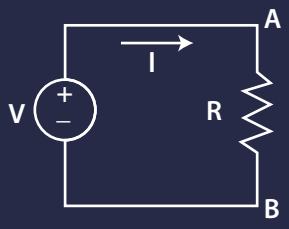
# ELECTRICITY

If n electrons pass through the cross section of a conducor in time t , then total **charge** passed through the conductor is **Q = n × e**.

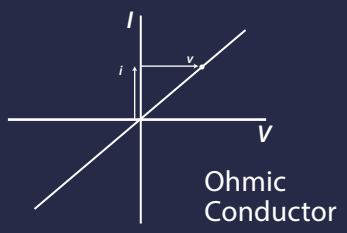
$$1\,e = 1.6 \times 10^{-19} C \;;\; 1\,C = 6.25 \times 10^{18} e$$

- **Current** : Rate of flow of charge $I = \frac{Q}{t}$ $\quad 1A = \frac{1C}{1s} = 1Cs^{-1}$
- **Potential at a point** : Amount of work done per unit charge in bringing a postive charge from infinity to that point ; $V = \frac{W}{Q}$ $\quad 1V = 1JC^{-1}$




Potential Difference : $V_A - V_B = \frac{W}{Q}$

*Ohm's Law* : $V = IR \Rightarrow R = \frac{V}{I}$ $\quad 1\Omega = \frac{1V}{1A}$



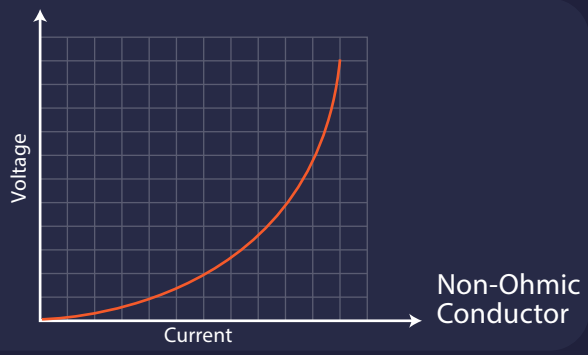

- **Resistance :** Obstruction offered to the flow of current by conductor.

$R = \rho \frac{l}{A}$ $\quad$ *Resistivity* $\rho = \frac{\pi r^2 R}{l}$ $\Omega m$

Ohm's Law is NOT applicable to

a) Unilateral networks : Diodes, Transistors

b) Non- linear elements : Thyristors

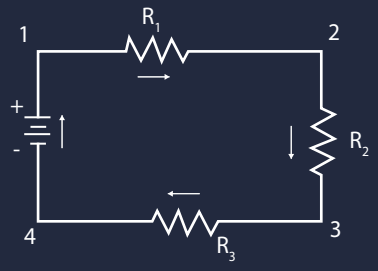



## Band Resistor

| | First Digit | Second Digit | Multiplier | Tolerance |
|---|---|---|---|---|
| Black | Nil | 0 | 1 | Nil |
| Brown | 1 | 1 | 10 | ±1% |
| Red | 2 | 2 | 100 | ±2% |
| Orange | 3 | 3 | 1000 | ±3% |
| Yellow | 4 | 4 | 10000 | ±4% |
| Green | 5 | 5 | 100000 | ±0.5% |
| Blue | 6 | 6 | 1M | ±0.25% |
| Violet | 7 | 7 | 10M | ±0.10% |
| Gray | 8 | 8 | 100M | ±0.05% |
| White | 9 | 9 | 1G | Nil |
| Gold | Nil | Nil | ±10 | ±5% |
| Silver | Nil | Nil | ±100 | ±10% |

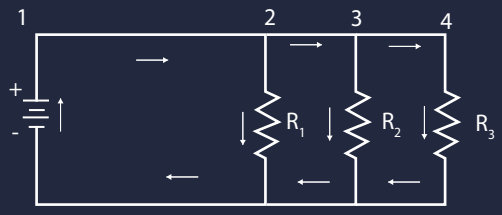
## Combination of Resistances

**Series**




$R = R_1 + R_2 + R_3$

**Parallel**




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

*Heating effect of current* depends on:

a) Amount of current passing , $I^2$

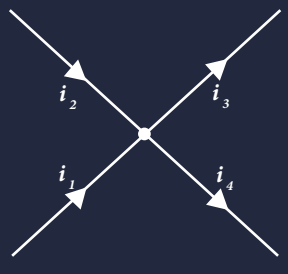
b) Resistance of wire , R

c) Time for which current flows, t

$H = I^2 Rt$ Joule

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

## Kirchoff's 1st Law

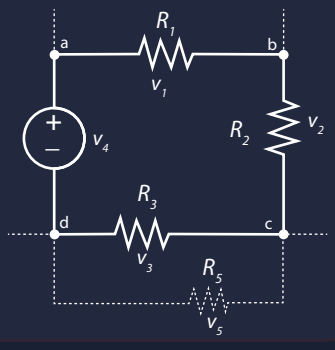



$\sum I = 0$

$i_1 + i_2 = i_3 + i_4$

## Kirchoff's 2nd Law

$\sum V = 0$




## Applications