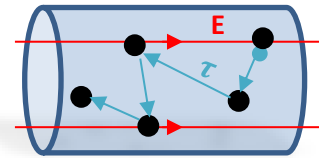


CONCEPT: DRIFT VELOCITY & CONDUCTIVITY

- The speed of electrons through conductors is called the _____ velocity

$$\rightarrow v_d = \underline{\hspace{2cm}}$$

- e is elementary charge
- m is mass of electron (9.11×10^{-31} kg)
- E is Electric Field strength
- τ is the average time between collisions, called MEAN FREE TIME



- CURRENT can be calculated as $\rightarrow I = e * n * A * v_d = \underline{\hspace{2cm}}$

- n is FREE Electron Density (# of FREE electrons/m³)

- Current DENSITY becomes: $\rightarrow J = \frac{I}{A} = \underline{\hspace{2cm}}$

EXAMPLE: A conductor has 1×10^{20} electrons per cubic meter, 1% of which are free electrons. If the electric field in the conductor is 5000N/C, and the mean free time is $5\mu\text{s}$, what is the current density in the conductor?

- RESISTIVITY of a conductor can be calculated as

$$\rightarrow \rho = \frac{m}{ne^2\tau}$$

- CONDUCTIVITY of a conductor can be calculated as

$$\rightarrow \sigma = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

EXAMPLE: Copper has a conductivity of $5.8 \times 10^7 \Omega^{-1}\text{m}^{-1}$. If the density of free electrons in a copper conductor is 5×10^{17} , what is the mean free time for the free electrons?