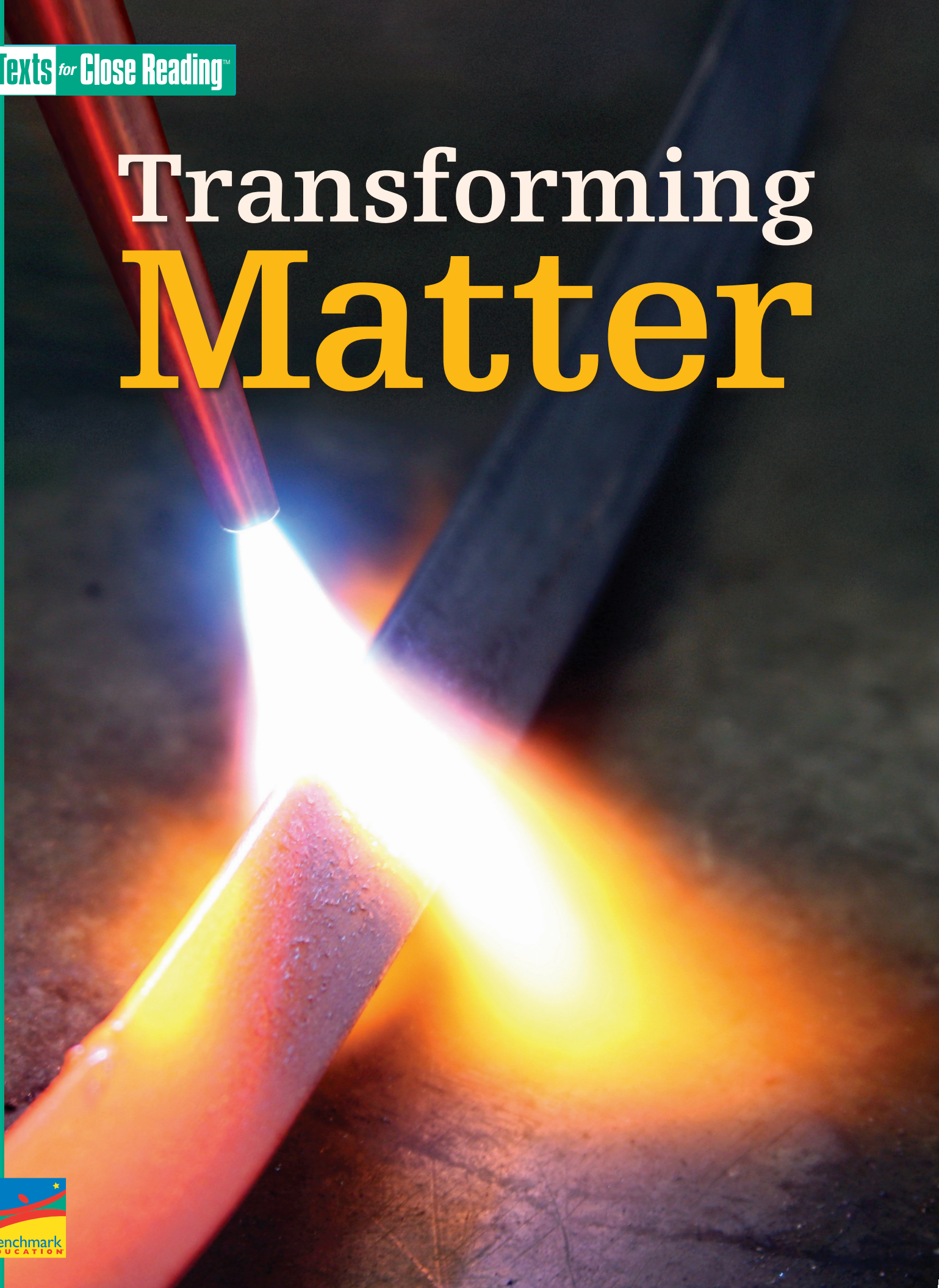
Texts for Close Reading™

Transforming Matter



Benchmark EDUCATION

Transforming Matter

Student Objectives

I will be able to:

- **Read and analyze informational texts about physical science.**
- **Share ideas with my peers.**
- **Build my vocabulary knowledge.**
- **Conduct research to write an opinion essay.**

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Tips for Text Annotation

As you read closely for different purposes, remember to annotate the text. Use the symbols below. Add new symbols in the spaces provided.

Symbol	Purpose
underline	Identify a key detail.
☆	Star an important idea in the margin.
1 2 3	Mark a sequence of events.
magma	Circle a key word or phrase.
?	Mark a question you have about information in the text. Write your question in the margin.
!	Indicate an idea in the text you find interesting. Comment on this idea in the margin.

Your annotations might look like this.

3 Madison argued for a strong central government. At ① the time, the thirteen states had a lot of power ? to govern themselves. This made it hard for a national government ☆ to collect taxes or create a military. After ② months of discussion and debate, and many compromises, the delegates decided on a final document. They mostly followed Madison's Virginia Plan ! and established a stronger federal government.

4 Madison also helped write a series of newspaper articles called the Federalist Papers. These articles helped persuade readers to accept the new Constitution.

5 ③ Soon after, Madison helped create the Bill of Rights. These are the first ten amendments, or additions, to the

Notes

What power did the sides have?

Find out more about the Virginia Plan

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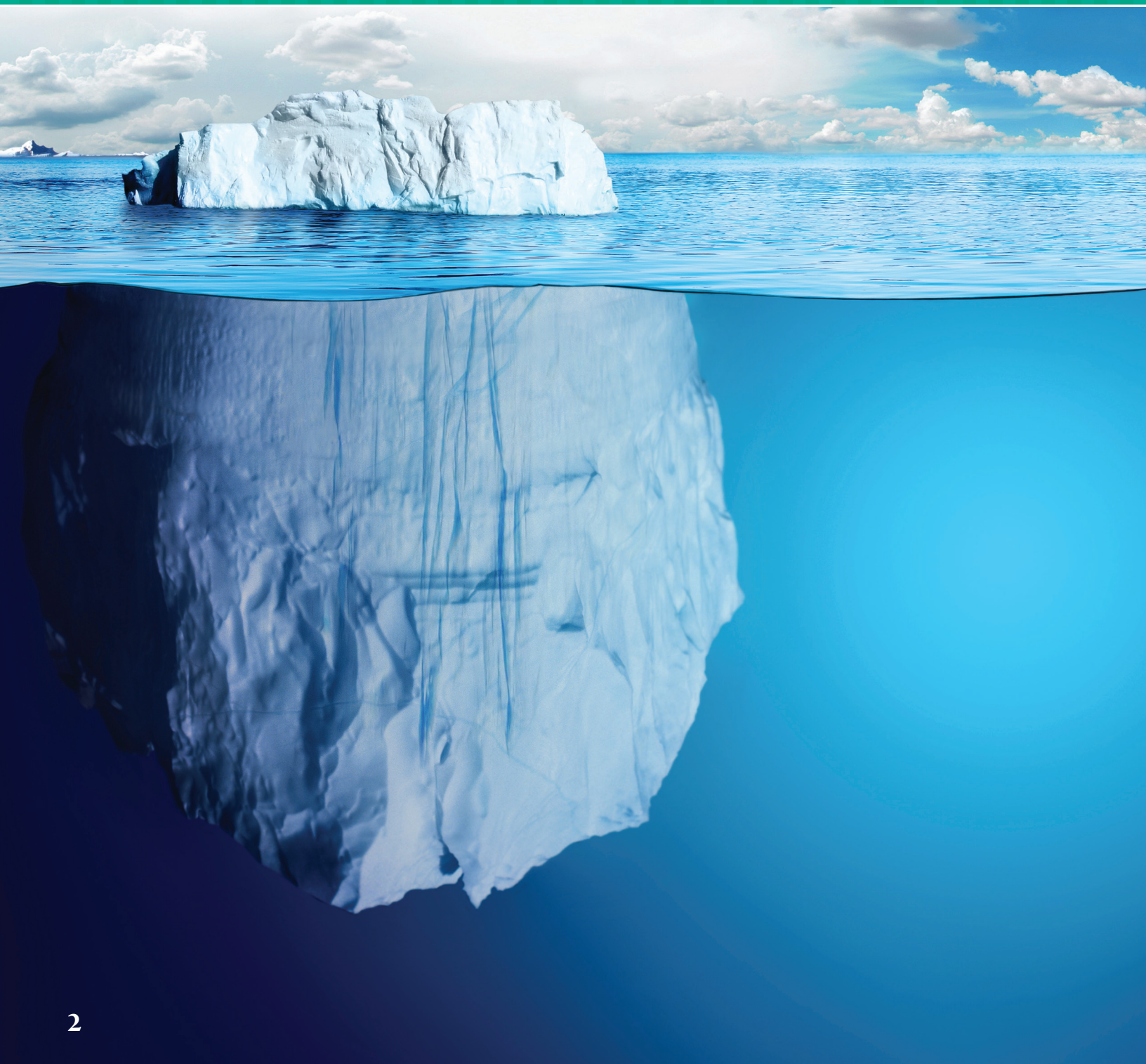
Essential Question

Why do we measure and describe the world?



