

GRADES K-2

TIME

10-15 minutes

EXPLODING BAGGIES



Science



Physical Education

EXPLODING BAGGIES

The Children's Museum's lessons are designed to weave classroom experiences and museum education together. All lessons are interdisciplinary and can be used as individual classroom experiences or in combination to create a cohesive unit. Lessons are optimized when used in connection with museum field trips.

This simple, classic experiment is a great way to review states of matter and introduce the concept of chemical reactions. By combining baking soda and vinegar, students will learn what a chemical reaction is and how to identify when one has occurred. The product of this reaction is delightfully messy, so we recommend doing this lesson outdoors.

FOCUS QUESTIONS

- What are the characteristics of solids, liquids, and gases?
- What is a chemical reaction?
- What are some signs that a chemical reaction has occurred?
- How do baking soda and vinegar react with each other?



INDIANA ACADEMIC STANDARDS

Science: 1.PS.1, 2.PS.2

Physical Education: K.2.3.A, 1.2.3.A

OBJECTIVES

Students will:

- Identify the characteristics of solids, liquids, and gases.
- Predict how baking soda and vinegar will react with one another.
- Observe signs of a chemical reaction.



MATERIALS

- $\frac{3}{4}$ cup of vinegar
- 3 tablespoons of baking soda
- Sandwich-sized zip-top bag
- Clothespin, chip clip, or twist tie
- Measuring cup
- Measuring spoon
- Food coloring (optional)

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What Makes It Explode?

Note: This experiment is messy. We recommend doing it outdoors.

PROCEDURES

1. Share with students that everything around them is made of matter. Matter is anything that has mass and takes up space. Matter can be a solid, liquid, or gas. Ask students to characterize the vinegar and baking soda as a solid, a liquid, or a gas and to explain their reasoning.
2. Explain to students that different kinds of matter can be combined, sometimes causing a chemical reaction. A chemical reaction is when two substances are combined and as a result, a new type of matter is created. Share with students that they will be observing a simple chemical reaction with vinegar and baking soda.
3. Ask students to predict how the baking soda and vinegar will react when mixed together. Share with students possible signs of a chemical reaction, such as a change in color or temperature, creation of a new state of matter (gas, liquid, or solid).
4. Guide students through the process of creating a chemical reaction, using the steps below. Encourage students to observe the baggies for signs of a chemical reaction.
5. After students have completed the exploding baggies experiment, invite them to share their observations. How do their observations compare to their predictions? What did they observe when they mixed the baking soda and vinegar? Did a chemical reaction occur? How do they know?
6. Explain that we know a chemical reaction occurred because we saw the creation of a new product. The product of the reaction is carbon dioxide, which is a gas. The gas caused the bag to expand and explode.
7. Encourage students to repeat the reaction multiple times and experiment with different amounts of baking soda and vinegar.

STATES OF MATTER

Matter is anything that has mass and takes up space. Matter is made of tiny particles called atoms, which can combine to form other particles called molecules. Matter can take a variety of forms, or states. Below are three common states of matter.

Solid: In a solid, the molecules are very close together and do not move very much. A solid keeps its shape. Baking soda is a solid. When you scoop up some baking soda, it seems to take the shape of its container like a liquid. This illusion happens because the individual solid particles are so small and so close together. If you could scoop up only one particle of baking soda, it would not take the shape of its container.

Liquid: In a liquid, molecules are close together (but not as close as molecules in a solid) and move around a little bit. A liquid takes the shape of its container. Vinegar is a liquid.

Gas: In a gas, the molecules are far apart and move around a lot. The air you are breathing is a gas.

- 1 Add food coloring to the vinegar (optional).



- 2 Pour vinegar into the sandwich bag and pinch the bag just above the vinegar.



- 3 Add a clothespin, chip clip, or twist tie to the pinched area. The bag should now be separated into an upper and lower compartment.



- 4 Pour baking soda into the bag's upper compartment and seal the bag.



- 5 Place the bag on the ground and carefully remove the clothespin.



- 6 Stand back and watch. The bag should begin to expand. If it does not, shake the bag to better mix the baking soda and vinegar.



Move Like a Molecule

Use this kinesthetic activity to deepen understanding of states of matter.

Instruct students to make two fists. Explain that each fist represents a molecule. Use the directions below to model how molecules behave in different states of matter.

1. Ask students to press their fists together so that their knuckles are touching, then keep their fists still. This is how molecules behave in a solid.
2. Ask students to keep their fists touching and slide them up and down against each other. This is how molecules behave in a liquid.
3. Ask students to move their fists far apart and move them around quickly. This is how molecules behave in a gas.

Say "solid," "liquid," or "gas" at random and ask students to model each state of matter with their fists.

STATE OF MATTER



SOLID



LIQUID



GAS

cool

hot

VOCABULARY

- Matter
- Solid
- Liquid
- Gas
- Chemical reaction
- Reactant
- Product

HAS A REACTION OCCURRED?

A chemical reaction creates a new product by rearranging atoms. Atoms are too small to see with the naked eye; therefore, it is sometimes difficult to tell if a chemical reaction has occurred. Below are some signs of a chemical reaction. Not all signs will occur in every reaction.

- Change in temperature
- Change in color
- Creation of a gas, sometimes visible through bubbles
- Creation of a solid



CHEMICAL REACTIONS

Imagine that you are walking down the street and see your best friend. What would you do? Wave? Say hello? Give them a high five or fist pump? You would probably react, or do something, and that action would probably create happiness in your day.

Just like people, substances can react to each other. When two or more substances interact and create a different substance, a **chemical reaction** has occurred. In a chemical reaction, atoms in the original substances rearrange to form one or more new substances. The substances that exist at the beginning of the reaction are called the **reactants**. The substance that exists at the end of the reaction is called the **product**.

WHAT'S HAPPENING IN THIS REACTION?

When baking soda and vinegar react, they produce a gas called carbon dioxide. This gas creates bubbles and changes the shape of the bag. Gas molecules move quickly and like to spread away from each other. As the carbon dioxide forms, the gas molecules move farther apart and press against the bag, which causes the bag to expand. As they continue to spread out, they press against the bag so hard that it explodes! Now that the bag is open, the carbon dioxide molecules can spread out into the space outside the bag.