Name: _____ **Packet Due:**

Life Science

Module 4	**Matter & Energy in Ecosystems**
Part 2	**Photosynthesis**

INVESTIGATION QUESTION:

Why didn't the plants and animals in the biodome have enough energy storage molecules?

Lessons & Objectives

Lesson 1: Investigating a Biodome

- **I can...** explain my role as a student ecologist and fully understand the problem that needs to be solved.

Lesson 2: Sunlight & Life

- **I can...** determine the role of producers in an ecosystems and be introduced to photosynthesis.

Lesson 3: Where Energy Storage Molecules are Made

- **I can...** explore different types of energy storage molecules and develop an understanding of how producers use energy from sunlight and carbon dioxide to make energy storage molecules.

Lesson 4: Photosynthesis in Ecosystems, Examining Data from the Biodome

- **I can...** discover factors that can decrease and increase the energy storage molecules in living things.
- **I can...** use evidence and reasoning to construct an explanation for the Econauts about the decrease in energy storage molecules in the biodome.

Grading
for each section you will earn a grade based on the following criteria

4	3	2	1	0
Nothing is missing. Responses consistently meets ALL the criteria for high quality work. Evidence of exemplary effort is evident.	Work is 75-100% complete and accurate. Work/effort misses the criterion for high quality consistently.	Work is 50-75% complete and accurate. Work has evidence of quality but not consistently.	More than 50% of the work in incomplete or incorrect. Work does not meet the expected level of quality.	No work completed.

Lesson 1: Investigating a Biodome

Objective: I can explain my role as a student ecologist and fully understand the problem that needs to be solved.

Lesson 1 DO NOW	*List your three observations:* 1. _____ 2. _____ 3. _____ *Record two inferences:* 1. _____ 2. _____ *Formulate one question:* 1. _____ _____

Video Introduction:

As you watch the video consider the following:

What is one thing you find interesting about this biosphere?

_____

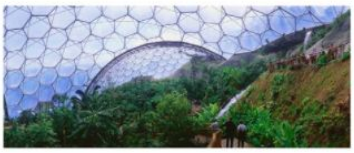
_____

What questions do you have about living in a biosphere?

_____

_____

Problem Introduction



Bryan Corry
To: Student Ecologists
Re: Welcome to Your Mission!

Welcome to the Biodome Investigation Team! You just learned about Biosphere 2, an experimental research facility that was built for learning more about Earth and its ecosystems.

Five years ago, the Econauts constructed a biodome similar to Biosphere 2. They recently noticed that the organisms inside the biodome were getting sick and failing to reproduce. To protect the people and organisms inside, they shut down the biodome. The Econauts hired us to figure out what caused their biodome to fail, but we need your help. I'm including a presentation that explains your mission in more detail.

Student ecologists, we are counting on you!

Bryan
Dr. Bryan Corry, Head Ecologist
Biodome Investigation Team

Introducing the Biodome

Five years ago, a local group called the Econauts began an ambitious project to determine if humans could survive on another planet. They constructed a biodome, an ecosystem inside a glass dome larger than a football field. The ecosystem was filled with plants, animals, and a volunteer group of eight humans.

The Problem

For the first few years, the plants and animals inside the biodome seemed healthy and normal. In the last few years, however, the Econauts began to notice some problems. Animals were getting sick and failing to reproduce.

Plants weren't growing as big or producing as much fruit as they once did. The Econauts realized that something had gone wrong. Although the organisms were safely removed from the biodome, the cause of these problems is still a mystery.

Your Mission!

The Econauts want to build another biodome, but first, they need to understand what went wrong with this one. Please help us solve this mystery!

Think-Pair-Share

1. Why do organisms need energy storage molecules?

2. What is the connection between releasing energy and energy storage molecules?_____

_____

_____

ENERGY STORAGE MOLECULE:

_____

_____

_____

Examining Biodome Files

Dr. Corry left some of the Econauts' files about the biodome for you to examine. Please read and annotate *Biodome File #5: Goatherd's Journal*, highlighting any important information that will help you answer the Chapter 1 question. After you finish, please choose **at least one additional article** to read and annotate.

Once you're finished reading, record your ideas that might answer the Chapter 1 Question. Make sure to clearly cite which Biodome file your evidence comes from. This will help you as you write your final explanation to the Econauts at the end of this packet.

Chapter 1 Question: ***Why didn't the plants and animals in the biodome have enough energy storage molecules?***

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Baby goats are so cute!

Biodome File 5: Goatherd's Journal

Year 1

Winter:
Today was the first day of my dream job: my first day herding goats in the Econauts' biodome! I'm so glad I got to join the team on this great adventure. I'm taking care of a herd of twenty adult goats between the ages of three and eight years. Most goats don't live longer than ten years, so I might lose a few before we leave the biodome. Still, I'm looking forward to what this experience holds for all of us.

