

Static Electricity

Introduction

- What do lightning, a shock from a doorknob, and static cling have in common?
 - Static electricity
- Thales (624-546 BCE) noticed that when amber was rubbed it attracted small pieces of straw and wood shavings
 - The amber became charged

Types of Charges

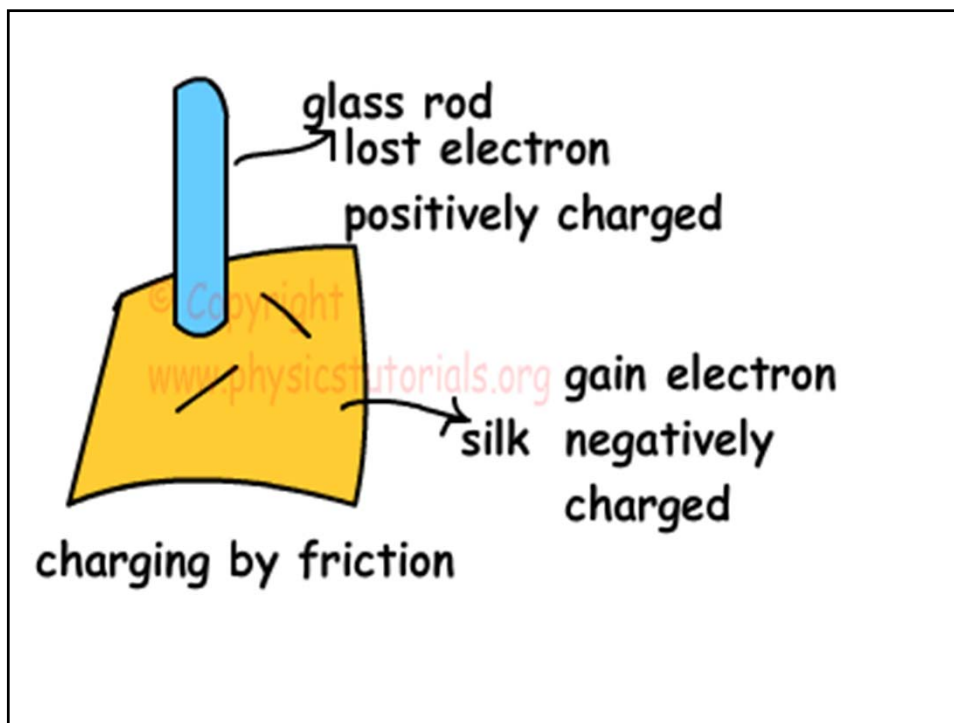
- There are two types of charges
 - Positive and negative
- Opposite charges attract
- Like charges repel
- Charged objects also attract neutral (uncharged) objects

How do you charge something?

- An object that is charged has either too many or too few electrons
- We can charge objects by
 - Friction
 - Conduction
 - direct contact
 - Induction
 - bringing a charged object near another object, but not touching

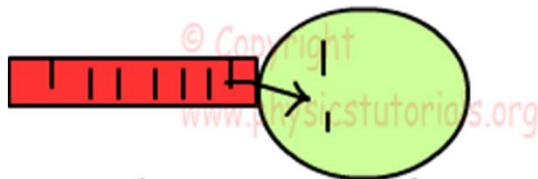
Friction

- When two non-conducting objects rub together, electrons can be transferred from one to another
 - One object will lose electrons and become positively charged
 - One object will gain electrons and become negatively charged

