Current Electricity

I=V/R

Current, $I = \frac{Q}{t}$

Q=n×e

$I = \frac{n \times e}{t}$

Potential difference, V=$\frac{work(W)}{charge(Q)}$

According to Ohm's law: $V = IR$ V→potential difference;I →current;R→resistance.

Conductance = 1/Resistance.

Specific resistance, $\rho = \frac{Ra}{l}$ R→resistance; a→area of cross section; l→length.

Conductivity, $\sigma = \frac{1}{specific\ resistance(\rho)}$

Electro-motive force(e.m.f), $\varepsilon = \frac{work\ done(W)}{charge(q)}$

Terminal voltage, V=$\frac{W'}{q}$

Voltage drop, $v = \frac{w}{q}$

$\varepsilon = V + v$

Internal voltage, $v = current(I) \times internal\ resistance(r)$

Total resistance of circuit=R+r

Current drawn from the cell, $I = \frac{\varepsilon}{R+r}$

Emf of a cell, $\varepsilon = I(R + r)$

The terminal voltage of the cell, V=IR

Voltage drop due to internal resistance, $v = Ir$

Internal Resistance, $r = \frac{v}{I} = \frac{\varepsilon - V}{I} = \frac{\varepsilon - V}{V/R} = \left(\frac{\varepsilon}{V} - 1\right)R$

Equivalent resistance in series,

$R_S = R_1 + R_2 + R_3 + \ldots\ldots R_n$

If there are n equal resistances each of value R, connected in series

$R_S = nR$

Equivalent resistance in parallel,

$R_P = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots\ldots \frac{1}{R_n}$

If there are n equal resistances each of value R, connected in parallel

$R_P = \frac{R}{n}$

Electrical energy, W=potential difference(V)$\times$ $current(I) \times time(t)$

Electrical energy, $W = QV = VIt = I^2Rt = \frac{V^2t}{R}$

Electrical power, $P = \frac{W}{t} = VI = \frac{V^2}{R} = I^2R$

Electrical energy,W=Power(P)$\times$time(t)

Cost of electricity= electrical energy in kWh$\times$cost per kWh

Heating effect, $H=I^2RT$

SI UNITS

- charge$\rightarrow$ $coulomb\ (C)$
- Current $\rightarrow$ $ampere(A)or(I)$
- Potential difference$\rightarrow$ $volt(V)$
- resistance$\rightarrow$ ohm
- conductance$\rightarrow$ ohm^{-1}
- Specific resistance$\rightarrow$ $ohm \times metre$
- conductivity$\rightarrow$ $ohm^{-1} \times metre^{-1}$
- Electrical energy$\rightarrow$ $joule(J)$
- electrical power$\rightarrow$ $volt \times ampere(VA)\ or\ watt(W)\ orJs^{-1}$
- e.m.f$\rightarrow$ $volt(V)$