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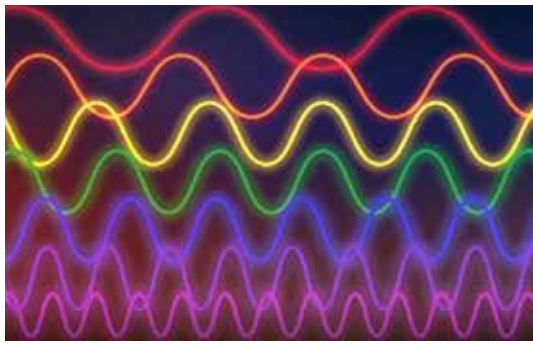

Louisiana Companion

Student Booklet: Grade 6

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Developed by the Learning Design Group at the University of California, Berkeley's Lawrence Hall of Science.

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Louisiana Companion Student Booklet: Grade 6
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Table of Contents

Student Booklet Pages

Safety Guidelines for Science Investigations

1. **Follow instructions.** Listen carefully to your teacher's instructions. Ask questions if you don't know what to do.

2. **Don't taste things.** No tasting anything or putting it near your mouth unless your teacher says it is safe to do so.

3. **Smell substances like a chemist.** When you smell a substance, don't put your nose near it. Instead, gently move the air from above the substance to your nose. This is how chemists smell substances.

4. **Protect your eyes.** Wear safety goggles if something wet could splash into your eyes, if powder or dust might get in your eyes, or if something sharp could fly into your eyes.

5. **Protect your hands.** Wear gloves if you are working with materials or chemicals that could irritate your skin.

6. **Keep your hands away from your face.** Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.

7. **Tell your teacher if you have allergies.** This will keep you safe and comfortable during science class.

8. **Be calm and careful.** Move carefully and slowly around the classroom. Save your outdoor behavior for recess.

9. **Report all spills, accidents, and injuries to your teacher.** Tell your teacher if something spills, if there is an accident, or if someone gets injured.

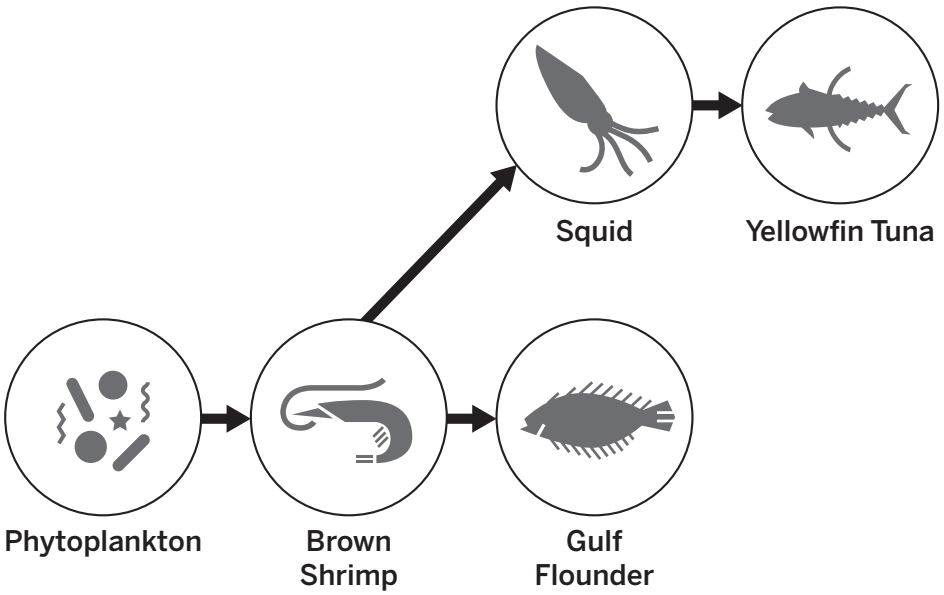
10. **Avoid anything that could cause a burn.** Allow your teacher to work with hot water or hot equipment.

11. **Wash your hands after class.** Make sure to wash your hands thoroughly with soap and water after handling plants, animals, or science materials.

Name: _____ Date: _____

Protecting Our Natural Resources

Part 1: Humans in the Gulf of Mexico Food Web



1. Add humans to the food web above. Be sure to include arrows to show resource and consumer populations.
2. Which populations could be affected if the size of the human population changed?

_____

_____

_____

_____

_____

Name: _____ Date: _____

Protecting Our Natural Resources (continued)

Part 2: Learning About Natural Resources

1. Pick one of the natural resources below to talk to your partner about. You can:
   - tell your partner what you know about this resource.
   - make a personal connection to this resource.

Fisheries

Forests

Wetlands

2. Read and annotate the Resource card.
3. Discuss your annotations with your partner. Use the questions below to guide your discussion.
   - How do humans use this natural resource?
   - How can our use of this resource harm Earth?

Name: _____ Date: _____

Protecting Our Natural Resources (continued)

Part 2: Learning About Natural Resources (continued)

4. Answer the questions below.
   a. I read about **fisheries** / **forests** / **wetlands**. (circle one)
   b. How do humans use this natural resource?

_____

_____

_____

_____

_____

_____

_____

_____

   c. How can our use of this resource harm Earth?

_____

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_____

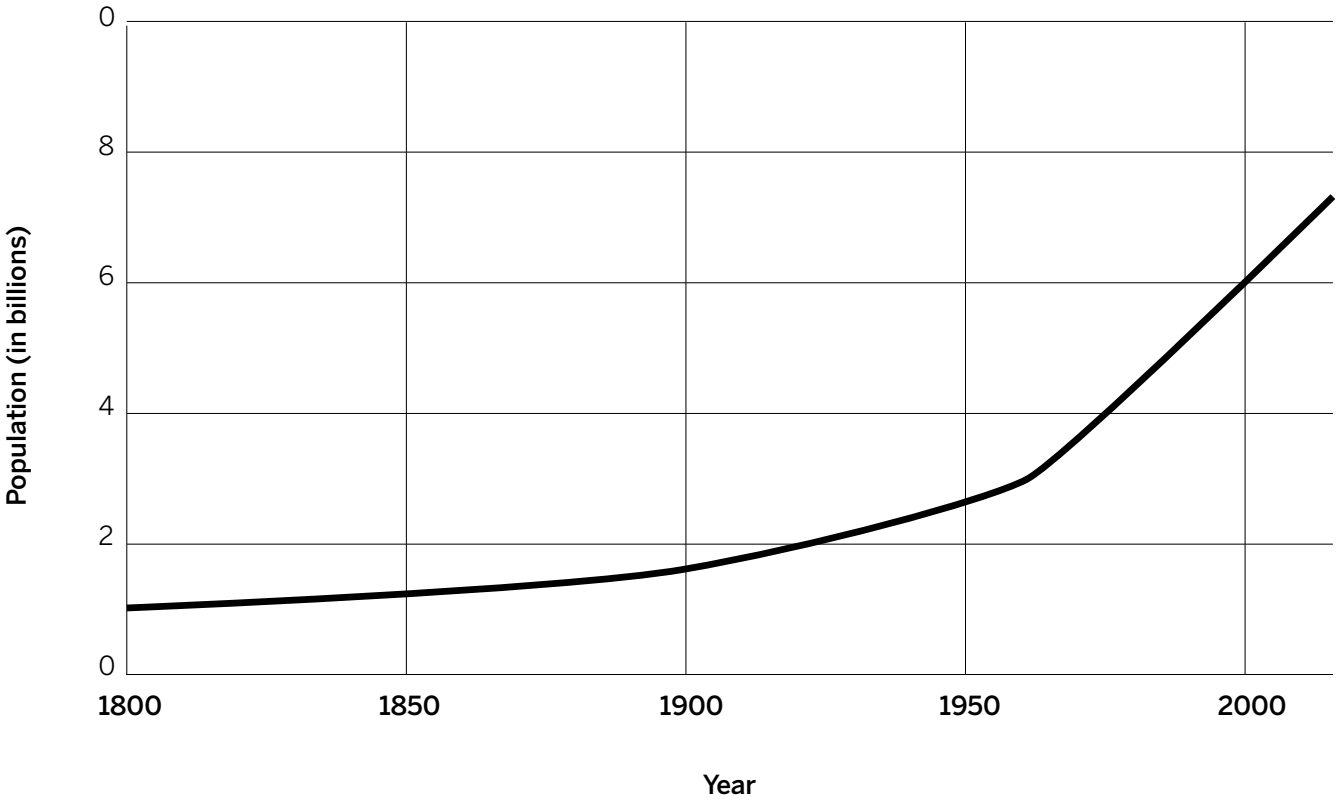
Name: _____ Date: _____

Protecting Our Natural Resources (continued)

Part 3: Considering Human Population Data

1. Analyze the graph.
2. Discuss the following questions with your partner:
   - According to the graph, how is the human population changing over time?
   - What does this change in the human population mean for the resource you read about?

Human Population Size (1800–2005)



Name: _____ Date: _____

Protecting Our Natural Resources (continued)

Part 4: Acting to Protect Natural Resources and Earth

1. Read and annotate each Action card.
2. Discuss each Action card with your partner and how it might be used to protect the natural resource you read about.
3. With your partner, determine which action you think would best help protect the natural resource you read about.
4. Record your ideas:

   I am thinking about how to protect **fisheries** / **forests** / **wetlands**. (circle one)

   The action I think would best protect this resource is
   laws / **restoration** / **technology** / **sustainability** (circle one)

   How would you suggest using the action you chose to protect the natural resource?