Short Read 1

Remember to annotate as you read.

Notes

John Dalton:
Father of the Atomic Theory

by Kathy Furgang

John Dalton, 1766–1844

1 John Dalton was a renowned nineteenth-century chemist. Dalton once said, "If I have succeeded better than many who surround me, it has been chiefly…from universal assiduity." Indeed, Dalton's hard work and persistent focus helped him answer one of the most mysterious questions of all time: "What is the world made of?"

2 Dalton spent his youth studying the weather. He was fascinated by the daily changes in the conditions of Earth's atmosphere. He wondered what caused these phenomena. In his spare time, Dalton made sketches and built instruments that measured wind speed and rainfall. Each day, he recorded the air quality, temperature, and pressure. In his mid-twenties, he joined the Manchester Literary and Philosophical Society. It was there that he first gained access to a laboratory.

3 Dalton continued researching meteorology using the daily weather logs he had kept since he was a boy. In 1793 he published his first book on the subject: *Meteorological Observations and Essays*. His observations and theories about gases in the atmosphere led him to questions about the very fabric of matter. At that time, it was widely believed that air was one specific compound. Dalton proposed that air was actually a mixture of gases that had their own unique properties. His theory was tested and proven by himself, as well as by other scientists. Today it is called Dalton's Law of Partial Pressure.

Notes

4 In 1803, Dalton's experiments with air led him to a theory first proposed by Democritus, the ancient Greek thinker. The idea was that matter was composed of tiny uncuttable "atoms" with unique properties. However, Democritus could not prove it. Centuries later, using more advanced tools, Dalton tested the weights of different atoms. His findings proved that all elements have a different atomic mass. This theory remains a fundamental principle of chemistry.

5 Since then, Dalton's atomic theory has been tested, proven, and expanded upon by others. His work established one of the first models of the atom and remains the basis for all modern understanding of matter. In fact, atomic mass is measured in units called "daltons" in his honor. Though he lived almost two hundred years ago, his observations are still sound today. As a result of his dedication and attention to the "matter" at hand, Dalton is hailed as the "father of the atomic theory."

Dalton's Atomic Theory

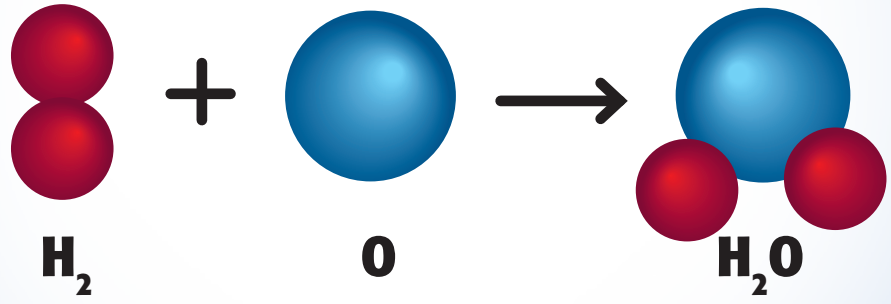
1. All matter is composed of tiny particles called atoms.

2. All atoms of a given element are identical.

3. Atoms cannot be created, destroyed, or subdivided.

4. Compounds form when atoms of different elements join in fixed ratios.

5. A chemical reaction is a rearrangement of atoms, not a change in the atoms themselves.



H_2 — 2 hydrogen atoms

O — 1 oxygen atom

H_2O — 1 water molecule

Short Read 2

Remember to annotate as you read.

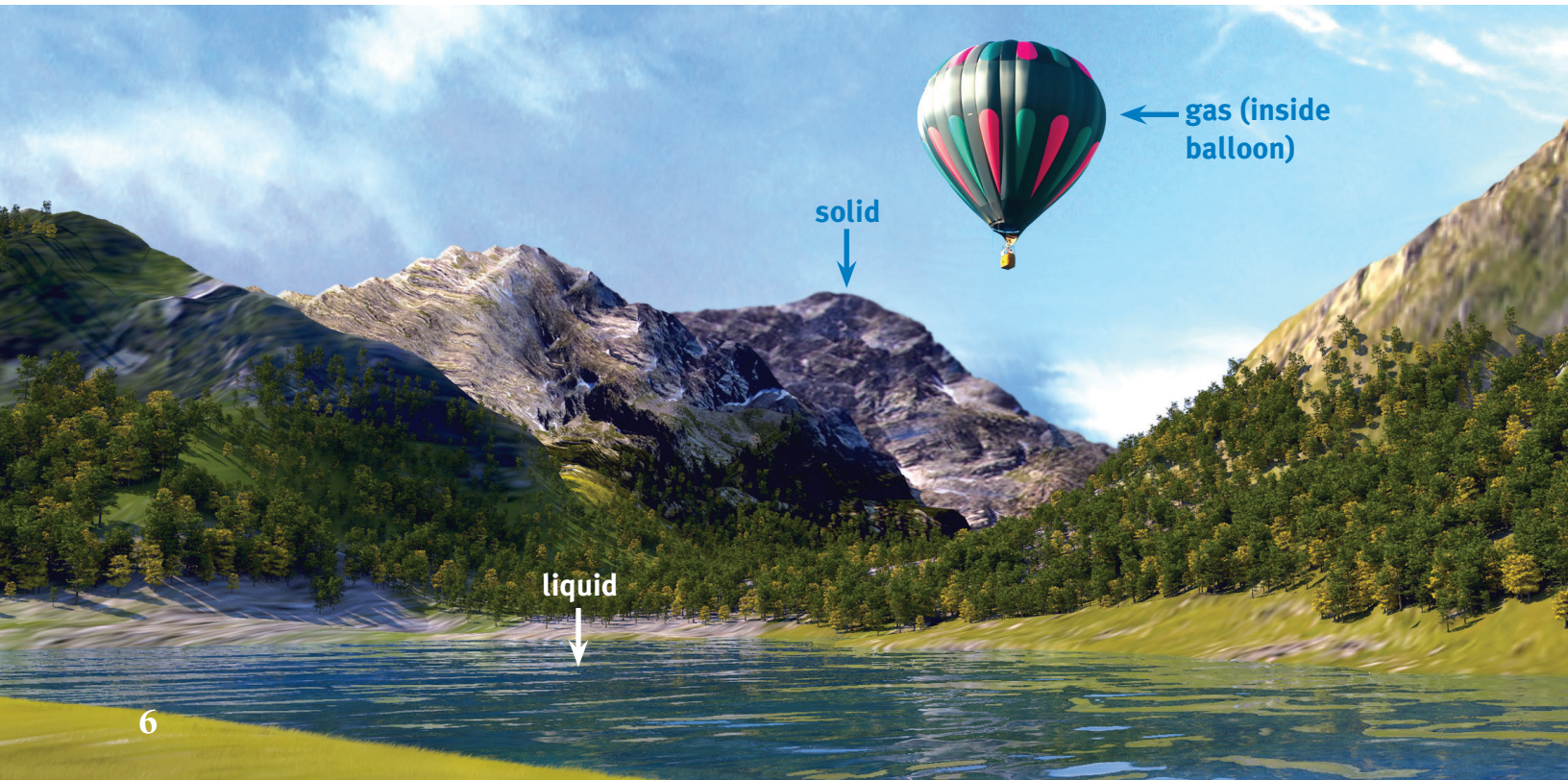
Matter Is Everywhere!

by Seba Milo

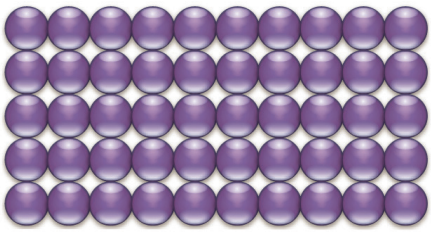
Notes

1 What is matter? Matter is anything that is made of material substance and takes up space. For example, people are matter. The water people drink is matter, and the food people eat is matter. The rocks and the soil people walk upon are also matter. Even the air people inhale and exhale is matter. In technical terms, matter is anything that has mass and volume. Mass is the amount of matter in an object, and volume is the amount of space the object takes up.

