

INSTRUCTIONAL GUIDE

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- Instructional Guide

Recommended for activities:

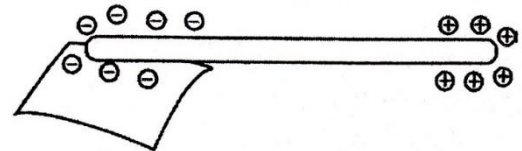
- [Discharge Tongs \(P6-3390\)](#)
- [Friction Rod Kit \(P6-1600\)](#)
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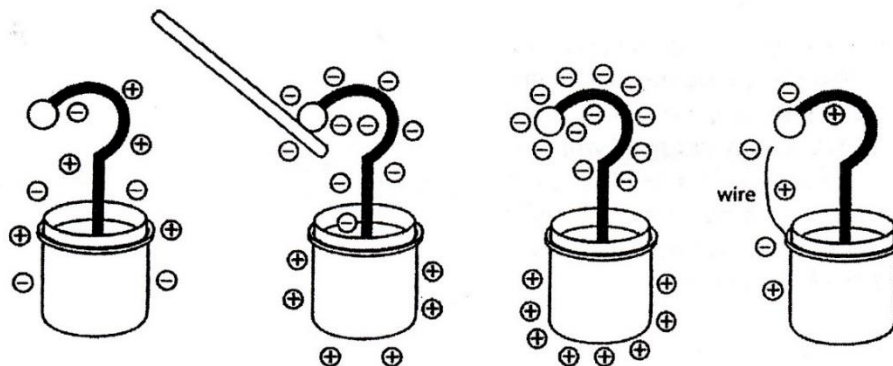
Background

Leyden jars are a type of capacitor created during the early phases of the discovery of static electricity as a means for storing a static charge. It consists of two or more conducting plates separated by a dielectric. As one plate is charged it forces an opposite charge in the other plate. The greater the potential difference the higher the voltage stored. This potential is determined by the surface area of the plates and the insulator between them. Both plates will try to restore themselves by either jumping across the dielectric or taking an easier path back through a conductor in an effort to regain a neutral state of charge.

Take a look at the illustration of the Leyden jar being charged. The rod first being rubbed with a piece of fur takes on an abundance of electrons from the fur. The rod is then touched to the Leyden jar which takes away some of these electrons. The inside plate has more electrons than it did previously and so the protons are pushed

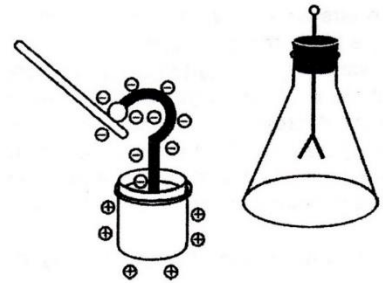


toward the inside of the cup while the excess of electrons is drawn toward the outside cup in an effort to regain a natural state. Repeated rubbing of the rod with the fur and touching the Leyden jar with the rod causes a highly disproportional distribution of positive and negative charged atoms. If left alone, the plates will eventually regain neutrality by either leaking through the insulator or by leaking through the air. However, if a path is created, as in illustration, a spark will occur as the plates find the easiest and quickest route to even out their unequal distribution.



Experiments

In order to become familiar with and to better understand the principles of a Leyden jar you will need a few other items. First you will need something to create a static charge with. There are many different materials that will work. Acrylic rods or sheets, vinyl strips, different plastics and even glass can be rubbed with material such as silk, wool, acetate etc. to create static charges. For this experiment we will be using animal fur and a PVC rod however other materials can be substituted. Keep in mind that some will work better than others. The electroscopes is a device used for detecting a difference in electrical potential of an object. It makes for a good accessory to have when teaching with a Leyden Jar.



Another item that will really help to educate as well as hold a student's attention is a small neon lamp. The type with two wire electrodes and rated around 90 to 120 volts works great. These can be found at most electronic supply stores.

Place the Leyden jar on a non-metallic table. If you are using an electroscopes, keep it a few feet away. Begin to rub the rod with your materials or fur and after a few strokes touch the rod to the ball of the Leyden jar. Repeat this procedure several times. Now pick up the Leyden jar by holding onto the outside metal surface only. Bring the ball close to your electroscopes and notice that the electroscopes indicates a strong charge is present.

Bring the outside cup close to the electroscopes and notice what happens. Move this cup away and bring the ball of the inside cup close to the electroscopes. Is there a difference? You should have noted that the ball still elicits a charge on the electroscopes even though the outside can is removed. If you will replace the outside can however and bring the ball close to the electroscopes you should notice that the charge is greatly increased.

Once again start with the Leyden jar assembled and resting on a non-metallic surface. Rub the rod with the material that you have selected and then charge up the Leyden jar by touching the ball with the rod and then repeating the procedure. You will use a small neon lamp to indicate the charge. After initially charging the jar hold the lamp as indicated in the illustration and touch the wires to the outside can and bring it close to the ball. You should not have to actually touch the ball as a spark should jump from the ball to the electrode and light the lamp briefly.



Related Products

E-Field Detector (96-3580) Using the E-field detector, teachers and students can investigate the effects of positive and negative charge. The probe of this detector can "sniff out" unknown charges, demonstrate charging by induction, and even prove the inverse square dependence of Coulombs Law.

Proof Plane (96-3585) This small Proof Plane has a solid brass disk attached to an insulating brass composite handle. Plate size is 20mm and is used to transfer charge from a charged object to another.

Hand Crank Van de Graaff Generator (P6-3400) Now you can demonstrate all of the classic Van de Graaff experiments for less! Our new hand-crank model can develop potentials of up to 200 kV and produce a spark 3.2 inches long.

Wimshurst Machine (P6-3350) Produce a higher current with a lower voltage! Produce static electric charges and discharges with our Wimshurst Machine. This is always an impressive demonstration.