Q1 Find the ratio of F_E to F_G for two electrons placed at some distance apart in air.

Charge on electron $= -1.6 \times 10^{-19}$ C

Mass electron $= 9.1 \times 10^{-31}$ kg

$K = 9 \times 10^9$ Nm²/C²

$G = 6.67 \times 10^{-11}$ Nm²/kg²

Sol

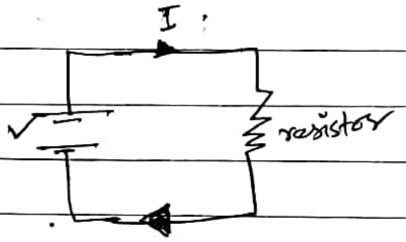
$$F_E = \frac{kq_1q_2}{r^2} \qquad F_G = \frac{Gm_1m_2}{r^2}$$

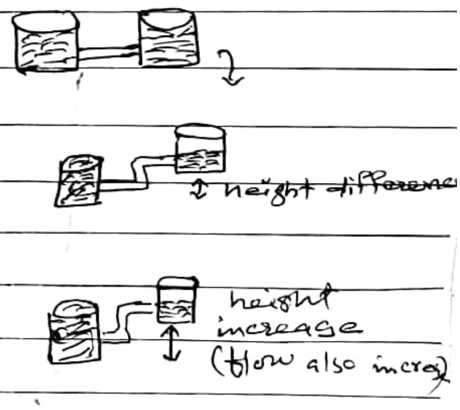
$$\frac{F_E}{F_G} = \frac{\frac{kq_1q_2}{r^2}}{\frac{Gm_1m_2}{r^2}} = \frac{kq_1q_2}{Gm_1m_2} = \frac{kq^2}{Gm^2}$$

Ohm's Law

⇒ Georg Simon ohm established the relation b/w electric Current and potential difference.

⇒ Statement:- Electric current flowing through a conductor is directly proportional to the potential difference accross it.





→ Battery provide potential difference
→ Increase potential difference then also current flow increase.

Direct proportion

If increase potential difference then automatically current flow increase. this type of relation is called direct proportion.

$I \propto V$ → constant (conductance) of conductor

$I = KV$ (I: current, V: potential difference)

$$I = \frac{V}{R} \qquad IR = V$$

∴ Conductance is opposite of resistance it is ability to allow passage of current.

V↑ I↑

R↑ I↓

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$

$$K = \frac{1}{R}$$

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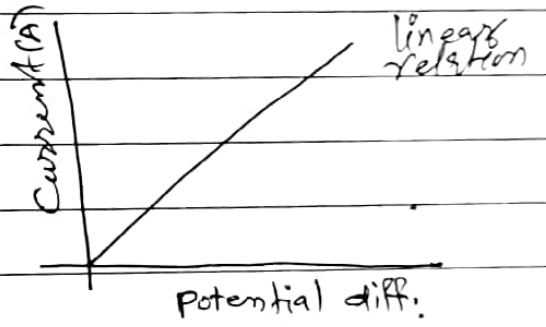
Ohm's points to Conceptualize:-

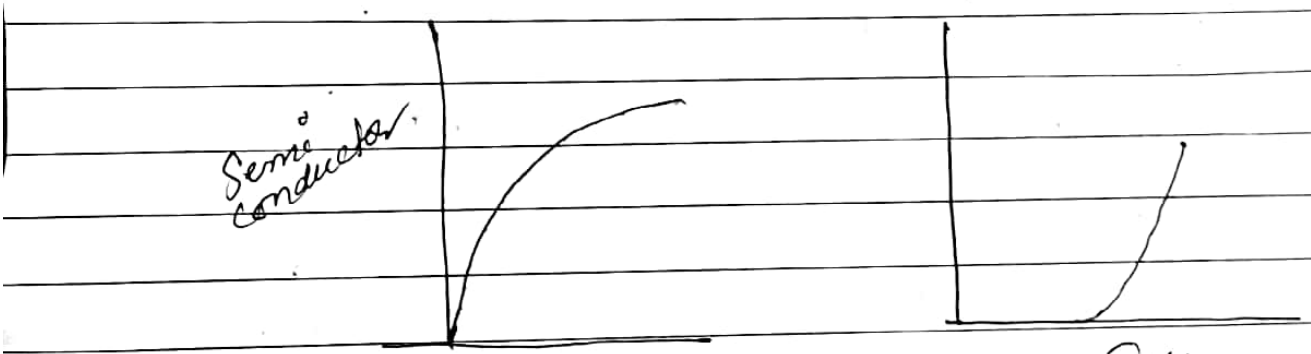
→ ohm's law is applicable when the resistance, temperature, and other physical conditions remain constant.

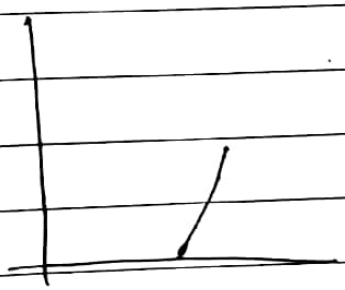
→ ohm's law is only valid for metallic conductors called ohmic conductors.

→ ohm's Law does not hold for liquids, gases and Semi conductors.

If we plot a graph b/w V & I, we get a straight line (linear relationship)







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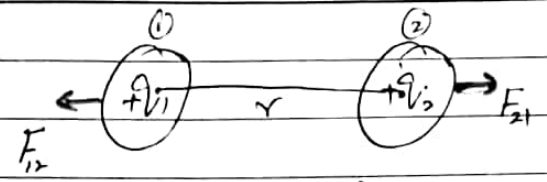
Coulomb's Law



$$F = |\vec{F}_{12}| = |\vec{F}_{21}|$$

Interaction of charges

+	+	repel
−	−	〃
+	−	attract

Facts along line joining center of 2 charges.

① $F \propto q_1 q_2$

② $F \propto \frac{1}{r^2}$ (Inverse square law)

③ F depends upon medium.

$$F = \frac{k q_1 q_2}{r^2}$$

k → constant (depends upon medium)

$k = 9 \times 10^9 \ Nm^2/c^2$ for free space/vacuum

$$k = \frac{1}{4\pi\varepsilon}$$

ε → permitivity

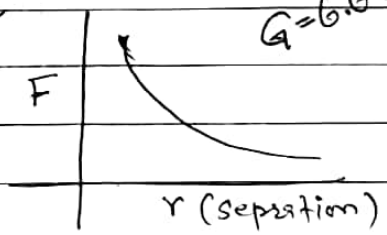
$G = 6.67 \times 10^{-11} \ Nm^2/kg^2$

$$F_E = k \frac{q_1 q_2}{r^2}$$

Electro static force

$$F_G = \frac{G m_1 m_2}{r^2}$$

→ universal gravitational force



Similarity

① Inverse square law ($F \propto \frac{1}{r^2}$)

② Line center joining

Difference

① F_E → repulsive as well as attractive
F_G → always attractive

② F_G → Independent of medium