

CHAPTER 1

About Matter

Chapter Objectives

- Evaluate what matter is and the worldviews related to matter.
- Evaluate means of measuring matter.
- Analyze the physical properties of matter.
- Apply the inquiry skills of *measure*; *collect*; *record*; and *interpret data*; *communicate*; *observe*; *classify*; and *infer* to the concept of matter.
- Apply the engineering design process to solve a real-life problem related to the density of matter.

Where did all matter come from?

Lesson 1 Objectives

- 1.1 Infer from key text features the topics for *SCIENCE 5*.
- 1.2 Identify what matter is.
- 1.3 Relate matter and mass.
- 1.4 Explain why it is beneficial to know how matter works. **BWS**
- 1.5 Differentiate worldviews regarding the origin of matter. **BWS**

Biblical Worldview Shaping

Importance of Humans (explain): Understanding how creation works enables people to help one another. (1.4)

History of Nature (evaluate): A naturalistic worldview requires opposition to the Bible on nearly every subject. (1.5)

Printed Resources

- Instructional Aid 1.1: Anticipation Guide: About Matter
- Activity: Answers in Genesis: Seeing the Invisible, pp. 7–8

Digital Resource

- Video: About Matter

Materials

- 1 chocolate candy, 1 pretzel, and 1 sour gummy candy in a resealable snack-sized plastic bag, per student
- 14 sticky notes



CHAPTER 1

- 3 paper bags; 3 resealable plastic bags; 1 wooden block; water

Preparation

- Copy or print Instructional Aid 1.1: Anticipation Guide, per student.
- Prepare the vocabulary sticky notes. See the clarifying note on page 6.
- Label each paper bag with a number (1–3). Place a wooden block in one plastic bag, fill another with water, and blow air into the third. Seal the bags. Place one plastic bag into each of the three paper bags. Leave the top of the three paper bags open. Place the paper bags around the room.

Allergies: Check the students' food allergy information and adjust materials as needed.

ENGAGE

Unit Introduction

Use the **teaching notes** on pages 2–3 to introduce Unit 1.

Chapter Introduction

Direct the students to complete the Before Reading portion of the *Anticipation Guide: About Matter* to **preassess** the students' knowledge of the chapter topic.

Explain that the After Reading portion of the anticipation guide will be completed in Lessons 4–5 after the students have read the chapter.



About Matter

Your neighbor broke her ankle recently. Wanting to be helpful, you and your family have been doing yard work and running errands for her. Today you decided to encourage your neighbor by making her brownies. You need to melt some chocolate for the frosting.

How will you melt the chocolate? You will need different kinds of matter to help you with this task. You will need bits of chocolate, a pan to hold the chocolate, and a spatula to stir it. You will also need a stove to heat the pan that is holding the chocolate bits. But what if all kinds of matter melted at the same temperature? How would that change things for you? The pan, spatula, and chocolate would all melt at the same time. This type of problem would be unending. Learning about matter and how it works is important so that you will know how to use matter to serve others.



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Anticipation Guide: An anticipation guide is used to stir student interest in and curiosity about a topic. Before reading the chapter, the students mark the Before Reading column on the anticipation guide. After reading the chapter, the students mark the After Reading column, compare their answers with what they have read, and reflect on what they have learned.

Play the *About Matter* video to introduce the chapter and provide the students with an overview of the topics covered in this chapter.

PowerPoint Presentation: Each text lesson has an editable PowerPoint presentation for your use.

Chapter Photo

Conduct a **visual analysis** of the picture on pages 4–5 to generate interest in the chapter.

How does this picture relate to the title of the chapter? Possible answer: Everything in the picture is made of matter.

Chapter Photo

The photo is of two sisters preparing batter for baking.

Lesson Introduction

Conduct a **taste test** to generate interest in the topic of matter.

Distribute one prepared snack-sized plastic bag to each student. Direct the students

to taste each of the items, one at a time. Discuss the taste of each item as it is tasted (chocolate candy—sweet; pretzel—salty; sour gummy candy—sour).

Guide a **discussion** of the food items to help the students understand that each item is made of matter and that not all matter is the same.

What would happen if the

... sugar was left out of the chocolate candy recipe?

... salt was left off the pretzel?

... sour flavoring was left off the gummy candy?

How would changing one ingredient cause the food item to taste?

Use **direct instruction** to point out that in this lesson the students will understand why it is important to learn about matter and how it works.

