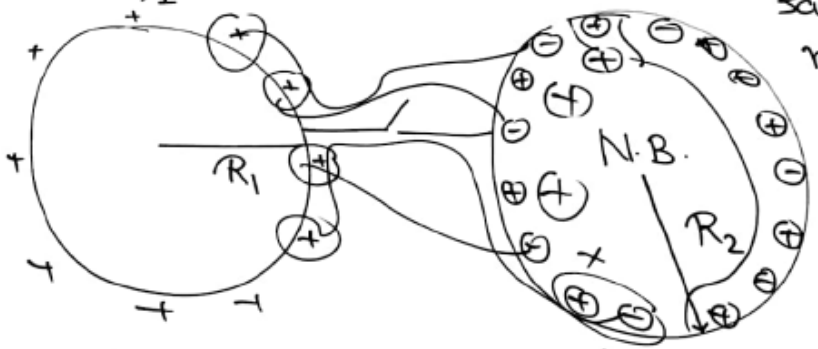
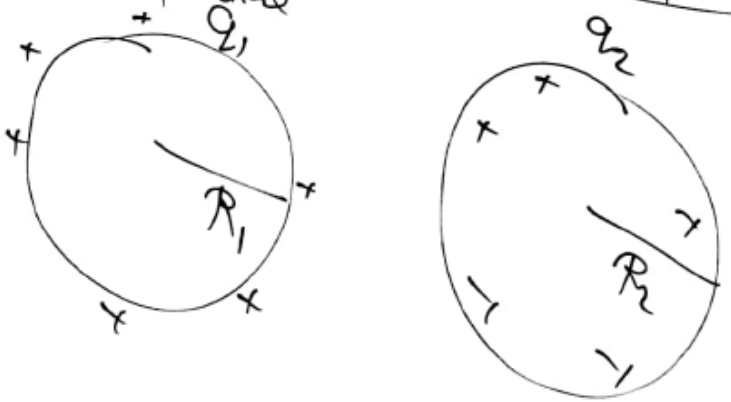
Charging by Conduction :- due to potential difference electrons are move from low potential to high potential, when both both have same potential move will stop



High potential

Low potential



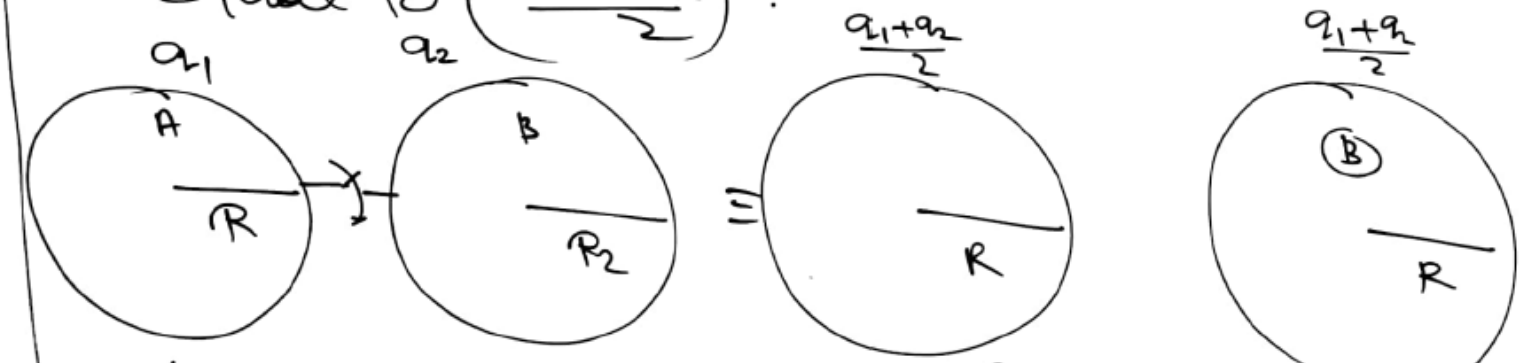
(+) ive charge → High potential

(−) ive charg → Low potential

(+ve) charge Always move from Low potential To high Potential.

(+ve) charge move from High potential to low Potential.

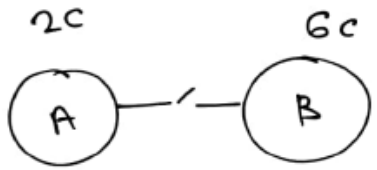
$\Rightarrow$: two identical Conducting body having same radius & charge are q_1 & q_2 respectively then after connection, charge on both body will equal & Equal to $\left(\frac{q_1+q_2}{2}\right)$.