_____

_____

_____

Part 5: Informing Others About Your Natural Resource

Share with your group what you read about your natural resource. Be sure to tell your group the following:

- which natural resource you read about
- how an increase in the human population can affect this natural resource and Earth
- which action you think would best protect the natural resource

Name: _____ Date: _____

Protecting Our Natural Resources (continued)

Part 6: Connecting to Louisiana

1. I am thinking back to **fisheries** / **forests** / **wetlands**. (circle one)
2. Why is taking care of this natural resource important for Louisiana?

_____

_____

_____

_____

_____

_____

3. What is something else you would like to know about this natural resource?

_____

_____

_____

_____

_____

_____

This Louisiana bayou ecosystem includes living and nonliving things, and they are all made of matter.

What's the Matter in Ecosystems?

Imagine for a moment that you are looking out over a Louisiana bayou. The sun shines brightly on the wetland grasses and soggy ground, and a heron wades in the water looking for a fish for its next meal. You can't see the air here, but you can feel the wind as it blows on your face and hear it rustle the leaves of the nearby trees. You can't see the fish either, but they are swimming around in the water eating algae. The bayou is an ecosystem—living and nonliving things that interact in a particular area. The wind, the water, the grasses, the algae, the fish, and the heron are all part of the ecosystem. The living and nonliving things that interact in an ecosystem may seem quite different, but they are more similar than they appear. Everything in an ecosystem that takes up space is made of matter.

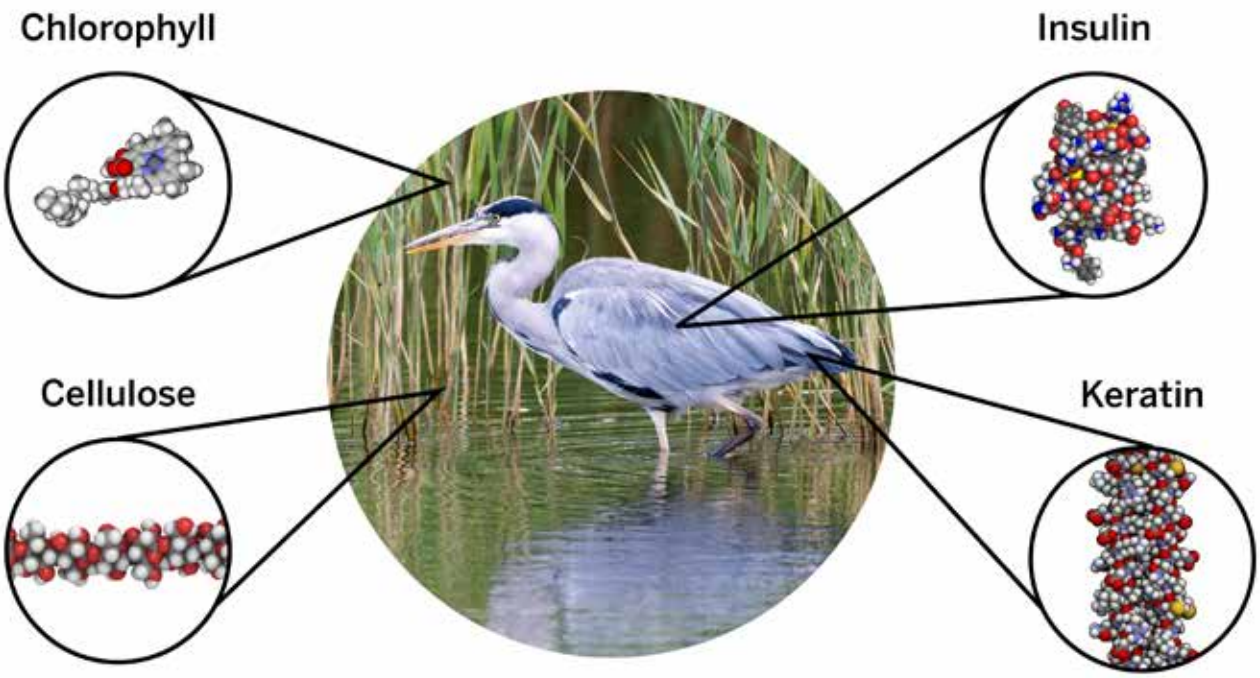
Matter can be classified as biotic or abiotic. The prefix *bio-* means living, so biotic matter is the matter that makes up living things. In the bayou,

this includes things such as the trees and the grass and the heron. Things that are dead now but were once living are also made of biotic matter, such as the animals that have died or the decomposing leaves that have fallen from the trees. Scientists consider once-living dead things to be different from those things in an ecosystem that were never alive, such as the air that blows through the trees at the edge of the wetland or the water that pools over the soggy ground. These nonliving things are made of abiotic matter. The prefix *a-* means not, opposite, or without, so *abiotic* means not living.

In any ecosystem, the biotic and abiotic matter are quite different from each other and have different properties, but all matter is similar at a very small scale. All matter is made of very tiny pieces called atoms. Atoms are too small to see, but scientists have evidence that they make up all the matter around us. There are over a hundred known types of atoms in the universe—such as carbon, oxygen, and hydrogen—and these atoms connect in different ways to form different kinds of matter.

Wetland grasses are living things, so they are biotic matter. That matter is made of molecules, and those molecules are made of atoms. Molecules are groups of atoms that are joined together in a particular way. Grass is made of many different molecules, but two important molecules that make up all plants are cellulose and chlorophyll. Cellulose molecules

A heron eats a fish. This is one way that living things interact in an ecosystem. A heron and a fish are both made of biotic matter. The water and air are made of abiotic matter.

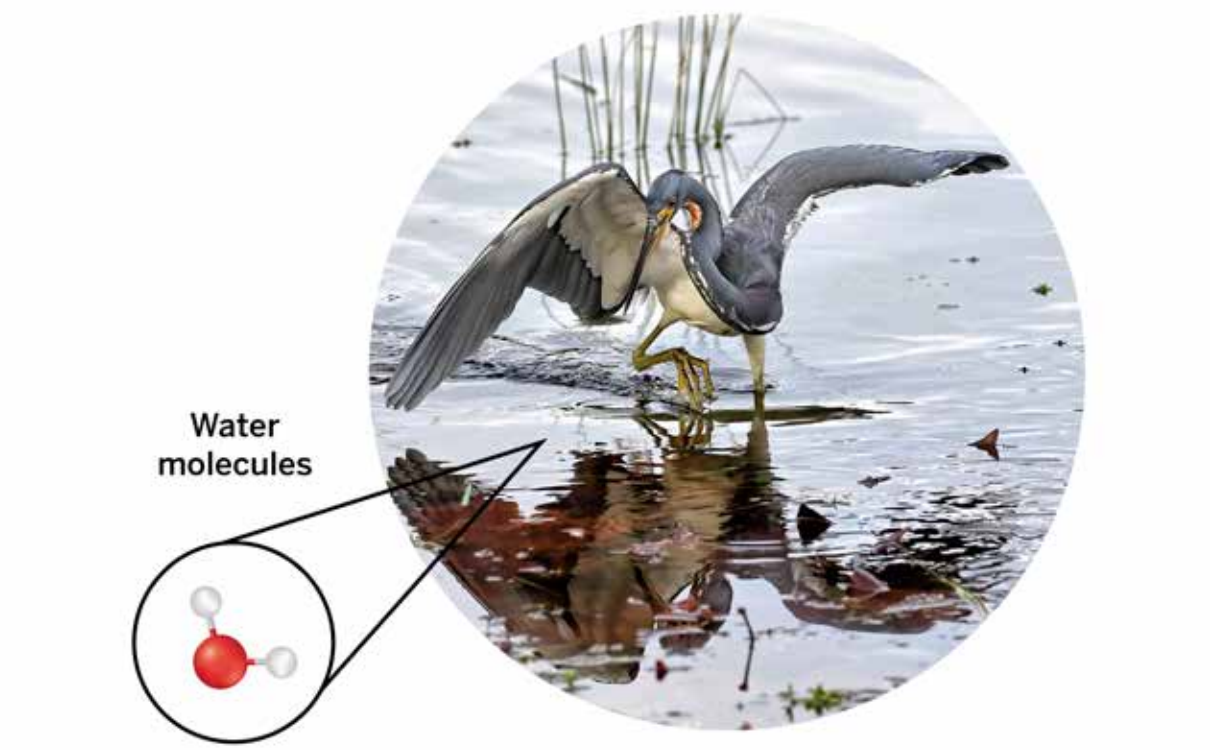


Wetland grasses and herons are made of biotic matter which is made up of many different types of molecules. All molecules are made of atoms.

