

Balloon Blow-up

AT A GLANCE:

In this activity, we will use simple materials to generate static electricity and explore its behavior.

STUDENTS WILL BE ABLE TO:

Use baking soda and vinegar to create chemical reaction that gives off gas as a product.

BACKGROUND INFORMATION:

Baking soda is a chemical called sodium bicarbonate and it reacts with vinegar. Vinegar is called acetic acid. These two chemicals react and form something new. You can see that a reaction is happening. The baking soda and vinegar fizzed and you may have seen some bubbles. The bottle probably feels cool around the mixture. The balloon blew up. All of these observations tell us that a reaction occurred.

PRINCIPLES:

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DETAILED EXPLANATION:

Vinegar ($\text{HC}_2\text{H}_3\text{O}_2$) is a solution of acetic acid. It reacts with baking soda, sodium bicarbonate (NaHCO_3), to produce carbon dioxide gas (CO_2) and an aqueous solution of sodium acetate ($\text{NaC}_2\text{H}_3\text{O}_2$). The reaction can be written as follows:



The carbon dioxide filled up the balloon, causing it to expand. We saw the volume change caused by the carbon dioxide in this activity. What might have happened if we had capped the bottle off, leaving no place for the carbon dioxide to go? It would have built up pressure because carbon dioxide takes up space. Why do you think the bottle felt cold? The reaction needs heat to make it happen so it takes heat, leaving the bottle feeling cold. A reaction that needs heat to make it happen is called endothermic. How did you know that your reaction finished? What might have caused the reaction to stop? Your reaction stops when you run out of reactants. The reactants are the things on the left of our reaction equation above. Our reactants were baking soda and vinegar. When one of these is used up completely, the reaction will stop.

MATERIALS:

- Safety Goggles
- Balloon
- Bottle with a narrow neck
- Funnel or straw
- Water
- Vinegar
- Baking soda



PROCEDURE:

1. Pour about an inch of liquid (half vinegar, half water) into the bottle.
2. Use the funnel to fill the balloon half full of baking soda. (If you don't have a funnel, you can use a straw to load the balloon. Stick the straw into the baking soda, and put your finger over the top of the straw. Lift the straw out, put it into the balloon, and blow or tap gently.)
3. Stretch the open end of the balloon over the neck of the bottle. Make sure it's on tight! Let the heavy end of the balloon dangle, so no baking soda goes in the bottle.
4. Hold onto the balloon at the bottle neck, and pick up the heavy part of the balloon so that all the baking soda falls into the vinegar at the bottom of the bottle.
5. If the balloon does not begin to expand right away, shake the soda bottle slightly to mix the baking soda and vinegar.
6. Wow! Hear the fizz? There are thousands of bubbles! And look at what's happening to the balloon...

TRY THIS:

- Add more vinegar or baking soda, does this change your results at all?
- Try other chemicals like Baking Powder & flour or try water instead of vinegar
<http://www.fi.edu/tfi/activity/energy/ener-4.html>
- Do several trails, each time manipulating another variable.

INTEGRATE:

- Have students practice their table-making and data-recording skills by having them design tables to keep track of their results.
- Have students time their experiments and compare results.