

define Current :: Rate of flow of charge

$$I = \frac{Q}{t} \quad \text{or} \quad Q = It$$

units $A = C s^{-1}$
 This formula can ONLY be used to calculate Charge when Current remains **CONSTANT**.

If Current is **not** constant

$$Q = I_{AVG} \times t$$

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

$$Q = It$$

$$Q = 200 \times 8$$

$$Q = 1600 \text{ mC}$$

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

$$Q = I_{AVG} \times t$$

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

$$Q = 7200 \text{ mC}$$

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

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

Volts V or $J C^{-1}$

• Electrical Power

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

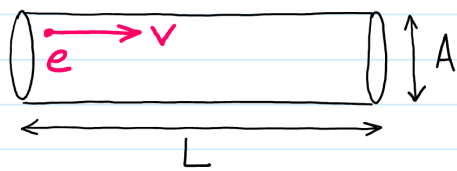
Power produced P dissipated
 Power developed
 Power Transformed
 Power generated

• Electrical Energy $E = P \times t$

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

produced Loss or developed dissipated Transformed generated

Concept of "drift velocity"



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

$$1 \text{ m}^3 \rightarrow n \text{ electrons}$$

$$(AL) \text{ m}^3 \rightarrow (nAL) \text{ electrons}$$

$$1 \text{ electron charge} \rightarrow e$$

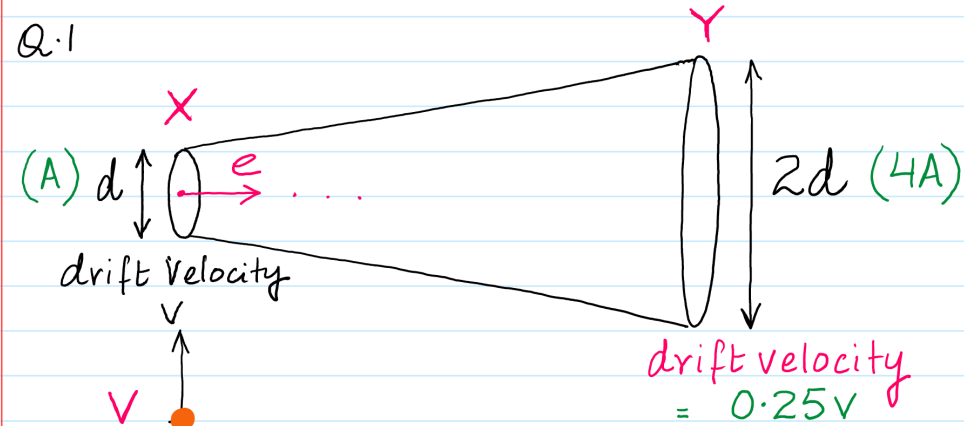
$$(nAL) \text{ electron} \rightarrow (nALe)$$

Total Charge

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

$$\text{Current} = \frac{\text{Total Charge}}{\text{time}} \rightarrow I = \frac{nALe}{\frac{L}{v}} \rightarrow I = nAve$$

material
 good conductor n high
 poor conductor n low.



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

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

