

Sec. 7.1 Electric Charge

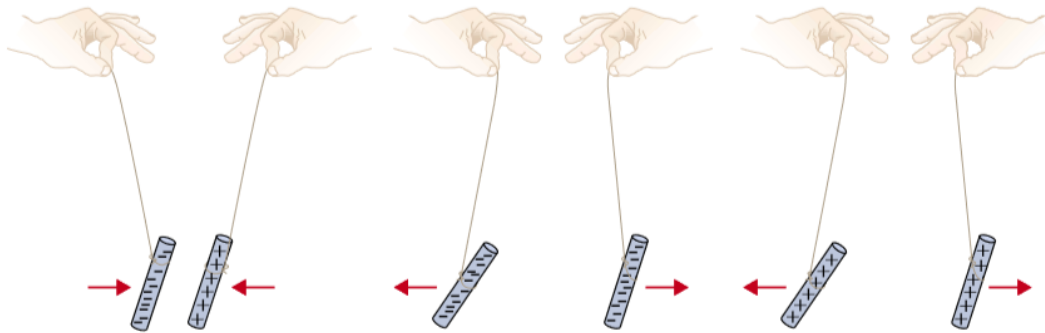
Learning Goal: By the end of today, I will be familiar with the laws of electric charges and the ways to create a charge on an object.

The Laws of Electric Charges

Opposite electric charges attract each other.

Similar electric charges repel each other.

Charged objects attract some neutral objects.



In the Bohr-Rutherford atomic model, the nucleus is considered to be stable and non-changing and it is the electrons that move around.

Conductors are substances that have electrons that move relatively freely.

Insulators are substances that hold on to their electrons very tightly.

Semi-conductors do a bit of both, and are really amazing.

1 - Charging by Friction

Rubbing two materials together can allow charge (electrons) to move from one nuclei to the other.

Table 1 The Electrostatic Series

| | | |
|--------------------------|--------------------------|--|
| acetate | weak hold on electrons | |
| glass | | |
| wool | | |
| cat fur, human hair | | |
| calcium, magnesium, lead | | increasing tendency to gain electrons |
| silk | | |
| aluminum, zinc | | |
| cotton | | |
| paraffin wax | | |
| ebonite | | |
| polyethylene (plastic) | | |
| carbon, copper, nickel | | |
| rubber | | |
| sulphur | | |
| platinum, gold | strong hold on electrons | |

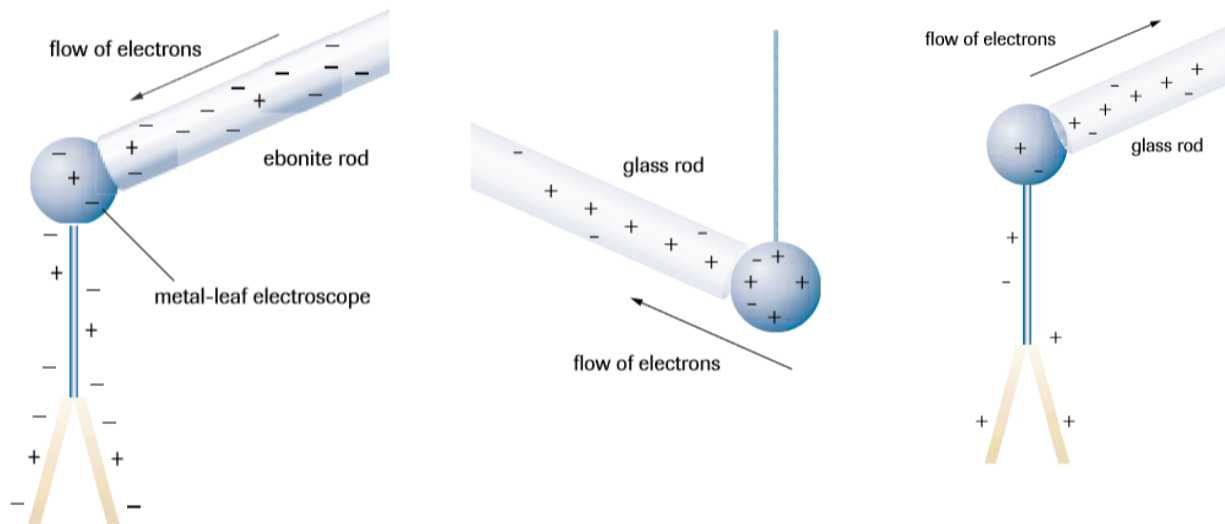
Ebonite = negative charged (gains electrons)

Glass = positively charged (gives up electrons)

