

Static Electricity: Investigations with Tape

In this activity we will begin to develop a model for charge. Try to answer the questions based solely on the observations you are making today. Work in groups to conduct the investigations and answer the questions. Before moving on to a new part, make sure all the members of your group have reached the same conclusions.

- I. Pull a piece of tape, approximately 8 to 10 cm off the roll and fold an end over to make a "handle" so the tape doesn't stick to your fingers. Put the tape sticky side down on a cleaned, dry tabletop. With a pen label the tape **1**. Vigorously pull the tape off the table and stick it on the edge of the table so that it can hang freely.
 - A. Slowly bring objects like your finger, a pencil, etc. near, but not touching, tape **1**. Describe what happens to **1**.
 - B. Were there any objects that did not interact with tape **1**? Describe what you observed.
- II. Pull off a new piece of tape, make a handle, and label this tape **2**. Put it on the table, rip it off, and slowly bring the non-sticky side of **2** near the non-sticky side of **1**. (This is so they do not get stuck together.)
 - A. Describe your observations.
 - B. How does the distance between the tapes affect the interaction between the tapes?

We say that an object is “electrically charged” when it interacts as you have observed the tape interact.

- III. Pull off a new piece of tape, make a handle, label it **B** for bottom, and stick it to the table. Pull off another piece of tape, make a handle, label it **T** for top, and put it "piggy back" on top of **B**, sticky side down. Gently pull the **B-T** combination up off the table. Touch the sticky side of the tape combination with your hand, taking care not to wrinkle the tapes. Stick the **B-T** combination to the edge of the table.
 - A. Is the **B-T** combination “charged?” How do you know, what was your test for charge?
 - B. What does it mean for something to be "uncharged" or “neutral?” Is your finger neutral? Explain.

If the combination is charged then touch the **B-T** combination again and test it again until it is no longer charged.

C. Now vigorously rip **B** and **T** apart and hang the tapes to the edge of the table. Bring an object like your finger or pencil near **B** and then near **T**. Describe your observations.

D. Describe the interactions when the following pairs are brought together.

- a **B** tape with a newly charged **1** tape

- a **B** tape with a newly charged **2** tape

- a **T** tape with a newly charged **1** tape

- a **T** tape with a newly charged **2** tape

E. Do you think there is more than one kind of charge? What is your evidence?

F. How do you know when two objects have the same or different charge? Explain.

G. How do you make two pieces of tape with the same kind of charge?

IV. A. Predict how two **B** tapes would interact and how two **T** tapes would interact. Justify your prediction.

Each member of the group should now make new **B** and **T** tapes to test your prediction.

B. Before the **B-T** combination was taken apart it was not charged. After they were pulled apart the tapes were charged. Were they now charged the same or different? What is your evidence?

- V. A. Predict how the north pole of a magnet would interact with the **B** and **T** tapes. Justify your prediction.

Obtain a magnet from the instructor, make new **B** and **T** tapes, and test your prediction.

- B. Is the pole of a magnet charged? What is your evidence?

VI. Extension questions:

- A. How many different types of charge do there appear to be? Justify your answer.
- B. How do two objects that have ‘like’ charge interact with each other? How do objects with ‘unlike’ charge interact?
- C. What evidence would you look for if you thought there might be yet another kind of charge, more than what you have found so far?
- D. If you were to stick **B** and **T** back together, do you predict the combination would be neutral or charged? Explain your prediction with words and pictures.