# Electricity

**Electric Current :** The rate of flow of charge is called electric current.

- S.I Unit → Ampere (A)
- The electric current is measured by Ammeter.
- $i = \frac{Q}{t}$, $i$ = current, $Q$ = charge (in Coulomb)

**Electric Potential :** The work done in bringing a unit positive charge from infinity to a point inside the electric field is defined as electric potential at that point.

**Electric Potential Difference :** The amount of work done in bringing a unit positive charge from one point to another in an electric field is called potential difference between these two points.

- S.I Unit → Volts (V)
- The potential difference is measured by Voltmeter.
- $V = \frac{W}{Q}$

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**Ohm's Law :** (V. Imp) If physical conditions like temperature remain constant, the potential difference across the ends of a conductor is directly proportional to the current flowing through it.

- $V = iR$ → Resistance

**Resistance (R) :** The opposition or obstruction offered by a conductor to the flow of electrons is called electric resistance.

- S.I Unit → Ohm (Ω)
- A conductor is said to have 1 Ω resistance if a current of 1A flows through it at a potential difference of 1V.

# Electricity - Formula Sheet

(i) Electric current ($i$)

$$i = \frac{Q}{t}$$

$Q \rightarrow$ charge and $t \rightarrow$ time

(ii) Potential Difference ($V_d$)

$$V_d = \frac{W}{Q}$$

$W \rightarrow$ work done and $Q \rightarrow$ charge

(iii) Ohm's law

$$V = iR$$

$R \rightarrow$ Resistance

(iv) Resistance ($R$)

$$R = \rho \frac{l}{a}$$

$\rho \rightarrow$ Resistivity, $l \rightarrow$ length of conductor, $A \rightarrow$ area of c/s

(v) Combination of Resistors

Series: $R_S = R_1 + R_2 + R_3 + \text{-----}$

Parallel: $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \text{------}$

(vi) Heat and Power

$$H = i^2Rt = Vit = \frac{V^2}{R} \times t$$

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

**Electric Power :** The electric power of a conductor is given by the expressions

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

- Unit of electric power is Watt (W).
- One Watt is the power, when a current of 1A flows through a conductor at a potential difference of 1V.

**Commercial Unit of Energy:** The commercial unit of energy is kilowatt-hour (kWh).

$$1\,kWh = 3.6 \times 10^6\,J$$

# Electricity Diagrams

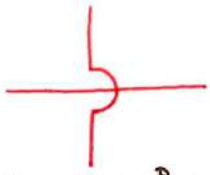

Electric cell


Battery

Switch open

Switch Closed

Wire joint



Wire crossing without joint

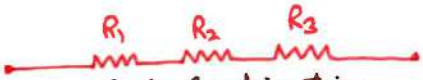
Electric bulb

Resistor


Rheostat


Ammeter


Voltmeter




Series Combination


Parallel Combination