly proportional to electric current

$V \propto I$

as here
to remove proportionality sign, we add a constant

$V = IR$

Resistance (a constant).

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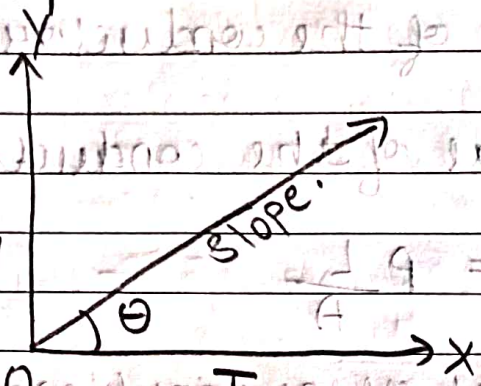
* Graph



the graph between potential difference (V) and current (I) is found to be a straight line

* Resistance *.
it is the property of conductor by virtue of which it resist the flow of current/charge through it
it SI unit is ohm (Ω)

* It is said to 1 ohm, if potential difference of 1 volt across the ends of conductor makes current of 1 ampere to flow through it

$$1\ \text{Ohm} = \frac{1\ \text{volt}}{1\ \text{ampere}}$$

* Factor on which the Resistance of conductor depend upon :-

i) Length of the conductor

$R \propto L$

~~Since the wire~~

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(ii) Area of cross section of the conductor.

(iii) Nature of the material of the conductor

$$R \propto \frac{L}{A} \quad \text{or} \quad R = \rho \frac{L}{A}$$

where ρ is the constant of proportionality and is called electric resistivity

* Resistivity
it is defined as the resistance of a conductor of unit length and unit area of cross section its SI unit is ohm meter (Ωm)

Alloys have higher resistivity than that of their constituent metals

The resistivity depend on its length or thickness but depend on the nature of substance and temprature

* Numaricles
Numarical 1

Q1) Given:
$I = 0.5 A$
time $= 10$ times $= 600 s$

To find = Q

Solution = $Q = I \times T$

$Q = 600 \times 0.5$

$Q = 300 C$