DIGITAL EDUCATION
MARTCOST

INTERMEDIATE

Electrodynamics

Hand Notes For JEE Mains, Advance, NEET UG, Class 11 & 12 etc…

Hand Notes

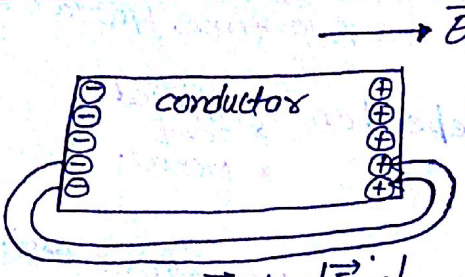
Page Length : 13

Note : *We also providing IIT JEE, Advance, NEEt, JEE UG, GATE, IES, PSUs & Competitive Exam Materials [Handnotes, Shortnotes & Books], All Reports [Seminar Reports & PPT]*

Goto : www.martcost.com

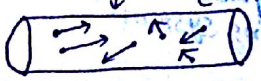
Electrodynamics

CURRENT ELECTRICITY



$|\vec{E}_{in}| = |\vec{E}_{ext}|$

Electric field inside the conductor will be non-zero.



A/R Due to thermal speed free e^- performed a random motion / brownian motion so net disp. of charge remain zero. So current is zero.

|1| → **Free e^- density (n)** → No. of free e^- in unit volume of metal ($n = 10^{28}\ e^-/M$).
* Depend on nature of metal. (Highest in silver).

|2| → **Thermal speed (v_T)** → Speed of free e^- due to surrounding temp.

K.E of one free e^-

$$\frac{1}{2}MV_T^2 = \frac{3}{2}KT$$

$$* V_T = \sqrt{\frac{3KT}{M}} \propto \sqrt{T}$$

* At room temp. $V_T = 10^5$ M/sec.

Ex → copper $n = 10^{29}/m^3$

$v_{thermal} = 10^6$ m/sec
$= 1000$ km/sec.

* Net velocity of an e^-

$$\boxed{\vec{V}_{net} = \vec{V}_{thermal} + \frac{e(-\vec{E})}{m}t}$$

t = time b/w two successive collision.

$$* \langle \vec{V}_{net} \rangle = \langle \vec{V}_{thermal} \rangle + \left\langle \frac{e(-\vec{E})}{m} t \right\rangle$$

$$\vec{V}_{drift} = 0 + \frac{e(-\vec{E})}{m}t$$

|3| → **Relaxation time (τ)** → It is average free time b/w two conjugative collision. * also depend on metal.

A/R AIIMS

$[\tau = 10^{-14}\ sec]$ $1\ sec = 10^{14}$

NOTE → |i| → on ↑ temp. relaxation time ↓, hence drift speed ↓.

|ii| → Physical significance of Resistance →
The resistance offered by a conductor is due to collision of e^-s with atoms of the lattice.
So, on ↑ temp., resistance should also ↑.

|4| → **Mean free path** → (λ) ⇒ distance covering in τ (relative time)

$\boxed{\lambda = 10\text{Å}}$