

Electrostatics & Electric Charge

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- an electric field is the space around an electric charge, just like gravitational field is space around a mass
- charge creates an electric field that exerts forces on other charges, mass creates a gravitational field that exerts forces on other masses
- gravitational forces are far weaker than electric forces → $G = 6.7 \times 10^{-11}$, $E = 1.8 \times 10^{25}$

FIELD:- a field is defined as a property of space in which a material object experiences a force, the direction of field is determined by force

$$g = \frac{F}{m}$$

ELECTRIC FIELD:- electric field at a point in space is defined as the electric force per unit ~~pos~~ charge that would be exp by a pos test charge placed at that point.

- $E = \frac{F}{q}$ N/C (valid for point charge only), if q +ve, force and field are in same direc, if q -ve, force and field in opp direc

- $F = k \frac{q_1 q_2}{r^2}$ NIC (force b/w source and test charges from coulomb's law)

$$k = 9.0 \times 10^9 \text{ coulomb's constant}$$

- $E = k \frac{q}{r^2}$

- $E = k \sum \frac{q}{r^2} \longrightarrow$ at any point P, the total electric field due to a group of source charges equals the vector sum of the electric fields of all charges at that point.

- test charge is taken as pos for now, force on charge is with field direction.

ELECTROSTATICS

ELECTRIC CHARGE:- electric charge is a property of tiny particles in atoms, its unit is coulomb (C)

- it should always be identified with a pos or neg sign.
- all ordinary matter contains both pos and neg charges
- an object is electrically neutral when it has equal amounts of both types of charges
- an object can lose or gain electric charges
- the net charge is sometimes called excess charge because a charged object has an excess of either pos or neg charges, this causes static electricity

CONDUCTORS AND INSULATORS:- all materials contain electrons

- electrons in conductors are free to move and carry current along a conductor.
- electrons in insulators are not free to move, they are tightly bound inside atoms
- a semi conductor has a few free electrons and atoms with bound electrons that act as insulators

COULOMBS LAW:- force b/w two charges is \propto to product of two charges and $\frac{1}{r^2}$ to the square of dist b/w them

