Chapter - 01

"Current Electricity"

** Charge :→ The intrinsic property of matter which gives rise to electric force between various objects.

There are two type of charges :→

(i) Positive Charge (Vitreous Charge)

(ii) Negative Charge (Resinous Charge)

- Positive Charge :→ Glass rod, Woolen Cloth, Cat skin. etc.
- Negative Charge :→ Silk Cloth, Ebonite rod, Amber etc.
- It is denoted by 'Q'.
- S.I unit :→ Coulomb

  CGS unit :→ Statcoulomb
- Dimension :→ $M^0L^0T^1A^1$

$1\ C = 3 \times 10^9$ statcoulomb

Particle	Charge	Mass
Electron	-1.6×10^{-19} C	9.1×10^{-31} kg
Proton	$+1.6 \times 10^{-19}$ C	1.67×10^{-27} kg
Neutron	zero	1.67×10^{-27} kg

Note :→ Charge always comes with mass. For example :→ neutron has mass but no charge.

Properties of Charges :→

i) It is a scalar quantity.

ii) A charge at rest produces only electric field around itself, a charge having uniform motion produces electric

iii) Like charges repel each other.

+ + } Repelsion / Dushmani
− − }

iv) Unlike charges attract each other

+ − } Attraction / Dosti
− +

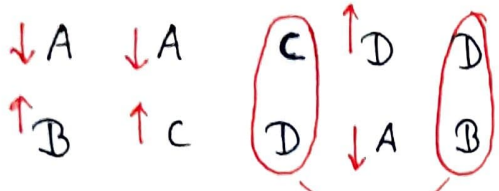
v) A charged body and a neutral body always attract.

O → ← O
Charged body — neutral — Dosti

Note :→ Attraction is not sure test for electrification but repelsion is sure test for electrification.

Example :→

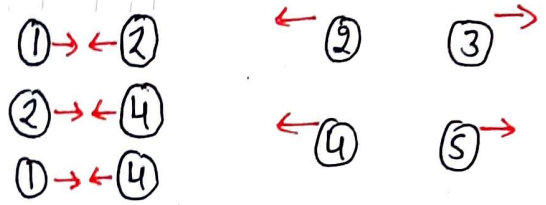
i)



A, B, D = Charged
C = neutral

Ans :→ Both pair are attractive in nature

2) ① ② ③ ④ ⑤ are five body with unknown charges. Find charge on first body.



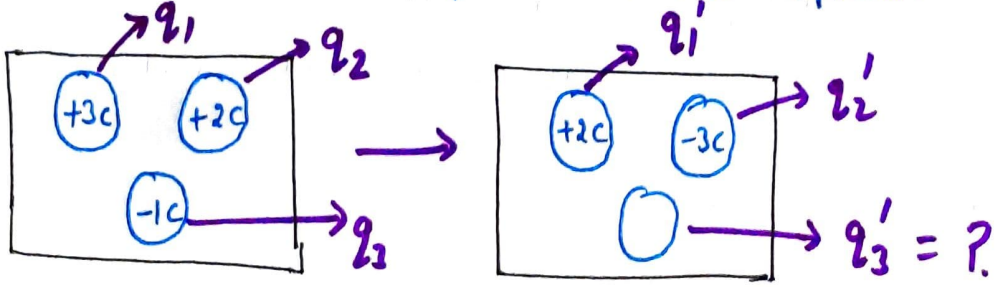
Ans :→ neutral.

vi) Conservation of Charge :→

i) Charge can neither be created nor be destroyed it can only transfer from one body to another body.

ii) In a isolated system, total charge remain constant whatever change take place in that system.

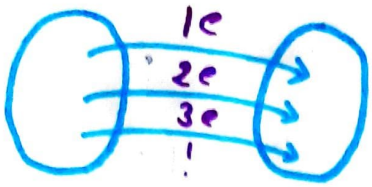
Ex :→



$$q_1 + q_2 + q_3 = q_1' + q_2' + q_3'$$

Quantization of Charge :→

(fixed amount)



Charge always exists an integral multiple of fundamental charge.

$$\left\{ \begin{matrix} 1e, 2e, 3e, - - - , +ne \\ -1e, -2e, -3e, - - , -ne \end{matrix} \right\} \text{ possible.}$$

$$\{1.5e, 2.5e, 3.5e - - \} \text{ not possible.}$$

$q = \pm ne$ → Charge on electron (1.6×10^{-19} C)

Charge on any body

Integer = 1, 2, 3, - - -

Ex :→ Is 1.0×10^{-7} C charge possible ?

Ans :→ $q = ne$

$$n = \frac{q}{e} = \frac{1.0 \times 10^{-7} C}{1.6 \times 10^{-19} C} = \frac{1.0}{1.6} \times 10^{12} = 0.625 \times 10^{12}$$

Yes possible.

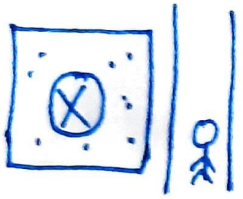
Ex :→ How many electrons constitute one coulomb charge ?

Ans :→ $q = ne$

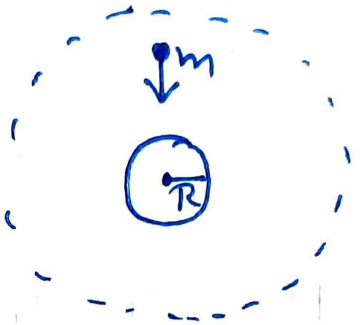
$$n = \frac{q}{e} = \frac{1C}{1.6 \times 10^{-19} C} = \frac{1.0}{1.6} \times 10^{19} = 0.625 \times 10^{19}$$

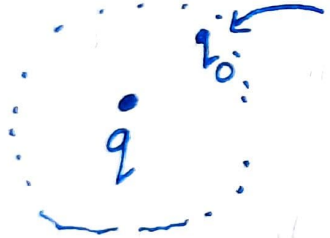
$$= 6.25 \times 10^{18}$$

Electric field :→



G. field





Def.→ It is the space around a charge in which its electric force experienced by other charge.