

Electric Charges, Conservation of Charge

CLASS-XII

SUBJECT : PHYSICS

CHAPTER NUMBER: 01

CHAPTER NAME : ELECTRIC CHARGES AND FIELDS

CHANGING YOUR TOMORROW

LEARNING OUTCOME

- Understand the basic properties of electric charge.
- Explain the transfer of electrons between two objects.
- Compare different objects based on their electric charge.
- Identify the attraction or repulsion of charged objects.
- Identify when an uncharged object is being attracted to a charged one.
- Objects are charged if there is an imbalance of protons and electrons and to calculate the amount of charge on an object if given the number of excess protons or electrons.

INTRODUCTION

1. Why did the balloon attract the hairs?

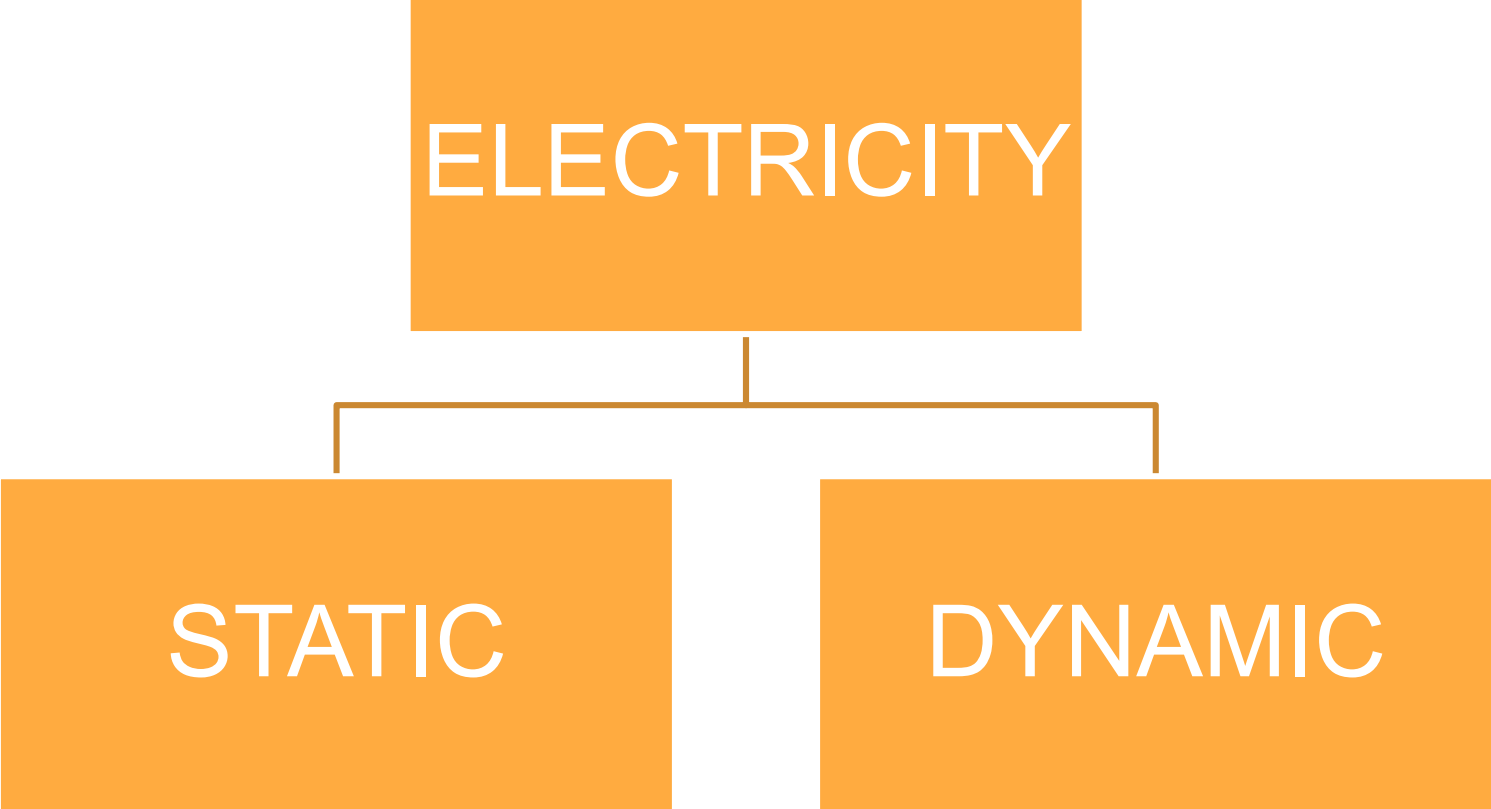


INTRODUCTION

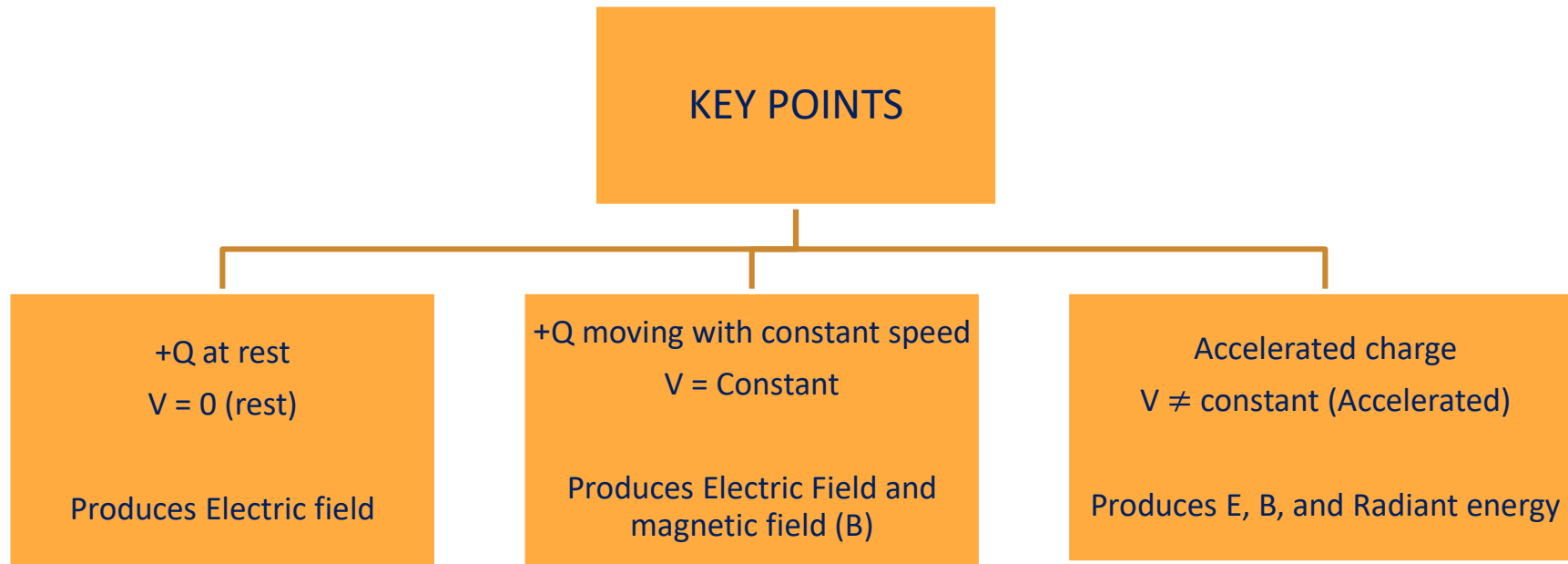
2. Why does a comb attract pieces of paper?



ELECTRICITY



ELECTRICITY



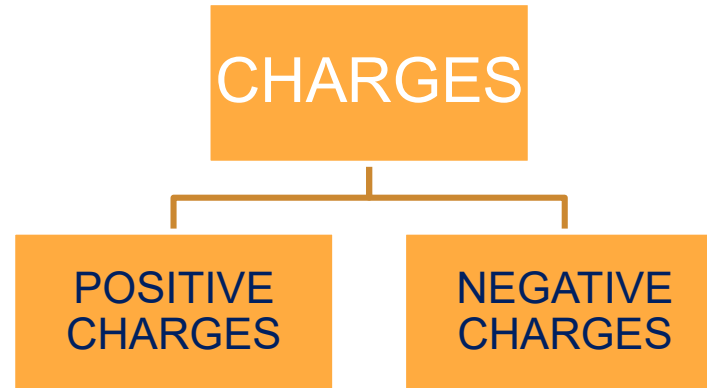
Electric Charge

- ✓ It is the basic property of charged particles like protons or electrons which give rise to the electric force between them.
- ✓ Represented by letter Q or q.
- ✓ It is a scalar quantity.
- ✓ Dimensional formula:- [AT]
- ✓ S.I unit of charge coulomb (C)
- ✓ 1C of charge: It is the Charge carried by 6.25×10^{18} nos. of electrons

