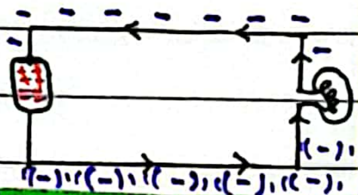
Date:..........................

Sun Mon Tue Wed Thu Fri Sat

Ch: 5 Current Electricity.

→ CURRENT: Flow of charges.



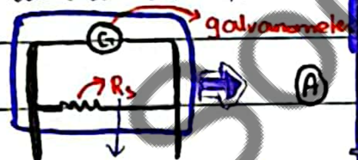
⊕ → ⊖	⊖ → ⊕
• conventional	• simple
• does not exist	• exist.
• Just for the shanti of our buzurgans atmain	$I = \frac{Q}{t}$ $I = Cs^{-1}$ $I = A$

→ Measuring current.

Galvanometer:	Ammeter:
• used for measuring small currents.	• used for large currents measurements
• two terminals. (i) Red (+ve) (ii) Black (-ve)	• Two terminals (i) Red (+ve) (ii) Black (-ve)
• can measure 1μA, 1mA current.	• can measure 1A, 10A.
• will be damaged if large current is given.	• will not show deflection if there is small current

→ Conversion of Ⓖ to Ⓐ

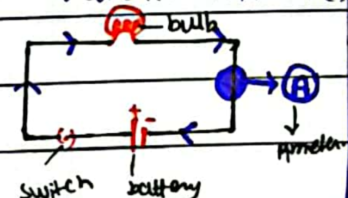
• we can covert a Ⓖ to Ⓐ by adding a small resistance shunt resistance, in parallel combinition.



R → Resistance

s → shunt.

• In order to measure a current by using a Ammeter connect Ⓐ in circuit in series combinition, b/c in series the value of current remains same.



→ Potential difference:

• high potential: the point from where the charges enter.

• low potential: the point from where the charges leave the bulb.

→ Potential difference causes the flow of charges.

→ No charges flow when No potential difference

• charges enter the conductor, the atoms of conductor oppose or resist the charges (charges) coming from battery, this resistance causes the consumption of wastage of energy, so, electrical energy is converted into heat & light energy.

→ Electromotive Force (EMF).

• energy supplied by battery to flow +ve charges through the circuit, is potential difference.

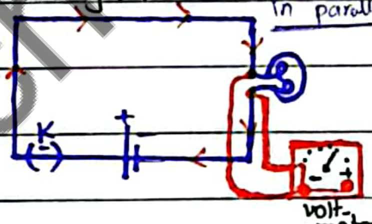
• when +ve charge moves from H.P terminal of battery to the L.P terminal of battery the battery gives w energy to drive to the H.P point.

→ Measuring Potential Difference

• a voltmeter is used for this purpose.

→ a galvanometer can be converted (modified) into a voltmeter by adding a large resistance

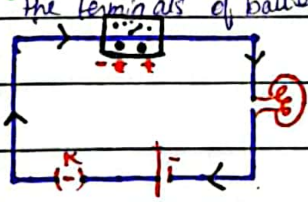
• → Large resistance so, that no current passes through it. • connected in parallel



→ Measuring EMF:

• voltmeter is used

• connected directly with the terminals of battery.



→ OHM'S Law:

• In metals (conductors) there are free electrons, and atoms, the atoms oppose the electrons.

• The opposition is the resistance.

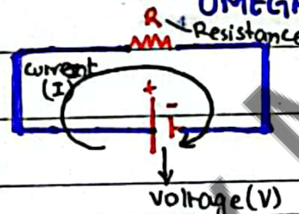
$I \propto V$, ↑V, ↑I. $V \propto I$, $V = RI \Rightarrow V = IR$.

Resistance | Propotionality constant

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

$R = \frac{V}{A}$; $R = VA^{-1}$; $R = \Omega$

• Ω : pronounced as OMEGA.



→ Voltage-Current Graph:

• Conductor that obey ohm's law are called ohmic conductors.

• The have a linear graph for V-I.

