# Electric Charge

## Introduction:

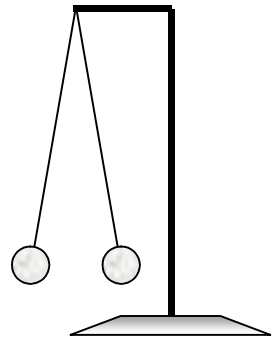
A few well known facts:

- *Positive charge* is due to a lack of electrons; *negative charge* is due to a surplus of electrons; *neutral* objects have a balance of electrons and protons.
- Opposite charges attract; like charges repel.
- An object's ability to charge depends on the type of material, its shape, and the presence of ions and humidity in the surrounding air.
- Amber, plastic, and rubber become negative when rubbed with animal fibers (fur, hair, wool). Glass becomes positive when rubbed with felt, silk, or wool.
- *Polarization* is charge separation within a single object: opposite ends have opposite charges. Neutral object may attract charged objects only if the neutral object becomes polarized.
- *Discharging* (*grounding*, *neutralizing*) removes excess charge on an object by allowing it to flow away from the object along a conducting path to the ground, which is a huge reservoir of positive and negative charge.

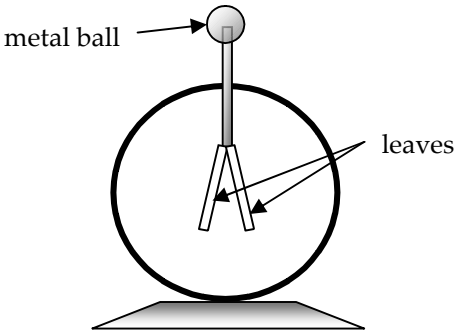
Make sure your group has each of the following: an electroscope, a rubber rod, a plastic rod, a glass rod, wool, silk, an electrophorus apparatus (plastic sheet, aluminum disk with plastic handle), Styrofoam spheres (connected by thread and hung from a stand), a heat lamp, and some matches.

## Procedure:

In each case, record in detail what happens (on a separate sheet) and explain why it has happened. Notes: When you read "DISCHARGE," touch the electrical outlet with one hand while touching the charged object with the index finger of your other hand. Also leave the rods and fibers under the heat lamp to minimize the humidity during charging.



Styrofoam spheres




Electroscope

**Part 1 – Styrofoam spheres**

1) Charge the rubber rod by rubbing with fur (or any other animal fiber.) Approach the spheres with the rod but do not let them touch the rod.
2) Let the rod touch the spheres then remove the rod.
3) Approach the charged spheres with the fur but do not let them touch the fur.
4) DISCHARGE the spheres then repeat Steps 1-3 with the glass rod charged with silk (or wool).
5) DISCHARGE the spheres. Charge the rubber rod and touch the spheres. Charge the glass rod and bring it close to the charged spheres.
6) Touch the charged spheres with the charged glass rod.

**Part 2 – Electroscope**

1) Charge the rubber rod and bring it close to the metal ball.
2) Touch the metal ball with the charged rubber rod.
3) DISCHARGE the electroscope then repeat Steps 1-2 with the glass rod.
4) DISCHARGE the electroscope. Charge the rubber rod and touch the metal ball. Charge the glass rod and bring it close to the metal ball.
5) Touch the charged glass rod to the charged electroscope.
6) (Flame Test) DISCHARGE the electroscope. Charge the rubber rod and touch the metal ball. Light a match and bring the flame close to the metal ball of the charged electroscope. Do not let the flame contact the metal!
7) (Charging by Induction) DISCHARGE the electroscope.

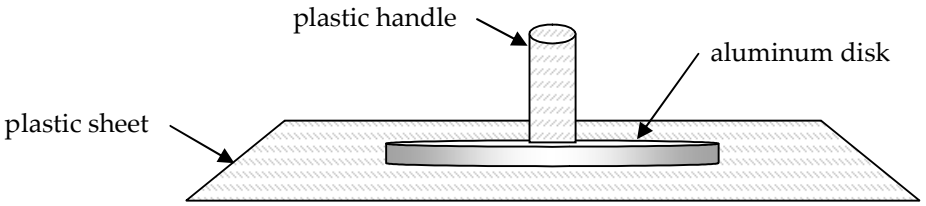
(a) Charge the rubber and bring it close to the metal ball but do not let it touch. Have your partner DISCHARGE the *opposite* side of the metal ball. Once your partner removes his/her finger from the metal ball, take away the charged rubber rod.

(b) Charge the glass rod and bring it close to the metal ball of the charged electroscope.

8) (Electrophorus) Rub the plastic sheet with wool (or fur). Pick up the aluminum disk by its handle and place it on the plastic sheet. DISCHARGE the electroscope. Charge the rubber rod and touch the metal ball.

(a) Bring the aluminum disk close to the metal ball.

(b) DISCHARGE the aluminum disk and return it to the charged plastic sheet. DISCHARGE the top surface of the disk while it is sitting on the plastic sheet. Once again bring the aluminum disk close to the metal ball.



Electrophorus

**Before you leave lab, turn in your sheet of detailed observations.**
**Don't forget to write the names of your partners at the top!**