Spring:
To keep our biodome environment neat and clean, the team is taking turns burying all trash, droppings, dead animals, and dead plant matter. Guess whose turn it is this month? Mine! I've been raking up all the dead leaves and plants I can find, putting them into garbage bags, and tying the bags tightly before I bury them deep in the ground. At least there haven't been any dead animals this month! This isn't my favorite job here in the biodome, but I guess we all have to help out.

Summer:
Summer in the biodome is beautiful! The sun is shining, the birds are singing, and the goats are enjoying all the lush, green grass they can eat. Everybody seems happy and healthy.

Fall:
It's goat-breeding season here in the biodome. Fingers crossed that we'll have baby goats—we goatherds call them kids—in the spring! The vet came today for the goats' annual checkups, and said they're healthy.

Year 2

Winter:
The winter days are short and cold...and the winter nights are long and cold! There isn't much food available at this time of year, so I feed the goats hay from the alfalfa we grew last summer. At least they have thick winter coats to keep them warm. Four of our female goats are pregnant and should have their kids when spring comes! Until then, we just have to bundle up and try not to freeze.

Spring:
Our kids were born last week, and they sure are cute! The kids are eating well and growing quickly. It's such a wonder to watch these new little goats every day. My job is the best!

The goats are getting a nice, healthy diet of grass here in the biodome.

Summer:
It's my turn to bury our dead matter again. Burying our dead matter is never my favorite job, but it's especially tough this month because one of my older goats died last week. I sealed the body in a plastic bag and buried it along with all the dead leaves and plants, droppings, and trash. At least we have kids to help keep our goat population up. Otherwise, everybody in the biodome seems to be doing well.

Fall:
It's breeding season again! The vet visited for the goats' yearly checkup and said they're in good health. Looks like we're in for another good year in the biodome.

Year 3

Winter:
Winter again, and one of the goats died. I'm not sure what happened—she wasn't very old, and she didn't seem sick. I'm sad to have lost one of the herd. Otherwise, we're all doing pretty well and are trying to stay warm until spring.

Spring:
I love spring! The warm weather is much more comfortable, and it's good for the goats to have some fresh grass to eat. Two of my goats had kids this year. They're so cute, and I'm glad we have kids, since we lost a couple of older goats in the last year. It's my turn to bury dead matter again. It's a dirty job, but I think I'm getting used to it.

The goats love the alfalfa we harvested last summer!

Summer:
I can't figure out why, but it seems like we've harvested less alfalfa this summer than we did in the past. That means there's less for the goats to eat now, and they'll have less hay for the winter. Nobody's sure why, since we're getting plenty of sunlight in the biodome. I guess I'll have to start feeding the goats a bit less, so we don't run out.

Fall:
Time for the goats' yearly checkup. The vet said the goats don't have any diseases, but they're looking a bit thin. I guess we're seeing the effects of this summer's alfalfa shortage. I'm not sure what to do: I don't want to use up too much hay, but I want to make sure the goats have enough to eat. Anyway, it's breeding season again. Hoping for some kids in the spring!

Year 4

Winter:
I'm starting to get worried. Two of my goats died this winter, and I'm not sure why. The rest of the goats look a little thin, but they eat everything in sight, and they don't have any diseases. I think we have enough hay to get us through the winter. Maybe everything will get better once the goats can eat some fresh spring grass.

Spring:
None of the goats had kids this spring. I'm so disappointed. Kid goats are so much fun, and I like to think the herd is doing well. It's my turn to gather and bury dead matter again; I raked up a lot of leaves and droppings, but at least there weren't any dead animals to bury. Looking forward to a good summer harvest for the goats.

Summer:
This year's alfalfa harvest is even smaller than last year's. I'm worried about how we're going to feed the goats enough this summer and still have enough alfalfa to make hay for the winter.

Fall:
It's breeding season again, and time for our yearly visit from the vet. She said the goats don't show any signs of disease, but that they are looking very thin. This seems to be a problem with many of the animals in the biodome: they are all getting thinner. I don't know what to do; the alfalfa crop is still producing less than in the first few years of the biodome project.

Year 5

Winter:
Three more goats died this winter. I was sad to lose them, and I'm confused about what's happening to the goats. I know they're not sick, but why aren't they really healthy? Should I be doing something different? Something has to change soon.

Spring:
Another spring with no kids born. We now have fewer goats than we started with, even though six kids were born in the early years of the biodome. I don't like to see the herd getting smaller. It's my turn to gather and bury dead matter again.

Summer:
This summer's alfalfa harvest was the smallest yet. I'm not sure what the goats are going to eat this winter. They're already too thin.

Fall:
We've all been removed from the biodome. It turns out all of the populations had started to decrease, and it wasn't safe for us to stay. The vet couldn't find any signs of disease, though. I wonder what happened. I'm so sad that we won't be able to complete our mission.

I don't know why our goats are looking so thin—it's scary.

Lesson 2: Sunlight + Life

Objective: I can determine the role of producers in an ecosystems and be introduced to photosynthesis.