• Mostly metals,

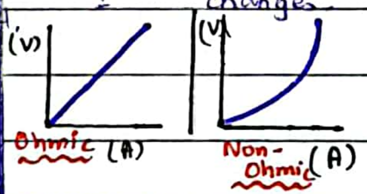
• $R = \frac{V}{I}$; constant over wide range of voltages

• Conductors that don't obey the ohm's law are Non-Ohmic conductors

• The form an irregular graph for I-V.

• Filament lamps & thermistors

• $R = \frac{V}{I}$ changes as V changes.



→ Factors affecting resistance:

(i) cross-sectional area (ii) Length. (iii) Nature of material (iv) Temperature.

$R \propto L$ —(i) $R \propto \frac{1}{A}$ —(ii)

combining (i) & (ii)

$R \propto \frac{L}{A} \Rightarrow R = \rho\frac{L}{A}$.

ρ; Rho, specific resistance.

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

$\rho = \frac{RA}{L} \Rightarrow \Omega \times \frac{m^2}{m} = \Omega m$

→ Combinition of Resistors:

→ Series combinition.

• Voltage drop: $V_1 + V_2 + V_3 = V$

• Current same: $I = I_1 = I_2 = I_3$

• $V = IR$.

$IR = IR_1 + IR_2 + IR_3$

$(I) R_e = I(R_1 + R_2 + R_3)$

$R_e = R_1 + R_2 + R_3$.

$R_e > R_{(induvival)}$

→ Parallel combinition:

• Voltage same $V = V_1 = V_2 = V_3$.

• Current changes: $I = I_1 + I_2 + I_3$,

• $I = \frac{V}{R}$

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

$V\left(\frac{1}{R_e}\right) = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$

$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

$R_e < R_{(induvival)}$

→ Joule's Law:

Energy is Vitamin.

• By electrostatic potential $V = \frac{W}{Q}$

(i) — $QV = W$

• By electric current formula

$I = \frac{Q}{t}$; $It = Q$ —(ii)

put (ii) in (i): (x)

$(It)V = W$; $W = VIt$.

From Ohms law. $V = IR$ —(i) put in (x) $W = I^2 tR$ $W = I^2 Rt$ (Y)	$I = \frac{V}{R}$ —(i) put in (x) $W = \frac{V^2 t}{R}$ (Z)

• By power formula; $P = \frac{W}{t}$

• $P = \frac{I^2 R t}{t}$ $P = I^2 R$	• $P = \frac{V^2 t}{R t}$ $P = \frac{V^2}{R}$

Electric power:

- $P = \frac{W}{t}$; $W = QV$
- $P = \frac{QV}{t}$; $\frac{Q}{t} = I$
- $P = VI$; $V = IR$.
- $P = (IR)I$
- $P = I^2R$ } Unit: Watt(W).

Kilo-watt hour:

on commercial basis large SI units are used such as kW & h.

$1kWh = 1000W \times 1h$

$1000W \times 3600s$.

$3.6 \times 10^6 Ws$

$3.6 \times 10^6 J$

$1kWh = 3.6 MJ$

Hazards of Electricity.

- Insulation damage:
  - good insulated wires should be used.
  - when cables are over heated short circuit occurs.

→ Short circuit.

(draw Backs of Ill comb).

→ due to low opposition by atoms of conductors for e, a large amount of current passes through the wire, in parallel combination, this large current produces large heat & melt the insulation, wires meet & spark occur.

- Damp Conditions:
  - wet hands have moisture & it can act as electrolyte and conduct current, FIRE!!!

SAFE USE OF ELECTRICITY IN HOMES.

→ Fuse is a device which does not allow large amount of current (that can cause fire), when a large amount of current is coming, the fuse melts and breaks away. Otherwise, if there is no fuse, the large currents can set the home on FIRE!!!

→ Circuit breaker; It is also a device like Fuse, it also does not allow large amount of current, the circuit breaker directly cuts the supply by pulling the metal strip to separate the contact b/w circuits. After repair the contact is restored.

→ Earth wire

Earthwire is basically grounding process, when a very very large current is supplied, a wire is grounded so the extra amount of current goes into the ground.