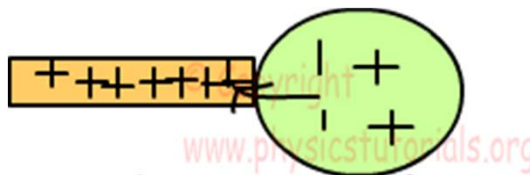


Conduction

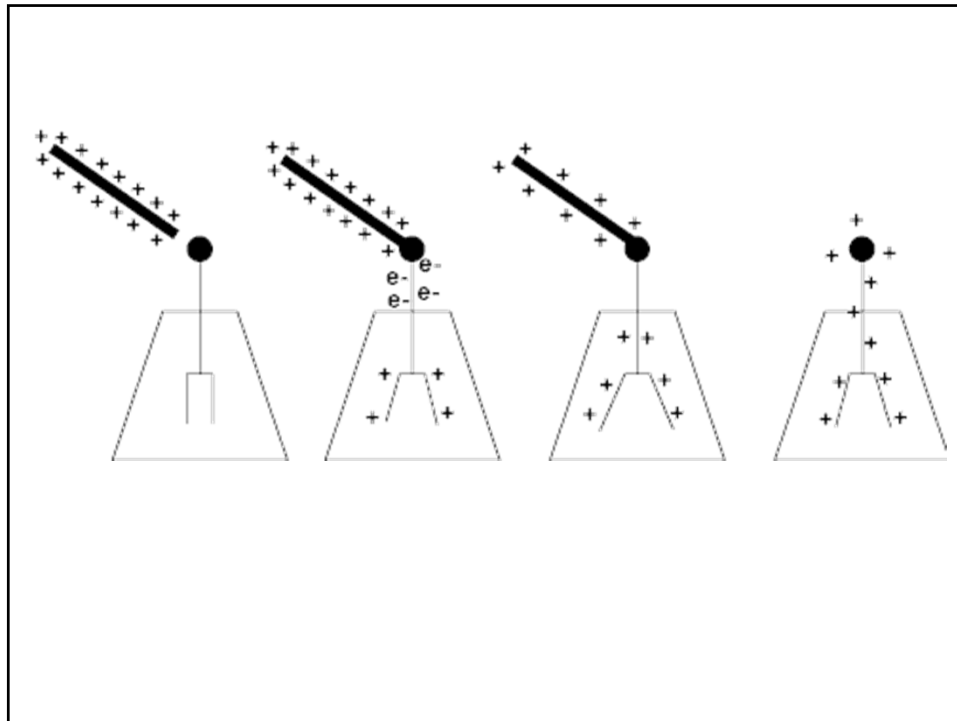
- When two objects touch, any charge is distributed equally between the two objects
- When the objects are separated both remain charged



