

Unit:- 9 ^{cc} Electrostatics And Magnetostatics⁹⁹

Electrostatics:-

* It is a branch of physics that studies electric charges at rest.

* An electric field (\vec{E}) is said to be an electrostatic field if:-

(i) \vec{E} is independent of time.

(ii) $\vec{\nabla} \times \vec{E} = 0$

i.e. $\text{curl } \vec{E} = 0$.

Electric charge:- * A charge is a fundamental characteristic property of elementary particles of matter which can explain certain processes of interaction and some types of interaction energies.

* Electric charge is a scalar quantity.

* Like charges repel each other, while opposite charges attract each other.

Coulomb's Law

* It states that ^{cc} "The electrostatic force of attraction or repulsion between two charged bodies is directly proportional to the product of their charges and varies ~~linearly~~ inversely as the square of the distance between the two bodies."

* The force acts along the line joining the two charges.

* Suppose two point charges q_1 and q_2 are situated at a distance r from each other in the same medium. The magnitude of the electrostatic force F which one exerts on the other will be given by,

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

Combining the above two we have,

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

$$\Rightarrow F = \frac{\beta \cdot q_1 q_2}{r^2} \quad \text{--- (i)}$$

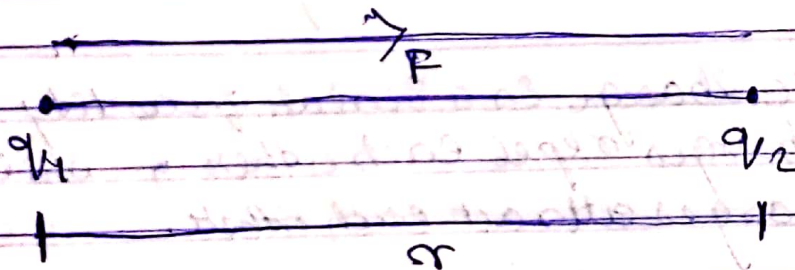


Fig:-1

where, β is a proportionality constant which depends on the nature of the medium in which the two charges are situated.

* Coulomb's Law is strictly true for point charges only.

(i) In e.s.u. (e.s.u.) electrostatic unit system