LESSON 11:
ELEPHANT TOOTHPASTE

SUPPLIES

TEACHER BRINGS

- Hydrogen peroxide (6 cups)
- Water (if no sink in classroom)
- Hand wipes (if desired)

MAIN BIN

- Baking trays (20)
- Spoons (20)
- Dish soap (1 bottle)
- Measuring Cups
- Food coloring
- Plastic cups (20)
- Tablecloth (2)

ELEPHANT TOOTHPASTE LESSON KIT #11

- Yeast packets (20)
- Soda cups with lids (20)

OBJECTIVES

- ☑ Understand what a **catalyst** is
- ☑ Be able to identify 2 signs of a chemical reaction taking place

INTRODUCTION

2 min

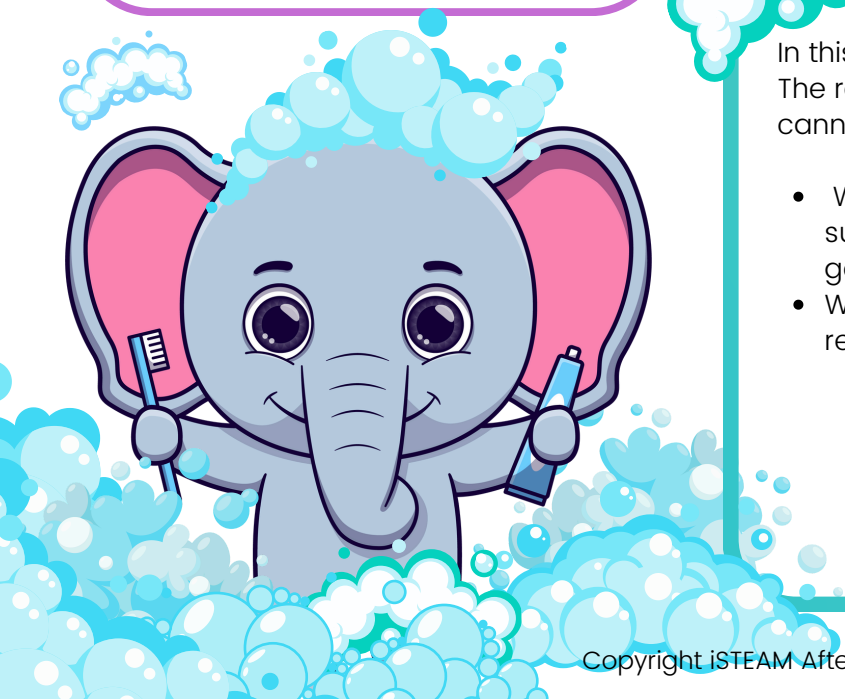
Today we are going to create toothpaste large enough for an elephant! We'll be using a hydrogen peroxide which is made up of tiny atoms, some hydrogen, and some oxygen. On its own, hydrogen peroxide changes slowly into water and oxygen gas. But when ingredients like yeast or dish soap are added, chemical reactions occur!

A chemical reaction is when two or more substances mix together and create a new substance. Remember, this toothpaste is for elephants and not people, so please remember to not taste our experiment.

HOOK

1 min

What would toothpaste for an elephant look like? How do you think we could make toothpaste for an elephant using the materials you see here? Let students brainstorm and discuss ideas.



COLOR FACTOR

In this experiment we cause a chemical reaction to occur. The reaction creates oxygen, a gas that--usually--we cannot see.

- When dish soap is added to the mixture, it creates surface tension, allowing the oxygen gas bubbles to get trapped. This causes a foam to form.
- We added coloring to the mixture in order to see the reaction occur in a more visual and fun way!

SIGNS OF CHEMICAL REACTIONS

- color change
- temperature change
- smell change
- production of gas
- production of a solid
- emission of light

ELEPHANT TOOTHPASTE

DISCUSSION

3-5 min

Sometimes, a chemical reaction can be so slow that we don't notice it happening. But if we speed it up, we can observe an exciting reaction! When we want to speed up a chemical reaction, we use something called a **catalyst.** A catalyst gets the job done quicker, but it doesn't get used up itself.

Imagine you're building a puzzle, and someone comes to help you find the right pieces faster. That helper is like a catalyst—they make things go faster, but they don't become part of the puzzle! Today's catalyst is something called yeast.

