

Name _____
Class _____ Date _____

Static Charges and Electric Fields A Student-Made Electrophorus

Materials

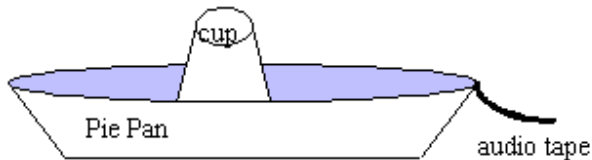
Sheet of Styrofoam neon lamp, piece of wool fabric film canister, Styrofoam cup paper clip, aluminum pie pan glue, small strip of audio tape

Setting Up

Tape the audio tape to the edge of the pie pan.

Tape the bottom of the Styrofoam cup to the middle of the inside of the pan. ALWAYS handle the pie pan by this Styrofoam cup handle unless the directions specifically state otherwise.

Tape the sheet of Styrofoam to the table and rub it lightly but briskly with the piece of wool.



Both the wool and the Styrofoam are insulators. When the wool is rubbed across the Styrofoam some electrons are actually scraped off of the wool. They accumulate on the Styrofoam, but because Styrofoam is an insulator, the electrons are stuck where they land. They cannot migrate around the surface of the Styrofoam or instantly move to another material.

Based on the information given above, what is the charge on the surface of the Styrofoam?

Place the pie pan on the Styrofoam.

What is the charge, if any, on the pie plate at this point?

Touch the lip of the pan with your finger.

What happened? List your visual observations then come up with a possible explanation.

What is the charge on the pie plate now?

Lift the pie pan by the Styrofoam cup handle and touch the lip again.

What happened? List your observations and explanations.

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What is the charge on the pie plate now?

Return the pan to the Styrofoam sheet and touch it again, then lift it and touch it again. Record your observations. Do this several times and look for changes, if there are any.

Why is it important to handle the pie pan by the Styrofoam cup handle?

What happened to the pie pan when it was placed on the charged surface of the Styrofoam sheet?

What happened when you touched the pie pan as it rested on the Styrofoam sheet and then when you touched it again after lifting it from the Styrofoam sheet?

When you repeated the activity why didn't you have to rub the wool across the Styrofoam again?

Neon Lights. What's the Charge?

Rub the wool across the Styrofoam sheet a few more times. Separate the leads of the neon lamp for easy holding. Hold one of the leads and bring the other lead near the Styrofoam sheet. What do you observe?

Repeat this several times. Try sweeping the lead over the surface of the charged Styrofoam. Then look closely at the interior of the lamp when illumination occurs. You should be able to tell which of the two rods inside the lamp is surrounded by the orange glow. You should also be able to tell which of the two leads is connected to that particular rod. Which of the two leads glowed?

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The rod that glows is connected to the lead which is in contact with or near the more negatively charged object. If the rod connected to the lead that you held glowed, then you were negatively charged with respect to the Styrofoam. We could then say that the Styrofoam had a positive charge. If the rod which glowed is connected to the lead near the Styrofoam surface, then the Styrofoam surface was negatively charged with respect to you.

What was the charge on the Styrofoam, according to this activity?

Storing Charges

In this exercise you will construct a mini Leyden jar, a device that can be used to store charges. It works just like a capacitor.

Remove the lid from the film canister and set it aside. Use the glue to stick some aluminum foil completely around the outside of the film canister leaving only about 1 cm around the top edge uncovered. Loosely fold a small piece of foil and place it in the canister. Fill the canister with water to about 1 cm from the top. Replace the lid. Unbend two loops of the paper clip and push it through the center of the top and into the aluminum foil inside. Make sure the paper clip touches the foil inside the canister.

Charge the pie plate (by setting it on the charged Styrofoam and touching the lip.) Then lift the plate and touch it to the end of the paper clip that extends from the canister. Recharge the plate and touch it to the end of the paper clip again. Repeat this procedure two or three more times. Each time you are increasing the amount of charge stored in your Leyden jar.

Is the stored charge positive or negative? _____

Touch the tip of the paperclip with your finger, or your friend's finger. What happens? Explain why.