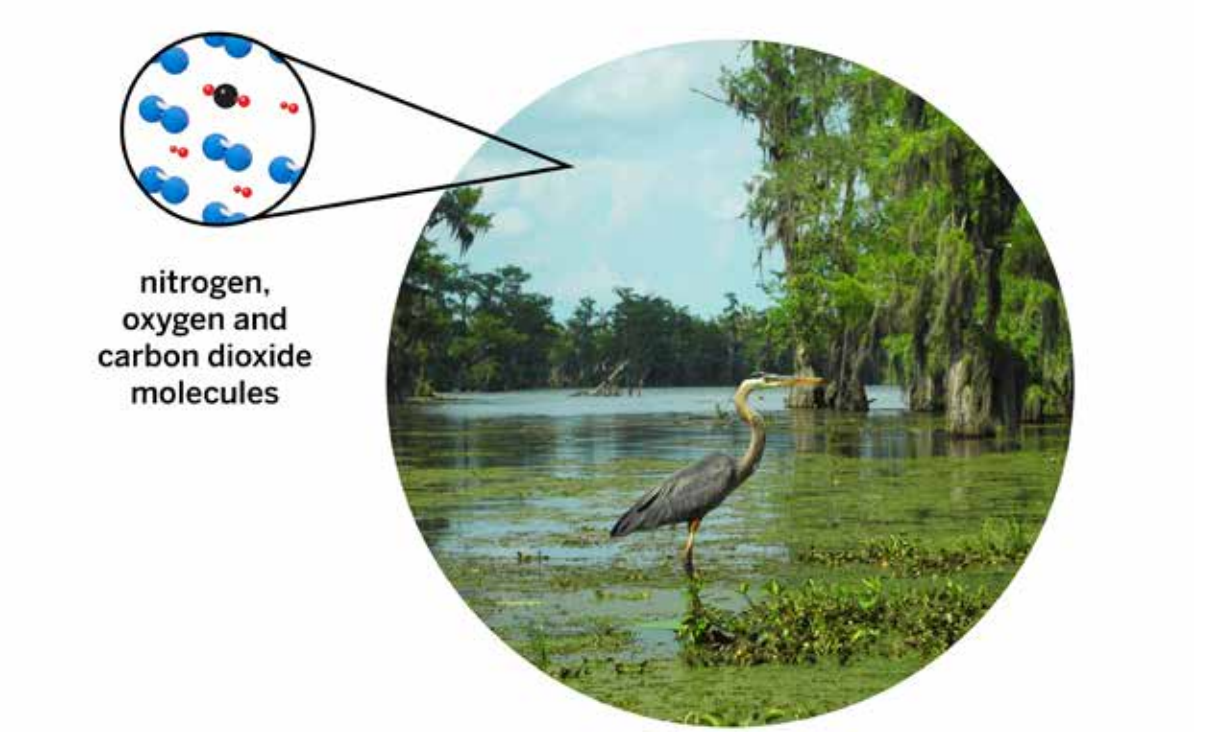
are made of carbon, hydrogen, and oxygen atoms, and the way these atoms connect forms a strong substance that helps plants stand upright. Chlorophyll molecules are made of carbon, hydrogen, oxygen, nitrogen, and magnesium atoms that connect together in a specific way. The way the atoms are connected allows chlorophyll to capture energy from the sun for photosynthesis.

A heron may seem very different from wetland grasses, but herons are also made of molecules, which are made up of atoms. Insulin and keratin are two examples of molecules that make up a heron, but there are many, many more. Insulin, which is made of carbon, hydrogen, oxygen, nitrogen, and sulfur atoms, helps a heron regulate the glucose levels in their blood. Keratin is made of the same types of atoms as insulin but arranged in a different way. The way the atoms are arranged makes keratin durable and strong. Keratin is one of the molecules that makes up a heron's feathers and beak.

The water that flows through the bayou is not living. It is made of abiotic matter, but just like the grass and the heron, it is made of molecules, and those molecules are made of atoms. Water has very different properties than a molecule such as cellulose or keratin because of the atoms that make up water and the way they are arranged. Water molecules are made of a single oxygen atom connected to two hydrogen atoms.



Water is made of molecules. These molecules are made of oxygen and hydrogen atoms.

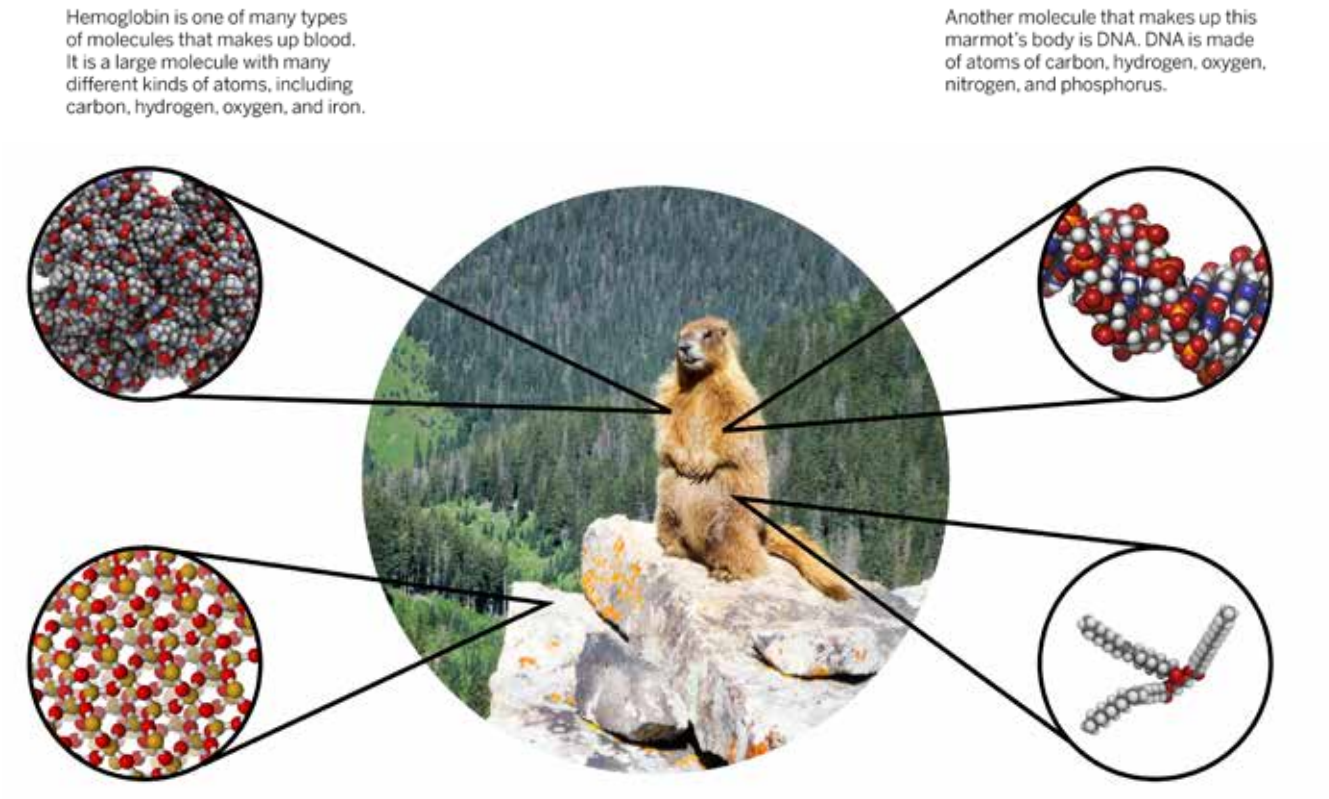


Air is made of many different types of molecules. This image shows a model of three of those molecules. Nitrogen is made of two nitrogen atoms, oxygen is made of two oxygen atoms, and carbon dioxide is made of one carbon and two oxygen atoms.

Another part of the ecosystem that is made of abiotic matter is the air. Air is also made of molecules. Two important molecules that make up the air are oxygen and carbon dioxide. These molecules are necessary to sustain life, such as the heron wandering the bayou and the grasses growing nearby. Oxygen molecules are made of only oxygen atoms, and carbon dioxide molecules are made of carbon atoms and oxygen atoms. The atoms that make up the molecules in the air and how they are arranged allow air to fill the space around you so you and the heron can breathe in the oxygen.

A high mountain ecosystem is very different from a bayou. The terrain is very rocky, and instead of herons and fish, you might see golden eagles and marmots. Still, no matter where they are located, all ecosystems are made of both biotic and abiotic matter, and all matter is made of atoms. Let's take a closer look at what makes up a high mountain ecosystem.

Whether you examine a forest ecosystem, a desert ecosystem, or an ocean ecosystem, all the matter that makes them up is made of atoms. In fact, all matter in the universe is made of atoms. The atoms connect in different ways to form molecules or extended structures, and the types of atoms and the ways they connect determine the properties of the substances that are part of the ecosystem. Trees grow tall because cellulose is rigid, fish can swim in water because water flows, and mountains last for millions of years because quartz is so strong.



Name: _____ Date: _____

Reading "What's the Matter in Ecosystems?"

1. Read and annotate the "What's the Matter in Ecosystems?" article.
2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.
3. Now, choose and mark a question or connection, either one you already discussed or a different one that you would like to discuss with the class.
4. Answer the reflection question below.

   Rate how successful you were at using Active Reading skills by responding to the following statement:

   As I read, I paid attention to my own understanding and recorded my thoughts and questions.

   - ☐ Never
   - ☐ Almost never
   - ☐ Sometimes
   - ☐ Frequently/often
   - ☐ All the time

Active Reading Guidelines

1. Think carefully about what you read. Pay attention to your own understanding.
2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
3. Examine all visual representations carefully. Consider how they go together with the text.
4. After you read, discuss what you have read with others to help you better understand the text.

Name: _____ Date: _____

Rereading "What's the Matter in Ecosystems?"

Preview the questions below and then reread the article "What's the Matter in Ecosystems?" to answer the questions. As you read, you may want to highlight or annotate parts of the text that will help you answer the questions.

1. Which of the following things from the article are made of **abiotic matter**? Circle all the abiotic things:
   a. heron
   b. air
   c. water
   d. quartz
   e. wetland grass
   f. marmot
2. Choose one of the abiotic things you circled and describe what it is made of.

Name: _____ Date: _____

Rereading "What's the Matter in Ecosystems?" (continued)

3. Which of the following things from the article are made of **biotic matter**? Circle all the biotic things:
   a. heron
   b. air
   c. water
   d. quartz
   e. wetland grass
   f. marmot
4. Choose one of the biotic things you circled and describe what it is made of.