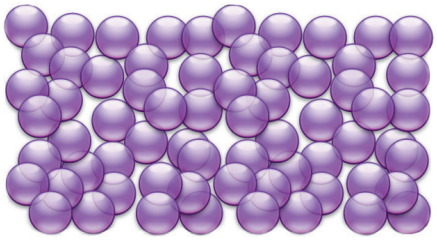
2 Matter is made of tiny particles called atoms. These microscopic building blocks cannot be seen by the eye alone. They join, or bond, together to form all of the different objects and organisms on Earth. Matter can exist in three states, or forms: solid, liquid, or gas.



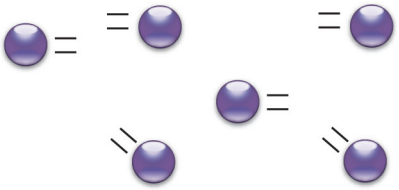
solid



liquid



gas



Notes

3 Solids have a definite shape and a definite volume. The particles in a solid are packed tightly together, so they can barely move. This gives the solid its fixed shape and volume. Liquids have a definite volume, but not a definite shape. A set amount of liquid can flow from one container to another and change its shape. Unlike a solid, the particles in a liquid are not held together tightly, but are farther apart. This means they can slide past one another, which gives liquid a unique property: the ability to flow and take the shape of whatever container it is in.

4 Like liquids, gases also have no fixed shape or volume. The particles in a gas are held together even more loosely than those of a liquid. The particles are also farther apart than in a liquid. For this reason, they can bounce around and expand to fill a very large space, or they can be compressed, or squeezed together, into a much smaller space. This is why a set amount of a gas can have any shape or volume.

Notes

Investigate Physical Changes in Matter

Materials: 1 piece of paper

How can you make physical changes to paper?

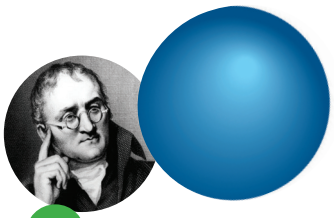
1. **Observe and record the piece of paper's physical qualities.**
2. **List the different ways you can physically change a piece of paper (without changing its chemical makeup).**
3. **Test different options.**
4. **Record your observations.**
5. **Make a chart and draw diagrams to present your data. How many ways did you come up with?**

5 Matter can be measured and described by its different physical properties. The state of matter, its size, color, texture, and odor are physical properties. Metals and minerals can also be measured and described by their hardness, reflectivity, conductivity, and response to magnetic forces. These traits can be observed without matter changing its chemical makeup.

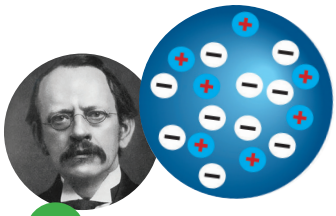
6 Any change in a physical property is called a physical change. Tearing or folding a piece of paper causes a physical change. What changed is the paper's physical appearance. The paper's weight and chemical composition are still the same. A physical change does not change the paper into a different type of matter: the paper is still paper. Likewise, matter can physically change from one state to another. Changing the state of matter does not change what the matter is made of. It just changes its form, or how its atomic particles are positioned.

History of the Atomic Theory

circa 400 BCE
Democritus introduces the idea of uncuttable "atom."

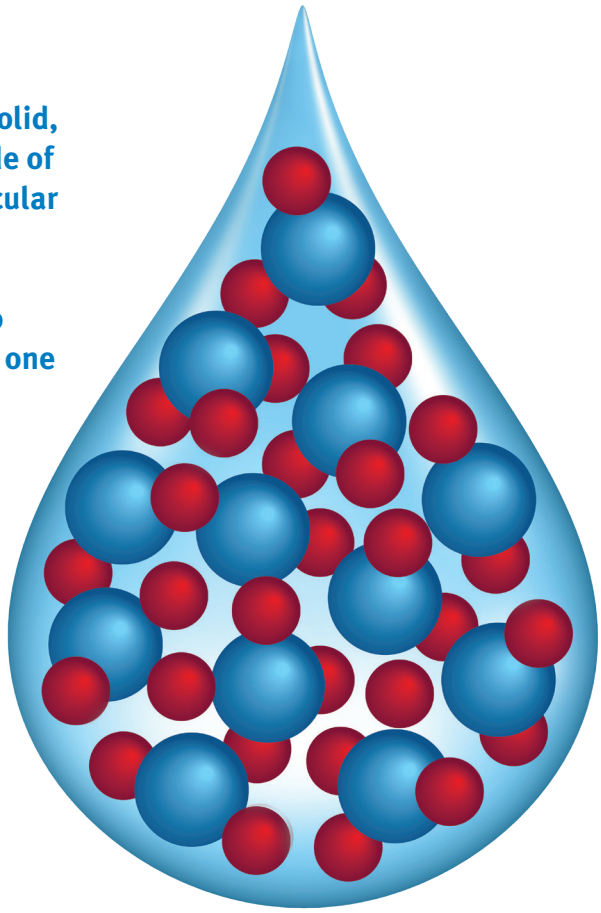


1803 CE
John Dalton proposes the "billiard ball" model of atom.



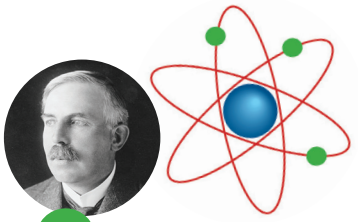
1897
J.J. Thomson develops "plum pudding" model that shows electrons.

Notes

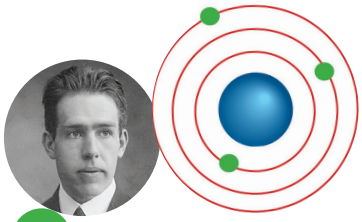


Water, whether it is solid, liquid, or gas, is made of particles of the molecular compound H_2O. This means each water particle contains two hydrogen atoms and one oxygen atom.

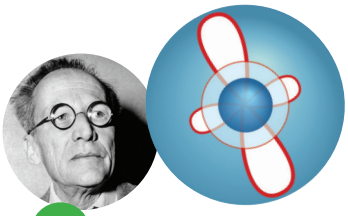
7 If energy, such as heat, is added to matter, the particles move faster. If energy escapes, the particles slow down. The physical state of matter changes in either case, but the amount of matter remains the same. For example, when water, a liquid, is heated to its boiling point, it becomes a gas called steam. When steam, or water vapor, loses energy, it cools and becomes liquid water again. When the energy in liquid water escapes, it cools. If it reaches its freezing point, it becomes a solid called ice. If heat energy is added to the ice, it melts and becomes liquid water again. In each state, the water molecules maintain their fixed ratios of two parts hydrogen atom to one part oxygen atom.



1912
Ernest Rutherford introduces nuclear model that shows nucleus.



1913
Niels Bohr's model shows electron orbits around the nucleus.



1930–Present
Erwin Schrödinger and others refine orbital Quantum Mechanical Cloud Model.

Remember to annotate as you read.