INSTRUCT

Chapter Opener

Reading Skills: Reading for information is an important skill. Reading to “find out” (or “find where”) helps motivate reading and focuses the students’ attention. The students should look for the answer as they read silently.

Direct the students to **read silently** page 5 to find out why learning about matter is important.

Guide a **discussion** to find out why understanding how matter works is beneficial.

In this story, what are some ways you and your family are helping your neighbor? Possible answers: doing yard work, running errands, baking brownies

What is one thing you need to do to make the frosting? melt chocolate

What are some kinds of matter you will need to melt the chocolate? chocolate bits, pan, spatula, stove

Continue the **discussion** to allow the students to share what they think would happen if all kinds of matter melted at the same temperature.

Why do you think it is important to learn about matter and how it works? Possible answer: to know how to use matter to serve others

Essential Question

Guide a **discussion** of the essential question to generate interest in the lesson topic. Explain that the students will find the answer to the essential question as they read the lesson.

Vocabulary

Engage the students in a **sticky note matching game** to identify vocabulary terms the students are familiar with.

Sticky Note Matching Game: Before class, write each vocabulary term on a sticky note and the definition on a separate note. Stick the terms to one wall and the definitions to the opposite wall. After students arrive, divide them into two teams. Instruct the first team to select a term off the wall and stick it to the definition on the other wall. If the term and definition match, award a point. If the term and definition do not match, allow the other team the opportunity to match the term with the correct definition. Continue alternating teams until all words have been matched up.

Reading the Lesson

Direct the students to **read silently** pages 6–8 to find out what people with different worldviews believe regarding the origin of matter.

Matter

Guide a **discussion** to help the students understand what matter is and how matter and mass are related.

What is matter? *anything that has mass and takes up space*

Where can we find matter? *Matter is everything around us that can be observed.*

What is another term for matter? *substance*

What is mass? *the measure of the amount of matter in an object*

Guide a **visual analysis** of the photo to identify examples of matter.

What examples of matter can you observe in the photo? *Possible answers: people, stars, grass, fire, trees, mountains*

Is there anything around you that you can observe that is not matter? *No, matter is everything around me that can be observed.*



ESSENTIAL QUESTION:
Where did all matter come from?

VOCABULARY

- matter
- substance
- mass
- worldview
- biblical worldview
- naturalistic worldview
- big bang

Matter

Matter is anything that has mass and takes up space. In other words, matter is everything around you that can be observed. Sometimes we use the term *substance* to refer to matter. **Mass** is the measure of the amount of matter in an object. You take up space, and you have mass. You are made of matter. The food you eat, the clothes you wear, and the stars you see at night are all made of matter. They all take up space, and they all have mass.

It is beneficial to know how matter works. You used your understanding of matter to make brownies for your neighbor. You used ingredients and utensils to make your brownies. You used all the correct ingredients—you did not leave anything out. You also baked the brownies at the correct temperature. If you had not, the brownies may not have tasted good. Although the objects you used to make the brownies are different in many ways, they are alike in at least one way. Each one is made up of matter. But where did all matter come from?

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Continue the discussion to help the students understand why it is beneficial to know how matter works.

Why is it important to know how to use matter to make the brownies and frosting? *Possible answers: It is important to learn about matter and how it works to know how to use it to serve others. If an ingredient is left out of the frosting or brownies, they may not taste good. If the brownies are not baked at the correct temperature, they may not taste good.*

How are the objects that are used to make brownies (chocolate bits, pan, spatula, and stove) alike? *They are all matter.*

Origin of Matter

Biblical Worldview

A *worldview* is the way a person thinks about and understands the world. It comes from the story a person believes, and it guides how a person lives. A **biblical worldview** is a worldview that comes from the belief that the story of the Bible is true. The Bible shapes the way a person with a biblical worldview thinks, believes, and lives. People with a biblical worldview believe God created all matter a few thousand years ago. Creation is recorded in Genesis 1 and 2. God created the matter that makes up all living and nonliving things. He created the matter that makes up plants and animals and people. He created the matter that makes up air, water, and rocks. The Bible tells us that without God, nothing would exist (Colossians 1:16–17).



Biblical Worldview

Guide a **discussion** to help the students understand what a biblical worldview teaches about where all matter came from.

