

NAME \_\_\_\_\_ GROUP \_\_\_\_\_ DATE \_\_\_\_\_

## **SILLY PUTTY LAB**

**READ THIS INFORMATION BEFORE PERFORMING THE EXPERIMENT!!!!**

### **BACKGROUND INFORMATION**

The liquid latex (Elmer's glue) which you use contains small globules of hydrocarbons suspended in water. The silly putty is formed by joining the globules using sodium borate (a cross-linker). The silly putty is held together by very weak intermolecular bonds that provide flexibility around the bond and rotation about the chain of the cross-linked polymer. If the cross-linked bonds in a polymer are permanent, it is a thermosetting plastic, even if above the glass-transition temperature ( $T_g$ ). If the bonds are non-permanent, it can be considered either thermoplastic or an elastomer.

### **MATERIALS**

- 55 % Elmer's glue solution in water
- 4 % borax solution (Sodium tetraborate)
- 2 beakers
- 1 Popsicle stick
- 1 ml pipette
- food colors (optional)

### **DIRECTIONS**

1. Wear goggles.
2. Pour 20 ml of the Elmer's glue solution into a beaker
3. Add 4 full droppers of (borax solution) to the beaker
4. Immediately begin stirring the solutions together using the wooden stick.
5. After a couple of minutes of mixing, the silly putty should be taken out of the cup and kneaded in the hands. Don't worry about the material sticking to your hands as these pieces will soon mix with the larger quantity with which you are working. Continue to knead until the desired consistency is reached.
6. Remove the silly putty from the beaker put it in your hands. (play with it to examine the properties)
7. Using a ruler to measure, drop the ball from a height of 30 centimeters. To what height does it rebound?
8. Stretch the silly putty slowly from each side.
9. Compress the silly putty back into a ball.
10. Pull the silly putty quickly from each side and compare the results.
11. Place the silly putty on some regular news print and press down firmly.
12. Remove the silly putty from the news print and make observations.
13. Follow good laboratory procedure and wash your hands with soap and water when you have finished the experiment.

**Data and Analysis:**

1. Height of the rebound \_\_\_\_\_ cm.

2. Observations of pulling the silly putty slowly:

\_\_\_\_\_

3. Observations of pulling the silly putty quickly:

\_\_\_\_\_

4. Observations of the silly putty on newsprint:

\_\_\_\_\_

5. Observations of the silly putty on the comic's section of the newspaper:

\_\_\_\_\_

**Questions: ANSWER IN COMPLETE SENTENCES.**

1. How do the physical properties of the glue, water mixture change as a result of adding the sodium tetraborate?

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2. What would be the effect (your thoughts) of adding more sodium borate solution?

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3. Press the silly putty against your hand. Describe what happens.

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4. What is the ratio of the height of the drop to that of the rebound distance?

\_\_\_\_\_

5. Who in your group had the ball with the most elasticity? Why?

\_\_\_\_\_

6. Try to roll the silly putty into a ball on the table. Describe what happens.

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7. Stretch the silly putty slowly. How long can you stretch it? (cm)

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8. Based on the background information, why silly putty stretches, instead of breaking quickly?

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9. How do silly putty acts like water? Why?

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