Notes

Balloon Ride

1 It is just after sunrise when you enter the field. The dew-dropped grass is damp beneath your feet. The wind is the calmest at this time of day, which is why this is the best time for a hot air balloon flight. Due to wind and weather conditions, balloon launches are sometimes canceled at the last minute, so it is exciting to see that there is no breeze. The red, orange, and golden trees beyond the meadow are still. Men, women, and children gather around. You and the passengers wait on benches. Then, the ground crew begins to spread the brightly colored silken envelope out on the grass.

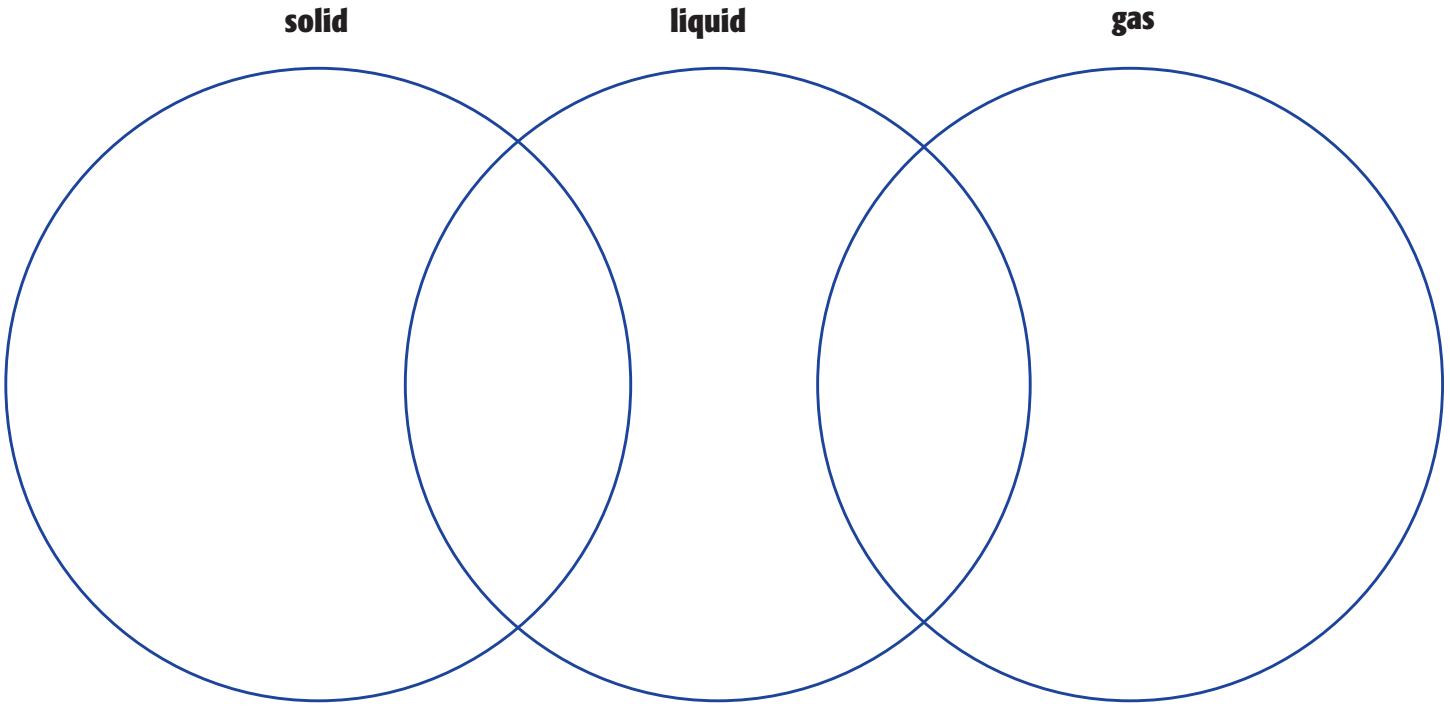
2 An inflator fan is placed at the neck, and the balloon starts to fill up with air. In no time the cavernous envelope is inflated enough for the crew to walk in and out. A giant picnic basket is then attached to the envelope and secured to the ground with tethers. Then the burner is put in place and is fired up. The envelope fills up more quickly now with the hot air expanding, taking the shape of a giant rainbow lightbulb that rises from the ground and begins to float over the basket.

3 Once the envelope is completely full, you make your way to the basket with the other passengers. People stand on boxes and hop aboard. When all the weight is fully balanced, the balloon is detached from the ropes holding it to the floor. The difference in air pressure allows the balloon to rise. The flight is officially underway! Flying in the balloon, softly soaring over the hills and valleys on this autumn day, you see the foliage. A sea of bright red, orange, and yellow leaves stretches out below as you drift along, floating on air. On this clear day you can see for miles. After about an hour, the pilot starts looking for a safe place to land. Good luck!

BuildReflectWrite

Build Knowledge

Use the Venn diagram to compare and contrast the three states of matter.



Reflect

Why do we measure and describe the world?

Based on this week's texts, write down new ideas and questions you have about the Essential Question.

Research and Writing

Opinion

Research inventions or discoveries made in the field of chemistry over the last 100 years. In your opinion, which invention or discovery has had the greatest impact on people's everyday lives? Write an essay in which you clearly state your opinion and provide supporting reasons and evidence based on your research.

Choose Your Topic

Conduct a pre-search to identify at least three important inventions or discoveries of the past 100 years. Construct three or more guiding questions that will help you learn more about these inventions or discoveries so that you can formulate your opinion about which one has had the greatest impact.

Extended Read 1

Remember to annotate as you read.

Notes

Investigate:
Changes in Matter

by Laura McDonald

1 Whether a person is making a bed or making a salad, the person is making physical changes to matter. A physical change can be a change in any physical property. When a pencil is sharpened, a physical change has taken place. The pencil is still a pencil; it is still made of wood, metal, rubber, and graphite. The properties that change are the size and shape of the pencil. However, if you were to compare the weight of the pencil shavings and sharpened pencil to the original weight of the unsharpened pencil, you would see that they are equal.

2 Chopping a carrot, crushing a can, tearing a piece of paper, and any other changes in shape, size, or texture are physical changes. A change in the state of matter is also a physical change. Making mixtures and solutions involves other physical changes that can be observed every day.

slicing **crushing** **shaving**

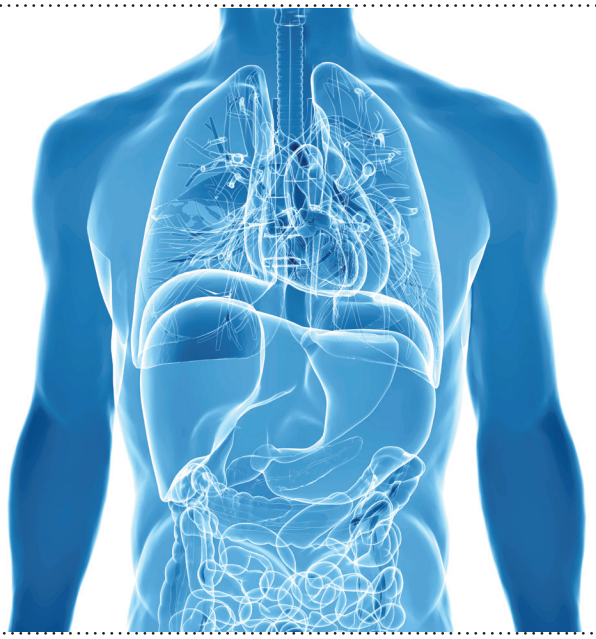
These physical changes alter the shape and size of matter, but not the substance.

Notes

Physical changes occur constantly, altering matter on Earth.

Chemical Change vs. Physical Change

The moment food enters the mouth, the body begins to digest it. Chewing begins the mechanical digestion, which is a physical change. The saliva in the mouth begins the chemical digestion. This is a chemical change. The saliva begins to break down the chemical composition of food. It changes the food from one type of matter to another. This chemical digestion continues in the other digestive organs.



