

Unit 1

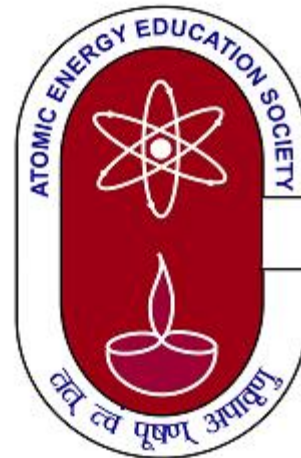
Chapter 1: ELECTRIC CHARGES & FIELDS



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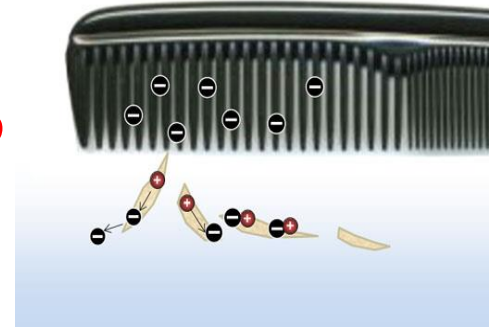
Atomic Energy Education Society, Mumbai

Module 1





1. ELECTRIC CHARGES & FIELDS

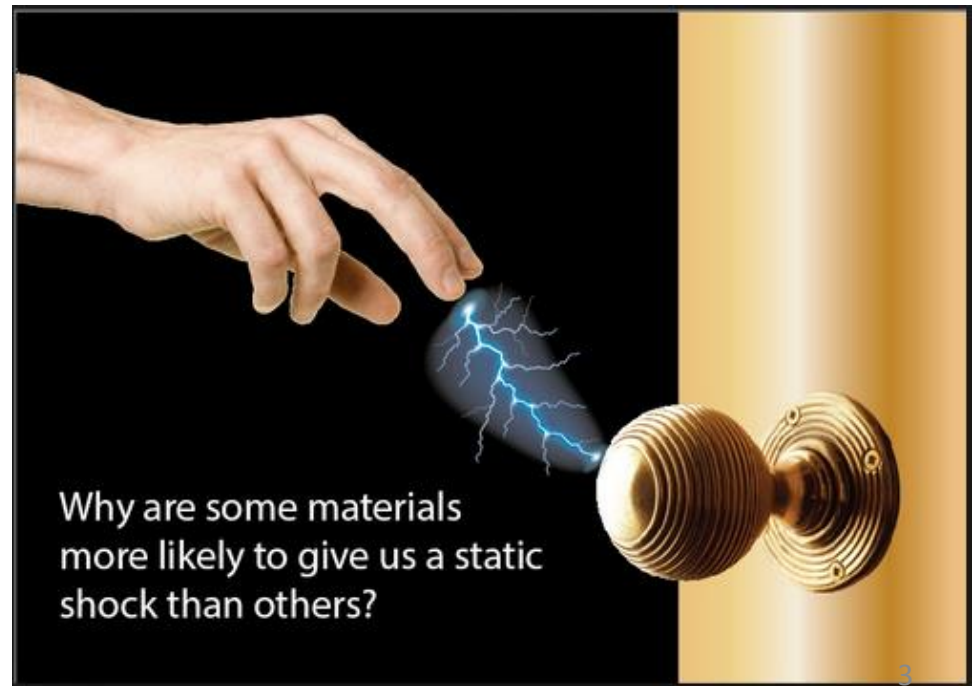


Dear students, you must be familiar with the following pictures.....



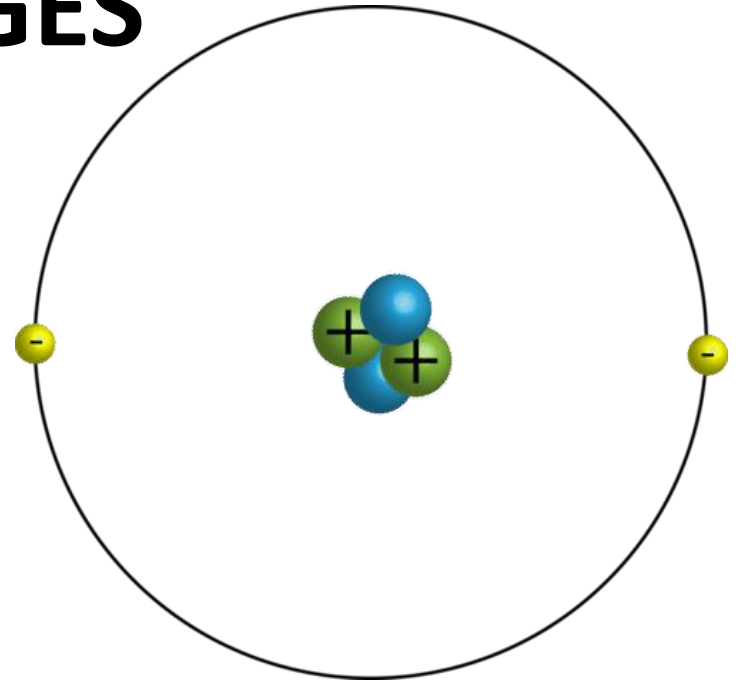
1.1: Electrostatics-Introduction

- Static means anything that does not move or change with time.
- *Electrostatics deals with the study of forces, fields and potentials arising from static charges.*



