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Electrostatic Charge Kit
#ELSTCH-01

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **Choking hazard – small parts**
- **Contains latex**
- **California Proposition 65 Warning: This product can expose you to chemicals including nickel, styrene, and lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov.**

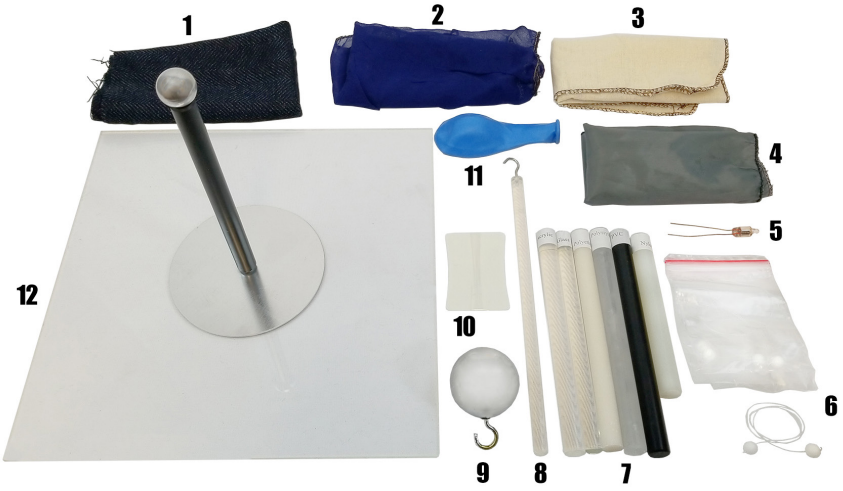
Introduction

Electricity refers to the physical processes associated with the movement of free electrons to produce electrical charges and their relationship to magnetism. The first form of electricity that humans discovered and began experimenting with is static electricity. In fact, "electron" and "electricity" both come from the Greek word for amber, "elektron." The ancient Greeks noticed that, when rubbed with fur, amber would attract small objects. Though static electricity eventually fell out of mainstream interest in favor of studying current electricity, understanding static electricity is still essential in understanding phenomena such as lightning, as well as technologies like xerographic copying, X-ray imaging, pollution control, and more.

Unlike current electricity, which flows through a conducting material via magnetic fields, static electricity is instead the physical transfer of free electrons from one object to another. With electricity, like charges repel each other and opposite charges attract, meaning that matter tries to maintain a neutral charge. Static electricity forms when friction between two (or more) objects causes the free electrons on one object to be transferred to another, giving it a negative charge until it discharges those electrons and returns to a neutral state.

Components

1. **Wool cloth**
2. **Silk cloth**
3. **Cotton cloth**
4. **Acetate cloth**
5. **Neon lamp**
6. **Pith Balls (six pairs)**
7. **Friction rods (acrylic, glass, polyethylene, polystyrene, PVC, nylon)**
8. **Acrylic rod with a hook**
9. **Conductive ball with a hook**
10. **Spool of string**
11. **Balloon**
12. **Electrophorus and charge plate**



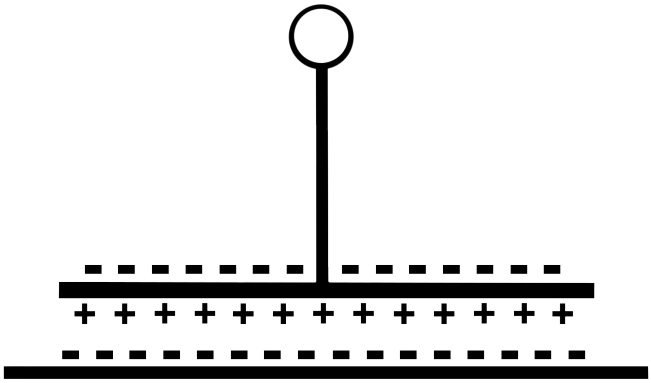
Key Concepts and Parts

Insulator – An insulator is a substance in which electrons do not flow well. Air, though usually an insulator. can act as a conductor depending on the humidity in the air, allowing static electricity to appear to us as sparks (or, on a larger scale, lightning!).

