Bouncy Ball Experiment Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Partner(s): \_\_\_\_\_\_\_\_\_\_\_\_\_

Store-bough bouncy balls are made of rubber, a material that is made up of polymers. When the bouncy ball is stretched, these polymer chains uncoil and straighten. When released, the chains coil back up again. This makes the material stretchy and bouncy.

Which ingredient makes a bouncier ball?

Choose one ingredient to alter (more/less/none/substitution - eg baking soda instead of Borax) to test the effects on the performance of the bouncy ball. Make a “modified” bouncy ball and make one of the original recipe. You will compare the performance of the two formulations.

Original Recipe:

* 1/2 cup warm water
* 1 Tbsp Borax
* 1 Tb Cornstarch
* 2 Tbsp white glue
* Food coloring - few drops
* 2 disposable bowls for mixes
* Stirring stick
1. Stir together the warm water and Borax in one of the bowls using the stirring stick. Make sure the Borax dissolves completely.
2. Measure the glue into the other bowl. Add food colouring to glue.
3. Add 1/2 tsp of the Borax solution into the bowl with the glue. Let it sit for 10 to 15 seconds before stirring together.
4. Once the mixture becomes difficult to stir, remove it from the bowl and shape it into a sphere with your hands. As you continue to squeeze and shape the ball, the mixture will get less sticky.
5. Prepare second batch with altered ingredient.
6. When you like the ball’s shape, perform comparative testing (stretchines and bounciness) .

**Stretch Test:** Which formulation can stretch the most?

Hypothesis: If\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Independent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class Data

|  |  |  |
| --- | --- | --- |
| Group | Modified formulation | Length stretched (cm) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Bounce Test**

Hypothesis: If\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Independent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class Data

|  |  |  |
| --- | --- | --- |
| Group | Modified formulation | Bounce Height (cm) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Conclusion:**

* 1. Summarize your results. What did you modify?
	2. What effect did your modification have on the amount it could stretch?
	3. What effect did your modification have on bounce height?
	4. Evaluate: What challenges/ sources of error did you encounter? What would you change for next time? What other tests would you like to perform?

Background

Polymers are used to make numerous things, including clothing, plastic containers, nonstick cookware, and bulletproof vests, to name a few. Polymers are very large molecules, formed by repeated patterns of chemical units strung together. Although “polymer” might bring to mind rubber or slime, did you know that there are polymers all around us, including inside our bodies? The protein DNA, which is the “blueprint” for cellular reproduction, is a naturally-occurring polymer. The protein casein, in cow’s milk, is a polymer as well. Other natural polymers are cellulose and starch. Bone, horn, cotton, silk, rubber, paper, and leather all come from naturally-occurring polymers!

There are manmade polymers, as well. Fabrics such as rayon and polyester, polystyrene (used in styrofoam coffee cups), and PVC (used in pipes) are common examples of these artificially-occurring polymers.

You can use the following recipes to learn more about non-edible, naturally-occurring polymers.

Ingredients

There are two polymers working together to make your bouncy ball bounce that high. Polyvinyl acetate, a strong and flexible polymer, is found in glue. Amylopectin, a “branched” polymer, is found in cornstarch. The polyvinyl acetate gives your ball strength while amylopectin gives your ball elasticity. When borax is combined with the glue and cornstarch, the two polymers are connected and become a material that holds its form but also has enough give to compress and then bounce back to you when tossed against the floor. When molded into a ball, this material becomes a bouncy ball.