What is a worldview? *the way a person thinks about and understands the world*

Where does a worldview come from? *It comes from the story a person believes.*

How does a worldview affect a person? *It guides how a person lives.*

To help the students understand how the story a person believes can affect the way a person thinks about and understands the world, use the following illustration. Explain that some people believe the story of the Loch Ness Monster in the Scottish Highlands. They believe the monster is real and spend a lot of time and money trying to find it. Their faith in the story is more important than everything else. It affects their choices and behavior.

What is a biblical worldview? *a worldview that comes from the belief that the story of the Bible is true*

Point out that, unlike believing the story of the Loch Ness Monster, believing the true story of the Bible is the most important thing a person can do.

How do we know the story of the Bible is true? *Possible answers: The Bible is the Word of God. The Bible is true because God cannot lie.*

How does believing the Bible affect a person? *God has given us the Bible so we can know Him and the truth about His world. The Bible shapes the way a person thinks, believes, and lives.*

What does a person with a biblical worldview believe about the origin of matter? *God created all matter a few thousand years ago (Genesis 1–2). Without God, nothing would exist (Colossians 1:16–17).*

Guide a **visual analysis** of the Creation image to review with the students that all matter was created by God.

Although they are not visible, include a discussion of the gases that make up the atmosphere.

Naturalistic Worldview

Continue the **discussion** to explain what a naturalist believes about the origin of matter and why this view cannot be true.

What is a naturalistic worldview? a worldview that comes from the belief that Earth and space came into existence by natural processes

What do people with a naturalistic worldview think about nature and natural processes? They believe that nature is all there is. They think that natural processes can explain everything.

What do people with a naturalistic worldview think about the origin of matter?

They think the origin of matter is the result of natural processes.

What event do most naturalists believe was the start of everything in the universe? the big bang

What can a naturalist not explain? where the original matter came from that was condensed into a tiny point that then rapidly expanded; where the original matter came from that a naturalist believes was part of the big bang

Point out that while naturalists believe everything came into existence by natural processes, they cannot explain where the natural processes came from.

How do people with a biblical worldview know that a naturalistic view of the origin of matter cannot be true? The naturalistic view does not agree with what God says in the Bible.

Quote

Ask a volunteer to **read aloud** the Answers in Genesis quote to strengthen the students' understanding of the biblical view of the origin of matter.

Using the quote and text, contrast God's creation of matter with the naturalistic view of the origin of matter.

How did God create all matter? "out of nothing in six literal normal-length days"

Poll the class to find out how many students have ever made something out of nothing. Point out that only God can create matter from nothing.



Naturalistic Worldview

A **naturalistic worldview** is a worldview that comes from the belief that Earth and space came into existence by natural processes. People with a naturalistic worldview believe that nature is all there is. The Bible does not shape the way they think, believe, or live. They think natural processes can explain everything because they do not believe in God. They believe the origin of the earth and space is the result of these natural processes. Most naturalists believe the matter you see is the result of an event called the big bang. They think the **big bang** happened about 14 billion years ago and was the start of everything in the universe. All the matter in the universe was condensed into one tiny point. The matter then rapidly expanded. A naturalist cannot explain where the original matter came from. This view of the origin of matter does not agree with what God says in the Bible.

"The Creator did not need matter, large amounts of time, energy, or anything else. He created out of nothing in six literal normal-length days. . . ."
—Answers in Genesis, "Creation"

1. How are matter and mass related?
2. Why is it good to know how matter works?
3. According to the biblical worldview, what is the origin of all matter?
4. According to the naturalistic worldview, what is the origin of all matter?

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1. Matter is anything that has mass. Mass is the measure of the amount of matter in an object.
2. Possible answer: People will know how to use matter to help or serve others.
3. God created all matter (Genesis 1-2).
4. Matter is the result of the big bang. Matter came into existence without God.

Seeing the Invisible

Identify what is in each bag as solid, liquid, or gas.

Bag 1 _____ Bag 2 _____ Bag 3 _____

If you look around the room, you will see many things. All these things are made up of matter. You can touch them, measure them, and throw them. You can determine what their colors are.

But scientific study by measurement and observation can answer only certain kinds of questions. One question it cannot answer is where matter came from in the first place. A different source is needed to discover the truth about the beginning of matter.

Read Hebrews 11:1–3. Answer the questions.

- According to verse 3, where did the world come from?
It came from the word of God. He made it from nothing (not from visible things).
- According to verse 1, what is the only way for an individual to relate to something that is invisible (not seen) or still in the future (hoped for)?
by faith; by believing
- What is the only way to know where matter came from in the first place?
by faith; by believing in the Bible

There are other places in Scripture that also talk about how God created matter.

