MAKE ELEPHANT TOOTHPASTE

I wonder...
What happens when molecules break apart?

In this adventure, you'll create a safe chemical reaction that some call elephant toothpaste.

MATERIALS

- Hydrogen peroxide liquid (available at a drugstore or beauty supply store)
- Liquid dish soap
- Dry active yeast
- Warm water (keep it in a thermos)
- Food coloring
- Clean, empty plastic water bottle(s)
- Small cup
- Measuring cup
- Measuring spoons
- Funnel
- Safety goggles
- Plastic wash tub

SETUP

Put on the safety goggles.

Set the bottle in a plastic wash tub to contain the mess.

Adults only: Pour ½ cup hydrogen peroxide into the bottle using the funnel.

Add a few drops of food coloring to the bottle.

Add a generous squirt of dish soap to the bottle.

In the small cup, combine 1 tablespoon dry yeast (one packet) with 3 tablespoons warm water.

Mix gently to dissolve the yeast into the water—this creates a yeast "slurry."

OBSERVATION AND PREDICTION

What does the mixture in the bottle look like? Is anything happening? Sketch what you see in the "before" section of your worksheet.

What does the yeast slurry look like? Is anything happening yet?

What do you think will happen when you pour the yeast slurry into the bottle?

TEST

Quickly pour the yeast slurry into the bottle and watch what happens!

Sketch the "after" picture on your worksheet.

How does the bottle feel?

If possible, capture the reaction with the slo-mo function of a smartphone camera app.

WHAT IS HAPPENING HERE?

The yeast causes the molecules in the hydrogen peroxide (H_2O_2) to break down into water and oxygen gas. The soapy water captures the oxygen gas in bubbles. The food coloring just makes it pretty.

More Chemistry for older students:

Each molecule of hydrogen peroxide has two hydrogen atoms and two oxygen atoms. The yeast acts as a ***catalyst*** that ***decomposes*** the hydrogen peroxide, ***liberating*** the water and the extra oxygen atom. This is an ***exothermic*** reaction, which means it releases heat also. The foam is made up of oxygen gas which gets trapped in the soapy water. It is perfectly safe to handle.

$$2H_2O_2 + \text{catalyst (yeast)} \rightarrow H_2O\ (\text{water}) + O_2(\text{oxygen})$$

Key words

- **Catalyst:** kick-starter for the reaction
- **Decomposes:** breaks down
- **Liberating:** freeing
- **Exothermic:** a reaction that releases heat

TRY THIS AT HOME

What if the water were cold? What if you used more yeast? What if you used less hydrogen peroxide? What if you omitted the dish soap? What if you did this in a bowl instead of a bottle?

LEARNING MESSAGES

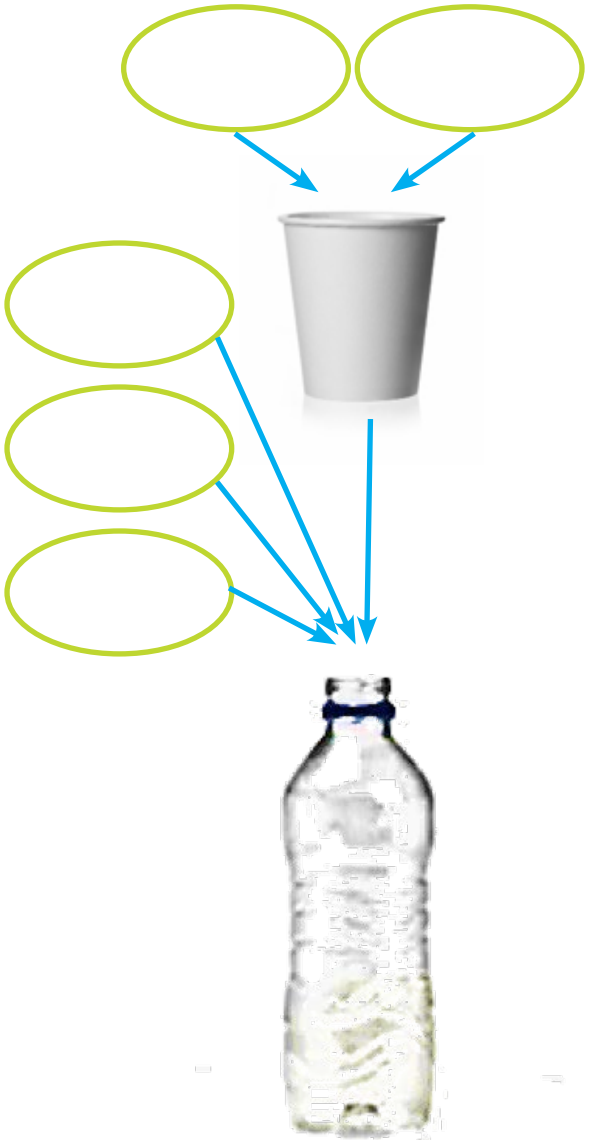
Complementary Next Generation Science Standards

- Topic focus: Physical Sciences, Chemistry
- Disciplinary core ideas:
  - PS1 Matter and Its Interactions
  - PS1B Chemical Reactions
- Cross-cutting concepts: Cause and effect

Safety Smart Science Investigator's Journal: Make Elephant Toothpaste

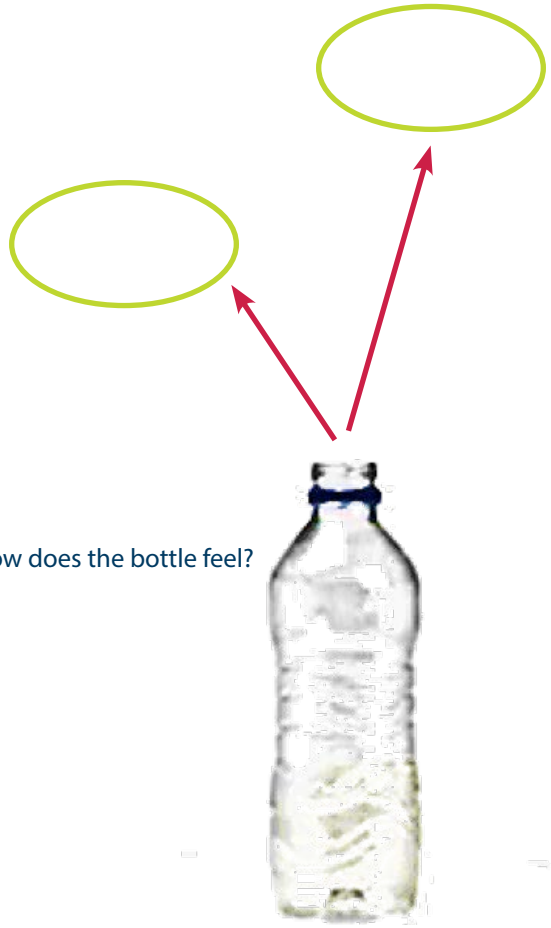
Fill in the ingredients

BEFORE



Sketch what happens

AFTER



How does the bottle feel?