

PHYSICAL OR CHEMICAL? (MODIFIED FOR ADEED)



Science Concept:

Solids and liquids can change physically and chemically.

Objectives:

The student will:

- identify whether a solid and/or liquid is changed physically or chemically;
- infer and describe physical and chemical changes; and
- create an illustrated diagram of a physical or chemical change.

GLEs Addressed:

Science

- [5] SB3.1 The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by identifying physical and chemical changes based on observable characteristics (e.g., tearing paper vs. burning paper).
- [5] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Math

- [5] S&P-1 The student demonstrates an ability to classify and organize data by [designing an investigation and collecting L], organizing, or displaying, using appropriate scale, data in real-world problems (e.g., social studies, friends, or school), using bar graphs, tables, charts, diagrams, or line graphs with whole numbers up to 50 (M6.2.1 & M6.2.2).

Vocabulary:

chemical change – a change in the arrangement of the atoms or molecules of two or more substances that come into contact with each other; this rearrangement causes one or more new substances to come into being

physical change – a change in physical properties which include: texture, shape, size, color, odor, volume, mass, weight, and density

matter – something that occupies space, has mass, and exists as a solid, liquid, or gas

Materials:

- Baking Soda (one box)
- Salt (one 26 oz. package)
- Sugar (one 5-pound bag)
- Cornstarch (one 1-pound box)
- Plaster of Paris (one 1-pound package)
- Containers to hold powders without identifying them (five)
- Iodine (one 16-ounce bottle)
- Vinegar (one small bottle)
- Water source
- Eyedroppers (one per student group)
- Spoons or scoops (ten)
- Transparent cups or beakers for holding liquids (one per student group)
- Aluminum foil or pie plates (one 6-inch x6-inch square per student group, plus extra)
- Sticky notes or blank pieces of paper (eight)
- Safety goggles (one per student)
- Science journal (one per student)

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Activity Preparation:

1. Cut aluminum foil into 6-inch x 6-inch rectangles for holding various solids.
2. Put baking soda, salt, sugar, cornstarch, and Plaster of Paris into separate containers. Pour iodine, vinegar, and water into separate cups. Label solids A-E and liquids 1-3 with sticky notes.
3. Place a scoop of baking soda onto a piece of aluminum foil.
4. Fill a transparent cup half full of water.
5. Write directions and display for students to refer to.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: *observing, describing, and inferring*

Teacher Note: Do not tell the students which solids and liquids are on the foil and in the cups. Explain solids and liquids can physically and chemically change. Tell students to observe how this can be done.

1. Add a spoon of sugar to the cup half full of water then stir until sugar granules are no longer visible. (This is a physical change.) Ask the students what they think happened to the solid. Have students describe what they observed and record answers on the board marking each response with students' initials.

With the scoop of baking soda on a piece of tin foil, fill an eyedropper with vinegar and squeeze the vinegar onto the baking soda. The baking soda should fizz and bubble. (This is a chemical change.) Ask the students why they think the solid and liquid reacted that way. What is the difference between physical and chemical change? Again, record observations on the board, initialing each observation.

Explore

Process Skills: *predicting, observing, describing, inferring, and communicating*

2. Divide students into groups of two to four, depending on class size. Hand out a pair of safety goggles to each student. Ask groups to select one solid and place a scoop on a piece of foil. Students should then choose either an eyedropper or a cup to fill with their liquid of choice. Students should record in their science journal which solid and liquid their group chose, then make a prediction about what will happen when the solid and liquid combine and then record the prediction.
3. Student groups should combine the materials and observe what happens. Students should record what they observe in their science journals. Students should discuss with their group whether the change was physical or chemical and why.
4. Students should now explore other combinations of solids and liquids and record further explorations and findings in their science journals.

Generalize

Process Skills: *describing, making generalizations, and inferring*

5. After clean-up, discuss the following questions as a class:
 - a. What happens when baking soda and vinegar are combined? How do we know it is a chemical change?
 - b. What happens when sugar and water are combined? How do we know it is a physical change?
 - c. What do you think would happen if the liquid evaporated?
 - d. How could the solid return to the way it looked before the liquid was applied?
 - e. How could a matter experience both a physical and chemical change?
 - f. What kind of change would you have if you mixed two solids together? Why?
 - g. What kind of change would you have if you mixed two liquids together? Why?

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Apply

Process Skills: describing, making generalizations, and inferring

6. Remind students that baking a cake involves both physical and chemical changes. Ask students to write a paragraph in their science journal that describes the changes that occur as a cake is being made.

Source:

Editors of the American heritage dictionaries, (2009). *The American heritage student science dictionary*.
Wilmington, MA: Houghton Mifflin Co.

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RUBRIC

Assessment Task

Based on knowledge of physical and chemical changes, students are to create an illustrated diagram with at least one vocabulary label and one naming label that demonstrates at least one of the following examples of change: burning logs in the fireplace, an iron pipe that has rusted, a steel wool pad that becomes wet, chocolate milk, water freezing to ice, milk that has become curdled, or a birthday candle that has melted. Students must identify how the matter was changed physically or chemically and infer and describe how that change occurred.

Rubric

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student identifies whether a solid and/or liquid is changed physically or chemically.	[5] SB3.1	The student does not attempt, or does not correctly identify whether a solid and/or liquid is changed physically or chemically.	The student identifies whether a solid and/or liquid is changed physically or chemically.	The student identifies two or more ways a solid and/or liquid is changed physically or chemically.
The student infers and describes physical and chemical changes.	[5] SA1.1	The student does not attempt, or makes an inference about a physical or chemical change or describes a physical or chemical change.	The student infers and describes how the physical or chemical change occurred.	The student infers and describes two or more ways a physical and/or chemical change occurred.
The student creates an illustrated diagram of a physical or chemical change.	[5] S&P-1	The student does not attempt, or creates an illustration with an incorrect diagram; illustration does not include a vocabulary word and/or omits label.	The student creates an illustrated diagram, with one vocabulary and one naming label of a physical or chemical change.	The student creates an illustrated diagram with two or more vocabulary and naming labels of more than one physical or chemical change and includes correct spelling and punctuation.

