

Cheap Thrills with Electrostatics

Names:

Grade:

This is a group write-up.

Notes on your report:

1. All explanations for this report need to be accompanied by a diagram or diagrams showing your ideas of the charges (signs, distributions, etc.) involved. **Diagrams alone are not enough, words alone are not enough.**

2. Make sure that your diagrams distinguish conductors and insulators.

3. Make sure that your diagrams are integrated into the text of your explanations, i.e. not attached at the end of the report. The explanations must be typed and integrated into this document. Please use **boldface** for your explanations to distinguish them from the instructions.

4. In the past students have often ignored note 1 above, so I decided to repeat it in boldface: **make sure your diagrams have charges in them. Make sure those charges have a sign!**

5. Make sure your explanations have the correct terminology:

- a. Is the object an insulator or a conductor?
- b. Is the object polarized or charged or both?

Activity One: The electroscope**Instructions:**

Get an electroscope, a PVC rod and a piece of fur. Tape is also available to test the sign of a charge (recall the tape experiments done last week: the top tape carried a positive charge). Use the **same** rod and fur for the two procedures.

- Find a procedure to give a positive charge to the electroscope. Test your procedure.
- Find a procedure to give a negative charge to the electroscope. Test your procedure.

Describe the procedures (with pictures and numbered steps). Explain what you think is happening on a microscopic level in terms of charge.

Activity Two: The Wonders of Blue Foam!

Please use the blue or pink insulation material for this activity.

- 2.1 Rub the blue foam with a piece of wool or animal hair or the back of your forearm. Pick up the foam and hold the rubbed side near an empty aluminum can that's lying on its side.

Observation:

Explanation (Sketch a picture of what happened and explain what you think is happening electrically):

- 2.2 Rub the blue foam again. Put some paper dots on the table. Bring the rubbed side of the foam close to the paper dots.

Observation:

Explanation (Sketch a picture of what happened and explain what you think is happening electrically):

- 2.3 Make a tassel of tinsel with about 5-10 strands of tinsel. Cut with scissors so each strand is of equal length. Rub the blue foam again. Leave the foam on the table – rubbed side up. Lower the tassel vertically down to the foam.

Observation:

Explanation (Sketch a picture of what happened and explain what you think is happening electrically):

Activity Three: Electrophorus

3.1a. Use an existing electrophorus or build your own. Rub blue foam and place it on the table. Put the electrophorus on the blue foam. Do not touch the aluminum and lift the electrophorus off the table. While holding the electrophorus, touch the aluminum. Repeat the procedure several times.

Observation:

Explanation (Sketch a picture and use it to explain your observation.):

3.2a Rub the blue foam again and place the electrophorus on the blue foam. This time, touch the RIM of the pie plate with your finger.

Observation:

Explanation (Sketch a picture and use it to explain your observation.):

3.2b Lift the electrophorus off the table and while holding it, touch the rim with your finger.

Observation: what do you observe? Compare with 3.1a.

Explanation (Sketch a picture and use it to explain your observation.):

Activity Four: Is Water Biased?

4.1 Rub one of the acrylic plates (ask me if you are unsure of what that is) with fur, turn on one of the faucets in the lab such that a steady but light stream of water comes out and hold the plate near the stream of water.

Observations:

Explanation (Sketch a picture and use it to explain your observation.):

4.2 Explain what would happen if your plate had the opposite charge. Would your observation be the same or different? Explain why.

Activity Five: The Wonders of Blue Foam – The Sequel!

Rub a piece of blue foam leaving the foam on the table – rubbed side up. Put a carbon covered Styrofoam ball on the foam. Move your finger close to the ball, from different angles. Try to ‘catch’ the ball with your finger WITHOUT moving the finger too rapidly.

Observations:

Explanation (Sketch a picture and use it to explain your observations.):
Spend some time with this. It’s more difficult to explain than it looks.

Activity Six: Making Sparks, a Shocking Experience!

Go into a dark space and crunch some winter green lifesavers with a pair of pliers.

Observations:

Explanation (Explain in detail why you see what you see when you crunch life savers. You'll likely need to do a bit of research. Cite your source and write this in your own words.):

Activity Seven: Don't leave unless you have participated in the 'group hug'.

Example for report (this is not part of the lab instructions but it might give you ideas for the report):

Make sure you state if an object is a conductor or an insulator.

Make sure you use correct and appropriate terminology, e.g.: is the object charged or polarized or both?

Example activity: Electroscope?

3.1a. Rub a rubber rod with fur and hold it close to the top of an electroscope. Do not touch the electroscope.

Observation:

The leaves spread apart (a bit).

Explanation (Sketch a picture and use it to explain your observation.):

1. The rod was negatively charged. We know this from the triboelectric series: rubbing rubber with fur will cause the rod to be negatively charged and the fur positive. The rod is an **INSULATOR**.
2. Bringing the rod in close (no contact) will polarize the electroscope (see figure 1). The leaves will be negatively charged and therefore repel.
3. The total charge on the electroscope is still zero but the polarization separates the charge *within* the electroscope. The electrons can move all the way to the bottom because the electroscope is a **CONDUCTOR**.

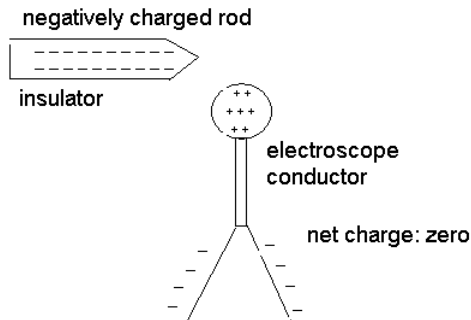


Figure 1

3.1b Remove the rod again.

Observation:

The leaves move together again (no spreading).

Explanation (Sketch a picture and use it to explain your observation.):

1. The charge on the electroscope was zero throughout this experiment. There was no contact between the rod and the electroscope and we didn't observe any sparks.
2. The polarization of the electroscope was caused by the presence of the rod. Now that the rod is removed the negative charge in the leaves and the positive charge at the top will neutralize each other. The leaves will therefore move together again (Figure 2).

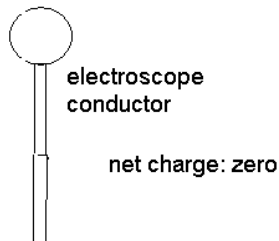


Figure 2