Notes

Change of State

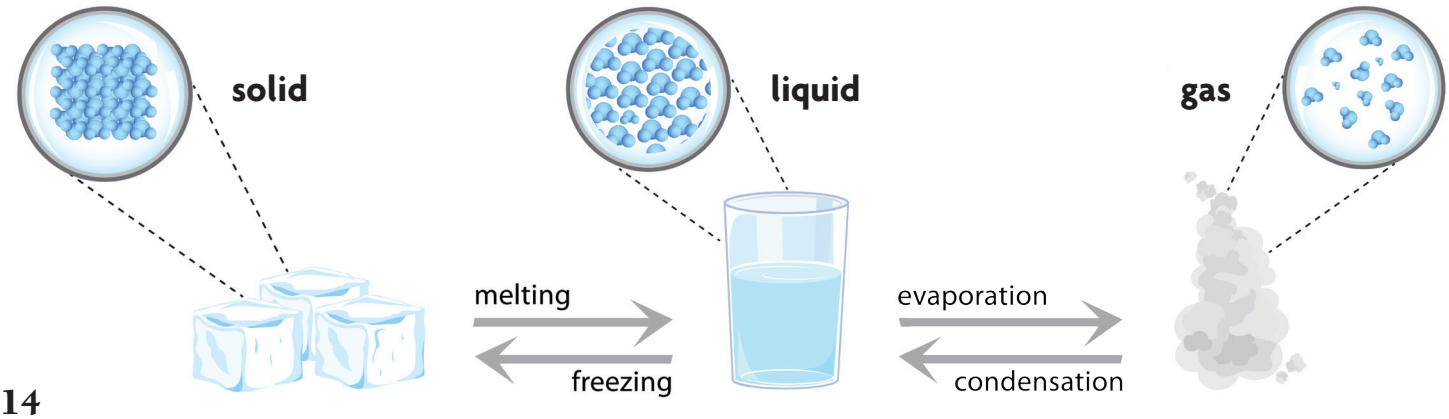
3 State is a physical property; therefore, a change in state is also a type of physical change. The three common states of matter are solid, liquid, and gas. Each state looks and behaves differently. Water, for example, can change from solid to liquid to gas, and vice versa. It does so without changing its chemical makeup. The only thing that changes is the arrangement of its particles.

4 Water in the gaseous state is invisible. When you see fog or mist, you are seeing tiny liquid water droplets condense from vapor or steam in the air. When it's cold out, water vapor condenses into droplets of liquid water. Many droplets of water together make fog. If the water vapor condenses on a freezing, cold surface, frost forms.

Salad is a mixture.

Mixtures

5 A mixture is a combination of two or more different types of matter. A mixture is an example of a physical change. For instance, to make a salad, a person puts lettuce, tomatoes, and other ingredients together in a bowl. The parts of the salad are changing size, shape, and position, but no chemical change is taking place. The lettuce is still lettuce. The person can also separate the salad mixture back into its original parts.



Water can occur freely in nature as a solid, liquid, or gas.

When solid **rock** is heated, it can flow as liquid rock lava.

Air is a mixture of oxygen, nitrogen, and other invisible gases.

Notes

Sorting and Recycling: Physical Changes at Work

When a person drops something into a recycling bin, the person is adding to a mixture. The mixture could include paper, metal cans, plastic, and glass. A recycling center has a complex way of separating the mixture. First, the mixture is put on a spinning table. The paper and cardboard fall off the table. Everything that is left moves along a conveyor belt. Next, a magnet pulls out the steel cans. Then, a strong fan blows the plastic into a container. Finally, the remaining materials are sorted by workers or by an electronic scanner so they, too, can be melted down and recycled.

Solutions

6 A solution is a special type of mixture in which one substance dissolves into another. The two parts of the mixture are no longer visible. A solution looks like a pure substance, even though it is still a mixture.

7 To make a solution, first add a few teaspoons of salt to a cup of water. At first, the salt and the water are still both visible because it's not a solution yet. Next, use a spoon to stir the mixture until the salt disappears. You will observe that the salt is dissolving in the water. When all of the salt dissolves, a saltwater solution will result.

8 Unlike a salad, or a recycling bin, the contents cannot be so easily separated or sorted. One way is evaporation. Pour the saltwater into a shallow pan, and the water in the solution will gradually dry up. The salt will remain in the pan while the water will have escaped as a gas into the air.

Notes

Chemical Changes

9 When you crush salt crystal into smaller pieces, you change the size and shape of the salt. You do not change the salt into a different substance. Breaking the salt apart is a physical change. A physical change is a change in the state or appearance of matter. Melting ice, tearing paper, sawing wood, and molding clay are examples of physical changes. In general, physical changes can be reversed.

10 Unlike a physical change, a chemical change produces one or more new substances. A chemical change is the result of a chemical reaction. During a chemical reaction, atoms of one substance rearrange to form a new substance. The new substance has different physical and chemical properties. The substances that enter into a chemical reaction are known as reactants. The substances that result from a chemical reaction are known as products. A chemical reaction cannot be reversed by physical processes. The products cannot be changed back into the reactants by physical processes.

salt + water = saltwater solution

Notes

11 Chemical changes involve energy. There is often evidence that chemical changes have taken place. Some chemical reactions occur when the reactants absorb energy. Others involve a release of energy. Therefore, an increase or decrease in temperature is one clue. A change of color or smell may also be a good clue. Sometimes there may be a new solid substance sinking to the bottom of a liquid. Other times bubbles of a new gas may rise through the liquid.

Investigate Matter: Oobleck

Materials:

- box of cornstarch
- food coloring
- mixing bowl
- water

Procedure:

Step 1. Observe and record the physical properties of each of your ingredients.

Step 2. Write predictions. What do you think will happen when you mix these substances?

Step 3. Pour 237 milliliters (1 cup) of water into a clean mixing bowl. Observe and record what happens.

Notes

12 Physical and chemical changes occur constantly on Earth. Physical changes alter the shape and form of a substance. Chemical changes use energy to combine and alter matter into new substances. These changes continually work to shape and reshape Earth. They occur when we make a salad, and they occur when we eat a salad and convert that food into energy. They occur inside all living things, allowing all life to form, move, and grow. We are all matter, and matter is always changing.

Step 4. Mix in 474 milliliters (2 cups) of cornstarch. You can stir with a spoon or use your hands. Observe and record what happens.

Step 5. Add in 3 to 4 drops of food coloring. Observe and record what happens. Describe the physical changes that occur.

Step 6. Play with the oobleck for a few minutes. Record your observations. How would you describe the physical properties of oobleck? What is the color, texture, and odor? Is it solid, liquid, or gas?

Analysis:

Look over your recorded predictions and observations. Ask questions. Is oobleck a mixture?

Can it be separated into its parts?
Or is it a new substance?

Record and explain your findings. Based on your findings, what type of changes have occurred?

Did you know?

Oobleck is named after a gooey green substance in the Dr. Seuss book *Bartholomew and the Oobleck*. In the story, the gooey oobleck falls from the sky!

Remember to annotate as you read.

Notes

My Dad the Street Chef

1 Sometimes when I walk down the sidewalk and smell the sweet aromas of food trucks and hot lunch stands, I think of my dad. My dad is a street chef. He and other street chefs are now competing for the best food truck in the city. Cooking runs in my family. My grandfather was a street chef, too. He had one of the first propane-fueled portable refrigeration carts in the city. Even my grandfather's grandfather was a street chef. In fact, he was one of the city's first! He worked on the Lower East Side, making roasted-pepper-and-sausage sandwiches out of the back of a horse-drawn cart.

