

The study of charged particle always fascinated scientists and thinkers. They can be broadly classified into two, the study of charged particle at rest which is called *Electrostatics* or *Static electricity* and charged particle in motion called *Current electricity* or *Electrodynamics*. *Electrostatics deals with the study of Forces, Fields and Potentials arising from static charges.*

- **Charge :**

- The intrinsic character of a fundamental particle
- They are classified into two <sup>1</sup> *Positive* charge and *Negative* charge
- The same charges repel each other and opposite charges attract each other
- The deficiency of electrons gives *Positive ions* and the excess number of electron gives *Negative ions*
- Charge of an electron =  $-1.6 \times 10^{-19}$  Coulomb (C)
- Charge of an Proton =  $+1.6 \times 10^{-19}$  Coulomb (C)
- **Two types of charges:** When different objects are rubbed with each other they tend to come closer or repel each other. When two glass rods are rubbed with silk cloth then they repel each other similar behaviour can be seen whe plastic rods are rubbed with wool and when a glass rod rubbed with silk is placed near to a plastic rod rubbed with wool they attract each other, this suggests that there are two types of charges. Which object is charged negative/positive depend on the ability to hold up charge. An object looses charge will be positively and that gains charge will be negatively charged.

### Method of charging conductors

Conductors can be charged by three methods by *conduction* , *induction* ,and *polarization*

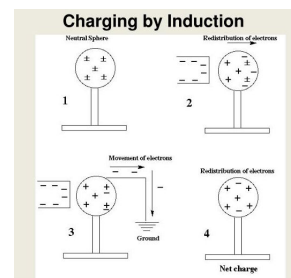
<sup>1</sup>The name are the conventional choice made by Benjamin Franklin

- *By Conduction or Friction* : A charged conductor(P) is brought in contact with another uncharged conductor(Q) then the uncharged conductor get the same charge as the charged conductor (P). This occurs due to the transfer or sharing of charges.

Since in an insulator free charges are not available it can not charged in this method. Eg:

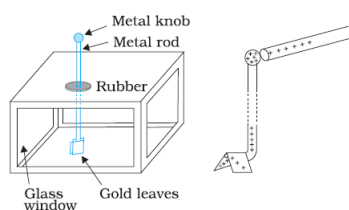
- \* When glass rubbed with silk, glass become positive by loosing electrons and silk become negative by gaining electrons.
- \* When ebonite rod is rubbed with fur, ebonite becomes negatively charged and fur become positive.

- *By Induction* : A conductor which can be charged in the presence of a Field without any contact of the conductors. A conductor which is to be charged is placed on an insulated stand and another charged conductor is brought near to the conductor, then due to the field the uncharged conductor is oppositely charged at one end and same at the other end. Then by proper earthing we get a charged conductor. The charge will be always be opposite to that of the initially charged conductor.



- *By polarization* : This method can be used for both conductors and insulators. For conductor it is similar to the method of *induction* and for insulators the positive and negative charges will be separated which produces a *polar atom* and the process of production of polar atom is known as *Polarization*.

– Detection of charged state by Gold Leaf Electroscope



A simple apparatus to detect charge on a body. It consists of a metal rod housed inside a box and at the bottom two gold leaves are placed. When charged object is placed in contact with metal rod, charge flows to the leaves and they diverge. Degree of divergence depends on the amount of charge.