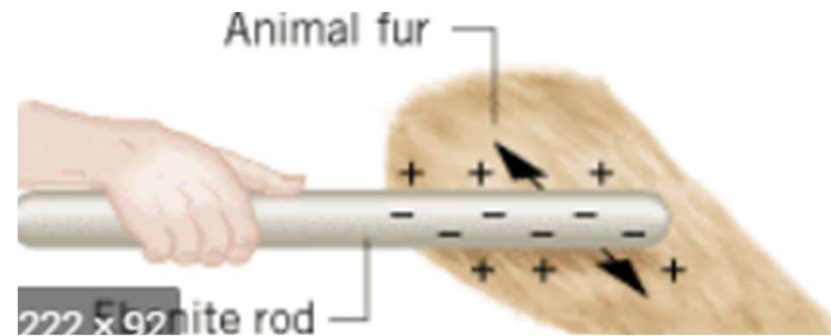
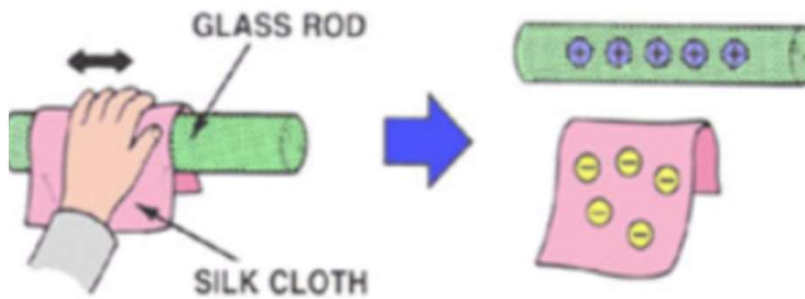
NCERT NUMERICAL

If 10^9 electrons move out of body to another body every second, how much time is required to get a total charge of 1C on the other body? (NCERT)

KINDS OF CHARGES



➤ An object can attain positive charge by losing electrons while other can attain negative charge by gaining electrons.



KINDS OF CHARGES

Body acquires **positive** charge on rubbing

- Glass rod
- Cat fur
- Woolen cloth
- Woolen cloth
- Woolen cloth

Body acquires **negative** charge on rubbing

- Silk
- Ebonite
- Amber
- Rubber
- Plastic bodies

CONDUCTORS AND INSULATORS

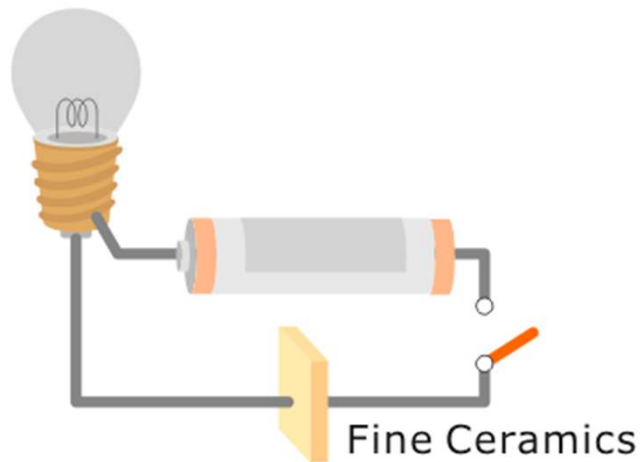
- Conductors are those substances which can be used to conduct electric charge from one point to other.

Examples: Silver, metals (Copper, iron, Al), Human body

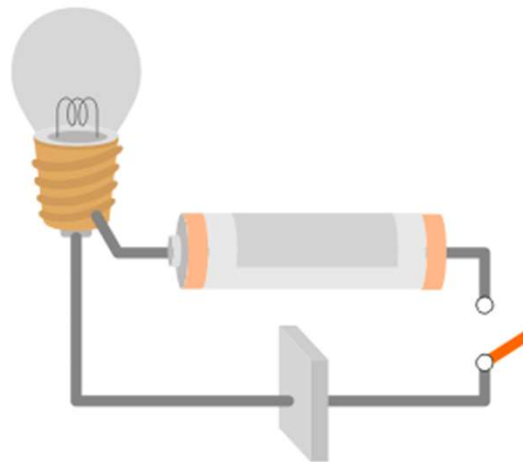
- Insulator are those substances which cannot conduct electric charge

Examples: Glass, Plastic, Rubber, Wood, etc.