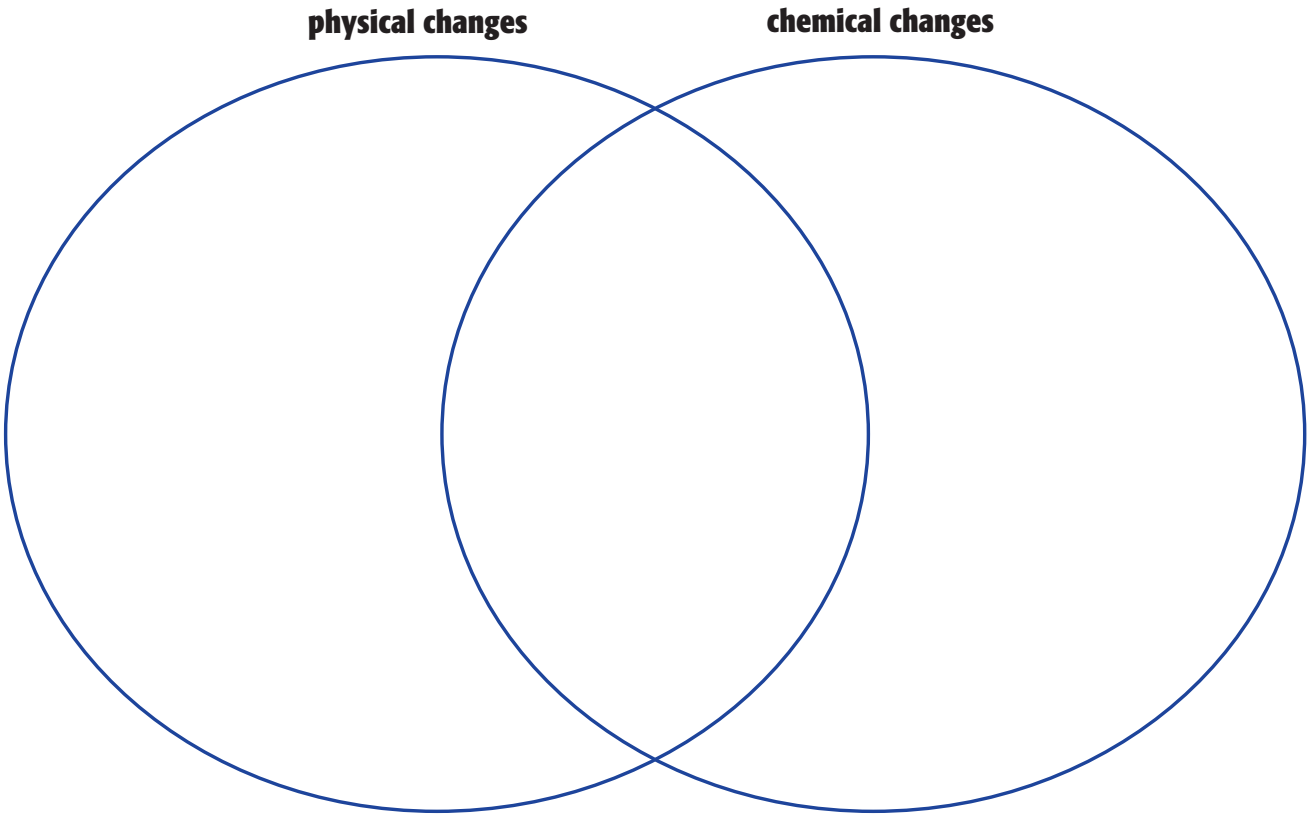
2 Dad says the work of street chefs hasn't changed much over the years (centuries!), but Grandpop disagrees. Grandpop describes some of the concoctions that street chefs make today and shakes his head in amazement. One game-changing recipe is my dad's mint-and-curry coleslaw. This mixture of chopped cabbage, carrots, mint, and seasoning is mouthwatering. His secret trick is to soak the cabbage in a honey-and-vinegar solution before adding the seasoning. Grandpop says this is very different from throwing whatever fresh ingredients they had together and making it work. But Dad is quick to remind him that good cooking is chemistry. No matter where you are in history, the same physical and chemical changes are taking place. Besides, it was Grandpop's vinegar-and-honey coleslaw flavor formula that first put his truck on the map.

3 I stand on the street motionless and smell the flavors of the smoking meat carts and taco trucks. I hear the street chefs shouting orders above the traffic as the workers line up for their sidewalk lunches. Best of all, I pretend I hear my dad say, "Order up!"

BuildReflectWrite

Build Knowledge

Compare and contrast physical and chemical changes in matter.



Reflect

Why do we measure and describe the world?

Based on this week's texts, write down new ideas and questions you have about the Essential Question.

Research and Writing

Opinion

Research inventions or discoveries made in the field of chemistry over the last 100 years. In your opinion, which invention or discovery has had the greatest impact on people's everyday lives? Write an essay in which you clearly state your opinion and provide supporting reasons and evidence based on your research.

Conduct Research

Use your guiding questions to conduct research this week. Gather information from at least three sources, including both print and online sources. Use your sources to plan your opinion essay.

Extended Read 2

Remember to annotate as you read.

Notes

Marie M. Daly:
Biochemistry Pioneer

by Drake Conyers

1 All living things have chemical reactions occurring inside them at all times. Therefore, the study of biology and chemistry often cross paths. A biologist cannot understand what happens in a living cell if she doesn't also understand the chemical reactions that take place in the body. Likewise, a chemist cannot understand how energy and matter move and change throughout our world without understanding the biology of living organisms. For example, how does energy from the sun find its way into the food people eat? How does the human body process and convert this food back into useful energy? How do people know which foods are healthful and which are not?

Dr. Marie M. Daly, 1921–2003

2 Biochemistry provides the answers. This field of science focuses on the chemical reactions that occur within organisms. One woman's research profoundly changed people's understanding of how the human body works. Her curiosity about its complex chemistry helped answer many important questions about health. She studied how the body processes the chemicals in food. She focused on the chemical compounds that break down food substances and release energy to the body. She also examined the products of those inner chemical reactions and their effects on the body. Her work helped prove the direct relationship between dietary nutrition and health. That woman was biochemist Dr. Marie Maynard Daly.

Marie Daly was a groundbreaking biochemist.

3 Marie Maynard Daly was born in New York in 1921. Daly's love of science came early. Her father was an immigrant from the British West Indies. He had hoped to study science but could not afford to attend college. Marie Daly is quoted in *Contemporary Black Biography:* "My father wanted to become a scientist but there weren't opportunities for him as a black man at that time."

4 Still, thanks to her father's interest in science and her mother's love of reading, a strong curiosity blossomed in Daly. Her parents encouraged her love of learning however they could, even though young women during the twenties and thirties seldom finished high school. "My parents didn't discourage me because I was a woman," Daly stated.

Notes

Notes

5 During her youth, Daly loved to read and devoured books, especially about science. Among her favorites was *Microbe Hunters,* a popular book published in 1926 that her grandfather had in his library. Written by biochemist Paul de Kruif, this book is an exciting look at the discoveries of the first microbiologists, such as Antonie van Leeuwenhoek, Louis Pasteur, and Robert Koch. These scientists pioneered the microscope and were the first to explore what could not be seen by the eye alone. These early scientists became Daly's heroes and inspired her to make her own discoveries about the microscopic world.

6 Daly excelled as a student. She attended an all-girls high school, with an all-female faculty. Recognizing Daly's talent and passion for science, her teachers encouraged her to pursue a science degree in college.