_____

_____

_____

_____

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Name: _____ Date: _____

Investigating Energy Storage Molecules

1. **Make a claim.** Write a claim to answer the following question. You will have a chance to revise your claim after you gather more evidence.

   What are energy storage molecules made of?

_____

_____

_____

_____

_____

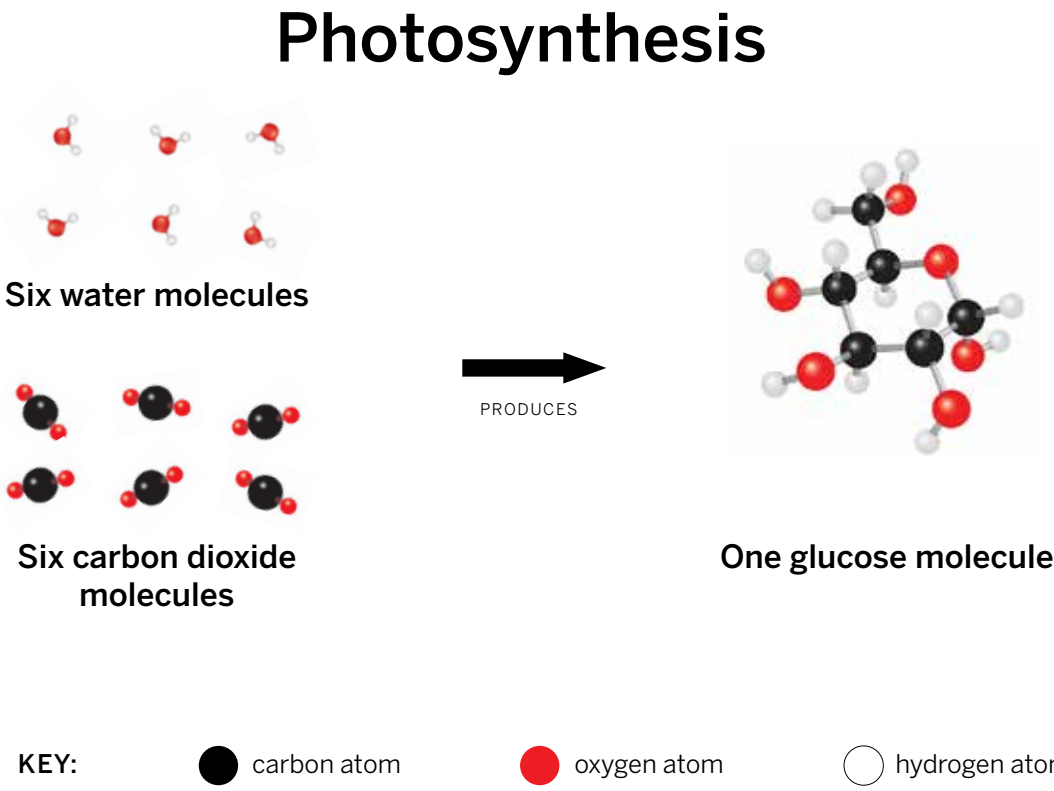
2. **Gather evidence about energy storage molecules.**
   - Read the information on your Energy Storage Molecules card.
   - Present your card to the rest of your group.
   - Work together to decide how energy storage molecules are similar and different.
   - Discuss with your group what information you have found that helps you figure out what energy storage molecules are made of.
3. **Revise your claim.** Return to the claim you made in Step 1 and change it or add to it, based on what you learned.

Name: _____ Date: _____

Modeling Chemical Reactions in Ecosystems

Part 1: Exploring the Reactants of Photosynthesis

During photosynthesis, one glucose molecule (an energy storage molecule) is produced from six molecules of water and six molecules of carbon dioxide. These molecules are shown below.



Discussion Questions

1. What are carbon dioxide, water, and glucose made of?
2. How do you think that a molecule of glucose is produced from six molecules of water and six molecules of carbon dioxide?

Name: _____ Date: _____

Modeling Chemical Reactions in Ecosystems (continued)

Part 2: Modeling Photosynthesis

Use the diagram of water, carbon dioxide, and glucose from Part 1 to model photosynthesis by using tokens. Each token represents an atom as shown in the key at the bottom of the diagram.

Directions

1. Group your tokens to represent six molecules of carbon dioxide and six molecules of water as shown in the diagram.
2. Use the tokens to build a glucose molecule. (Don't worry if your glucose molecule does not look exactly like the one in the diagram. Just make sure you have the correct number of atoms.)
3. Notice if you have any leftover atoms and set them aside.

Questions

Discuss the questions with your partner and record your responses.

1. What is the difference between water molecules, carbon dioxide molecules, and glucose molecules?

_____

_____

2. Where does the carbon that is in glucose come from?

_____

_____

3. What atoms are left over after producing glucose? What do you think happens to those atoms?

_____

_____

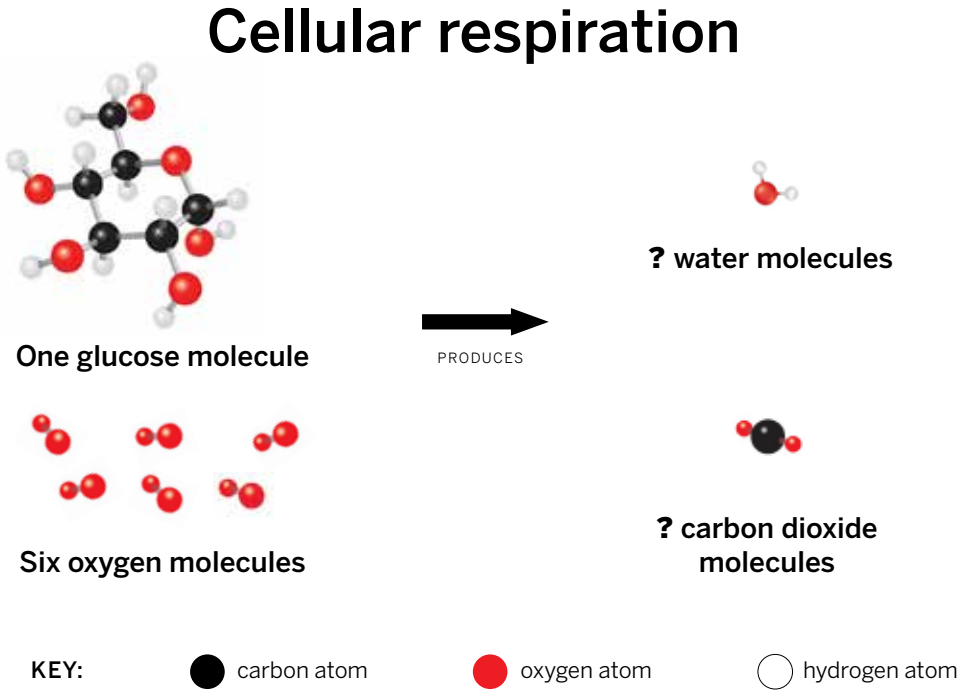
Name: _____ Date: _____

Modeling Chemical Reactions in Ecosystems (continued)

Part 3: Modeling Cellular Respiration

Directions

1. Build one glucose molecule and six oxygen molecules with your tokens.
2. Use the tokens to produce as many carbon dioxide and water molecules as you can.



Questions

Discuss the following questions with your partner and record your responses.

1. What does your model show you about how glucose and oxygen form carbon dioxide and water?

_____

_____

2. Where does the carbon that is in carbon dioxide come from?

_____

_____

Name: _____ Date: _____

Modeling Chemical Reactions in Ecosystems (continued)

Part 3: Modeling Cellular Respiration (continued)

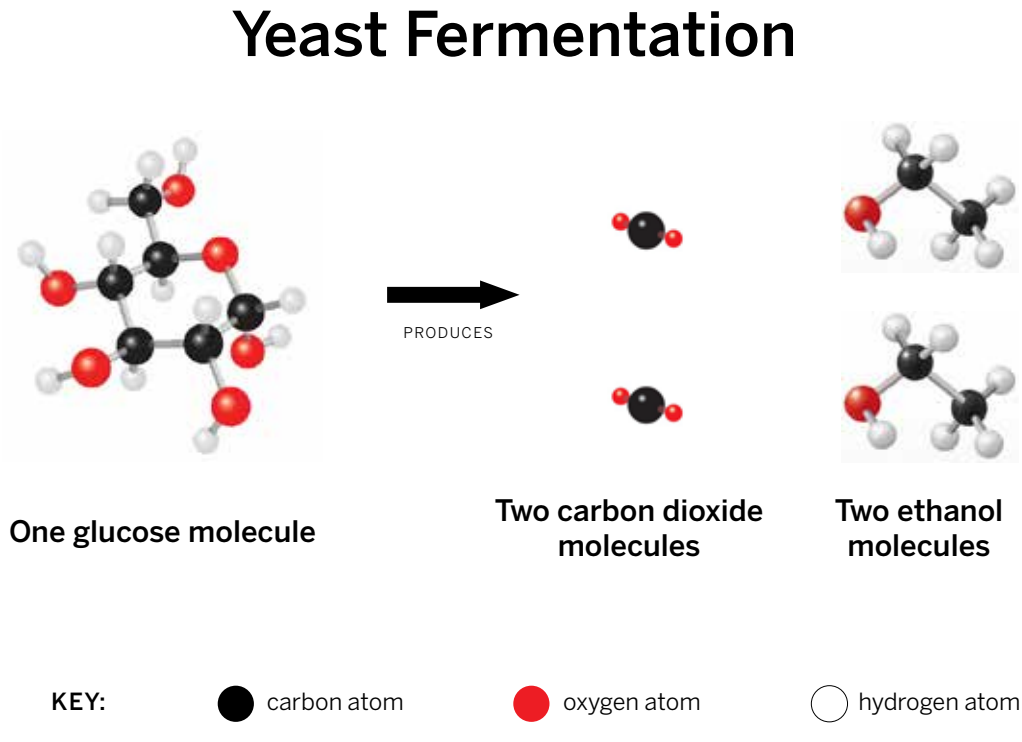
3. How many molecules of water and carbon dioxide are produced during cellular respiration?