2 - Charging by Contact

Ebonite = negative charged

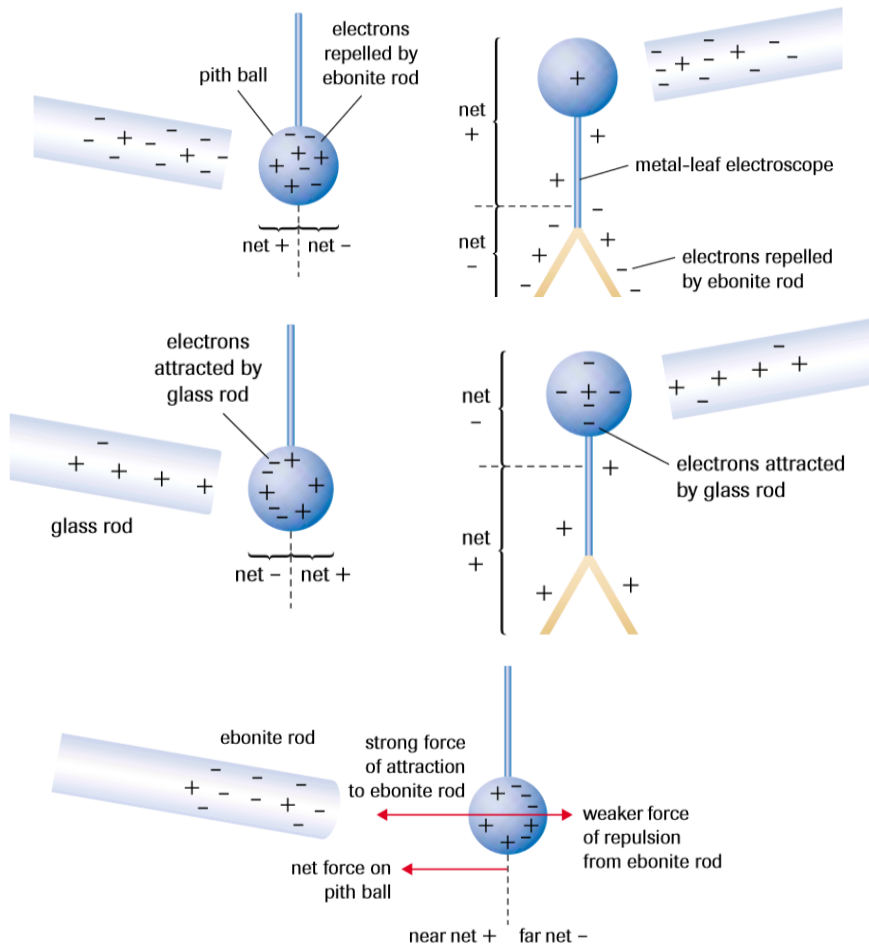
Glass = positively charged



When charging by contact, electrons can actually move from one material to the other.

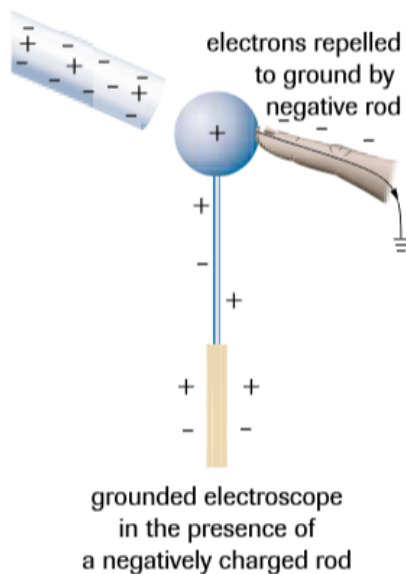
"Grounding" is when you are in contact with the Earth, and electrons can flow to the ground and not accumulate.

Induced charge separation - a distribution of charge that results from a change in the distribution of electrons in or on an object - no electrons are transferred, just pushed around. **NO Contact.**

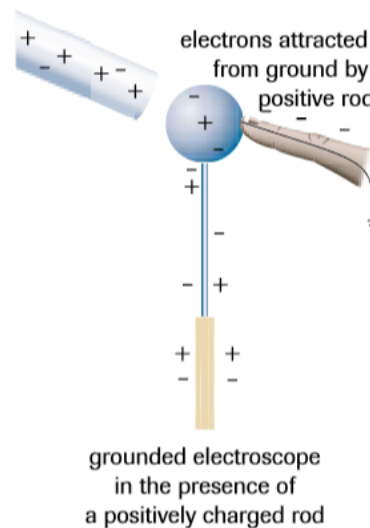


3 - Charging by Induction

When an induced charge separation scenario has an avenue for electrons to escape or join the party, an induced charge can be created.



Electroscope will be Positive after finger is removed.



Electroscope will be Negative after finger is removed.

Law of Conservation of Charge

The total charge (the difference between the amounts of positive and negative charge) within an isolated system is conserved.

SUMMARY

Electric Charge and the Electrical Structure of Matter

- The laws of electric charges state: opposite electric charges attract each other; similar electric charges repel each other; charged objects attract some neutral objects.
- There are three ways of charging an object: by friction, by contact, and by induction.

Homework

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