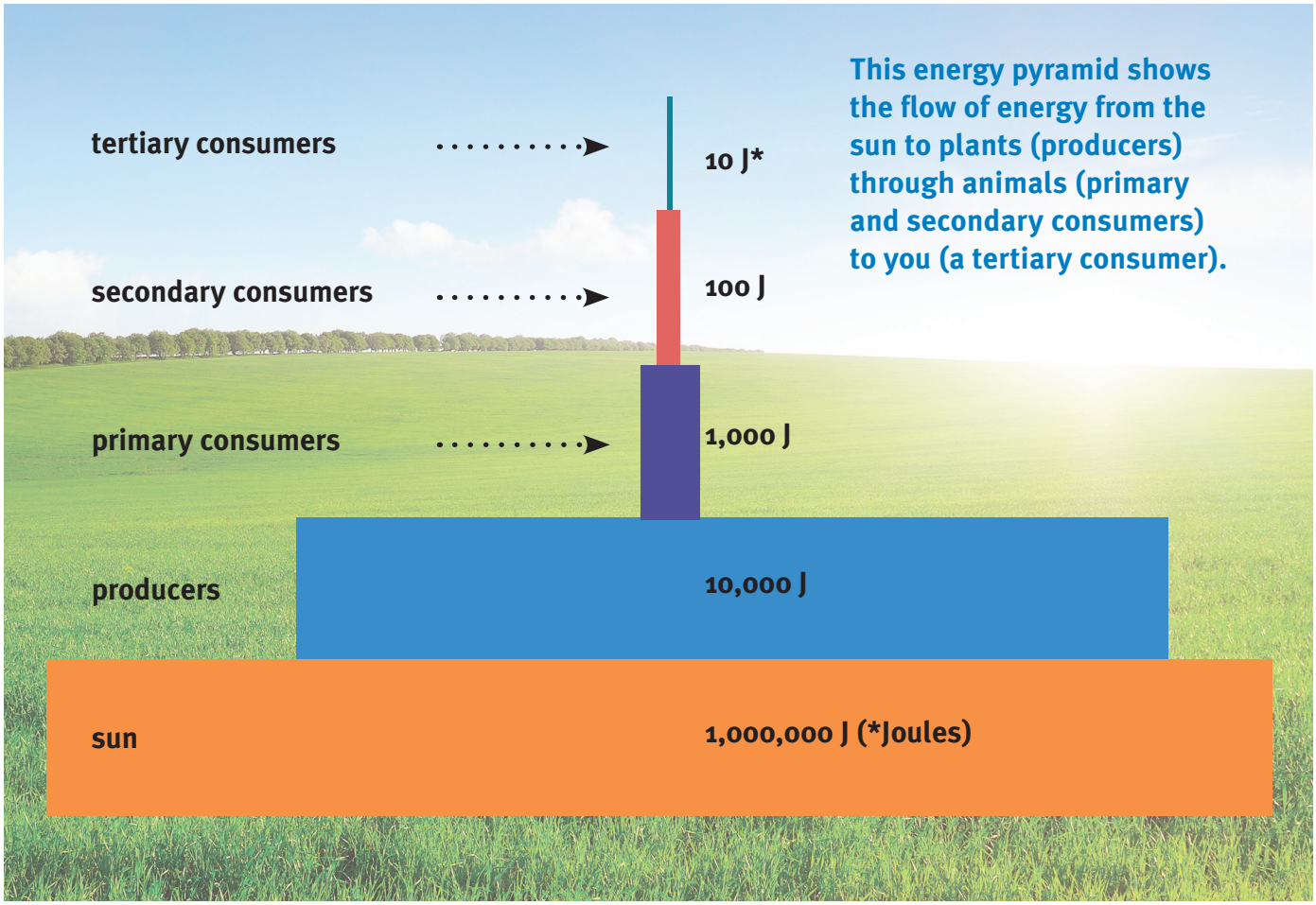
7 After graduation, she lived at home to save money while she attended Queens College. In 1942, she graduated magna cum laude and earned a bachelor of science degree in Chemistry. Though it was expensive, she then went on to attend New York University and earned her master's degree in Chemistry in 1944. Daly worked as a lab assistant and tutor in order to pay her way through graduate school.

8 After completing her studies at NYU, Daly had hoped to find work in her field. However, in 1944, the United States was still embroiled in World War II. There were few jobs for an African American woman in the field of chemistry. As Daly shared in an interview, "There wasn't any opportunity for me if I left school at that time." There was also a lack of male Ph.D. candidates at that time. This increased the odds of a woman getting accepted to a highly selective and competitive graduate program. As a result, Daly decided to continue her education and pursue a doctorate in Chemistry.

Notes

Energy Flow

The sun is the source for all energy in food. Plants get the energy they need from the sun. They absorb sunlight through their leaves and combine it with water and nutrients absorbed from the soil. Through chemical processes this material is converted to plant matter and useful energy. Animals get the energy they need from eating plants. This food provides animals with the energy they need to stay warm and be active. Humans get the energy they need from eating plants and animals. The digestive system works both to absorb nutrients and to chemically convert the starch, protein, and fat found in vegetables, meat, and dairy into useful energy. Eating a wide variety of fruits, vegetables, and protein sources helps maintain a balanced diet. This in turn can help ensure a healthy body.



This energy pyramid shows the flow of energy from the sun to plants (producers) through animals (primary and secondary consumers) to you (a tertiary consumer).

Notes

9 Daly worked as a science tutor for a year and then applied for a doctoral program at Columbia University in New York City. Daly was accepted and enrolled at Columbia, where she studied biochemistry under Dr. Mary Letitia Caldwell. Dr. Caldwell was a pioneering chemist and nutritionist. Caldwell also worked to expand opportunities for women in the field of chemistry. She welcomed Daly to her program.

10 Caldwell specialized in studying enzymes, the chemicals in the body that help digest, or break down, food. Enzymes also facilitate the chemical reactions that allow energy to be released and absorbed by the body. Under Caldwell, Daly was able to use chemistry to study the human digestive system. She wanted to see how chemical compounds in the human body affect digestion. She studied the products of the enzyme amylase, which helps the body break down sugar and starch. She wanted to understand how diet and nutrition were connected to the health of the human body.

11 After only three years, Daly completed her doctorate. In 1947, Dr. Daly was awarded her Ph.D. in Chemistry from Columbia University. Her hard work and determination had paid off. She became the first African American woman in the United States to earn a Ph.D. in Chemistry.

12 After completing her doctoral degree, Daly taught for two years at Howard University in Washington, D.C. Then she received a grant from the American Cancer Society to support her postdoctoral research. So she joined Alfred E. Mirsky, a pioneer in molecular biology, at the Rockefeller Institute in New York. There she worked for seven years on the composition and metabolism of components of the cell nucleus, among other studies. Then Daly took a new position, teaching biochemistry at the College of Physicians and Surgeons of Columbia University.

Notes

Agents of Change

Daly's research focused on the chemical reactions that take place during food digestion and metabolism. Metabolism describes any reaction by which complex molecules are broken down to produce energy. It also describes those by which energy is used to build up complex molecules. Once inside the body, sugar particles are broken down into simpler particles with the release of energy. This energy is then used by the body for different purposes. One purpose is maintaining body warmth, or building up bigger molecules. In order for metabolism to occur, the body uses enzymes to break down and digest different food substances. Each enzyme has a specific job.

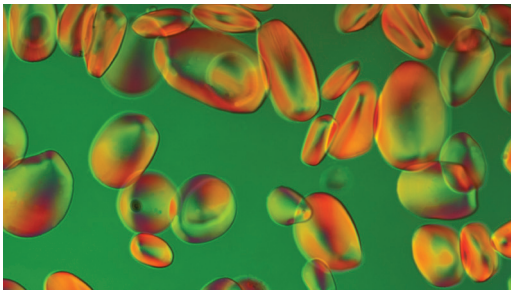
Amylase is the enzyme that helps the body process sugars and starches (carbohydrates) like pasta and potatoes.

Protease is the enzyme that allows the body to process proteins.

Lipase is the enzyme that helps break down fats (lipids) found in fatty foods such as nuts, meat, and dairy.

Notes

Cholesterol Chemistry

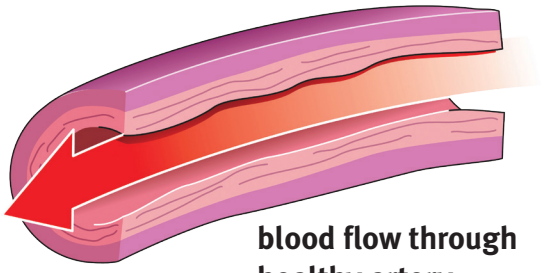


Cholesterol (kuh-LES-tuh-role) is a white, waxy, odorless, and tasteless substance that can be found in all animal tissue. Chemically, it is an organic compound. This means it is made largely of carbon. Its molecular formula is $C_{27}H_{46}O$.

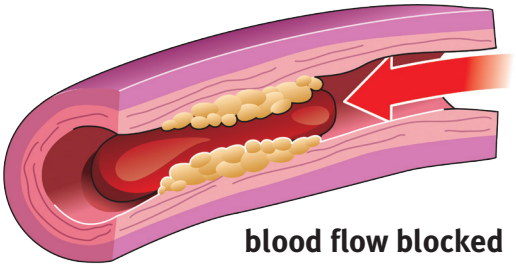
Cholesterol is essential to life. It helps make up the cell membrane that surrounds each animal cell. It also helps the body process different acids, hormones, and vitamins. It circulates freely in the bloodstream.

