

Charging an Object



Recall

- Object has an excess of electrons = **NEGATIVE**
- Object has a loss of electrons = **POSITIVE**
- Object that has the same # of protons and electrons = **NEUTRAL**

3 ways of transferring electric charges (electrons):

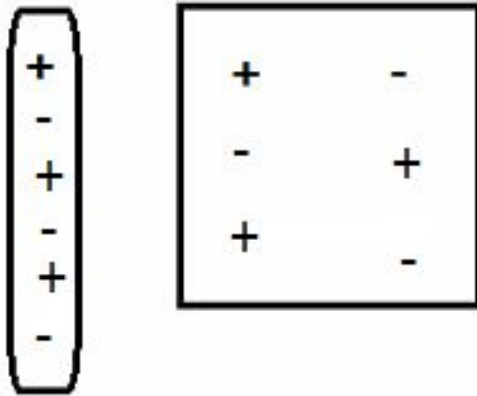
1. Friction
2. Contact
3. Induction

1. Charging by Friction

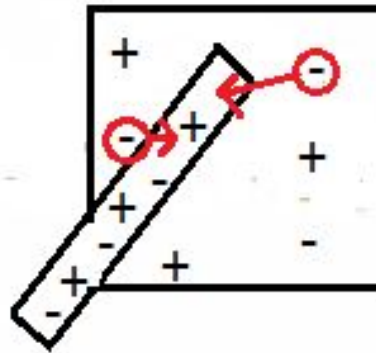
- Objects made of different types of matter are rubbed together; this produces a static net charge on each object.
- Recall: ***Electrostatic Series***
 - Matter that has a greater affinity for electrons will gain electrons and become negative
 - Matter that has a lesser affinity for electrons will lose electrons and become positive

Example

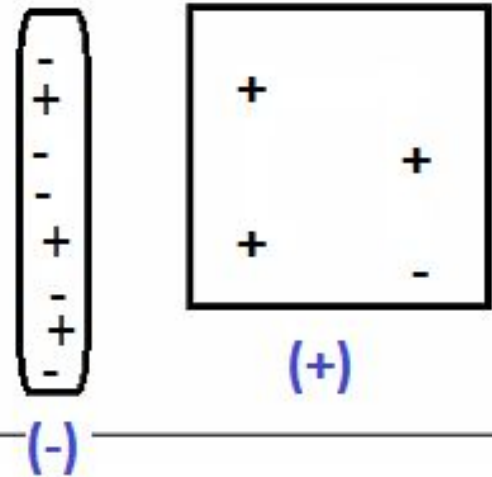
1. ebonite rod and fur



2. Friction Causes the transfer of electrons from the fur to the ebonite rod



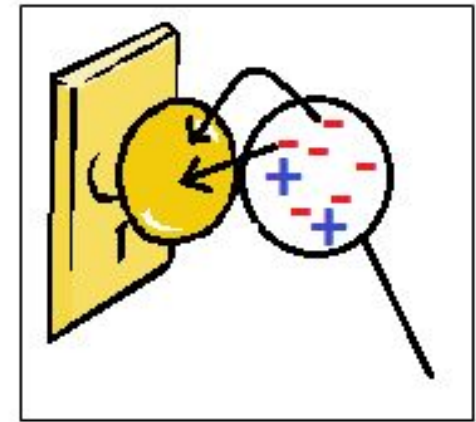
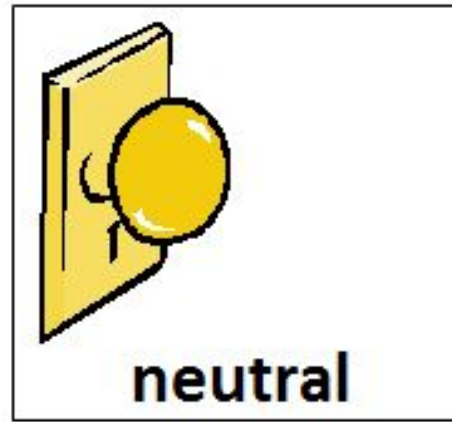
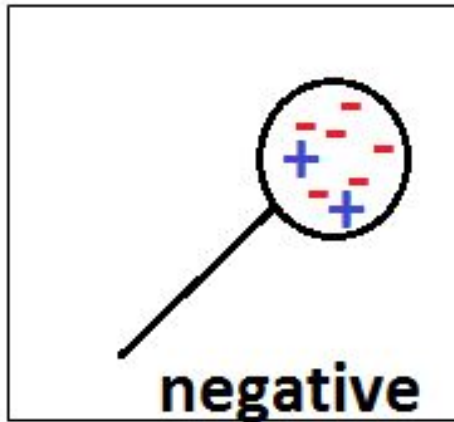
3. The ebonite is charged negatively and the fur is charged positively



2. Charging by Contact

- Charging by contact happens when a charged object touches a neutral object.
- Electrons will move in attempts to balance the charges (spread out) – thus will move towards the object that has the least number of electrons
 - This happens quickly - can be surprising or painful
 - It can even “jump” the gap prior to full contact
 - The result is an electric shock!

- The charged object acquires the **SAME** charge as the originally charged object that touched it; the total charge is shared



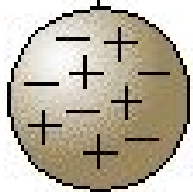
electrons move from
negative object to
neutral doorknob

3. Charging by Induction

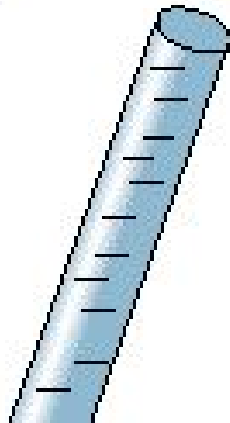
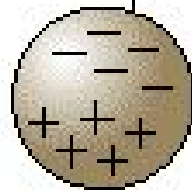
- A charged object can transfer a charge to a neutral object without touching it
- Only conductors can be charged in the induction process
- The electric field of the charged object forces the electrons of neutral object to move.

- If the object is negative, the electrons repel.
- If the object is positive, the electrons attract.
- If there is a ground, electrons can move into or out of the object being charged - the balance is changed and the object is now charged
- *An OPPOSITE charge to originally charged object.*

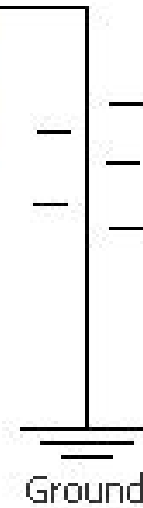
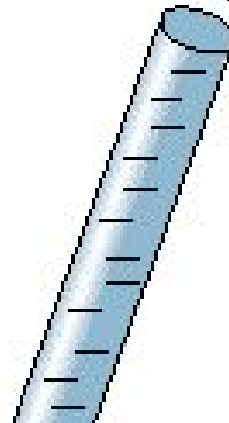
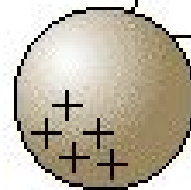
Neutral metal sphere



Temporary charging by induction



Permanent charging by induction



Positively charged metal sphere

