



5th Grade Lesson Plan: Matter and Chemical Reactions

Objective: Teach students that matter is neither created nor destroyed during a chemical reaction, rather, it is transformed. Identify evidence that a chemical reaction has occurred.

Materials: Empty plastic bottle, balloon, baking soda, white vinegar, funnel, and the matter and chemical reactions "What You Discovered" worksheet.

Procedure:

1. Start with a class discussion about matter and its basic properties. Throughout this discussion, write examples and key terms on the board to give a visual as you discuss.
 - a. Ask students an opening question, such as: **What is matter?** (Physical substance; everything is made of matter.)
 - b. Ask students **what the main states of matter are.** (**Solid, liquid,** and **gas.**) Discuss their different properties (spacing of molecules, whether they hold their shape, etc.).
2. Discuss how matter can undergo both physical and chemical changes.
 - a. Briefly explain the difference between **chemical** and **physical** changes.
 - i. With physical changes what you start with is what you end with. For example, matter can change states. You can cut a piece of paper and melt a popsicle. These are physical changes.
 - ii. With chemical changes what you start with is different from what you end with. Examples include baking a cake or burning a piece of paper.
 - iii. Write several chemical and physical reactions on the board and **ask students which belong in which category.**
 - b. Ask the students a question, such as: **How do we get energy from food? How does a fire burn?**
 - i. Chemical reactions are a part of everyday life. These reactions can be small and go unnoticed, but they can also be enormous. Without them, we wouldn't be able to function. Give examples of chemical reactions that students see every day such as an engine powering a car, photosynthesis, cooking food, etc.
 - c. A chemical reaction consists of **products** and **reactants**.
 - i. Reactants are what you start with and products are what you end with.
 - ii. Example: We eat a banana and feel energized. The reactant is the banana and the energy is the product.
 - d. Explain that matter is neither created nor destroyed; it is transformed. Use the example of hydrogen and oxygen combining to make water to explain this concept.
 - e. **Why are chemical reactions so important?** They help us to understand how the world, and our bodies, work.
3. Follow the steps outlined in the dōTERRA® Science for Kids Chemical Reaction Experiment and complete the "What You Discovered" worksheet.

Evaluation: Teachers will evaluate students' understanding by reviewing their responses to the questions on the "What You Discovered" worksheet, as well as the notes they recorded in their notebook.



Matter and Chemical Reactions

What You'll Need: (per group)

- **1 empty, clear plastic bottle**
- **1 balloon**
- **2 oz. (4 tsp) baking soda**
- **4 oz. (1/2 cup) vinegar**
- **1 funnel**

Hints:

This activity is designed to be done in groups (5-6 groups works well). As the students work together, assign jobs within the group to help everyone participate. Possible jobs include: getting the vinegar from the teacher, putting the baking soda into the balloon, putting the balloon on the bottle, emptying the baking soda into the bottle, and cleaning up the bottle and balloon by throwing them in the trash.

What You'll Do:

1. Before beginning the experiment, take a moment to answer questions 1 and 2 on your "What You Discovered" worksheet.
2. Pour 2 ounces of baking soda into the balloon. You may want to use the funnel to make it easier.
3. Next, pour 4 ounces of vinegar into the clear bottle. Take a moment to answer question 3 on your "What You Discovered" worksheet.
4. Fasten the balloon to the opening of the bottle and answer question 4 on your "What You Discovered" worksheet.
 - **Note:** *Be careful not to let the baking soda drop into the vinegar before you're ready.*
5. Lift the balloon so the baking soda pours into the bottle. As the baking soda (solid) mixes with the vinegar (liquid), it will create the third state of matter: gas. As you watch the reaction, answer question 5 on your "What You Discovered" worksheet.
6. Take a moment to finish your "What You Discovered" worksheet.

What Does It Mean?

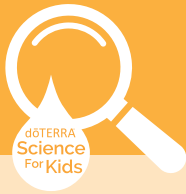
Like many concepts in chemistry, chemical reactions are constantly happening without us even noticing! In this particular experiment, we witnessed a chemical reaction between the vinegar and baking soda that we mixed. When mixed, vinegar and baking soda create a gas called **carbon dioxide**, the same gas that makes the carbonation in soda. Just like soda explodes when you shake it, the gas that we created in this experiment got excited and needed to expand. Because there was not enough room in the bottle, it had to expand and that is how the balloon inflated!

Now that you understand how chemical reactions work, can you identify the reactants and products in this reaction?



What to Do Next:

- The next time you see a cake rise in the oven or watch fireworks go off, think about the role that chemical reactions play in it all.
- Revisit the dōTERRA® Science for Kids tab on the dōTERRA Science Blog for more fun science experiments and activities.
- With your parent's permission, post a picture of your experiment on Facebook or Instagram. Make sure to tag @doterrascience and to use the hashtags #doterrascienceforkids and #featureme for a chance to be featured on the dōTERRA® Science Facebook page.



Matter and Chemical Reactions

What You Discovered:

Name Teacher's Copy

1. Draw a line to match the state of matter to its characteristic.

Solid

Liquid

Gas

The particles are so far apart, you can walk through them.

These have a stable, definite shape.

These take the form of their container.

2. Before you begin the experiment, observe all of the substances you gathered. What are the reactants in this experiment?

Vinegar and baking soda

3. As you pour the vinegar into the plastic bottle, what characteristics do you notice? Does it take the shape of the bottle? Which state of matter is it?

It pours easily and takes the shape of the container. It's a liquid.

4. What do you think will happen when you mix the baking soda and vinegar?

Answers will vary

5. Why do you think the balloon expands?

A chemical reaction occurs and creates a gas.

6. What is the product of this chemical reaction?

Carbon dioxide

7. What is one thing you learned about chemical reactions through this experiment and/or lesson?

Answers will vary



Matter and Chemical Reactions

What You Discovered:

Name _____

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The particles are so far apart, you can walk through them.

Liquid

These have a stable, definite shape.

Gas

These take the form of their container.

2. Before you begin the experiment, observe all of the substances you gathered. What are the reactants in this experiment?

3. As you pour the vinegar into the plastic bottle, what characteristics do you notice? Does it take the shape of the bottle? Which state of matter is it?

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