_____

_____

Part 4: Yeast Fermentation

Yeast are single-celled organisms that use cellular respiration to release energy, but they can also get energy from another process called fermentation. Yeast cells perform fermentation when they don't have enough oxygen for cellular respiration. (This is the process that happens in bread to make it rise!) The reaction is shown below. Analyze the diagram and answer the questions.



Discussion Questions

1. What is similar about glucose and ethanol molecules?
2. What makes glucose molecules different from ethanol molecules?
3. How is it possible for glucose molecules to become ethanol and carbon dioxide molecules?

There are nitrogen atoms in many parts of this farm and forest.

Sugarcane Farm and Pine Forest: The Nitrogen Cycle

A farmer works in her field of sugarcane that lies near a pine forest. The farmer will sell the sugarcane to a factory that will use the stems to make sugar. Today, the farmer will order nitrogen fertilizer for her sugarcane plants. Nitrogen is a type of atom and part of many different kinds of biotic and abiotic matter. The plants need nitrogen to grow, but the fertilizer is expensive. If the farmer adds too little fertilizer, the plants won't grow well. If the farmer adds too much fertilizer, some may get washed into the stream in the forest and harm the animals there. The farmer spends thousands of dollars on nitrogen fertilizer, but nitrogen is all around her farm: air in Earth's atmosphere is 78% nitrogen gas! Yet the pine forest grows just fine without any fertilizer. What's going on?

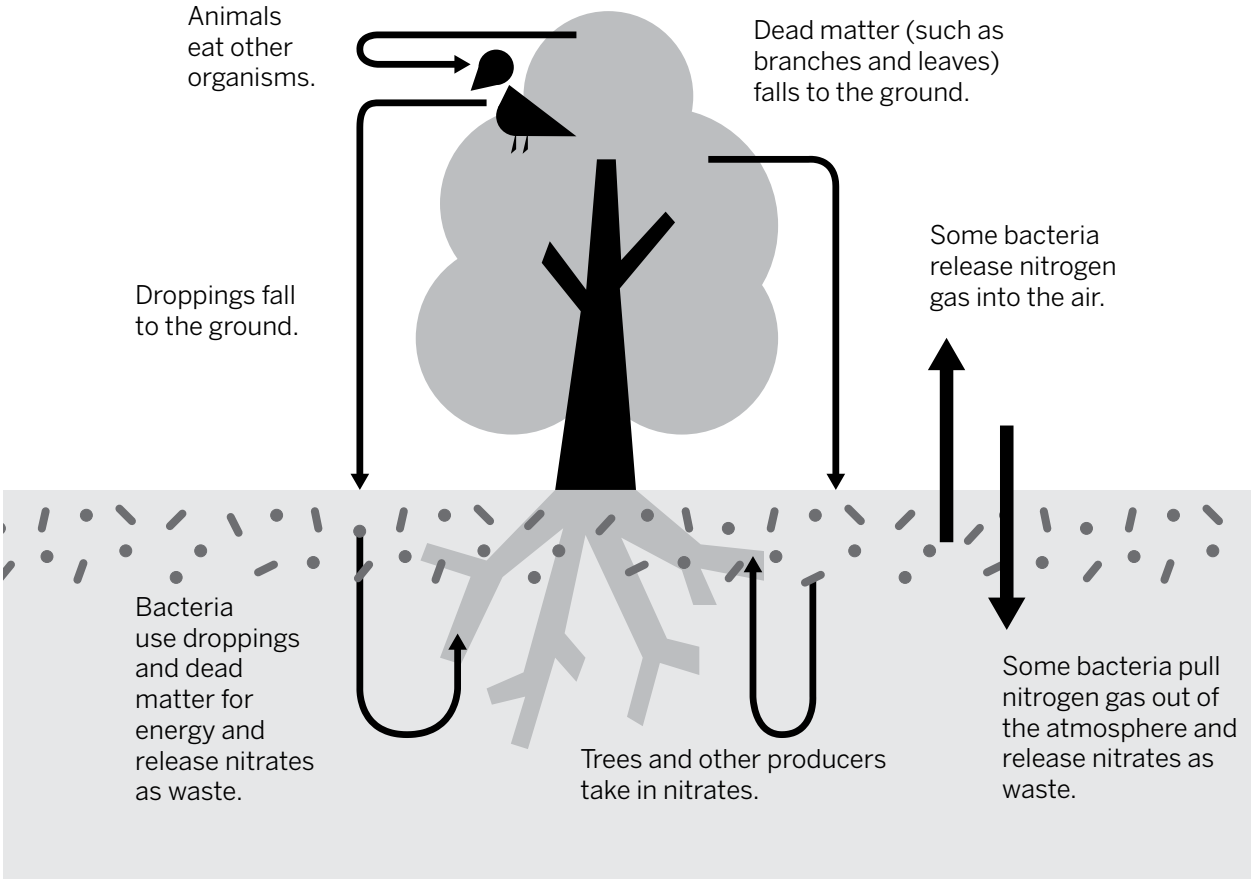
The answer has to do with the nitrogen cycle—the way nitrogen atoms move through biotic and abiotic parts of ecosystems. Plants, a type of producer, can't get the nitrogen atoms they need out of the air. Instead, they get those atoms from the soil, through their roots, from molecules called nitrates that are made partly of nitrogen atoms. Most producers can only get their nitrogen from these types of molecules. The nitrogen cycle allows the producers in the pine forest to get the nitrogen they need, but it doesn't work quite the same on the farm.

The Nitrogen Cycle in the Pine Forest

A small bird eats a seed from a pine cone in the forest. The nitrogen in the seed moves into the bird's body where it may be used to help grow the bird's muscles. When the bird makes droppings, some nitrogen remains in the droppings and returns to the soil. A branch from a tree falls to the ground, and nitrogen in the branch returns to the soil. However, the nitrogen from droppings and dead matter, like the fallen branch, is not in the form of nitrates, and plants are not able to use it in this form.

Nitrogen in the pine seed is taken in by the bird.

Decomposers living in the forest soil get their food from dead matter. The most important decomposers for the nitrogen cycle are bacteria. Bacteria use energy storage molecules from dead matter for cellular respiration, but they can also take in the nitrogen from dead matter and use it to build parts of their cells. The waste that some bacteria give off includes nitrates—the nitrogen-containing molecules that producers are able to take in.



Nitrogen cycles among biotic and abiotic parts of an ecosystem.

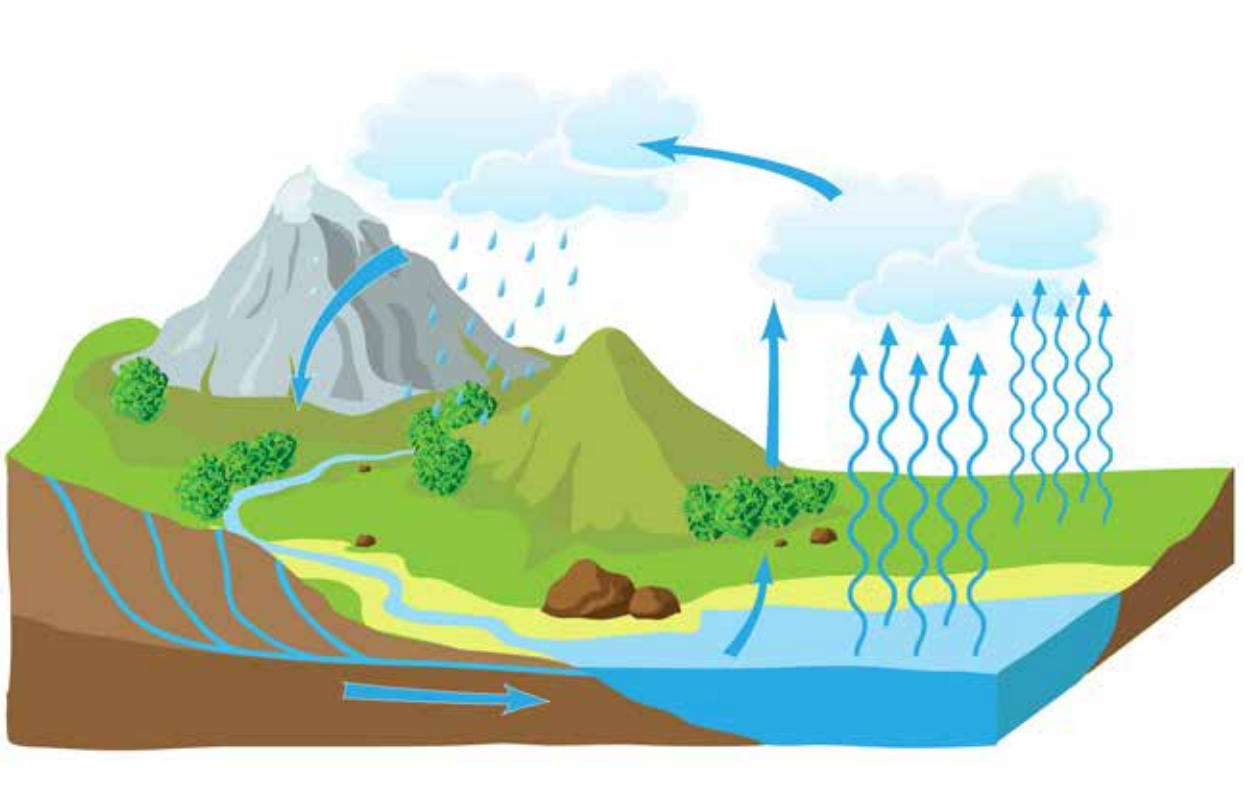
Sugarcane needs water to grow.