Insulating Ceramics



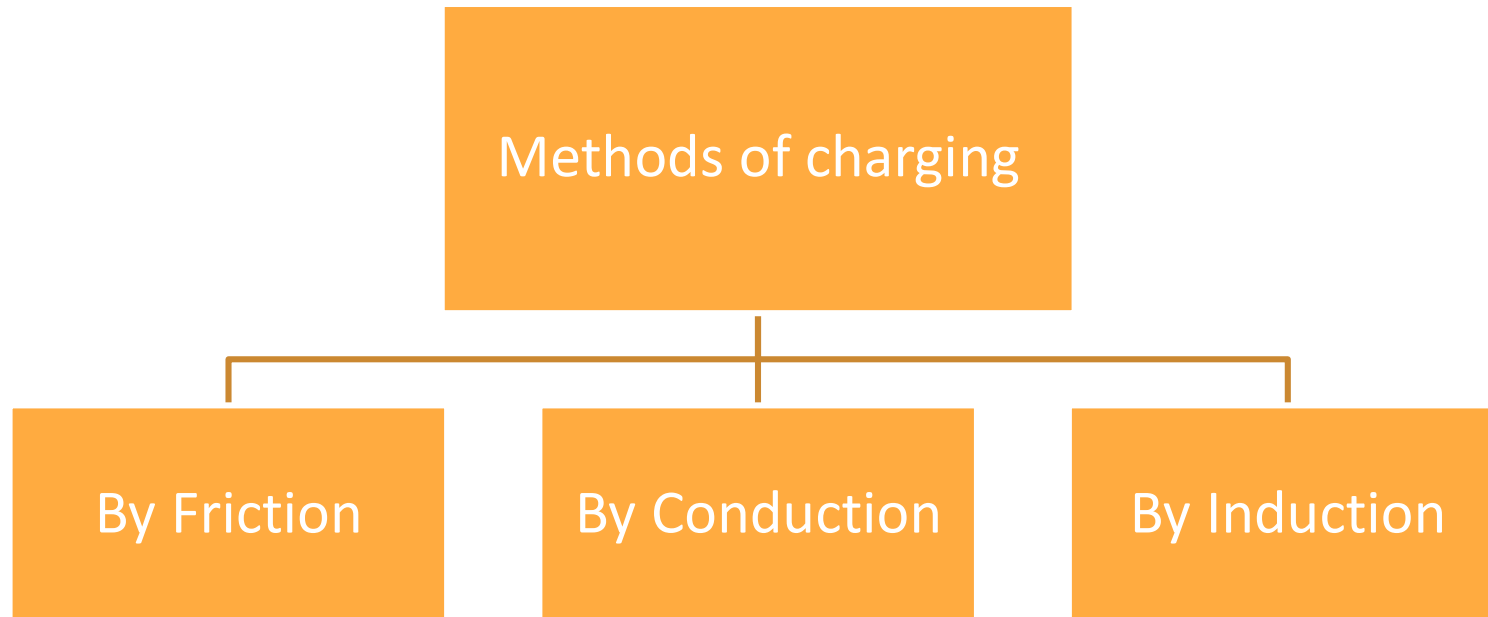
Metals



NCERT NUMERICAL

1. How much positive and negative charge is there in a cup of water (250g)? (NCERT)
2. A polythene piece rubbed with wool is found to have negative charge of 3×10^{-7} C
 - (a) Estimate the no. of electrons transferred.
 - (b) Is there a transfer of mass from wool to polythene?

