



MAKE YOUR OWN BOUNCY BALL

I wonder...

Can I make a ball that bounces from common household ingredients?

In this adventure, you'll use common household materials to make your own bouncy ball. Then you'll predict how well your ball will bounce, and run tests to see the actual results.



MATERIALS

- Borax
- Cornstarch
- Warm water
- Liquid glue, such as Elmer's Glue-All
- Food coloring
- Bowl of ice water
- Small zip-top bags, 1 per participant
- Paper cups, 2 per participant
- Measuring spoons
- Stir sticks
- Marker or pen
- Two yardsticks
- Masking tape

Set up the experiment:

You'll need access to both a hard surface (floor or tabletop) and a cushioned carpet surface (a carpet square could work).

- Secure one yardstick to the wall next to the hard surface.
- Secure the other yardstick to the wall next to the carpet surface.
- Have each participant label one cup "borax" and the other cup "glue."
- *Optional:* Have a slow-motion camera (smartphone) available to capture the bounces.

Predict the results:

How high do you think your ball will bounce? What if you bounce the ball on tile? On carpet? What if your ball is extra cold? Record your predictions in your Safety Smart® Science Investigator's Journal. Circle your highest prediction.





Make your bouncy ball:

Into the "borax" cup, add:

- 2 tablespoons warm water
- 1/2 teaspoon borax

Stir to dissolve the borax.

Into the "glue" cup, add:

- 1 tablespoon glue
- 1 tablespoon cornstarch
- Several drops of food coloring

Stir to mix in the color and break up the corn starch lumps.

Pour about half of the borax solution into the glue cup. Let it sit; do not stir for about 15 seconds. What do you see?

Stir the dough into a clump, then remove it from the cup and knead it with your hands. How does the dough feel? Is it slimy? Sticky? Dry? Does the feeling change as you knead it?

Roll the dough into a ball.

Run the bounce tests and record your observations:

1. Bounce your ball three times on the hard surface in front of the yardstick. Record the bounce heights in your journal.
2. Bounce your ball three times on the carpet. Record the bounce heights in your journal.

Put your ball in a sealed bag. Submerge the bag into a bowl of ice water for one minute.

Repeat the bounce tests with the chilled ball.

3. Hard surface
4. Carpet surface





What is happening here?

Glue, known chemically as a **polymer**, is a little bit like a bunch of cut strings in a pile. The strings don't hold together because they are not connected to one another. Borax comes along and ties all the strings into a tangled net, making the pile strong and resilient. Cornstarch helps dry up the wet goo to make it easier to handle and roll into a ball. And the food coloring just makes it look nice. It's a **chemical reaction**.



A chemical reaction occurs when two or more substances come together under just the right conditions for a new substance to be created. Chemistry doesn't just happen in a laboratory. Although some chemical reactions can be dangerous, safe chemical reactions happen around us all the time. For example, when baking bread, yeast combined with sugar and warm water gives off oxygen bubbles that make the dough rise (and accounts for all the little holes in soft bread). Other familiar forms of chemical reaction include:

- **Digestion:** Whenever you eat, your body uses many different and complex chemical reactions to break down the food and convert it into energy and other things that your body needs.
- **Combustion:** Fire is another type of chemical reaction, called combustion. Fire needs oxygen, fuel, and heat to exist, and the reaction creates light, heat, and smoke.
- **Oxidation:** Rust is a chemical reaction that you might see happening on old metal tools, wire fences, or nails. Some types of metal, such as iron, react with the oxygen and moisture (water) in the air to produce rust. Apples can also oxidize. If you leave a cut apple open to the air, the flesh turns brown. That is a safe form of oxidation.

LEARNING MESSAGES

Complementary Next Generation Science Standards

- ◇ Topic focus: Chemical Reactions (Physical Sciences)
- ◇ Disciplinary core ideas:
 - PS1B Chemical Reactions
- ◇ Cross-cutting concepts: Energy and matter; structure and function

Safety Smart Science Investigator's Journal: Make Your Own Bouncy Ball

Fill in your bounce predictions before you make the ball. Circle your highest prediction. Record the actual bounces here. Run three trials for each bounce test. Did you predict correctly?

BOUNCE TEST		Bounce Height (inches or cm)				
		PREDICT	OBSERVE			
			1	2	3	Average
1	Bounce on hard surface					
2	Bounce on carpet					
Chill the ball						
3	Bounce on hard surface					
4	Bounce on carpet					

When you combined the borax solution and the glue mixture, what did you see?

How did the dough feel when you first took it out of the cup?

How did the dough change as you kneaded it?

What substances are part of these common household chemical reactions? What happens as a result of the reactions?				
1. Kitchen	2. Dining Room	3. Bathroom	4. Garage	5. Inside YOU!
<i>Baking bread</i>	<i>Candle flame</i>	<i>Sudsy shower</i>	<i>Rusty tools</i>	<i>Digestion</i>

1. Yeast, sugar, water, heat -> risen bread; 2. Wick, oxygen, heat -> light, heat, smoke; 3. Soap, water, dirt -> clean skin; 4. Iron, oxygen, water -> rust; 5. Food, stomach acid -> energy

For longest play time, keep the ball in a sealed plastic bag. The ingredients used are generally safe, but the dough should never be eaten. Keep away from pets and small children.