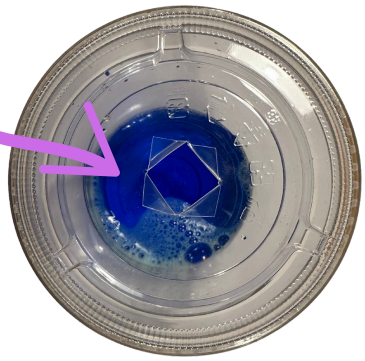
ACTIVITY

20 min

1. Divide students into groups of 3-4. To each group, pass out: 1 baking tray, 1 yeast packet, 1 spoon, 1 regular cup with about 1/4 cup water (warm works best), 1 soda cup with lid filled with 1/2 cup hydrogen peroxide. NOTE: make sure to use tablecloths to protect tables.

2. Fold open the hole in the center of cup lid (see photo). Have students place the soda cups into the baking tray.

3. Let each group choose the food coloring of their choice. Add a few drops to their bottle for them. NOTE: only the instructor should handle food coloring.



4. Have students add a squirt of dish soap to the hydrogen peroxide and swirl it to mix.

5. Ask students to carefully empty their yeast packet into their cup of water. Have them use their spoon to mix until it is nearly dissolved.

6. Have students carefully pour the yeast mixture into the hydrogen peroxide mixture and observe the results.

7. If you have access to a sink, have students take turns carefully touching the foam, then washing their hands. If you do not have access to a sink, have them hover their hands above the foam or touch the outside of the foil tray. They should feel heat.

ELEPHANT TOOTHPASTE

OBSERVE & EXPLAIN

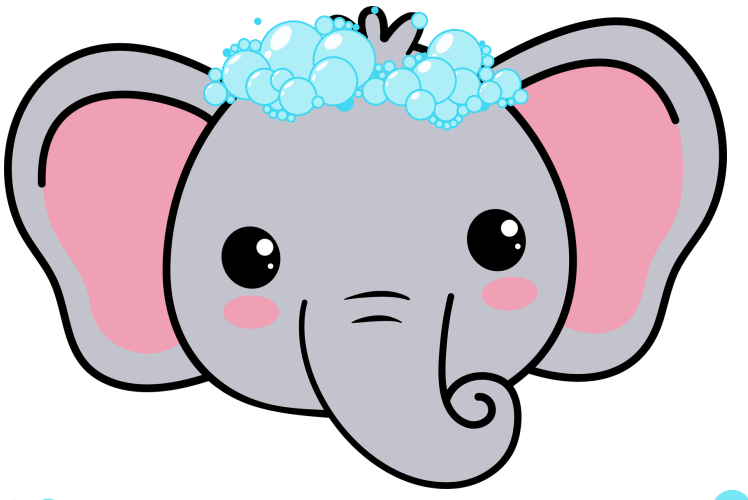
5-10 min

Hydrogen peroxide is a mixture of hydrogen atoms and oxygen atoms. It is usually stored in brown or dark colored bottles because light causes it to break down. When hydrogen peroxide breaks down, it separates into water and oxygen. This usually happens slowly over time.

In this experiment, a catalyst, yeast, was added to speed up the breakdown of the hydrogen peroxide. Yeast contains a chemical called **catalase** which helps to quickly break the hydrogen peroxide down into water and oxygen. Oxygen is a gas and when the breakdown occurs, small oxygen gas bubbles are created. Usually, we cannot see these oxygen gas bubbles because they quickly pop. However, when dish soap is added to the mixture, it creates surface tension, allowing the oxygen gas bubbles to get trapped. This causes a foam to form.

The foam felt warm to touch because the reaction was an exothermic reaction, meaning it produced heat. The foam is just water, soap and oxygen but is often referred to as 'elephant's toothpaste' because it looks like a big squirt of toothpaste.

But be careful, it will not taste good, so do not try it!



EXTENSION

If there is extra time and materials, the class can repeat the experiment with more or less of the following variables:

- Yeast
  - The less yeast, the slower the reaction since yeast is the catalyst.
- Dish Soap
  - The less dish soap, the less foam, because the soap creates bubbles.

CLEAN UP TIP

This experiment can easily cause a large mess if there are spills. Please:

- Leave plenty of time at the end of class for cleaning.
- Use the trays to contain the mess. We recommend bringing the trays to a sink by yourself, or having students carry them one at a time.

Exit Ticket

Ask each student the following question as they walk out the door.

- Q: What were the signs of a chemical reaction?
  - A: Students may have noticed bubbles (production of gas) and heat (a change in temperature)
- Q: What was the catalyst we used in today's experiment?
  - A. Hydrogen Peroxide!