Some bacteria make nitrogen gas as waste, and this goes back into the air. A few types of bacteria can also pull nitrogen out of the air and return it to the soil as nitrates in their waste.

The pine forest ecosystem is not a totally closed system (meaning that some matter does come in and out of the system), but as nitrogen moves among the parts of the system, the total amount in the system stays about the same. Nitrogen moves from the soil into the trees, from the trees into the animals that eat the pine seeds, from the dead matter back into the soil, and into and out of the air. Even with all this movement, there is usually enough nitrogen for the trees and other producers.

Nitrogen on the Sugarcane Farm

So what happens on the sugarcane farm? Why does the farmer have to add nitrogen to her fields in the form of fertilizer? In a forest, the nitrogen continually cycles through the ecosystem, and the total amount does not change much. However, on a farm, nitrogen is always being removed. When the farmer sends the cut sugarcane to be made into sugar, she is removing nitrogen from the farm ecosystem. The cut sugarcane won't decompose on the farm and, therefore, allow decomposers to replace nitrates in the soil. The farmer has to replace this nitrogen by using fertilizer.



Water continually cycles through an ecosystem, becoming available to organisms in that ecosystem.

Other Matter Cycles

Nitrogen is not the only matter that cycles through ecosystems and that producers need. Water molecules also cycle through ecosystems in the water cycle. There is water in the stream in the pine forest, mixed into the soil in the farm and forest, in the air and the clouds above, and in the bodies of plants and animals. When it rains, water moves from the clouds to the ground and into the soil and the stream. Some of it evaporates back into the air. Animals drink, and producers take in water through their roots. Water moves from plant leaves back into the air.

In the forest, the organisms get the water they need through this water cycle. The total amount of water in the system stays about the same. On the other hand, many crops, including sugarcane, require more water than can be provided naturally by the water cycle. This can be because crop plants are grown in locations with less rain than they need, or because farmers need the plants to grow quickly, or because so many of the plants are growing in the same location. For a variety of reasons, the farm system does not have enough water in it to support the crops. This means that water is another type of matter, like nitrogen, that needs to be brought into a farm.

Carbon, potassium, and phosphorus are other types of matter that producers need, and these all cycle through ecosystems as well. Since farms are not natural ecosystems, and matter does not cycle in the same way as it does in natural ecosystems, part of the challenge of farming is to make sure plants on the farm have all the types of matter they need to grow.

Name: _____ Date: _____

Reading "Sugarcane Farm and Pine Forest: The Nitrogen Cycle"

1. Read and annotate the "Sugarcane Farm and Pine Forest: The Nitrogen Cycle" article.
2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.
3. Now, choose and mark a question or connection, either one you already discussed or a different one that you would like to discuss with the class.
4. Answer the reflection question below.

   Rate how successful you were at using Active Reading skills by responding to the following statement:

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   - ☐ Never
   - ☐ Almost never
   - ☐ Sometimes
   - ☐ Frequently/often
   - ☐ All the time

Active Reading Guidelines

1. Think carefully about what you read. Pay attention to your own understanding.
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3. Examine all visual representations carefully. Consider how they go together with the text.
4. After you read, discuss what you have read with others to help you better understand the text.

Name: _____ Date: _____

Rereading "Sugarcane Farm and Pine Forest: The Nitrogen Cycle"

Preview the questions below and on the next page and then reread the article "Sugarcane Farm and Pine Forest: The Nitrogen Cycle" to answer the questions. As you read, you may want to highlight or annotate parts of the text that will help you answer the questions.

1. Describe **one way** nitrogen moves from one part of the ecosystem to another in the pine forest ecosystem.

_____

_____

_____

_____

_____

_____

_____

_____

2. When nitrogen moves in this way, it is moving from (circle one):

   biotic matter to another kind of biotic matter.

   biotic matter to abiotic matter.

   abiotic matter to another kind of abiotic matter.

   abiotic matter to biotic matter.

3. When nitrogen moves this way, the **total amount** of nitrogen in the ecosystem (circle one):

   increases decreases stays about the same

4. The farmer **sells sugarcane**, which has nitrogen in it. When nitrogen moves this way, the total amount of nitrogen in the farm ecosystem (circle one):

   increases decreases stays about the same

Name: _____ Date: _____

Rereading "Sugarcane Farm and Pine Forest: The Nitrogen Cycle" (continued)

5. The farmer **buys fertilizer**, which has nitrogen in it, and brings it to the farm. When nitrogen moves this way, the total amount of nitrogen in the farm ecosystem (circle one):

increases decreases stays about the same

Rainbows appear when there is both sunlight and rain.

Colors in the Sky

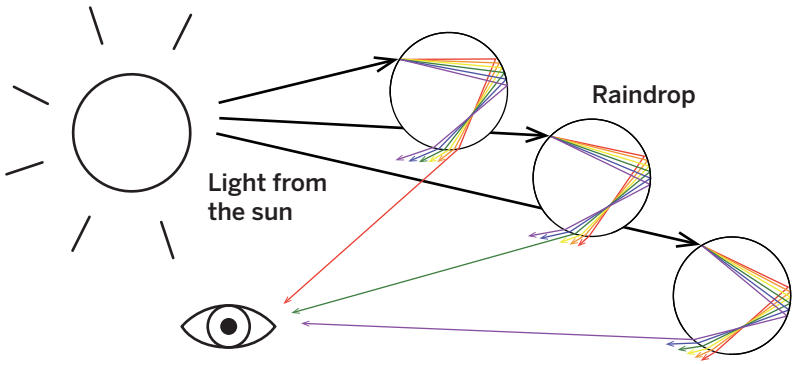
When we look up at the sky on a sunny day, it usually appears bright blue. On certain special days, we may look up and see not just blue in the sky but also red, orange, yellow, green, indigo, and violet. Both blue skies and rainbows are caused by light interacting with matter through processes called refraction and scattering.

Rainbows and Refraction

Late in the afternoon it is raining, but sunlight is also shining. Suddenly, a bright arc of colors appears in the sky: a rainbow! What causes rainbows?

A rainbow is caused by the interaction between sunlight and drops of water in the air. Sunlight is made up of many wavelengths of light, including all the colors of visible light. When sunlight hits a drop of water, some of the light travels into the drop. At the edge between the air and the water, the light is refracted, meaning that the path it takes bends. Light refracts whenever it passes from one material into another. Each wavelength (color) of visible light refracts at a different angle, so the colors of light separate when they enter the water drop. The light then continues through the water drop, and some of it reflects back off the far side of the

A rainbow is caused by refraction—the bending of light. When light from the sun passes from the air into the water of a raindrop, the light bends. Some wavelengths of light bend more than others, which causes the light to separate into different colors. This diagram only shows three wavelengths of light reaching the eye. However, when someone sees a rainbow, all wavelengths of visible light reach their eye.



drop. Some of this light then travels back out of the water into the air. At the edge between the water and the air, this light is refracted again, further separating the colors of light.

Sometimes the end of a rainbow appears to be touching the ground, but someone standing at that spot would not see a rainbow there. To be able to see the rainbow, a person needs to be standing in the path of the different colors of light that travel from the raindrops.

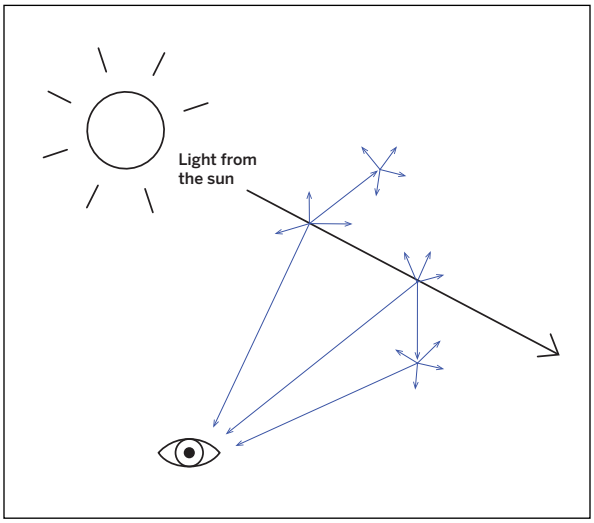
Blue Skies and Scattering

Rainbows are relatively rare, but another color in the sky is extremely common. Why is the sky blue?

The sky's blue color is caused by another interaction between sunlight and matter. When certain wavelengths of light interact with certain kinds of molecules, the light can get redirected in different directions. This is called scattering.

On a sunny day, the sky can be a brilliant blue.

In the atmosphere, gas molecules scatter light from the sun by absorbing and re-emitting the light in all different directions. This happens more with shorter wavelengths of light, such as blue light. When a person looks somewhere in the sky (not directly at the sun, which is damaging to the eyes), there is no sunlight traveling directly to their eyes. The light that does reach a person's eyes is light that has taken an indirect path, scattering from one gas molecule in the air to another. That light is a lot of blue light, since longer wavelengths most often scatter when they hit the molecules in the air.



The blue color of the sky is caused by scattering—when light is absorbed and re-emitted in a random direction. Blue light from the sun scatters more than other wavelengths of light.

Besides the classic blue of a sunny sky and the bright colors of a rainbow, there are other colors that can be seen in the sky as well. They can all be explained by different interactions between sunlight and matter.

What interactions between sunlight and matter might cause the colors of a sunset?

Name: _____ Date: _____

Explaining Rainbows and Blue Skies

Part 1: Exploring Rainbows with Flashlights and Prisms

1. **Mission**: Use the flashlight and prism to make a rainbow on the index card.
2. Discuss the questions (below) with your partner.

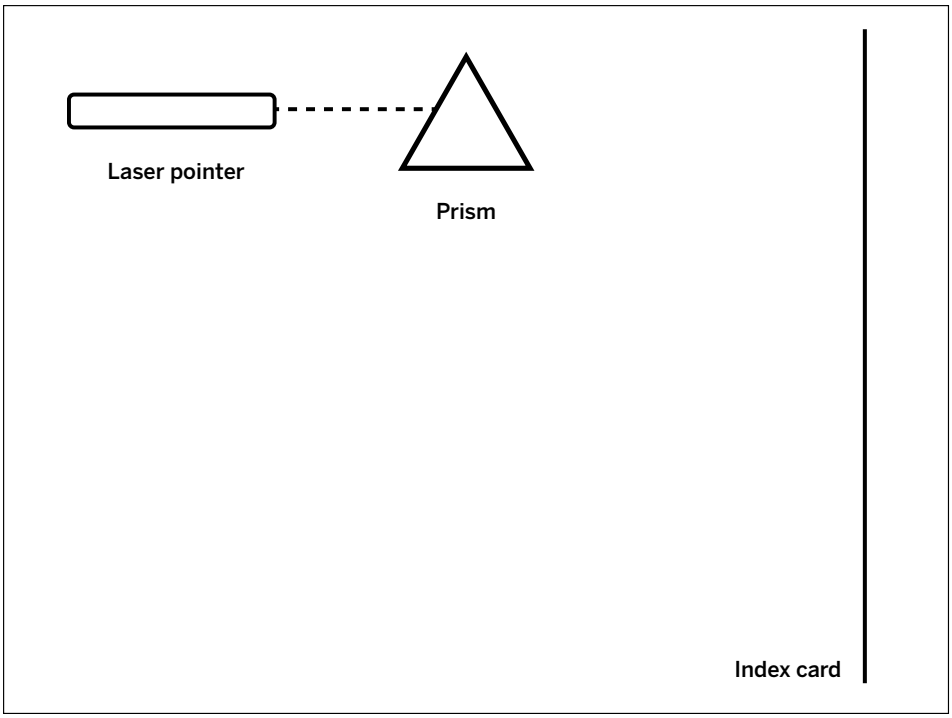
Discussion Questions

- How did you make the rainbow on the index card?
- Where did the different colors of the rainbow come from?
- What did you notice about the path of the light from the flashlight and the location of the rainbow?
- What are your ideas about how a rainbow forms?

Part 2: Investigating Red and Blue Light

Safety Note: Laser Pointers
Although the laser pointers are fairly low energy, they can be damaging if shined directly into eyes.

1. **Predict:** How would the path of light differ between a red laser pointer and a blue laser pointer? Draw your ideas on the diagram and then discuss with your partner.



Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

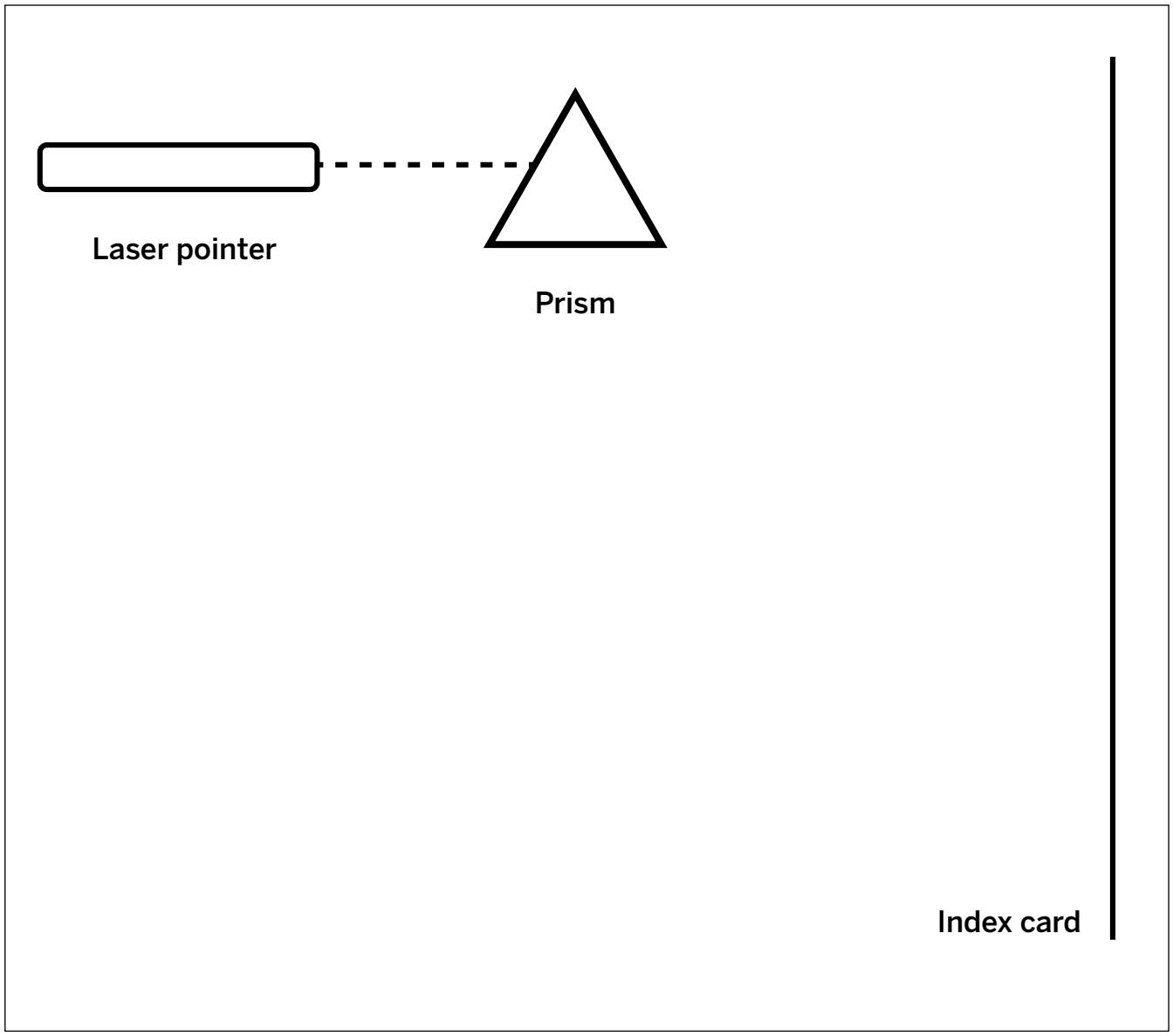
Part 2: Investigating Red and Blue Light (continued)

2. **Set up your investigation** (It's important that you place the objects on the sheet exactly as they are shown.)**:**
   - Place the red laser pointer on the spot shown on the Path of Red and Blue Light sheet.
   - Place the prism on the labeled triangle on the sheet. It is very important that the prism stays in the exact same position for the red laser and the blue laser.
   - Place the index card attached to the binder clip on the labeled position on the sheet so it stands upright.
   - Place the second index card on the vertical gray line between the laser pointer and the prism and turn on the laser pointer. Adjust the position of the laser pointer until the beam of light on the index card is directly above the dashed line on the sheet. Remove this second index card and be careful to not move the laser pointer.
3. **Draw the path of light:** On the Path of Red and Blue Light sheet, trace the path of light starting from the laser pointer to the prism to the index card.
4. **Repeat Steps 2 and 3 with the blue laser pointer.**
5. **Use the path you drew on the Path of Red and Blue Light sheet to record the path of red and blue light on the diagram on the next page.**

Name: _____ Date: _____

Explaining Rainbows and Blue Skies

Part 2: Investigating Red and Blue Light (continued)



Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

Part 2: Investigating Red and Blue Light (continued)

6. **Discuss and respond to the following questions:**

   How does the path of light from the red laser pointer compare to the path of light from the blue laser pointer?

_____

_____

_____

   Why do you think the path of the red light was different from the path of the blue light?

_____

_____

_____

Part 3: Gathering Evidence from "Colors in the Sky"

1. Read and annotate the "Rainbows and Refraction" section of the "Colors in the Sky" article. As you read, make annotations that will help you answer the following question:
   - What does a raindrop do to the light from the sun to create a rainbow?
2. Discuss the question with your partner and record your response below.

