

Generating Charged Tape

Follow along the worksheet and it will walk you through the in class activity. You are to record your observations, predictions and answer the questions. They are labeled with Os, Ps, (observations and predictions in bold) and Qs (questions in italics) and these will all be graded, predictions for completion, observations and questions for content. Important information or ideas are bulleted.

Equipment: Scotch tape, table edge or stand and piece of wood (at least 1 m long) to hold strips, moistened sponge

1. Pull off 40-60cm of transparent tape
2. Fold a short section (about 1 cm) to make a non-sticky “handle.”
3. Lay the tape adhesive side down and slide your finger along the tape to firmly attach it to the smooth, dry surface of a table or desktop.
4. (Do this fast.) Peel the tape from the surface vigorously pulling up the handle you made at one end. Try NOT to let the tape curl around itself of your fingers.

5. While holding the tape by the handle and away from other objects, attach the tape to a horizontal wooden piece or the edge of your desk. (It is important that you do not let the tape come in contact with anything other than the edge of the desk you are hanging it from.

6. Bring your finger or have someone else bring their finger near, but *not touching* the nonsticky side of the tape.

Q1: Is there any sign of interaction between the tape and the finger?

O1: Record your observations in the space below:

7. Try this with one or two other objects, *only* one or two at this time.

Q2: Is there any sign of interaction between the tape and these other objects?

O2: Record your observations below.

- You may realize that this interaction that you see is evidence that the tape has gained a new property called “charge.” When we cause this to happen to the tape we are “charging” the tape.

8. Remove the tape’s ability to behave as you have observed above by lightly running your finger along the nonsticky side of the tape. If this doesn’t work adequately you may get a better result by dragging the **nonsticky** side of the tape across a moistened sponge. *Be careful not to let the tape get too wet.* (Sometimes tape has water soluble adhesives so do not carry out this process on the sticky side.)

- It is important that you find a way to reliably and completely discharge the tape so keep trying things until you find a method that works. Even when you have found a reliable method, you should still check the results of your efforts.
- It is also important that you find a way of telling whether or not something is charged.

O3: Record the technique for telling that something is charged, i.e. is not charged in the space below.

Q3: How can you determine that something is discharged?

Now you will be making predictions individually and with your group. It is important for you to work alone for the first prediction, then come together and compare what you thought individually.

P1. Imagine that you have charged two pieces of tape and you attach one of the two pieces to the horizontal bar and you hold the second piece nonstick side near the

nonstick side of the first. In the space below, make a diagram of these two objects and indicate what you think will happen. The describe in words what you are trying to represent. In addition write down why you think this is what happens.

P2. Listen and look as the members of the group describe what they think will happen. Pay careful attention to why they think their answers seem reasonable to them. For each one that is different from yours, record the diagram and the reasons for that diagram.

O4: When the group is pretty sure of their ideas, make sure that both the original tape and the new tape are well charged. You need to recharge either tape if it seems uncharged. Test the two tapes for any interaction and see what happens. Record what happens.

Q4: In what way do two pieces of tape charged in the same way interact? Would you call this attraction or repulsion?

9. Share your ideas with your lab group.

O5: Record the group's conclusions below along with the reasons why those conclusions seem reasonable.

10. Set the original pieces of tape aside.
11. Take two additional pieces of tape and make a handle on each one.
12. Press the first one firmly on the table. Put the letter “B” (for bottom tape) on its handle.
13. Press the second one directly and firmly on the first. Put the letter “T” (for top tape) on its handle. Do not let the end of this second piece of tape lap over beyond the end of the first.
14. Now peel the pair of tapes from the table as a single unit.
15. Next, remove the charge from the pair of tapes by lightly dragging the nonsticky side of the tapes across a moistened sponge. Test the combinations to see if it is still charged. If it is still charged, try to remove more of the charge by gently dragging the other side across the moistened sponge and test again. Repeat until the pair is neutral.
16. Finally, peel the two pieces of tape apart by their handles and test one member of this pair of tapes for their interactions with the other.

O6: Record the interaction in the space below.

O7: Record the top tape’s interaction with the bottom tape:

17. Place them separately on the horizontal bar as shown below.

Q5: How do you think each of the two pieces of tape, as prepared above, will interact with one of the pieces of the original charged tapes? Based on what you have seen so far, what do you think will happen, and why does this seem reasonable to you? Record your thoughts below.

P3: Record what you think the top tape's interaction with the original tape will be.

P4: Record what you think the bottom tape's interaction with the original tape will be.

Explain why this seems reasonable.

P5: Listen to the members of the group describe their ideas about the tape interactions. Pay careful attention to the reasons behind their answers. Try to come a consensus and record it along with the group's reasoning below.

Top tape's interaction with the original tape:

Bottom tape's interaction with the original tape

Explain why this seems reasonable.

O8: When the group is pretty sure of their ideas, *makes sure that your top and bottom tapes are well charged.* RECHARGE one of the original tapes and try it with the top and bottom tapes. Record the results:

Top tape's interaction with the original tape:

Bottom tape's interaction with the original tape:

Q6: Based on the observations of the group, consider your answer to the following question. Can we say that we have oppositely charged the two pieces of tape that were prepared together?

Q7: Jot down your justification for your answer.

Q8: Share your answers to Q6 and 7 with the group and then listen as the other members of the group do the same. Try to come up with some conclusions and then write them down together with the reasons why they seem reasonable below.

EC if time:

If we had second pair of tapes prepared in the above activity, how do you think each of these 2 pieces of tape will interact with each of the two pieces you have already prepared?

ECP1; Based on what you have seen so far, what do you think will happen and why does this seem reasonable to you? Record your thought below:

Top tape with top tape:

Top tape with bottom tape:

Bottom tape with top tape:

Bottom tape with bottom tape:

Explain why this seems reasonable:

ECP2: Listen as the members of the group describe their ideas about the tape interactions. Pay careful attention to the reasons behind their answers. Try to come to a consensus and record it with the group's reasoning on the next page:

Top tape with top tape:

Top tape with bottom tape:

Bottom tape with top tape:

Bottom tape with bottom tape:

Explain why this seems reasonable:

ECO1: When the group is pretty sure of their ideas, prepare a second pair of tapes, make sure each of the original pair is well charged, and test them against each other. Record the results below:

Top tape with top tape:

Top tape with bottom tape:

Bottom tape with top tape:

Bottom tape with bottom tape:

ECQ1: Based on the observations of the group, consider your answer to the following question. Can we say that we have oppositely charged two pieces of tape when we prepare them together as in the previous activity?

ECQ2: Write down your justification for your answer.

ECQ3: Share your answer to Q1 and 2 with the group and then listen as the other members of the group do the same. Try to come to some conclusions and write them down together with the reasons they seem reasonable below: