

Lesson 24

Introduction

National Standards

Focus: B1

Related: A1, A2, B2, E1, E2

Category

Physical Science

Focus

Changes in Matter

Objective

To explore how matter changes from one state to another

Overview

Read the overview aloud to your students. The goal is to create an atmosphere of curiosity and inquiry.

Say: *“The three most common states of matter on Earth are solid, liquid, and gas. Chemical or physical forces can sometimes cause matter to change from one state to another.”*

Build A Ball

Lesson 24



FOCUS Changes in Matter

OBJECTIVE To explore how matter changes from one state to another.

OVERVIEW The three most common states of matter on Earth are solid, liquid, and gas. Chemical or physical forces can sometimes cause matter to change from one state to another.

WHAT TO DO

With your team, carefully follow each step below.



Observe

Look at the water. Look at the powder. Look at the mold. Think about the three most common states of matter (solid, liquid, gas). Which state describes each item?



Describe

Describe the water and the powder. What does each one look like? What does each one feel like? What color is each one? What shape is each one?



Discuss

What state of matter best describes powder? *solid*
What state of matter best describes water? *liquid*
What state of matter best describes air? *gas*

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Additional Notes

To introduce this lesson, give each student one piece of crunchy cereal (like Life® or Mini-Wheats®). Tell students to place the cereal on a napkin, then use their thumb to crush it into crumbles.

Explain that their thumb provided the **force** to change the cereal from one large piece into many tiny

pieces. The force caused matter in the cereal to change forms. But some kinds of force not only cause matter to change forms, but also its “state” (solid, liquid, or gas).

Say, *“In this lesson we’ll discover some ways that chemical and physical forces can change matter from one state into another.”*

Engage - Day 1

What To Do

Once students are seated in “research teams” with materials in front of them, read the first section (OBSERVE) aloud.

Say, “*To start this lesson, we’re going to **observe** some things. Good scientists always carefully examine the things they will be working with before beginning. First, I will read the instructions to you. Then you can follow the instructions as you **observe** the items in front of you.*”

Monitor teams closely as they follow instructions. When teams are finished with this section, repeat the process with the DESCRIBE section. Conclude with the DISCUSS section.

Options

Expand the DISCUSS section by having students trace dotted “key words” using crayons or markers. Trace the word **solid** in brown, the word **liquid** in blue, and the word **gas** in green.

Build-A-Ball Lesson 24



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Discuss

What state of matter best describes powder? **solid**
What state of matter best describes water? **liquid**
What state of matter best describes air? **gas**

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Teacher to Teacher

Solid, liquid, and gas are the three most common states of matter on Earth. For students this age, that’s a significant concept to master.

But don’t forget there’s more to the story. When it comes to the universe, *plasma* is the most common state of matter. (That’s what stars are made from.)

And advanced physics research continues to find new states of matter. Bose-Einstein Condensate (the “5th” state of matter) was discovered in 1996. Then in 2004, a related form called “Fermionic Condensate” was proven.

Who knows what other exciting discoveries lie ahead?



READ THE STORY

Matter comes in different states (solid, liquid, gas). But sometimes matter can change from one state to another. Read the story below to find out more.

Changes in Matter

Matter may change from one state into another.

A solid may turn into a liquid. A liquid may turn into a gas. Such changes in matter happen all the time. Common changes result from chemical or physical forces.



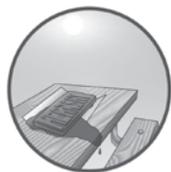
This is a chemical change.

A chemical may change matter.

Adding a chemical to a substance, or mixing chemicals together often causes matter to change states.

Mixing can create a chemical change.

Mixing an antacid with water creates carbon dioxide. Some of the solid and liquid matter changes into gas.



This is a physical change.

A physical action may change matter.

There are many kinds of physical change, like cutting, melting, freezing, or boiling. They can make matter change states.

Melting can create a physical change.

Heating makes chocolate melt. Many items melt if they get hot enough. Melting can change matter from solid to liquid.



