



Chemical Engineers

Engineers often design systems that control fast **chemical reactions**, from airbags deploying in cars to rocket propulsion systems. In this challenge, students will act as **Chemical Engineers** and **design a reaction that produces the tallest foam column.**

Elephant Toothpaste

How does 'elephant toothpaste' work?

Hydrogen peroxide naturally dissolves into water. The yeast acts as a catalyst for the reaction to happen quickly and breaking the chemical bonds in peroxide releases energy (heat). The dish soap traps the gas bubbles, which creates foam.

Ask

1. How does elephant toothpaste work, in your own words?
2. What ingredient (variable) had the biggest impact?
3. Did faster reactions create taller foam?
4. Can you use all 4 vocabulary words in a sentence to describe the challenge?

Directions

Goal: Design the tallest foam column

1. Pour a cup of hydrogen peroxide into an empty bottle.
2. Add a couple of tablespoons of dish soap and a few drops of food coloring to the bottle. Stir the liquid to mix it.
3. In a separate container, mix yeast with enough warm water that the liquid is easy to pour.
4. When you're ready, place the bottle on the tray or baking sheet, and pour yeast mixture into the bottle.
5. **Try again!** What can you change about your ingredients to create a taller foam column?

Vocabulary

- **Chemical Reaction:** a process in which substances change to form new substances
- **Reversible Change:** a change that can be undone (ex: freezing water)
- **Irreversible Change:** a change that cannot be undone (ex: baking a cake)
- **Mixture:** a combination of two or more substances that do not form a new substance

Materials

1. 6% hydrogen peroxide
2. Active dry yeast
3. Warm water (90°-110° F)
4. Dish soap
5. Food coloring
6. Plastic bottles
7. Measuring cups/spoons
8. Tray or baking sheet