- Read John 1:1–5. Who is the “Word” and the “him” who created all things? (Hint: Look at verse 14 if you need help.)
This is a reference to Jesus. Jesus is the Word.
- Look at John 1:1–2. What verse in the Old Testament is being referred to in these verses? (Hint: Look at the first three words of verse 1.)
The first three words of verse 1 are a reference to Genesis 1:1. Jesus, as a member of the Trinity, was present at Creation with the Father and the Holy Spirit.



For more information about Genesis in Genesis, please go to www.answersingenesis.org, www.creationmuseum.org, and www.ahar.com/genesis.

Answers in Genesis: Seeing the Invisible

Mystery Bag Activity: A mystery bag activity helps develop the students' senses as well as their curiosity about unknown objects related to a topic.

Guide completion of **Activities** pages 7–8 to expand the students' understanding of the origin of matter.

Use the three paper bags to lead the students in a **mystery bag** activity to determine what is in each bag.

Instruct the students to walk by each paper bag and to reach in without looking into the bag. Explain that they are to determine what each plastic bag, located inside each paper bag, contains: a solid, a liquid, or a gas.

Direct the students to record their observations on **Activities** page 7.

After they have recorded their observations, discuss the answers.

What state of matter was in Bag 1? Bag 2? Bag 3? solid, liquid, gas (order may vary)

How did you know what was in the bags? Elicit that the students' hands were acting like scientific instruments to gather data. Because of the sense of touch, the students were able to draw a conclusion about the state of matter in each bag.

Ask volunteers to read aloud the Scripture passages. After each passage is read, guide the students in answering the questions.

Continue with the **Activities** pages to contrast the biblical view of the origin of matter with the naturalistic view.

Ask a volunteer to read aloud the paragraphs at the top of the page.

Direct attention to the lenses on each pair of glasses.

How are the naturalistic lenses different from the biblical lenses? The naturalistic lenses are clouded. The naturalistic lenses are not clear. The biblical lenses are clear.

What are the glasses “looking” at? a fossil

Point out that people who look through the naturalistic lenses of materialism put their faith in their ability to make sense of the world through only what they observe and measure, such as matter and energy. Explain that materialism is a clouded view because it is wrongly based on the belief that studying the physical world can explain everything.

How do Christians, people with a biblical worldview, understand the world around them? Christians place their faith in God and what He has clearly revealed in the Bible. From that starting point, they use science to understand the world around them.

How do materialists, people with a naturalistic worldview, understand the world around them? Materialists place their faith in their own abilities and in science to understand the world.

What are both worldviews based on? faith

Emphasize that Christians put their faith in God and not in their own understanding.

Explain that the Bible teaches us how God created the universe. If we believe what God tells us in His Word, we will better understand His creation. The Bible also helps us understand that most fossils formed as a result of the Flood a few thousand years ago and not over hundreds of millions of years.

Discuss the statement in number 6 and guide the students in answering it.

Read aloud the last paragraph and guide any discussions that arise from this lesson.

Fossils and Dinosaurs: Chapter 8 will discuss fossils and dinosaurs in greater detail.

Some people are called *materialists*. Materialists have a naturalistic worldview. They reject the Bible. They believe that only matter and energy exist. Materialists do not look at the world through faith in God—through biblical glasses. They look at the world through faith in materialism—through naturalistic glasses.

Christians place their faith in God and what He has revealed in the Bible. Their faith helps them understand the world around them. Materialists place their faith in their own abilities and in science to understand the world. Both worldviews are based on faith. But Christians put their faith in God and not in their own understanding (Proverbs 3:5–6).



6. Respond to this statement: “You should follow the Bible’s teaching about being kind and loving. But you should not believe what it says about science and history.”
This statement demonstrates faith in science but not in what God has said. The statement fails to accept that the Bible is God’s Word, which means all of it is true. God’s Word tells me about being kind and loving, and it also tells me where everything came from. If I do not take the Bible seriously about where everything came from, why would I take it seriously about being kind and loving?

I How do you see the world? Are you putting your faith in the God who says He created everything out of nothing? Or are you putting your faith in what scientists say? You must accept by faith that Jesus is the Creator. You must also accept by faith that Jesus took on flesh to save people from their sins. Unless you accept these truths by faith, nothing in science really matters.