Changes happen all the time.

Changes in matter can be natural.

Unprotected iron rusts over time (chemical change). Cold weather can turn liquid water to solid ice (physical change).

Changes in matter can also be man-made.

Scientists combine chemicals and other ingredients to create many useful items — from plastic spoons to airplane parts!

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Inform - Day 2

Read The Story

Read the story aloud with your students. (See READING LEVELS on page 12.) After reading, monitor teams as they discuss what was read. Once you feel students have mastered the basic concepts, have them answer the comprehension questions (**What I Learned - part 1**) on the next page.

To introduce the story, say:

“The title of this story is ‘Changes in Matter.’ Look at your story and follow along as we read it together.”

If you wish, encourage Emergent readers to point to words and pictures as you read.

Note: This story is similar to the **Bicarb Balloon** lesson since both deal with chemical and physical forces. To expand student understanding, however, the examples used in each section are different.

What I Learned (part 1)

These are basic fact-based comprehension questions. Student answers will vary, but suggested responses include:

- ① chemical; physical
- ② answers will vary, but should include descriptions of common solids, liquids, and gases.
- ③ a) liquid

Field Trip

Visit a bakery. Encourage your guide to talk about the chemical and physical changes taking place to make bread.

Guest Speaker

Invite a chemistry teacher from a local college to visit your class. Ask him/her to demonstrate some simple chemical changes.

Extended Teaching

1. To expand vocabulary, discuss synonyms. For instance, the word “state” in this context refers to “form” — not to a geographic region like the state of Texas!
2. Students may have trouble seeing that powder is solid. Like liquids, many powders can be “poured” and take the shape of a container. But powders are made of tiny solid pieces. To demonstrate, have students pour a little salt on black construction paper, then look closely at the grains. Repeat using a little water. Then point out that water does not separate into solid pieces.
3. Share expanded ideas about the states of matter from the **Teacher to Teacher** section at left.
4. Help students make “States of Matter” Jell-O®. Point out that the powder is a solid; the steam from the boiling water is a gas; mixing the powder with water creates a liquid; and finally cooling the gel creates a solid again. Eat and enjoy!

Expand - Day 3

Materials Needed*

ball mold ball powder
paper cup water

Safety Concerns

3. Poison Hazard

Keep the powder out of mouths and away from faces and eyes.

4. Slipping

There is a potential for spilled liquids. Remind students to exercise caution.

Do the Activity

Read the activity in advance so you understand it thoroughly. (If time allows, try it yourself.) Before students begin, carefully go over the **Safety Concerns** together.

Pass out materials, then have your students follow along as you read the instructions for **Step 1**. Monitor teams closely as they complete this step.

Once teams have completed **Step 1**, read instructions for **Step 2**. Monitor teams as before. Repeat for **Step 3** and **Step 4**.

After the activity, allow time for each team to share their observations. To promote higher-level thinking, encourage teams to not only share their observations with each other, but also with other teams.

Special Instructions

Step 1 - Some teams may have difficulty snapping the mold together. Assist as needed. A tart pan or paper towel can catch spills as powder is poured. Snipping a corner off the bag creates a great make-shift funnel.

Step 3 - Be sure students roll the ball around in their hands to smooth the surface. The ball will eventually dry out, but keeping it in an airtight bag will prolong its life.

Other - The kit has two bags of powder. This is usually enough for two balls. Students may also mix colors if desired. Wash the mold between uses or it will get sticky and will no longer work.

* *Bold-faced items supplied in kit.*



DO THE ACTIVITY

Working with your research team, carefully follow each step below. Before you start, be sure you know the safety rules for this activity.



STEP 1
Snap together the ball mold. Pour the powder carefully into the mold, tapping gently so the mold is completely filled. Now fill a cup with water.



STEP 2
Place the mold in the cup. Hold the mold completely under the water for one minute. Remove the mold from the water and let it stand for three minutes.



