

## Sticky Tape Experiments Lab

### Teacher's Guide

**Topic:**

Static Electricity

**The following information is provided to the student:**

**Question:**

How do the variety of materials rank in terms of their relative affinity for electrons?

**Purpose:**

To charge a variety of materials by rubbing them together and to examine their interactions with a positive, negative and neutral object in order to rank the materials according to their relative affinity for electrons.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion/Discussion of Results. The Data section should include the provided table. The Conclusion/Discussion section should provide a ranking of the materials according to their relative affinity for electrons. Evidence for the ranking should be discussed. Any suspicious or inconsistent results should be discussed.

**Materials Required:**

Scotch tape; hole-punched paper bits; balloon; glass stirring rod; plastic grocery bag; acetate transparencies; wool; paper; saran wrap; vinyl tubes; ceiling light covers

**Description of Procedure:**

Students create a bottom rectangle and a top triangle piece of tape (using the procedure from the Action at a Distance Lab). The charge on these two pieces of tape are determined by observing their interaction with neutral paper bits and a negatively charged balloon. Once the type of charge on the two tapes is determined, the tapes are used to determine the charges of a variety of objects. See Data Table in the Auxiliary Materials section. The observations are used to rank the materials according to their relative affinity for electrons.

**Alternative Materials and Procedure:**

Once the prescribed tests are completed, students could conduct some experiments of their own using different materials. Ideas for possible materials can be found at [the triboelectric effect page](#) found at Wikipedia

**Safety Concern:**

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

**Suggestions, Precautions, Notes:**

1. The plastic bags are of the variety used to bag groceries. The acetate strips are cut from overhead transparencies. The vinyl tubes are cut from vinyl golf club holders. Foam boards can be cut from

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the foam insulation sold at home stores. Small 4-inch squares of acrylic ceiling light sections can be cut from the 2 foot by 2 foot ceiling light covers sold with suspended ceiling supplies at home stores. If the prescribed materials cannot be found, then substitutes could easily be used.

2. Students can refer back to results from their Action at a Distance Lab to identify the charge of the top triangle and bottom rectangle tape.
3. Objects tend to lose their charge over time (especially in humid environments). The tapes may need to be re-charged if a second and a third test is conducted with them.
4. Be aware of students who might be prone to allergic reactions to latex balloons.
5. Students are essentially creating a triboelectric series. Many such series are published as a result of procedures similar to those performed in this lab. One of the more extensive series is available at [Wikipedia](http://en.wikipedia.org/wiki/Triboelectric_series).

### Auxiliary Materials:

The following page is provided to the student for completion and inclusion in the Data section of their lab notebook.

|                                  | Interaction w/Bits of Paper | Interaction with - Balloon |
|----------------------------------|-----------------------------|----------------------------|
| Top piece of tape (triangle)     |                             |                            |
| Bottom piece of tape (rectangle) |                             |                            |

Type of Charge on Top Tape: \_\_\_\_\_ Type of Charge on Bottom Tape: \_\_\_\_\_

|                                      | Interaction w/Top Tape | Interaction w/Bottom Tape | Type of Charge |
|--------------------------------------|------------------------|---------------------------|----------------|
| Glass rod (rubbed w/plastic bag)     |                        |                           |                |
| Glass rod (rubbed w/acetate strip)   |                        |                           |                |
| Glass rod (rubbed w/saran wrap)      |                        |                           |                |
| Glass rod (rubbed w/wool)            |                        |                           |                |
| Glass rod (rubbed w/paper)           |                        |                           |                |
| Vinyl tube (rubbed w/wool)           |                        |                           |                |
| Vinyl tube (rubbed w/plastic bag)    |                        |                           |                |
| Vinyl tube (rubbed w/saran wrap)     |                        |                           |                |
| Vinyl tube (rubbed w/acetate strip)  |                        |                           |                |
| Vinyl tube (rubbed w/paper)          |                        |                           |                |
| Foam (rubbed w/plastic bag)          |                        |                           |                |
| Foam (rubbed w/saran wrap)           |                        |                           |                |
| Foam (rubbed w/wool)                 |                        |                           |                |
| Foam (rubbed w/paper)                |                        |                           |                |
| Acetate strip (rubbed w/plastic bag) |                        |                           |                |
| Acetate strip (rubbed w/wool)        |                        |                           |                |
| Acetate strip (rubbed w/paper)       |                        |                           |                |

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|                                      |  |  |  |
|--------------------------------------|--|--|--|
| Acetate strip (rubbed w/saran wrap)  |  |  |  |
| Ceiling Light (rubbed w/plastic bag) |  |  |  |
| Ceiling Light (rubbed w/wool)        |  |  |  |
| Ceiling Light (rubbed w/paper)       |  |  |  |
| Ceiling Light (rubbed w/saran wrap)  |  |  |  |

### Scoring Rubric:

| SE2. Sticky Tape Experiments Lab  | Score   |
|---|---------|
| <ul style="list-style-type: none"><li>___ Included, labeled and organized all parts of the lab report.</li><li>___ Data section includes the provided table; observations are reasonably accurate and the conclusions regarding the charge are consistent with the observations.</li><li>___ Conclusion/Discussion provides a complete ranking of the materials studied. Evidence from the Data section is discussed to support all rankings. Suspicious and/or inconsistent results are discussed.</li></ul> | ___/___ |

### Connections to The Physics Classroom Tutorial:

The following readings are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/estatics/u8l1c.cfm>

<http://www.physicsclassroom.com/Class/estatics/u8l2a.cfm>

### Connections to Minds on Physics Internet Modules:

Sublevels 2 and 3 of the Static Electricity module are suitable accompaniments to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>