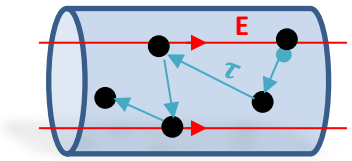
CONCEPT: DRIFT VELOCITY & CONDUCTIVITY

● The speed of electrons through conductors is called the _____ velocity → $v_d =$ _____

- **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 → $I = e * n * A * v_d =$ _____

- **n** is FREE Electron Density (# of FREE electrons/m^3)

- Current DENSITY becomes: → $J = \frac{I}{A} =$ _____

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 5μs, what is the current density in the conductor?

● RESISTIVITY of a conductor can be calculated as → $\rho = \frac{m}{ne^2\tau}$

- CONDUCTIVITY of a conductor can be calculated as → $\sigma =$ _____ = _____

EXAMPLE: Copper has a conductivity of $5.8\times10^{7}\ \Omega^{-1}m^{-1}$. If the density of free electrons in a copper conductor is $5x10^{17}$, what is the mean free time for the free electrons?