



CHEMICAL *Reactions*



Let's turn liquid into gas!

Elephant toothpaste is a super fun and easy chemical reaction that you can do at home with common medicine and kitchen items! Baking yeast is added to peroxide and soap to create mountains of warm foam.

WHAT IS A CHEMICAL REACTION?

A chemical reaction is when two or more substances (reactants) are combined and react to each other in such a way that a new substance (product) is formed.

There are **four main clues** that a chemical change has occurred:

1. There is a formation of gas which can be seen by a fizzing or bubbling
2. The reaction will cause heat, light or odor to be emitted
3. A color change is produced
4. A solid is formed during the change

HOW DOES ELEPHANT TOOTHPASTE WORK?

To put it simply, elephant toothpaste is the decomposition of hydrogen peroxide into water and oxygen. It is also an example of a reaction that is exothermic (gives off heat).

The yeast contains an enzyme called Catalase that breaks down hydrogen peroxide (H₂O₂) into oxygen gas and water. The oxygen gas gets trapped by the soap, and you get a large foamy solution that squirts out of the top of the bottle! The cool thing about this activity is that the enzyme Catalase can also be found in potatoes, dogs and even us! We have the same enzyme in our bodies. That is why you see the 3% hydrogen peroxide bubble when you put it on a cut or scrape. The oxygen released is what kills the germs in the cut. We have this enzyme because we naturally produce low amounts of hydrogen peroxide as a byproduct of oxidative metabolism (the way that a cell gains useful energy). Our cells need energy, but low amounts of hydrogen peroxide are produced and need to be neutralized through enzymes like Catalase.

(Imagination Station, Toledo, OH)

Lots of foam is created, so make sure to set up your experiment in a bin or on a cookie sheet. But, clean-up is easy: just pour it down the sink, and rinse with water.



Elephant Toothpaste

MATERIALS

- an empty plastic soda bottle (about 16oz)
- 1/2 cup of hydrogen peroxide (the 3% version you can get at the store)
- 1 package of yeast
- 1/4 cup of warm water
- dish soap
- a cup
- optional: glow stick liquid OR food coloring

METHOD

1. Pour peroxide into the bottle.
2. Activate a 'large' glow stick (or several small bracelet style) by breaking and shaking them so that they are glowing. Use a sharp pair of scissors to snip off the end, add the glowing liquid to the hydrogen peroxide. (If you do not want to use glow sticks, place a few drops of food coloring in the peroxide instead.)
3. Add a squirt of dish soap and swirl the bottle to mix.
4. In the cup, mix the water and yeast and stir for a few seconds to combine.
5. If using a Jack-O-Lantern, place the bottle in the pumpkin, making sure that it will stay upright.
6. Pour the yeast into the bottle with the peroxide and watch what happens!

Tell us how your experiment goes by sharing photos and tagging The Works on social media:
#attheworks and
#STEMActivity



In the spirit of Halloween, we suggest creating this chemical reactions INSIDE of a Jack-O-Lantern! For a bit of extra fun, add some glow stick liquid ... and don't forget to turn off the lights!

**We hope you enjoyed our STEM Activity of the Month.
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