METHODS OF CHARGING

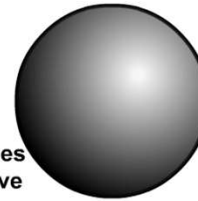
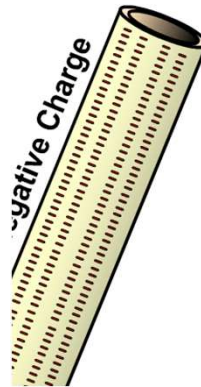


METHODS OF CHARGING

By Friction

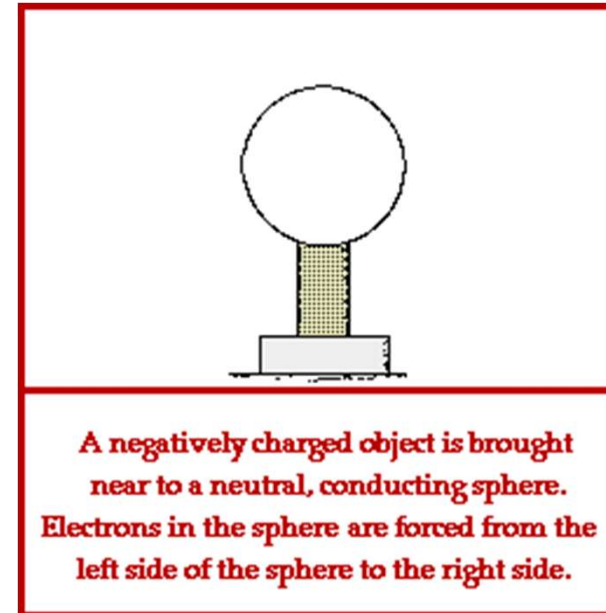


By Conduction



Electrons transfer to the object making it the same charge

By Induction

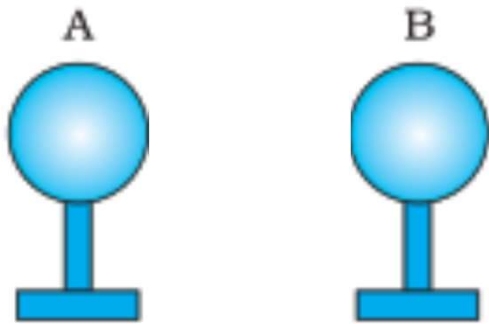


QUESTION

You are given two spherical conductors and a positively charged rod.

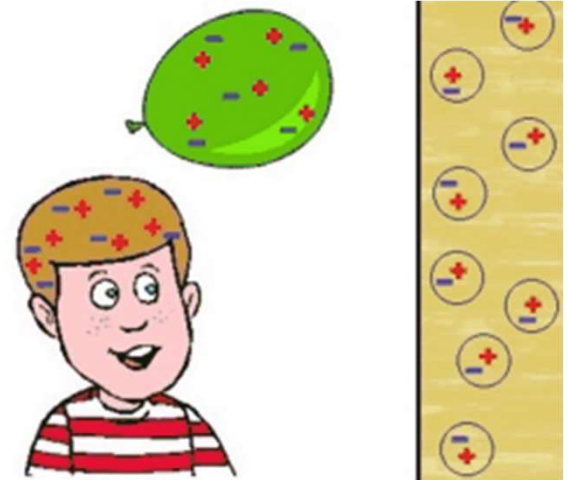
(a) How will you charge these spheres with equal and opposite charges?

(b) What will happen if a glass rod is subsequently removed and finally charged spheres A and B are separated apart?



BASIC PROPERTIES OF ELECTRIC CHARGES

- (a) Additive nature of Charge
- (b) Conservation of electric charge
- (c) Invariance of charge
- (d) Quantization of electric charge ($Q=ne$)



POINTS TO REMEMBER

1

Cause of quantization: when one body is rubbed with another only integral no. of electrons is transferred.

2

Protons and neutrons are made up of Up quark $+\frac{2}{3}e$ and
Down quark $-\frac{e}{3}$.

3

So proton = *uud* and neutron = *udd*

QUESTIONS

1. At the macroscopic level the quantization of charge can be ignored. Why?
2. A sphere '1' with charge q is touched to another sphere 2 of half the radius of 1. Find out the charge on each sphere.

POINTS TO REMEMBER

1

When two identical spheres with charges q_1 and q_2 are touched together and separated, the charge on each sphere will be. $\frac{q_1+q_2}{2}$

2

If one is charged ($=q$) other has no charge then each sphere will have $q/2$

3

The charge on a body is directly proportional to its size.

HOME ASSIGNMENT

NCERT Example: 1.1,1.2,1.3

THANKING YOU
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