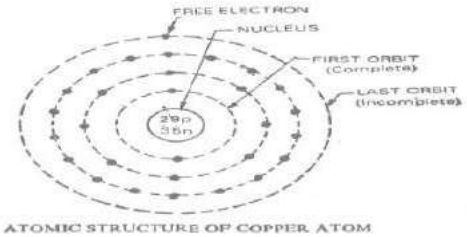
Static Electricity

Modern Theory of electricity:

- The electrons present in outermost orbit which are loosely bound to nucleus are called free or valence electrons.

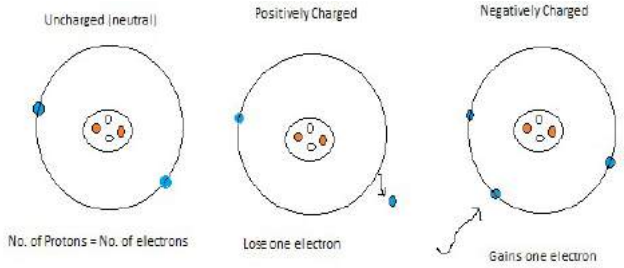


ATOMIC STRUCTURE OF COPPER ATOM

- Transfer of free electrons is responsible for the charging of bodies
- Only insulators can be charged with static electricity.

Types of charges :

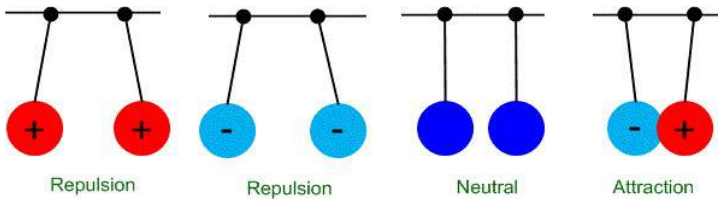
- An atom is electrically neutral
- **Negatively charged :** the atom on gaining one or more electrons.
- **Positively charged :** the atom on losing one or more electrons.



- Charged particles exert force on one another even when they are not in physical contact

Laws of Electrostatic Attraction and Repulsion:

- Opposite charges attract
- Same charges repel
- Charged body attracts uncharged body



The bodies which on rubbing acquire the property of attracting light bodies (such as paper pieces) are said to be electrified (or charged).

If the acquired charge is not allowed to flow it is said to be static electricity.

Study of properties of bodies electrified due to stationary charges is called electrostatics.

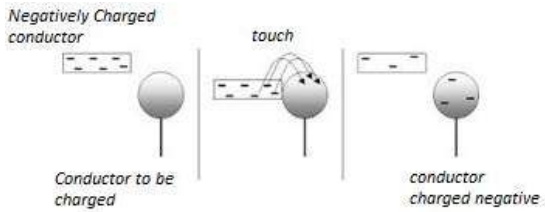
Conductors	Insulators
Allows electric charge to flow through it	Does not allow electric charge to flow through it
have large number of free electrons	have very less or no free electrons
Ex. All metals, earth, human body etc.	Ex. wood, rubber, oxygen etc.

Methods of Charging a conductor:

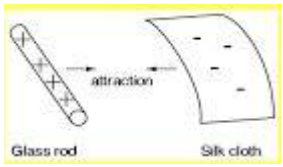
- Charging by Conduction
- Charging by Induction

Charging by conduction:

- by touching
-uncharged body acquires same charge as the charged body
- strength of charged body decreases
- on separation, both retain the charges



Charging by friction: - *Charging the Insulator*



Free electrons loosely bound in glass rod. On rubbing loses electrons and becomes positive charge.
Silk cloth acquires electrons and becomes negative charge.