_____

_____

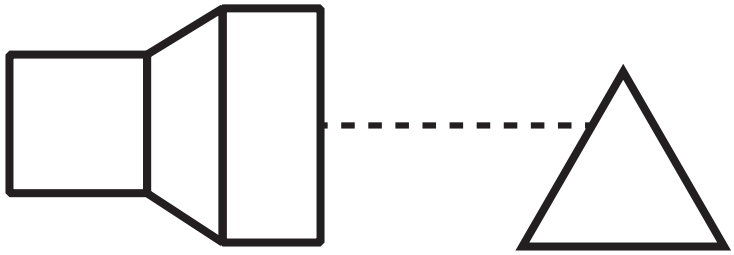
_____

Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

Part 4: Explaining the Rainbow on the Index Card

Use the evidence you gathered from your investigation with laser pointers and from the article to create a model to explain what caused the light from the flashlight to turn into a rainbow on the index card. Label and annotate your model to help with your explanation.



Flashlight Prism

Index card

Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

Part 5: Gathering Evidence About Blue Skies

1. Read the "Blue Skies and Scattering" section of the "Colors in the Sky" article. As you read, annotate the article to help you answer the following questions:
   - How does light from the sun interact with the molecules in the atmosphere?
   - Why does the sky appear blue?

2. Discuss the questions with your partner and record your responses below.

   How does light from the sun interact with the molecules in the atmosphere?

_____

_____

_____

   Why does the sky appear blue?

_____

_____

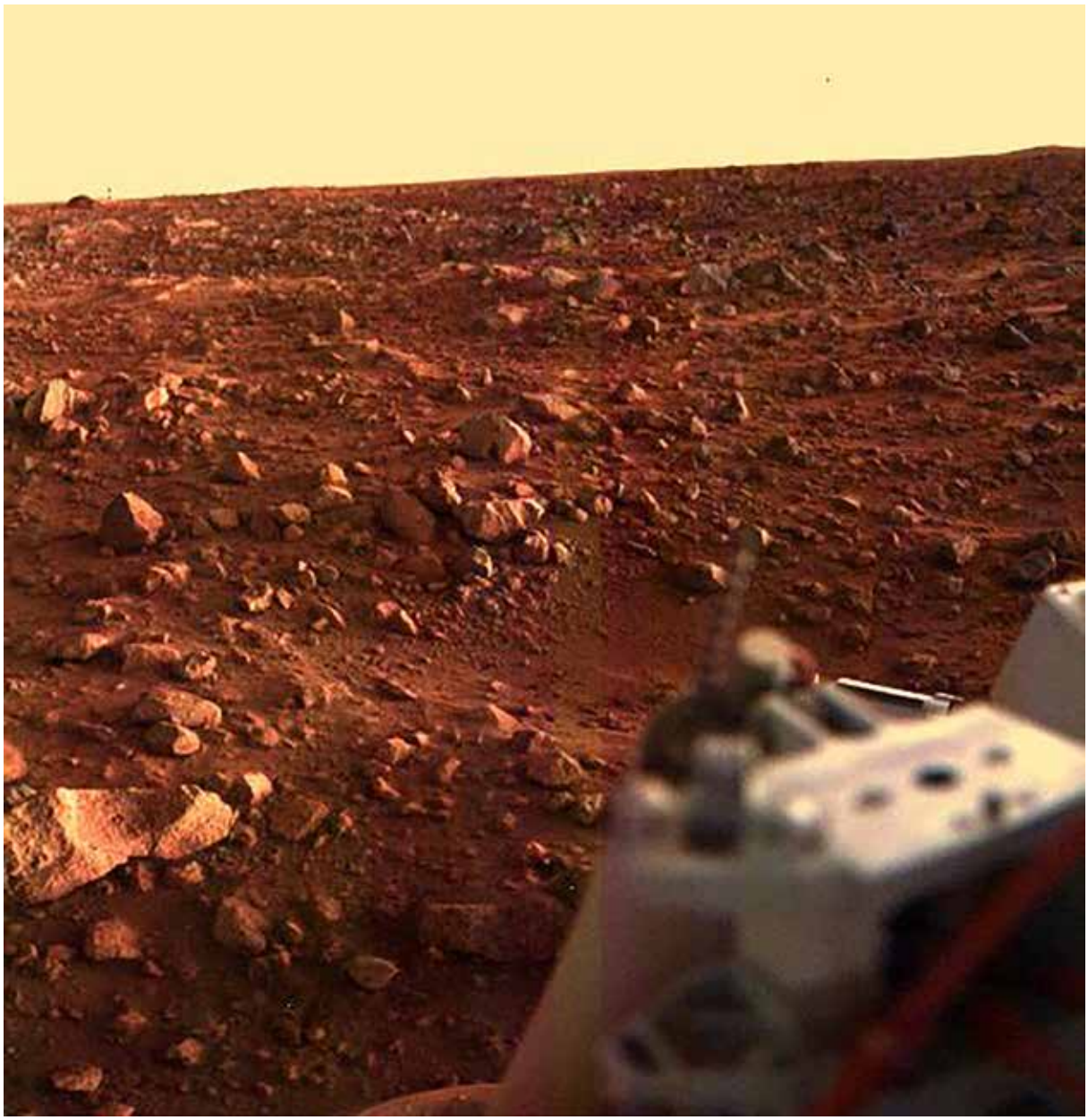
_____

Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

Part 6: Modeling the Martian Yellow Sky

Photos from Mars show that during the day, the sky on Mars can sometimes appear to be yellow. The molecules in Mars's atmosphere are different from the molecules in Earth's atmosphere. The molecules in Mars's atmosphere scatter the sun's light differently than the molecules in Earth's atmosphere.

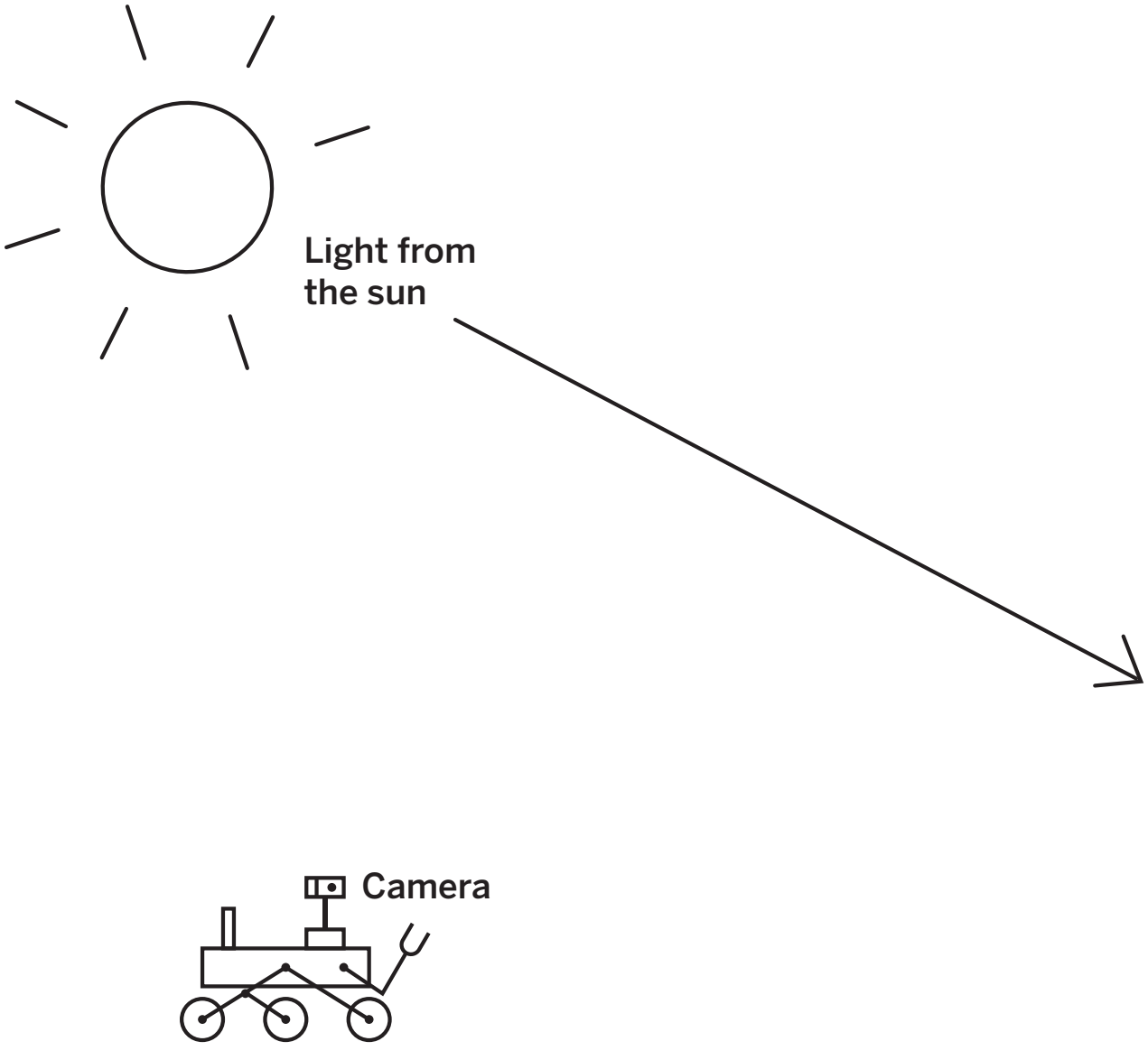


Name: _____ Date: _____

Explaining Rainbows and Blue Skies (continued)

Part 6: Modeling the Martian Yellow Sky (continued)

Complete the diagram below to model why the sky on Mars appears yellow in color.



Grade 6 Glossary

refract: to bend while passing from one material to another

refractar: curvarse al pasar de un material a otro

scatter: to get redirected in different directions

dispersar: ser diseminado en distintas direcciones

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