electrons pass from negatively rod to neutral sphere



electrons pass from neutral sphere to the positively charged rod



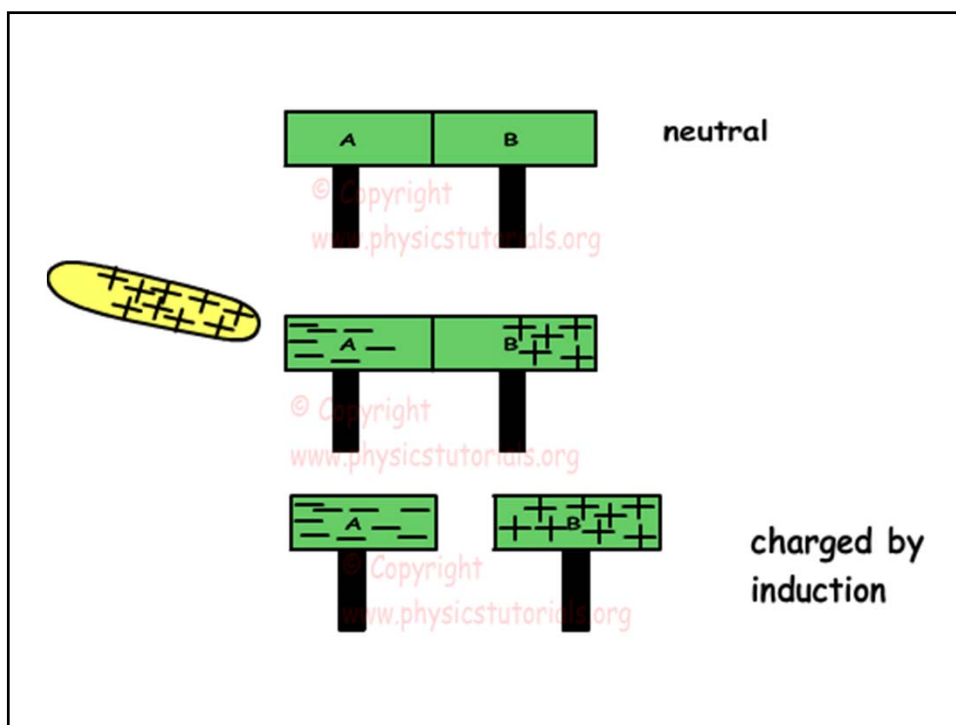
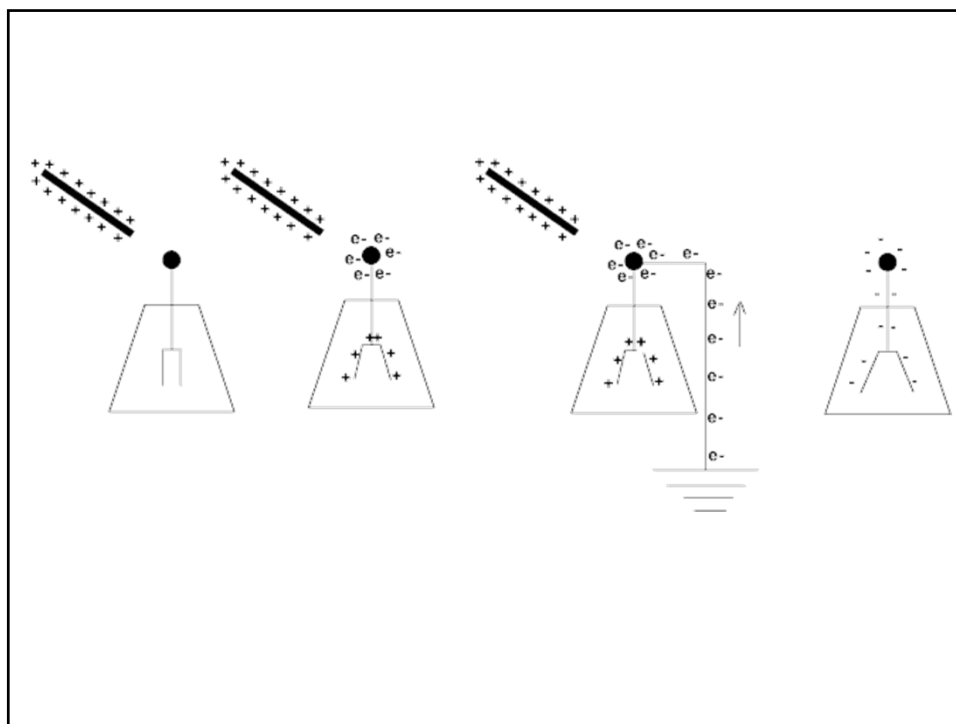
Induction

- When a positively charged rod is brought near a neutral object (but not touching) the charges in the neutral object will separate
 - The negative charges will move towards the rod
 - The positive charges will move away from the rod
 - Note: The object is still neutral since no charge has been transferred

- When the object is grounded extra electrons move up from the earth through the wire and onto the object making it negative
- The ground wire is then removed followed by the charged rod
- The object is left with a negative charge

- <http://www.physics.mun.ca/~jjerrett/induction/induction.html>

- For an object to be charged positively by induction, you would use a negatively charged rod
 - In this case electrons would travel away from the object to the earth



Grounding

- Electrically attaching the object to the ground (earth)
 - The ground in a house is usually attached to the water line
- The idea is that the earth is a infinite source of electrons and a place to put an infinite number of electrons

Everyday Applications

- Photocopier
- Laser printer
- Piezoelectric effect
- Electrostatic air filters/cleaners
- Spray painting cars