

Main Topic	Electrostatics
Subtopic	Static Charge
Learning Level	Middle
Technology Level	Low
Activity Type	Student

Description: Investigate the observable effects of static charge on objects including an electroscope.
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Required Equipment	Electrostatics Demo Kit, Hard Rubber Rod (2 total) Electroscope, Fishing Line
Optional Equipment	Electrostatics Demo Kit includes Hard Rubber Rod, Glass Rod, Fur Pad and Silk Pad.

Educational Objectives

- Determine the effect of positive and negative charges on objects.

Concept Overview

Static charge (electrons, in this case) can be physically transferred from one object to another through friction. Students will use rubber, glass, fur and silk to create positive and negative charges, and investigate how these charges cause forces.

The idea that like charges repel and opposites attract will not be new to students. They will observe those concepts, as well as how small objects (like confetti) are attracted equally well to positive and negative.

Excess charge can be transferred to another object by touching (conduction). A metal object can also be inductively charged; that is, it can have its charges separated within by merely bringing a charged object nearby, but not touching. An electroscope will be used to demonstrate this.

Lab Tips

Note: Static electricity demonstrations work better in dry air. Dry air is a better electrical insulator than moist air. On humid days, the experiments described here may not work.

The way in which charge transfers from one material to another can be understood by consulting a Triboelectric Series Chart.

Static Charge

Name: _____

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Goal:

Observe the forces created by charged objects.

Materials:

2 Hard Rubber Rods, Glass Rod, Fur Pad, Silk Pad, Electroscope, Fishing Line

Read this first! When you rub the rubber rod with the fur pad, the following charges result: **Rubber: Negative; Fur: Positive**. When you rub the glass rod with the silk pad, the following charges result: **Glass: Positive; Silk: Negative**.

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Procedure:

Basic Attraction and Repulsion

1. Suspend one rubber rod with fishing line so that it is balanced horizontally and can turn around its center. (Fishing line is preferred because it will allow the rod to hang still without twisting.) Bring each other rods near it. What forces do you observe between the neutrally charged rods?
2. Rub the suspended rod with the fur. Rub the glass rod with the silk and bring it near the suspended rod. What force do you observe?
3. Rub a second rubber rod with fur. Bring it near the suspended, charged rod. What force do you observe?
4. Conclusions: Like charges _____, and opposites _____. (Ben Franklin decided that the charge on the rubber rod would be called “negative,” and that on the glass rod would be “positive.”)

Electroscope—Charging by Conduction and Induction

5. Rub the glass rod with the silk to produce a positive charge. Touch the top knob of an electroscope. What do you observe in the electroscope leaves?
6. Explain your observation in terms of charge and force.

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7. Rub the glass rod again, and touch the positively charged electroscope again. What happens to the leaves? Explain in terms of charge and force.

8. Rub the rubber rod with fur to produce a negative charge. Touch the negatively charged rod to the positively charged electroscope. What happens to the leaves? Explain in terms of charge and force.

9. Discharge the electroscope by touching it with your finger. Explain why the leaves now hang straight down, and where the charge went.

10. Bring a negatively charged rod near (not touching) the electroscope. What happens to the leaves?

11. While holding the rubber rod near the knob, momentarily touch the knob with your finger. What happens?

12. Move the charged rod away from the electroscope and observe. What happens?

13. Determine the polarity of the charge on the electroscope using the procedure above.