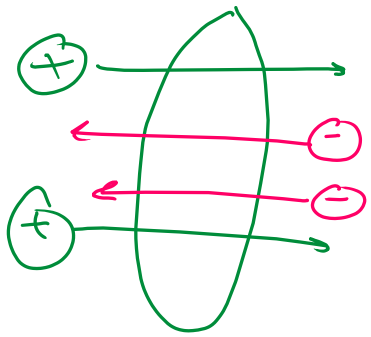
$$I = \frac{\Delta Q}{\Delta t} = \frac{Q_2 - Q_1}{t_2 - t_1}$$



moving positive charges

$$1\ A = 1\ C/s$$

$$I = \frac{dQ}{dt}$$

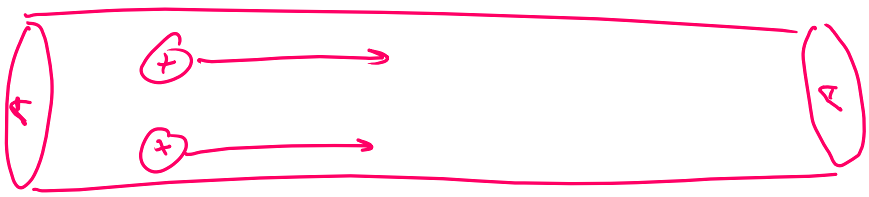
$$I = \frac{\Delta Q}{\Delta t} = n\ q\ v_d\ A$$

charge 1.6×10^{-19}

drift speed m/s

cross-sectional area of the conductor $= \pi r^2$

$\#$ of charge carriers $/m^3$



$$\frac{I}{A} = n\ q\ v_d = J \quad (A/m^2)$$

current density

Ohm's Law: $\dfrac{J}{E} = \sigma$ conductivity

ohmic material

non-Ohmic materials

$$R = \frac{\Delta V}{I}$$

voltage

current

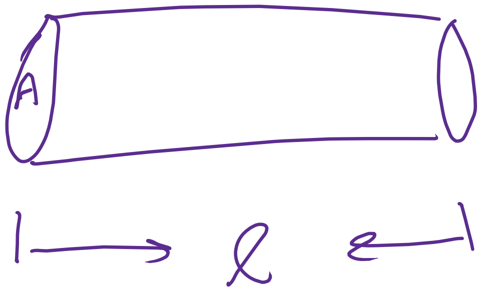
resistance (Ω)

$$\rho = \frac{1}{\sigma} = \frac{RA}{\ell} \quad ; \quad R = \frac{\rho \ell}{A}$$

length

cross-sectional area

resistivity



$$J = n q v_d \quad ; \quad v_f = \underset{0}{v_i} + at$$

$$v_f = a t, \quad a = \frac{qE}{m_e}$$

$$J = nq\left[\frac{qE}{m_e} t\right]$$

$$J = \frac{nq^2E}{m_e} t$$

$$\sigma = \frac{J}{E} = \boxed{\frac{nq^2t}{m_e}} \qquad \rho = \frac{m_e}{nq^2t}$$

$$\rho = \rho_0 \left[1 + \alpha (T - T_0) \right]$$

ρ_0 : reference resistivity at T_0

Find ρ at temperature T

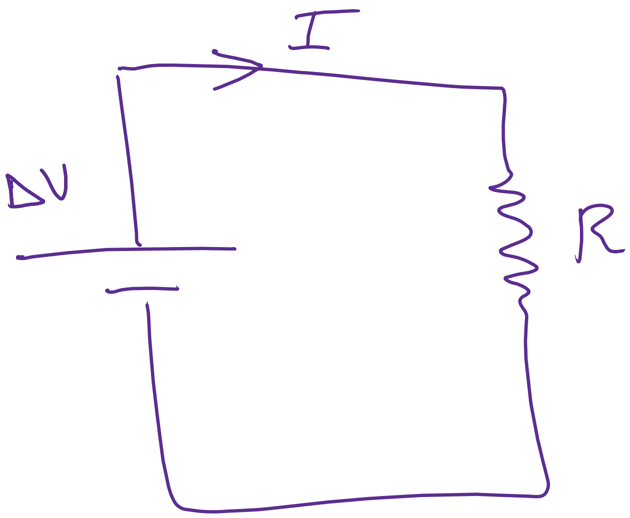
α : temperature coefficient C^{-1} $= \dfrac{1}{\rho_0} \dfrac{\Delta \rho}{\Delta T}$

α $\boxed{\dfrac{1}{R_0} \dfrac{\Delta R}{\Delta T} \quad \dfrac{1}{\rho_0} \dfrac{\Delta \rho}{\Delta T}}$

$$R = R_0 \left[1 + \alpha (T - T_0) \right]$$

$$\text{Power} = \frac{\Delta U}{\Delta t} = J/S = W$$

watts



$$P = \Delta V\, I = \frac{\Delta V^2}{R} = I^2 R$$