Conductor – Conductors are materials in which electrons move easily. Current electricity functions via magnetic fields moving electrons through conductive materials, like copper.

Grounding – Grounding something electrically is allowing the object to return back to a neutral state. When grounded, the electrons in a negatively charged item will leave the item and move to the ground, and a positively charged object will gain electrons from the ground. When experimenting, be careful to not accidentally ground your experiment so that you won't lose any charge that you have built up.

Electrophorus and Charge Plate – An electrophorus with a charge plate is one of the earliest electrical generators developed. When the acrylic charge plate is rubbed with fabric, it will develop a charge. When the metal electrophorus is placed just over the plate, the acrylic plate will induce an opposite-charge on the bottom side of the electrophorus and a like-charge on the top side of the electrophorus. Finally, by touching the top-side of the electrophorus with your finger to ground it, you will have generated a charge on the electrophorus opposite the one you made on the acrylic plate.



Experiments

Basic Static Charge Buildup (Extra Materials: Small pieces of a lightweight material, such as paper.**)**

1. Scatter your pieces of paper (see above) onto a flat surface.
2. Choose a friction rod and a piece of fabric. Holding one end of the rod, take the fabric and rub the other end.
   (Note: Feel free to experiment with the variables in this step. Use a variety of rod/fabric combinations and lengths of time spent rubbing the friction rod.**)**
3. Hold the charged rod above your pieces of paper, and observe as the paper becomes attracted to the rod and moves towards it or stick to it.

Discharging Built-Up Static Charges

1. Repeat the experiment above.
2. Touch the charged rod to a metal surface in your surrounding area.
3. Hold the rod over the pieces of paper again. Observe that the rod is no longer holding a charge.

Experimenting with Positive and Negative Charges

1. Charge two separate rods negatively.
2. Suspend one rod from a support stand using some thread.
   (Support stand not included. Other options include taping the string to a high surface, or holding the string with your hand or the hooked rod.**)**
3. Hold your free negatively-charged rod next to the suspended negatively-charged rod.
4. Watch as the rods repel each other. This is because like-charges always repel each other.
5. Do the same experiment, but with two positively-charged rods. Observe that two positive charges also repel.
6. Do the experiment once more, but this time with one negatively-charged rod and one positively-charged rod. The charges will be attracted to each other, drawing the suspended rod towards the one in your hand.
   (Note: This experiment also yields interesting results by charging and observing suspended pith balls or the conductive ball with a hook.**)**

Example Rod/ Fabric Combinations:

- **Negatively Charged: acrylic rod and acetate cloth**
- **Positively Charged: glass rod and silk**
- **Experiment to find out more!**

Charging an Electrophorus to Store and Transfer Charges

1. Rub the acrylic charge plate to give it a charge.
2. Grip the electrophorus by the insulated handle, and hold its metel plate just above the charged acrylic plate.
   (Note: This will produce a redistribution of charges on the metal electrophorus plate through a process known as **induction**. The charge on the bottom of the electrophorus will be opposite of the one on the acrylic plate, and the charge on top of the electrophorus will be the same as the one on the acrylic plate. Though the charges are redistributed in this step, the electrophorus is still electrically neutral.**)**
3. To leave a single positive or negative charge on the metal electrophorus, touch the top of it with your finger. This will ground the charge on top and allow it to discharge, leaving only the charge that was developed on the bottom of the plate.
   (Note: Try this step with the neon bulb instead. Hold one lead of the bulb with your fingers to keep it grounded, and touch the other lead to the top of the electrophorus. You will see the bulb light up as the charge on the top of the electrophorus discharges.)
4. Combine this experiment with the experiment above. Experiment with positive and negative charges and multiple rod and fabric combinations.