STEP 3
Open the mold and remove the ball. Roll it between your hands to smooth it. Bounce it a few times. Make sure everyone gets a turn to examine the ball.



STEP 4
Review Steps 1 and 2. Discuss which states of matter were present. Now compare your observations with those of other research teams.

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What Happened?

Immediately following the activity, help your students understand what they observed.

Say: *“In this activity you were able to observe matter changing from one state to another.”*

In Steps 1 and 2 you combined two different states of matter — a liquid and a solid.

In Step 3 you opened the mold and saw that the two states of matter had combined to create one state — a solid in the shape of a ball.

In Step 4 you shared and compared your observations with those of other research teams. You also compared the size, shape, and color of the balls that you created.”

NAME _____



SHOW WHAT YOU KNOW - 1

Circle any physical change in red. Circle any chemical change in blue. Write the word that best describes the change on the lines below.



These changes are

physical



These changes are

chemical

To the Parent . . .

Scripture Connection: 1 Corinthians 15:52

Lesson Focus:
Changes in Matter

Lesson Objective:
To explore how matter changes from one state to another

National Science Education Standards:
Standard B1 — "All students should understand that materials have observable (and measurable) properties . . . Materials exist in different states . . . some materials can be changed from one state to another . . ."

Follow-up Questions:
Ask your child to name the three most common states of matter (solid, liquid, gas).
Ask your child to describe at least one chemical change in matter (solid antacid tablet turning to gas, iron rusting, etc.).
Ask your child to describe at least one physical change in matter (freezing or boiling water, cutting paper, etc.).

Expand - Day 4

Begin **Day 4** with a review of **Day 3**, then have students answer "part 2" questions.

What I Learned (part 2)

These are higher-level cognitive questions (explain, compare, predict). Student answers will vary, but suggested responses may include:

- ① solid, liquid (Some students may add gas if they noticed air bubbles in Step 2.)
- ② a) both solids, same color b) powder was loose and shifting; ball was harder and stayed together
- ③ a) the "ball" would be square b) the combined water and powder takes the shape of the mold

Assess - Day 5

Suggestions for modifying assessments to reflect reading levels can be found under **ASSESSMENT METHODS** on page 12.

Food For Thought

A related "Scripture Object Lesson" you can share with your students

1 Corinthians 15:52

If the powder and water in this lesson had stayed separate, then they never would have changed. But by coming together, they quickly turned into something new — a fun bouncing ball!

Christians are like that. When we join with Jesus, we become a brand-new person inside.

But this text promises us

an even bigger change! One day everyone who believes in God will be changed from an earthly body to a heavenly one. In our brand-new bodies, we will never again have to worry about sickness, pain, or death.

And best of all, we will live forever with God, sharing in the wonders of this amazing universe He has created.

Show What You Know 1

(general assessment in Student Worktext)

1) physical 2) chemical Also, the top three illustrations should be circled in red; the bottom three illustrations in blue

Show What You Know 2

Answer key (optional Fluent Reader test):

- 1) chemical 2) chemical 3) physical
- 4) physical 5) chemical

To The Parent

Included at the bottom of all assessment tests, "To The Parent" provides a great way to solicit parent involvement. It not only gives parents an overview of the lesson, but also provides follow-up questions for home use.



Show What You Know 2

Read each sentence below. If it describes a chemical change, circle the word **chemical**. If it describes a physical change, circle the word **physical**.

chemical physical 1. An old iron fence is rusting away.

chemical physical 2. An antacid is dissolving in a cup of water.

chemical physical 3. Cold weather changes rain to snow.

chemical physical 4. A knife is chopping an onion into pieces.

chemical physical 5. A scientist combines liquids to make plastic.

To the Parent . . .

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National Science Education Standards:

Standard B1 — “All students should understand that materials have observable (and measurable) properties . . . Materials exist in different states . . . some materials can be changed from one state to another . . .”

Follow-up Questions:

Ask your child to name the three most common states of matter (solid, liquid, gas).

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