PHYSICS IN MOTION
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Unit 5B
Static Electricity
Conduction and Induction Lab

Name:

Date:

During your orientation as a new employee at the tape manufacturing company Tape-R-Us, you hear about a recent challenge in the manufacturing process. Apparently, some new rolls of tape are accidentally sticking together, leading to a costly loss of product. Your boss tasks you with investigating the issue, determining why the tape is sticking together, and recommending a solution to the problem. You suspect static electricity may be an issue and set out to investigate.

Materials:

- clear tape
- Teflon rod
- silk cloth

Part One: Static Electric Tape

a. Cut four pieces of clear tape, each 10 cm long.
b. Stick the pieces to the edge of a table with each piece hanging down.
c. Create a tape handle by folding a 1 cm tab on the free end of each piece of tape.
d. Label each piece of tape with a letter: A, B, C, D.
e. Stick the adhesive side of tape A to the nonadhesive side of tape B, then pull them apart.

1. When you bring the two pieces of tape together again, what do you notice about the force between them?

_____

f. Stick tape pieces A and B back in place on the table.
g. Stick the adhesive side of tape C to the nonadhesive side of tape D, then pull them apart.

2. When you bring the two pieces of tape together again, what do you notice about the force between them?

_____

h. Stick tape pieces C and D back in place on the table.
i. Remove tape pieces A and C from the table and bring them close to each other.

3. When you bring the two pieces of tape together, what do you notice about the force between them?

_____

j. Stick tape piece C back in place on the table and remove tape piece D.
k. Bring pieces A and D close to each other.

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4. When you bring the two pieces of tape together, what do you notice about the force between them?

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l. Stick tape piece A back in place on the table and remove tape piece B.
m. Before you bring pieces B and D together, do you predict they will attract or repel each other? What is the actual result?

Predicted Force Direction	Actual Force Direction

n. Use the silk cloth to charge the Teflon rod.

5. Does a positive or negative charge accumulate on the rod?

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o. Use the rod to check the polarity of charge on each piece of tape. Record your observations in the table below:

Tape Piece	A	B	C	D
Force Direction				
Charge Polarity				

Part Two: Measuring Static Electric Force

In this activity, you will compare how different materials create more or less static charge on an inflated balloon.

Materials:

- silk cloth
- wool cloth
- fake fur cloth
- cotton cloth
- balloon
- ruler with millimeter markings
- pepper
- sheet of white paper

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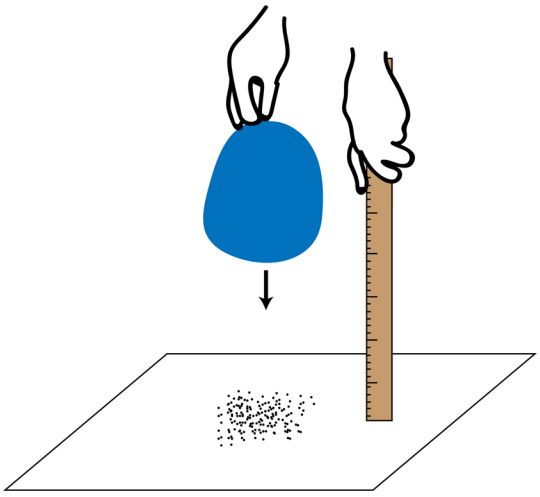
Rubbing two materials together makes them exchange electric charge. Depending on the materials involved, typically one gains positive charge and one gains negative charge after friction contact. You will rub an inflated balloon with four materials – silk, wool, fur, and cotton – and observe which one creates the most charge on the balloon.

Procedure:

a. Blow up a balloon about halfway and tie it shut.
b. Place a sheet of paper flat on a tabletop and shake ½ teaspoon of pepper onto it in one spot.
c. Rub the balloon for 30 seconds with one of the four materials.
d. Position the millimeter ruler vertically upright with one end on the paper next to the pepper. Holding the balloon upside down by the tie, bring it next to the ruler.
e. Slowly move the balloon down the ruler toward the pile of pepper until you see (or hear!) the pepper being attracted to the balloon.



f. Measure the position of the balloon when the attraction first occurs for each material, and record the values in the table below.

Rubbing Material	Distance From Table (mm)
Silk	
Wool	
Fur	
Cotton	

g. Repeat the process with each of the three remaining materials and record your measured distances in the table above.

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Questions to consider:

1. **Based on the completed table, which material creates the most charge on the balloon? Can you tell whether the polarity of the charge is positive or negative? When you rub the balloon with each of the different materials, what makes the balloon charge differently from one material to another?**

2. **Write a short report to your boss at Tape-R-Us about your findings. Include the following:**

   a. **Present evidence that static electricity can cause tape to move by both attraction and repulsion.**

   b. **Identify the most likely materials that, through friction in the manufacturing process, may be charging the tape.**