1.2: ELECTRIC CHARGES

We cannot imagine our life with out electricity...and electricity is nothing but moving charges ..Our first two chapters deal with static charges and third onwards moving charges....



Atom- Nucleus-Protons- Neutrons-electrons-nucleons-charge of nucleus and atom- ionisation – ions : +ve and –ve ions.....

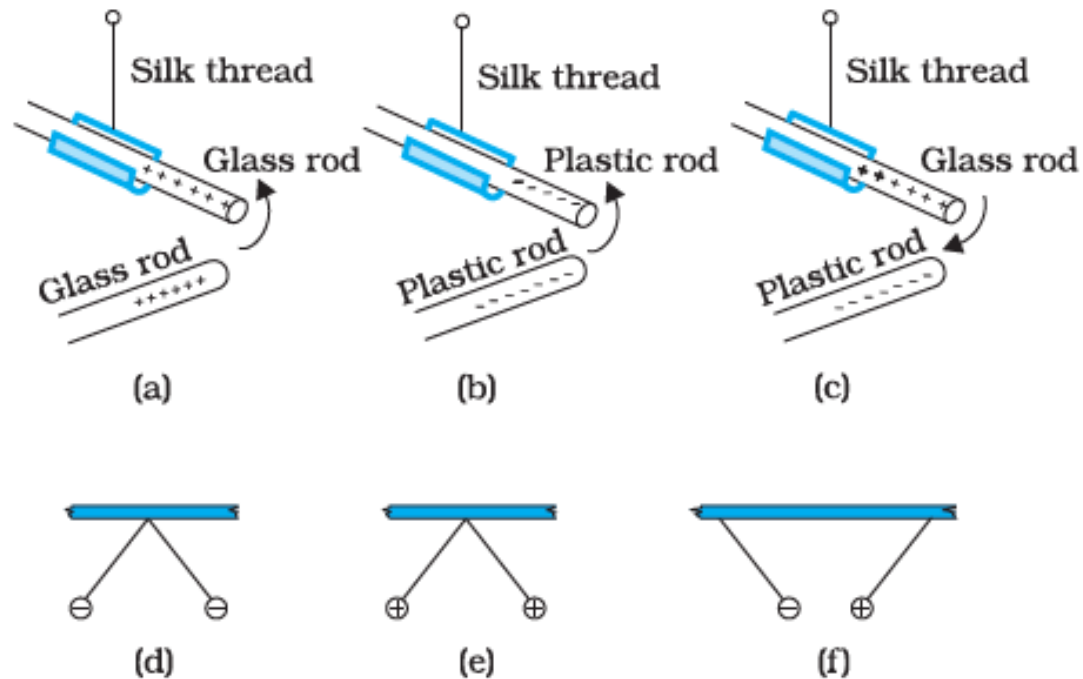
ELECTRIC CHARGE

Historically the credit of discovery of the fact that amber rubbed with wool or silk cloth attracts light objects goes to Thales of Miletus, Greece, around 600 BC. The name electricity is coined from the Greek word *elektron* meaning *amber*. While rubbing, amber becomes -ve and silk acquires +ve charge...



Electrification

- Two bodies like glass or plastic rods, silk, fur and pith balls are electrified while rubbing.
- They acquire an electric charge on rubbing.
- There are two kinds of electrification +ve and -ve
- (i) *like charges repel* and
- (ii) *unlike charges attract* each other.



Electrification

- The experiments also demonstrated that the charges are transferred from the rods to the pith balls on contact. It is said that the pith balls are electrified or are charged **by contact**.
- The property which differentiates the two kinds of charges is called the *polarity* of charge.
- Interactive animation on simple electrostatic experiments:

<http://demoweb.physics.ucla.edu/content/100-simple-electrostaticexperiments>

Electrification

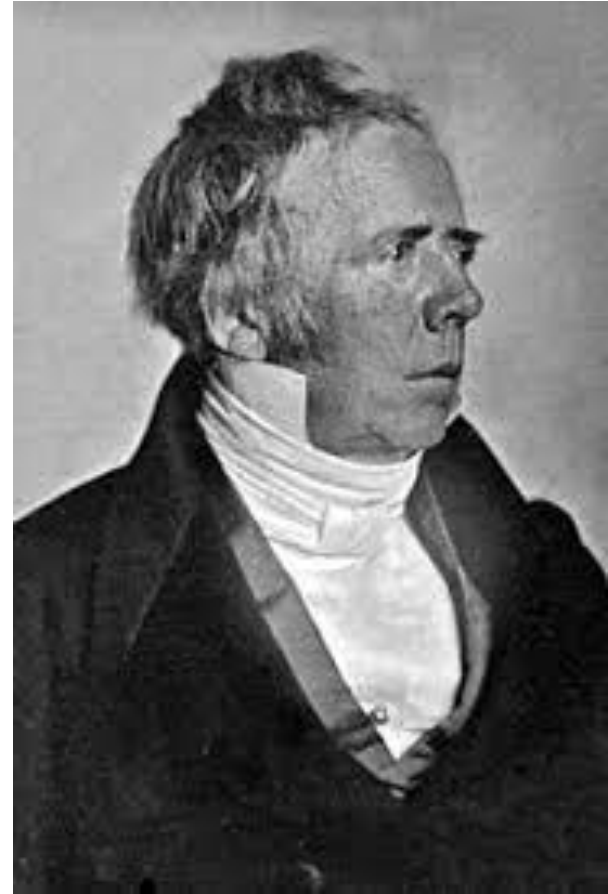


Benjamin Franklin

- The charges were named as *positive* and *negative* by the American scientist **Benjamin Franklin**.
- We know that when we add a positive number to a negative number of the same magnitude, the sum is zero.

Electricity & Magnetism

- In olden days, electricity and magnetism were treated as separate subjects. Electricity dealt with charges on glass rods, cat's fur, batteries, lightning, etc., while magnetism described interactions of magnets, iron filings, compass needles, etc.
- In 1820 Danish scientist **Hans Christian Oersted** found that a compass needle is deflected by passing an electric current through a wire placed near the needle.



Hans Christian Oersted

Electricity & Magnetism

André-Marie Ampère and **Michael Faraday** supported this observation by saying that electric charges in motion produce magnetic fields and moving magnets generate electricity



André-Marie Ampère



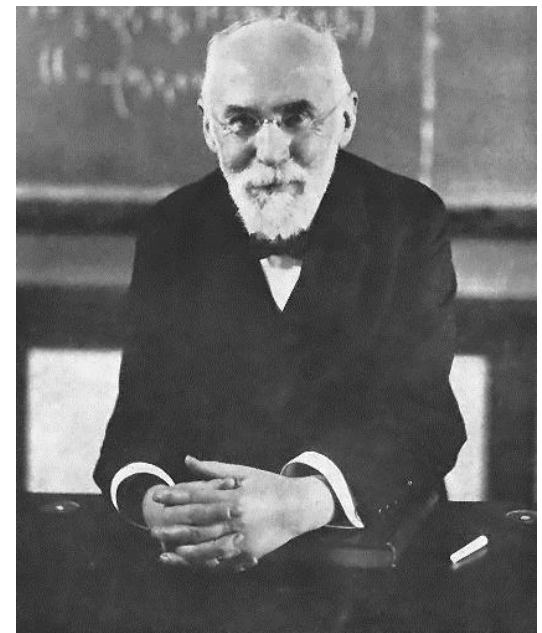
Michael Faraday

Electromagnetic Force

- The unification was achieved when the Scottish physicist **James Clerk Maxwell** and the Dutch physicist **Hendrik Antoon Lorentz** put forward a theory where they showed the interdependence of these two subjects. This field is called *Electromagnetism*.



James Clerk Maxwell



Hendrik Antoon Lorentz

Electromagnetic Force

- Most of the phenomena occurring around us can be described under electromagnetism.
- Virtually every force that we can think of like friction, chemical force between atoms holding the matter together, and even the forces describing processes occurring in cells of living organisms, have its origin in electromagnetic force.
- Electromagnetic force is one of the fundamental forces of nature.
- The other fundamental forces are gravitational force, strong nuclear force and weak nuclear force. (Class XI)

Gold-leaf Electroscope

It consists of a vertical metal rod housed in a box, with two thin gold leaves / aluminium foil attached to its bottom end. When a charged object touches the metal knob at the top of the rod, charge flows on to the leaves and they diverge. The degree of divergence is an indicator of the amount of charge.

(Try to make one such electroscope with available materials at home)



Thank you

Bibliography

- NCERT TEXT BOOK- CLASS XII-PHYSICS
- Previous Years CBSE Board Question Papers
- www.wikipedia.in

Rajeev G.L.

PGT(SS)

AECS - Kudankulam