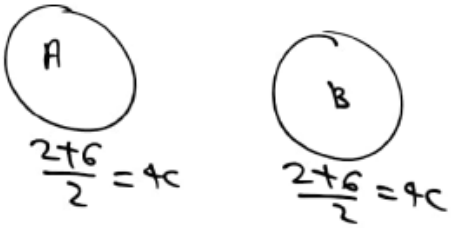
Initial charge $= q_1 + q_2$

Final charge $= q_1 + q_2$

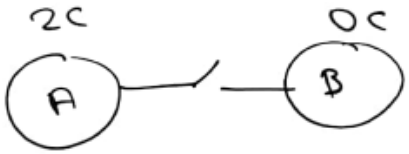
Q1) two identical body A & B



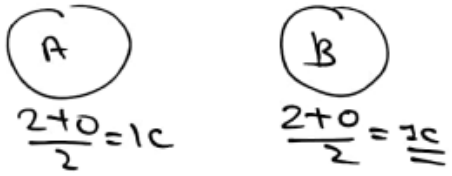
after connecting



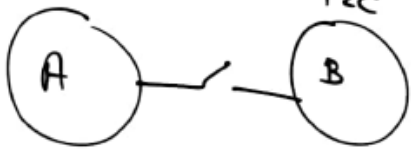
Q2)



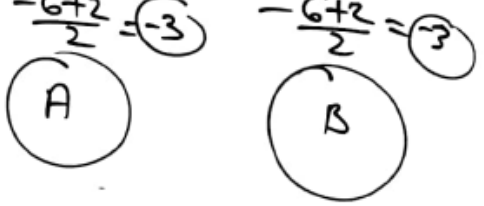
After connection



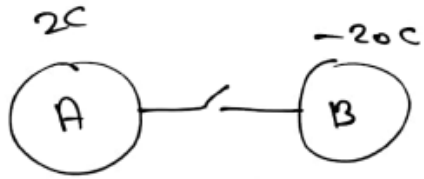
Q3) -6C, +2C



After connection

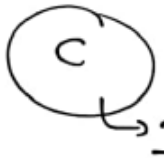


Q4)



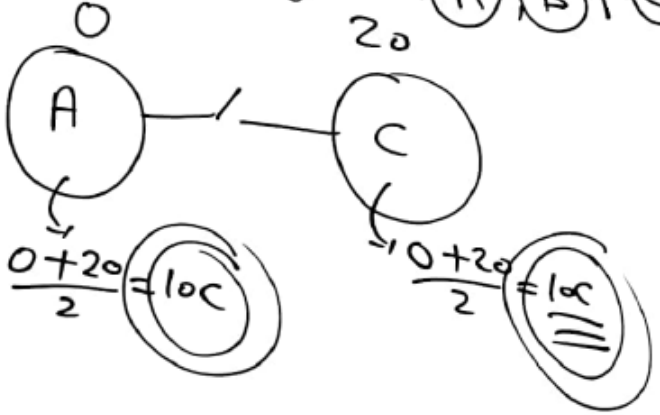
After connection charge on A & B is.

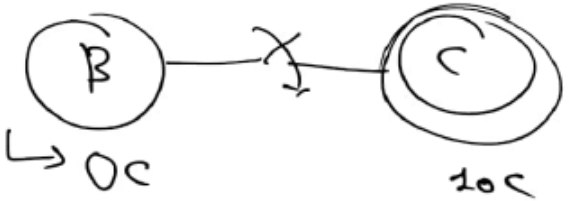
Q4)

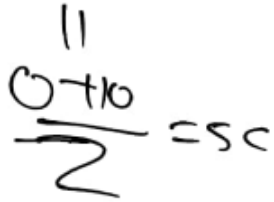


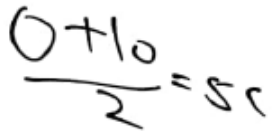
Identical Conduction

first (A) touch with (C)
then (B) touch to (C)
find final charge on (A), (B) & (C)



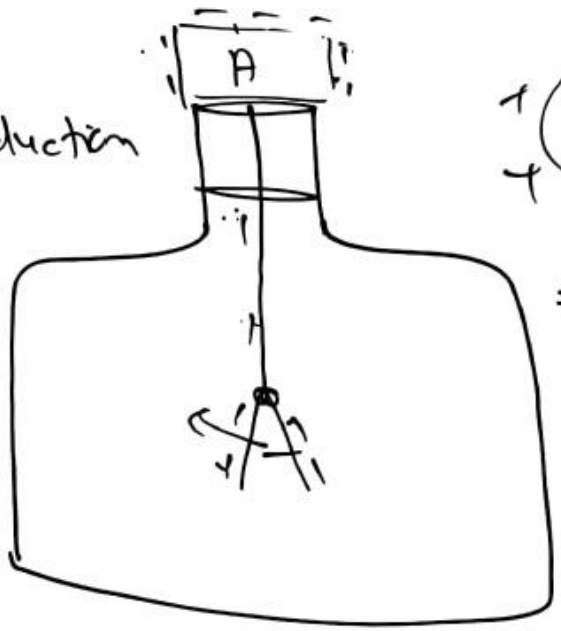






Electroscope: It is a simple device which detect charge on a body.

due to conduction



⇒ Electroscope can not find magnitude of charge & Nature of charge.