For more information about Answers in Genesis, please go to www.answersingenesis.org, www.creationmuseum.org, and www.arnold.com.

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Worldview Expansion

Explaining the Gospel: Many lessons in *Science 5*, as well as the Answers in Genesis Activities pages, present the gospel. One of the greatest desires of Christian teachers is to lead children to faith in the Savior. Relying on the Holy Spirit, take advantage of the opportunities that arise for presenting the good news of Jesus Christ. You may find the outline Explaining the Gospel, located at the end of this book, helpful.

Answers in Genesis Activities Pages: These Worldview Expansion pages, found in some chapters, will help the students look at a relevant topic by using the Bible as “glasses” to understand the world.

Links: Additional online materials related to Answers in Genesis are available as links.

APPLY

Answers in Genesis: Seeing the Invisible

Activities pages 7–8 were completed during the lesson to expand the students’ biblical worldview.

ESSENTIAL QUESTION: How can you measure the volume of something that is round?

Measurements of Matter

There are different ways to measure matter. Volume and mass are characteristics of matter that we often measure.

Volume of a Liquid

The **volume** of a substance is the amount of space that the substance takes up. The standard unit of metric measurement for the volume of a liquid is the liter (L). Many soft drinks come in two-liter bottles. A smaller unit for the volume of a liquid is the milliliter (mL). Liquid medicine often uses this unit. A teaspoon of medicine is about 5 mL.

The volume of a liquid is measured with a graduated container. Graduated means that the container is divided into equally marked parts. A graduated container has the units of measurement marked on its side. You can pour a liquid into the container.

Then you can compare the level of the liquid with the numbers on the side of the container. The numbers show the volume of the liquid. Scientists use containers called graduated cylinders.

A beaker and the measuring cup in a kitchen are also types of graduated containers.

VOCABULARY

- volume
- water displacement
- weight
- density

graduated cylinder

What is the volume of the liquid in the graduated cylinder?

beaker

measuring cup



TRY it Yourself

Make a Graduated Container

Gather a clear plastic cup, a smaller container that is at least one-fourth the size of the cup, and a marker. Fill the small container with water. Pour the water into the cup. Mark the top of the water level with the marker. Repeat until

the cup is full of water. The cup now has even markings, or graduations. It is a graduated container. If the smaller container is not already a standard unit of measure, you may want to think of a name for this new unit.

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How can you measure the volume of something that is round?

Lesson 2 Objectives

- 2.1 Identify what volume, mass, and density are.
- 2.2 Identify the scientific instruments used to measure volume and mass.
- 2.3 Explain how to determine the volume of a liquid and the volume of a solid.
- 2.4 Relate density to matter.

Printed Resources

- Instructional Aid 1.2: Comparing Densities
- Activity: Study Guide, pp. 9–11
- Assessment: Quiz 1A

Digital Resources

- Video: Density of Ice
- Link: Triple-Beam Balance

Materials

- cube-shaped wooden block
- centimeter ruler

Preparation

- For the Exploration in Lesson 3, room-temperature water is needed. Fill a container with tap water and allow it to sit overnight.

ENGAGE

Review

Direct a **Pair-Share** to encourage student pairs to verbally review and share the definitions of matter and mass.

INSTRUCT

Essential Question

Ask a volunteer to **read aloud** the essential question to generate interest in the lesson topic. Explain that the students will find the answer to the question as they read the lesson.

Vocabulary

Poll the class by using a **thumbs-up, thumbs-down** activity to identify the vocabulary terms the students are and are not familiar with.

Reading the Lesson

Direct the students to **read silently** pages 9–14 to find out different ways matter can be measured.

Volume of a Liquid

Guide a **discussion** to help the students understand how to measure the volume of a liquid.

What are the two characteristics of matter?
It has mass, and it takes up space.

What is mass? the measure of the amount of matter in an object

What is volume? the amount of space that matter, or the substance, takes up

Remind the students that mass and volume are characteristics of matter that are often measured.

What are the metric measurements for the volume of a liquid? liter (L); milliliter (mL)

What instrument is used to measure the volume of a liquid? Possible answers: a graduated container, a graduated cylinder

What makes a container “graduated”?
The container is divided into equally marked parts.

What are some examples of graduated containers? Possible answers: measuring cups, graduated cylinders, beakers

Guide a **visual analysis** of the images of the graduated containers to review the types.