

IT'S IN THE BAG

BENCHMARK and TASK

SC.A. 1.2.5 The student knows that materials made by chemically combining two or more substances may have properties that differ from the original materials.

- The student observes the original materials and compares their properties to the properties of the new material produced in a chemical reaction.

KEY QUESTION

What are the properties of matter after a chemical change?

BACKGROUND INFORMATION

Chemical changes take place all the time. In a chemical reaction, changes occur that produce new substances with new properties. Chemical reactions, such as those that take place when baking cookies, using some cleaning products, or digesting the food we eat, change the composition of substances. Baking cookies is a chemical reaction because the ingredients lose their identifying properties and the combined ingredients change to cookies, which have new properties. This is an endothermic reaction because the cookie absorbs **heat**.

MATERIALS

Teacher

1 sheet of paper
1 pair of safety goggles
1 candle
matches
1 cup of water for safety
2 balloons
1 nail
1 ice cube in a cup
vinegar
baking soda
1 glass soda bottle

Per pair of students

1 labeled container of vinegar
1 labeled container of baking soda
1 zipper-type plastic sandwich bag
1 spring clothespin
1 graduated cylinder
1 tablespoon
2 pairs of safety goggles
1 small piece of wood

TEACHING TIPS

1. Any type of plastic bag that can be sealed can be used for this activity; the sandwich size works well.
2. All students and the teacher should wear safety goggles during this activity.
3. The gas that forms in the bag is carbon dioxide, which is harmless so it is okay if the bags pop open during the reaction or if students open their bags at the end of the reaction to see if there is any odor. Encourage students who wish to smell the contents of the bag to use a wafting motion to bring the odor to their nose rather than sticking their nose into the plastic bag.
4. Try to save at least one reaction bag that has not been opened to use during the Explain portion of the lesson.

ENGAGE

1. Show students a piece of paper, crumple it in your hand, and ask the students how you have changed the paper. Guide students to see that you have not chemically changed the paper; you have only physically altered it. It looks different but is still the same material.
2. Tear the paper in half and again ask students about the change. Help students recognize that only a physical change has occurred. The paper is still paper, only in smaller pieces.
3. Put on your safety goggles. Hold the paper over a metal trashcan or other metal container. Then strike a match and burn the paper. (**Caution!** Have water handy when you do this.) Remind students that they should not try this at home. Ask students if the paper is still paper after it burns. The paper is permanently altered into a new substance. Explain that they are going to perform some chemical changes. Remind students that in the previous lesson, they created a physical change with a seltzer tablet by crushing it; they did not alter the chemical nature of the tablet itself.

EXPLORE

1. Place a labeled container of vinegar and a labeled container of baking soda on tables so all students can see the chemicals in the containers. Ask students to describe the characteristics of each chemical. Record their descriptions in a chart on the board. Encourage students to use terms such as solid and liquid when describing the chemicals.
2. Tell students to place 50 mL of vinegar in the plastic bag and carefully seal the bag just above the vinegar level with a spring clothespin.
3. Have students place 1 Tbsp. of baking soda in the bag. The baking soda should not go past the clothespin. Students should close the opening of the bag making sure it is completely sealed.
4. After closing their bags, students should observe carefully as they remove the clothespin that separates the substances. Encourage them to feel their bags. (They will become inflated and will feel very cold.)
5. Ask students to describe the changes in the bag. Write their descriptions on the board.
6. Save any of the unopened bags to use in the **Explain** portion of the activity. Have students throw their bags away and clean up the work area before discussing the results.

EXPLAIN

What changes occurred after the vinegar and the baking soda mixed together? (The bag inflated and got cold.)

What do you think caused the bag to inflate? (A gas was formed inside the bag that could not escape.)

In a chemical reaction, changes occur that produce new substances with new properties. Was this a chemical reaction? (yes) How do you know? (A new substance was formed - a gas that was not present before the reaction took place. The acid and soda are getting heat energy from the water to produce carbon dioxide.)

EXTEND/APPLY

The gas produced in this chemical reaction is carbon dioxide. Discuss the use of carbon dioxide in extinguishing fires. Light a candle. Use a bag in which the chemical reaction has occurred but has

not been opened to allow the gas to escape. Open the bag and quickly stick the candle in the gas inside the bag. The candle flame will be extinguished immediately.

ASSESSMENT

Perform the following demonstrations for the class and have students record whether a physical or chemical change has taken place and why they think so.

#1: Use a nail and scratch a piece of wood. (physical change)

#2: Open a book of matches and tear one out. (physical change)

#3: Strike a match. (chemical change)

#4: Blow up a balloon. (physical change)

#5: Blow up a balloon using vinegar and baking soda. (chemical change)

Place a small amount of vinegar in an empty soda bottle (glass works best). Fill a balloon with a small amount of baking soda. Twist the balloon so the baking soda will not escape while placing the mouth of the balloon on the top of the soda bottle. Make sure the balloon is tightly covering the mouth of the bottle before untwisting it and releasing the baking soda into the vinegar.

#6: Melt an ice cube. (physical change)