Current electricity 2

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define Current :: Rate of flow of charge

$I = \frac{Q}{t}$ or $Q = It$ ↳ This formula can ONLY be used to calculate Charge when Current remains CONSTANT.

units $A = Cs^{-1}$

If Current is not constant

$Q = I_{AVG} \times t$

Q A Current of 200mA flows for 8s
Cal Charge

$Q = It$

$Q = 200 \times 8$

$Q = 1600\ mC$

Q. A Current uniformly increases from 200mA to 1000mA in 12 s
Cal Charge

$Q = I_{AVG} \times t$

$Q = \left(\frac{200 + 1000}{2}\right) \times 12$

$Q = 7200\ mC$

· Voltage :: amt of work done in moving a unit charge through the external circuit

$V = \frac{W}{Q}$ or $W = QV$

Volts V or JC^{-1}

· Electrical Power

$P = IV$; $P = I^2R$; $P = \frac{V^2}{R}$

↳ $P = IV$: Power produced, Power developed, Power Transformed, Power generated

↳ $P = I^2R$: P_{LOSS} or $P_{dissapated}$

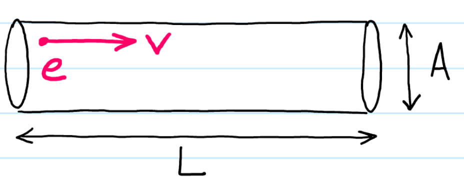
· Electrical Energy $E = P \times t$

$E = IVt$, $E = I^2Rt$; $E = \frac{V^2}{R} \cdot t$

↳ $E = IVt$: produced, developed, Transformed, generated

↳ $E = I^2Rt$: Loss or dissapated

Concept of "drift velocity"



① length = L , ② Area = A
③ Charge of electron = e
④ drift velocity of electron = v
⑤ n = number of electrons present in $1m^3$ of this conductor (number of electrons per unit Volume)

① $1m^3$ ⟶ n electrons ✓
$(AL)m^3$ ⟶ (nAL) electrons

② 1 electron charge ⟶ e
(nAL) electron ⟶ (nALe) ↳ Total Charge

Show that the Current I in this Conductor can be given by equation $I = nAve$

③ Current = $\frac{\text{Total Charge}}{\text{time}}$ ↳ $\frac{d}{s}$ ⟶ $I = \frac{nALe}{\frac{L}{v}}$ ⟶ $I = nAve$

↳ n: material
good conductor n high
poor conductor n Low.

Q.1

$V = \frac{I}{nAe}$

$\downarrow v \propto \frac{1}{A} \uparrow$