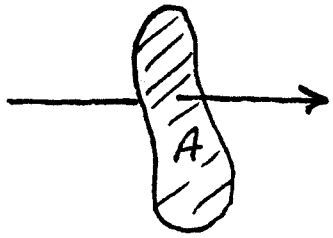
Electric Current + Resistance

Current - net charge flowing through an area per unit time



If charge ΔQ flows across A in time interval Δt

$$I = \frac{\Delta Q}{\Delta t}$$

Units obviously charge per time

$$1\,C s^{-1} = 1\,A \quad (\text{ampere or amp})$$

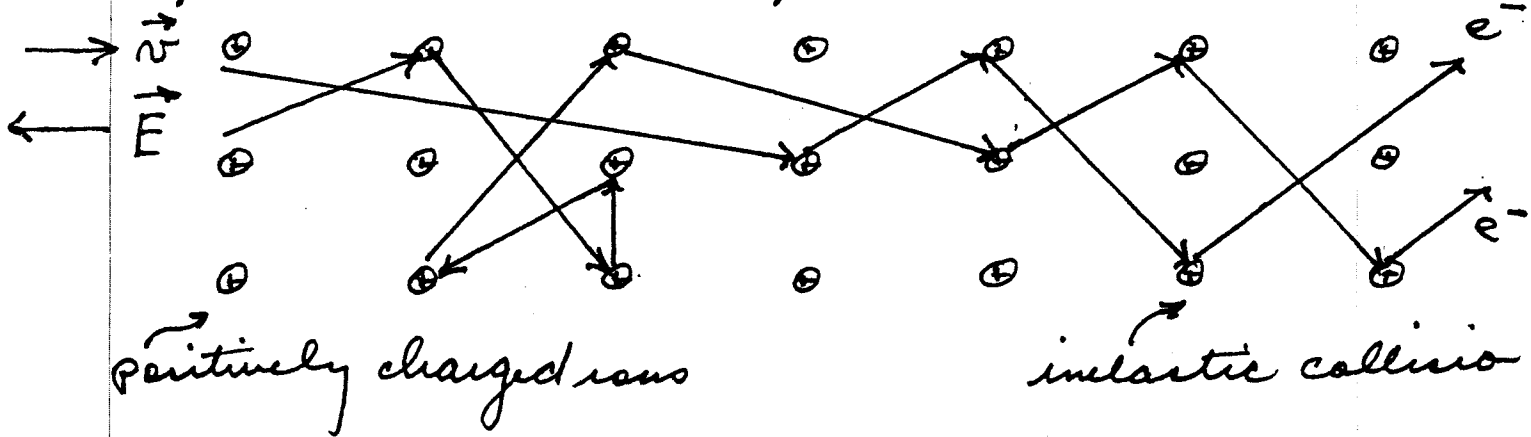
$(mA = 10^{-3} A, \quad \mu A = 10^{-6} A)$

In a conductor in presence of an electric field $\Rightarrow$ free charges [redacted] feel a force $F = q\vec{E}$ therefore they will exhibit motion hence a current will exist. In the case of a conductor which is non-uniformly charged or is in an electric field charges will rearrange themselves $\rightarrow \vec{E} = 0$ inside conductor

"transient current"

If we maintain constant field within conductor then a continuous force will be felt by free electrons and continuous current will result

Wait a minute? What about Newton's 1st law. Will particles move very differently in a conductor from motion in free space



Electrons e^- move through lattice of positive ions colliding inelastically

1) inelastic coll'n ⇒ electrons lose energy, require $\vec{F} = q\vec{E}$ to maintain motion

2) energy from coll'n goes into heating conductor - that's why a toaster wire gets hot

3) e^- move with a "drift velocity" $\vec{v}$ in opposite direction to $\vec{E}$