

Lab Partners:

Scotch Tape Electroscopes

Name:

Date:

Introduction

Use Scotch Magic Tape™ to determine the electric charge and force on objects.

Material

A roll of 1/2 to 3/4 inch (1.5 cm) wide Scotch Magic Tape™

Assembly of OLD tapes.

- Pull two 10 cm lengths (4") of tape off the roll and hang them from the edge of a table to age for a while. Call these OLD tapes.

Assembly of Upper Tapes

- Pull off a 10 cm (4" or 5") length of tape. Fold over about 1 cm of tape at one end so it sticks to itself and forms a handle
- Stick one as a base tape to the table, and *slowly* run your finger down the length of the tape. It is important to run your finger down the *whole* length whenever you do this.
- Tear off from the roll another similar tape and make a handle again. Lay this strip on top of the first. *Slowly* run your finger down the whole length of the tape, smoothing it down well so that it's stuck to the first strip for its whole length.
- Using the handle, quickly pull the Upper tape off, leaving the base tape in place.
- You have just prepared an 'Upper' or 'U' tape.

[In general, please reuse tape strips: This process works equally well with a strip of tape that's been used before – keep re-using your strips as long as they're still sticky.]

To Do and Notice

1. Hang the U tapes from the edge of the table. Now bring your hand near, *but not touching*, the tape. What do you observe?
2. Take one U tape and bring it near the other U tape. What do you observe?

What is the difference whether you:

- Bring the slick side near the slick side?
- Slick side near the sticky side?
- Sticky side near sticky side?
- Change the direction you bring the two tapes together?

Characterize the strength of the interaction between two U tapes when they're

- close together?
- far apart?

Assembly of Lower Tapes

- Begin the same way as making a U tape with base and Upper tapes on the table – run your finger down the length of each tape.

- Tear a 3rd strip off the roll and make a handle. Lay this strip on top of the other two and run your finger down the length.
- Gently pull off the top two strips together. Run your finger down the slick side until the tape pair is no longer attracted to your hand.
- Using a quick pull, separate the two strips.
- You have just prepared a 'Lower' or 'L' tape and an 'Upper' or 'U' tape. Keep them apart until you're ready to make observations.

To Do and Notice

Hang the U and L tapes from fingers on different hands and bring them near each other, but not touching. How do they interact?

Prediction: How do you think two L tapes will interact?

Create two L tapes using the method above – repeating the entire L tape process two times. Check the above prediction and comment on the results.

~~Prediction:~~ How do you think two L tapes will interact?

Summarize your results so far:

When two oppositely charged objects are brought near one another they ...

When two similarly charged objects are brought near one another they ...

When two uncharged objects are brought near one another they...

Rub a click eraser or plastic pen vigorously against wool, hair or fur.

- How does the pen interact with a U tape?

- How does the pen interact with an L tape?

Given that a plastic pen rubbed on wool acquires a negative charge,

What is the sign of the electric charge of the U tape?

What is the sign of the electric charge of the L tape?

Ask the instructor to come by with a lighter, and produce a flame briefly in the vicinity of two charged tapes.

- What is the effect of the flame on the charges, and why?

Experiment to see how U and L tapes interact with other materials (you may substitute others – write in the substitute material you used)

| Material | Interaction with U tape | Interaction with L tape | Explain** |
|--------------------------------------|-------------------------|-------------------------|-----------|
| Metal | | | |
| Plastic | | | |
| Paper | | | |
| U tape glass bottle | | | |
| Person | | | |

**Explain by telling what charge (if any) you think each type of material holds, whether it is a conductor or insulator, other reason, etc.

A negatively charged object will attract (check all that apply):

- Another negatively charged object
- A positively charged object
- A neutral object that is conducting
- A single water molecule
- A positively charged ion