Because many humans eat other animals as part of their daily diet, they consume added cholesterol. This additional cholesterol is processed by the liver. In most diets, the body can handle the additional cholesterol. But if there is an excess of cholesterol, the body cannot process it all. These resulting high levels of cholesterol in the bloodstream may cause a buildup of cholesterol in the arteries, the blood vessels that pump blood away from the heart. This buildup in the arteries can lead to blockage that makes it difficult for blood to circulate to the heart and through the body. That is why too much cholesterol causes heart disease and can lead to heart attacks.

Today, it is widely accepted that high cholesterol can clog arteries and lead to heart attacks. We know this due to Dr. Marie Daly's research.



blood flow through healthy artery



blood flow blocked by plaque caused by excess cholesterol

Notes

13 In 1955, back at Columbia, and with the assistance of Dr. Quentin Deming both there and later at Albert Einstein College of Medicine at Yeshiva University, Dr. Daly studied the effects of cholesterol on the mechanics of the heart. As a result of this research, she discovered the link between high cholesterol and clogged arteries. This breakthrough led to a better understanding of how heart attacks are caused. Her further research studied the effects of sugars and other nutrients on the health of arteries, and the breakdown of the circulatory system as a result of aging or high blood pressure.

14 Daly later studied how proteins are produced and organized in the cell. She also was an investigator for the American Cancer Society. Her work helped educate the public about the effects of cigarette smoke in lungs. In general, her work contributed greatly to people's understanding of health. She was especially helpful in shedding light on the causes of heart attacks and lung disease.

15 In 1960 Daly became a professor at the Albert Einstein College of Medicine. She remained there until her retirement in 1986. In addition to her teaching, she developed programs to increase the enrollment and success of minority students in scientific disciplines. In 1988, in honor of her father, Dr. Daly established a scholarship fund. The fund helps pay tuition fees for African American science students at Queens College.

16 Throughout her life, Daly worked hard to overcome both gender and racial barriers. She was also determined to give back to her community. But above all, Daly was dedicated to the science she loved. She died in 2003 at the age of eighty-three.

Word Study Read

Remember to annotate as you read.

Notes

What Makes It Pop?

1 It's light, crunchy, and fun to eat. You can buy it at the movies or make it at home. Few snacks are more popular than popcorn, but have you ever wondered about the chemistry of this culinary delight? What happens when popcorn pops, and just how do dry kernels of corn change into the fluffy treat we love?

2 Popcorn is different from the regular sweet corn we enjoy at meals. It is a type of corn that is grown especially for popping. Each popcorn kernel has a hard shell, or hull, with starch inside. You might not think of a popcorn kernel as moist, but each kernel holds a tiny bit of water. When you heat up a popcorn kernel, the water inside begins to expand. The hull holds in the moisture until its expansion causes a tiny explosion to occur. *Pop!* The hull breaks. *Phsst!* Steam is released. The starch inside the kernel has turned to jellylike goo that inflates and spills out. The result is the irregularly shaped snack we call popcorn.

3 Popcorn has been around for thousands of years. Ancient popcorn kernels have been found at sites in North and South America. Native Americans used popcorn for food and as a decoration, too. People still decorate their homes with strings of popcorn on holidays, but the best thing about popcorn is to eat it. Plain, buttered, or flavored, popcorn is a special snack most people just can't resist!

BuildReflectWrite

Build Knowledge

Answer the questions below about Dr. Marie M. Daly.

Marie M. Daly	
What were some of Daly's attributes, or characteristics, that led to her success?	**How would you describe the sequence of events or process in "Energy Flow"?**
How would you apply what you learned about energy and biochemistry to plan a healthy dinner menu for your family?	**What are some of the questions about chemical reactions in the body that Marie Daly asked?**

Reflect

Why do we measure and describe the world?

Based on this week's texts, write down new ideas and questions you have about the Essential Question.

Research and Writing

Opinion

Research inventions or discoveries made in the field of chemistry over the last 100 years. In your opinion, which invention or discovery has had the greatest impact on people's everyday lives? Write an essay in which you clearly state your opinion and provide supporting reasons and evidence based on your research.

Write Your Opinion Essay

Use your research results to draft, revise, and edit your opinion essay. Share your opinion essay with your peers.

Support for Collaborative Conversation

Discussion Prompts

Express ideas or opinions . . .

When I read _____, it made me think that _____.

Based on the information in _____, my [opinion/idea] is _____.

As I [listened to/read/watched] _____, it occurred to me that _____.

It was important that_____.

Gain the floor . . .

I would like to add a comment. _____.

Excuse me for interrupting, but _____.

That made me think of _____.

Build on a peer's idea or opinion . . .

That's an interesting point. It makes me think _____.

If _____, then maybe _____.

[Name] said _____. That could mean that _____.

Express agreement with a peer's idea . . .

I agree that _____ because _____.

I also feel that _____ because _____.

[Name] made the comment that ____, and I think that is important because _____.

Respectfully express disagreement . . .

I understand your point of view that _____, but in my opinion _____ because _____.

That is an interesting idea, but did you consider the fact that _____?

I do not agree that _____. I think that _____ because _____.

Ask a clarifying question . . .

You said _____. Could you explain what you mean by that?

I don't understand how your evidence supports that inference. Can you say more?

I'm not sure I understand. Are you saying that _____?

Clarify for others . . .

When I said _____, what I meant was that _____.

I reached my conclusion because_____.

Group Roles

Discussion Director:
Your role is to guide the group's discussion and be sure that everyone has a chance to express his or her ideas.

Notetaker:
Your job is to record the group's ideas and important points of discussion.

Summarizer:
In this role, you will restate the group's comments and conclusions.

Presenter:
Your role is to provide an overview of the group's discussion to the class.

Timekeeper:
You will track the time and help keep your peers on task.

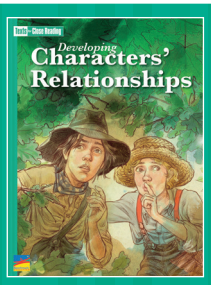
Making Meaning with Words

Word	My Definition	My Sentence
composed (p. 5)		
compressed (p. 7)		
condenses (p. 14)		
devoured (p. 24)		
dissolves (p. 16)		
facilitate (p. 26)		
fixed (p. 7)		
principle (p. 5)		
properties (p. 4)		
proposed (p. 4)		

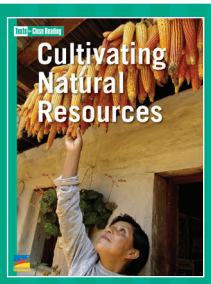
Build Knowledge Across 10 Topic Strands

Government and Citizenship

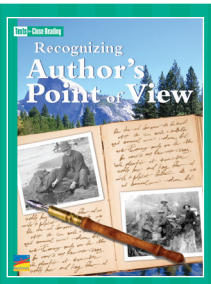
Character



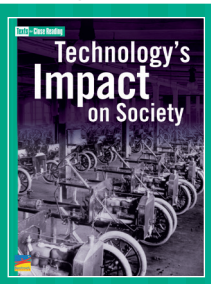
Life Science



Point of View

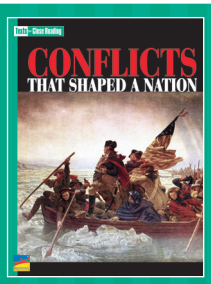


Technology and Society

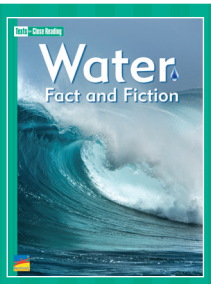


Theme

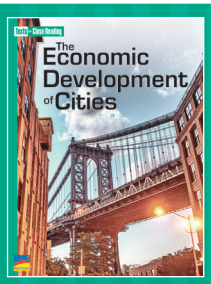
History and Culture



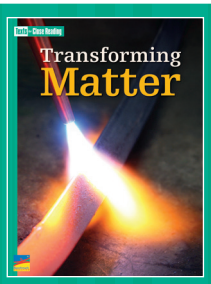
Earth Science



Economics



Physical Science



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