Coulomb's law: Force b/w two point charge is directly pro- to their magnitude of charges & inversely pro to square of distance between them.

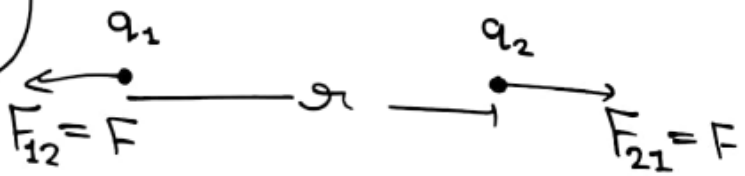
$$F \propto \frac{q_1 q_2}{r^2}$$

$$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$$

$$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \ \frac{N\text{-}m^2}{C^2}$$

↳ ε_0 = Permitivity of free space.

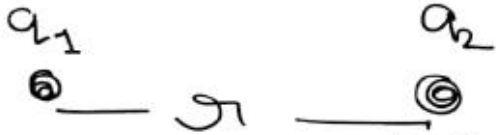
$8.85 \times 10^{-12} \ \frac{C^2}{N\text{-}m^2}$



$$F \propto q_1 q_2 \quad \text{—(i)}$$

$$F \propto \frac{1}{r^2} \quad \text{—(ii)}$$

⇒ Coulomb's Law :



$$F = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{q_1 q_2}{r^2}$$

$$F \propto q_1 q_2 \quad \text{(i)}$$

$$\left[\frac{1}{4\pi\varepsilon_0} = 9\times10^9 \ \frac{N\text{-}m^2}{c^2}\right]$$

$$F \propto \frac{1}{r^2} \quad \text{(ii)}$$

$$F = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{q_1 q_2}{r^2}$$

ε_0 = Permitivity of free space

$$\varepsilon_0 = 8.85\times10^{-12} \ \frac{c^2}{N\text{-}m^2}$$

$$\Rightarrow \varepsilon_0 = \frac{1}{4\pi F}\cdot\frac{q_1 q_2}{r^2} \qquad \varepsilon_0 = \frac{c^2}{N\text{-}m^2}$$

⇒ Q1 JEE mains 2013

find ① Dimensional formula of (ε_0) [Permitivity of free space]

(a) $[M^{-1}L^{3}T^{4}A^{2}]$

(b) $[ML^{3}T^{-4}A^{-2}]$

(c) $[M^{-1}L^{2}T^{2}A^{2}]$

(d) $[ML^{2}T^{-2}A^{4}]$

$[C] = [AT]$

$q = it$

$[q] = [A][T]$

$= [AT]$

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

$$\varepsilon_0 = \frac{1}{4\pi F}\frac{q_1 q_2}{r^2} = \frac{C^2}{N\text{-}m^2}$$

$M^{-1}L^{-3}T^{4}A^{2}$

$F = ma$

$[F] = [m][LT^{-2}]$

$= [MLT^{-2}]$

$$= \frac{[AT]^2}{[MLT^{-2}][L^2]} = \frac{[A^2T^2]}{[ML^3T^{-2}]}$$

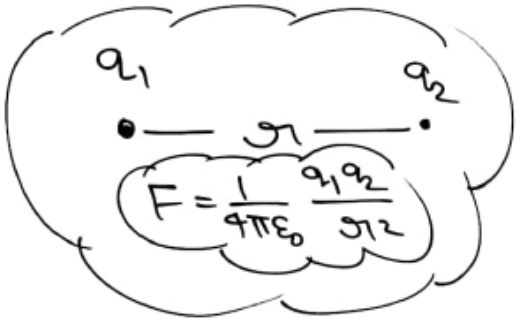
$= M^{-1}L^{-3}T^{+2}A^2T^2$

$= M^{-1}L^{-3}T^{4}A^{2}$

Q1) Find Force b/w two point charges 2mC & -3 HC placed at 3m apart & also find Nature of Force.

$[mC - 10^{-3} C$
$\mu C = 10^{-6} C]$

2mC ——— 3m ——— −3HC



$$F = \frac{1}{4\pi\varepsilon} \frac{q_1 q_2}{r^2}$$

$$= 9 \times 10^9 \times 2 \times 10^{-3} \times 3 \times 10^{-6} C$$

$$= \frac{9 \times 6}{9} = 6\ N \quad \text{Attractive}$$