Some Examples :

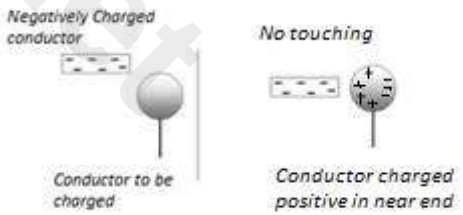
Positive Charge	Negative Charge
Glass Rod	Silk Cloth
Woolen cloth	Plastic sheet
Carpet	Comb
Nylon	Amber
Dry hair	Ebonite
Woolen coat	Rubber
	Cotton cloth

Electrostatic Induction:

The process in which an opposite charge is induced on the nearer end of an uncharged conductor, in presence of a charged body nearby it .

Charging by Induction:

- by bringing near and not touching
- uncharged body acquires opposite charge as the charged body in near end
- strength of charged body doesn't change
- on removing the charged body, the body charged by induction will become neutral



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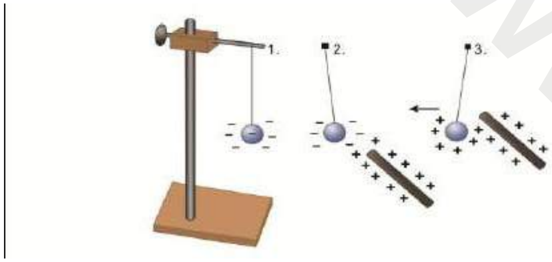
Pith Ball Electroscope:

Identification of charge on rod:



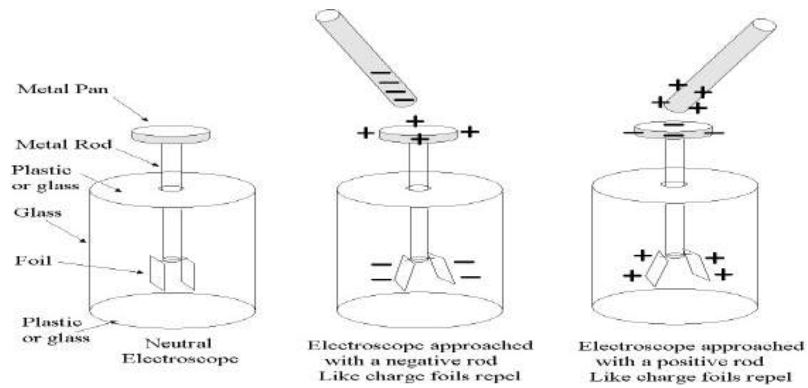
Test of charge:

Charge on pith ball electroscope	Movement of pith ball when the test body is brought near (without touching)	Charge on test body
Uncharged	i. No movement	Uncharged
	ii. Towards the body	Charged
Positive	i. Away from the body	Positive
	ii. Towards the body	Negative
	i. Away from the body	Negative

Sparking:

The flow of charge between the two charged bodies with a flash and chit-chit sound due to the ionization of air in between them.

Gold Leaf Electroscope:



Test of charge:

Charge on gold leaf electroscope	Effect of divergence of leaves when the test body is brought near the disc or touched with the disc	Charge on test body
Uncharged	i. No Divergence	Uncharged (Neutral)
	ii. Divergence	Charged
Positive	i. Increases	Positive
	ii.Decreases	Negative
Negative	i. Increases	Negative
	ii.Decreases	Positive

Lightning:

When 2 thunder clouds of opposite charges approach each other, the air between them gets ionized and the electrons move from negative cloud to positive cloud. The path of the discharge is very hot and glows as lightning flash.

The loud sound that accompanies the flash is due to rapid expansion and then contraction of the heated air. It is called *thunder*

Effect of Lightning:

- Very dangerous and damaging
- can melt metals
- Can cause fire
- Can shatter buildings

Lightning Safety: - During Thunderstorm,

1. Rush to safe place like low rise building
2. Be inside car or bus while travelling
3. Don't stand under tall tree or electric poles
4. Squat low on ground
5. Unplug TV sets, computers etc.
6. Avoid contact with running water

Useful effects of lightning:

- Fixation of atmospheric nitrogen.
- Formation of ozone from atmospheric oxygen

Lightning Conductor:

A device used to protect the large buildings against lightning during thunder storm.

Earthing:
The process of transferring charge from a charged object to the earth

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