

1. Two equal charged particles stay in air medium in the distance 10 cm and the force is 50 mg wt. Find the charge of the particle.

Ans: we know that,

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

then,  $F = \frac{q \cdot q}{r^2}$  [  $q_1 = q_2 = q$  ]  $F = 50 \text{ mg wt} = (50 \div 1000) \times 980 = 49 \text{ dyn}$

$$49 = \frac{q^2}{(10)^2}$$

$$q^2 = (49 \times 100) = 4900$$

$$q = (4900)^{(1 \div 2)} = 70$$

Hence,  $q = 70 \text{ StatC}$

2. Two point charges ratio is 2:3 and the distance between them is 5 cm and force is the 96 dyn. What is the value of the point charges?

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

$$q_1 = 2q = 2 \times 20 = 40 \text{ StatC}$$

$$96 = \frac{(2q \cdot 3q)}{(5)^2}$$

$$q_2 = 3q = 3 \times 20 = 60 \text{ StatC}$$

$$96 = \frac{6q^2}{25}$$

$$6q^2 = 96 \times 25$$

$$q^2 = (96 \times 25) \div 6 = 400$$

$$q = (400)^{(1 \div 2)} = 20$$

Hence,  $q = 20$

3. Two spherical contained charge 1C . When force is 1N , find the distance between the two sphere.

Ans:  $F = \frac{1}{4 \pi \epsilon_0} \cdot \frac{q_1 q_2}{r^2}$

$$1 = \frac{1}{4 \times 3.14 \times 8.854 \times 10^{-12}} \cdot \frac{(1 \times 1)}{r^2}$$

$$r^2 = \frac{1}{4 \times 3.14 \times 8.854 \times 10^{-12}}$$

$$\text{Then, } r = \left( \frac{1}{4 \times 3.14 \times 8.854 \times 10^{-12}} \right)^{(1 \div 2)} = 9.48 \times 10^4 \text{ m}$$

4. What is the force between the electron and proton in Hydrogen atom  ?

Where charge of electron and proton is  $4.8 \times 10^{-10} \text{ StatC}$  and radius from the nucleus is  $10^{-8} \text{ cm}$ .

Ans:

$$F = \frac{(4.8 \times 10^{-10})^2}{(10^{-8})^2} = 2.3 \times 10^3 \text{ dyn}$$

5. Find out the velocity of electron where charge of electron is  $e$  , charge of nucleus is  $Ze$  mass of electron is  $m$  and the radius is  $r$ .

Ans :

$$F = \frac{mv^2}{r} \text{ (i)}$$

$$F = \frac{e \cdot Ze}{r^2} = \frac{Ze^2}{r^2} \text{ (ii)}$$

$$\text{Then, } \frac{mv^2}{r} = \frac{Ze^2}{r^2}$$

$$mv^2 = Ze^2 \div r$$

$$v^2 = Ze^2 \div mr$$

$$v = (Ze^2 \div mr)^{(1 \div 2)}$$

$$\text{Hence, } v = e(Z \div mr)^{(1 \div 2)}$$