Lesson 2 DO NOW	As we start to investigate why the biodome failed, it's important to understand *how* **energy storage molecules** were added to the food web located in the biodome. In your own words, please write at least 5 sentences about what you already know about the process of ***photosynthesis*.** This will help us understand the base of the food web and build upon our understanding of topics covered in Part 1.

After the failure of their biodome, the Econauts are searching for answers. Why do some ecosystems support so much life, while others are relatively lifeless? As student ecologists, you know that organisms need energy to survive and that this energy comes from energy storage molecules. But where do the energy storage molecules themselves come from? In order to help the Econauts, you'll need to find out. Today, you'll learn the answers to these questions and others in Sunlight and Life, a set of articles about the key ingredients that make some ecosystems livelier than others.

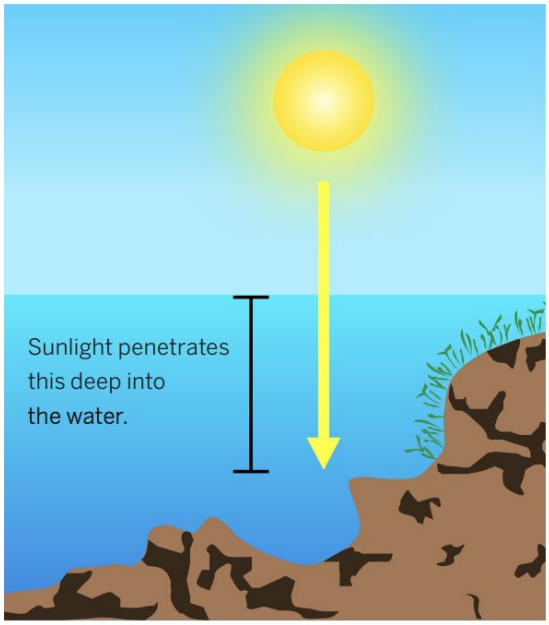
Background on Photosynthesis Video Notes

INTRODUCTION

Sunlight and Life

The edge of a big lake is full of life. Fish dart through the bright green reeds, ducks dive for algae growing in the shallow mud, and insects buzz everywhere. However, if you go out to the middle of the lake and dive to the bottom, you'll find a dead zone—a dark and barren area with hardly any organisms: no fish, no plants, not much of anything.

Why do some areas support so much life, while others are relatively lifeless? To survive, organisms need energy—and this energy comes from energy storage molecules. These molecules store energy that can be released in an organism's body. Energy storage molecules include glucose, starch, and fat. Ecosystems with lots of organisms need to have lots of energy storage molecules to keep all those organisms alive. Some ecosystems contain lots of energy storage molecules, while others don't contain as many.



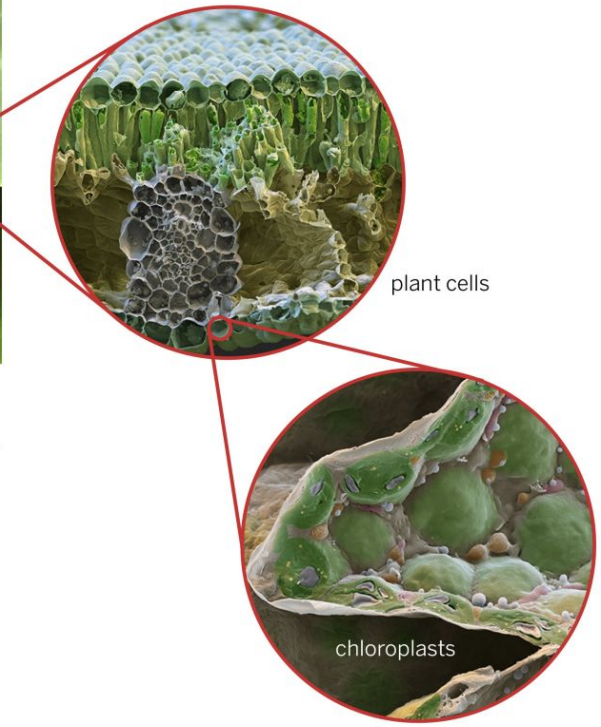
In deep lakes, there are many more organisms living in the shallow water where light can penetrate. In the deepest, darkest waters of a lake, not much life exists.

Where do energy storage molecules come from? Energy storage molecules are made mostly of carbon, and carbon is in the air all around us in the form of carbon dioxide. How can carbon that used to be in the air become part of molecules like glucose, starch, and fat? Through the process of photosynthesis, producers (such as plants) make glucose, a type of energy storage molecule, using water, energy from sunlight, and the carbon from carbon dioxide in the air. Once that carbon is in biotic matter in the form of glucose, organisms can use it to make other energy storage molecules, like starch and fat.

The process of photosynthesis takes place in tiny cell parts called chloroplasts. Only producers have them, so only producers can do photosynthesis. But in order to get the energy to do photosynthesis, producers need sunlight.

Sunlight is one reason some ecosystems have so many more energy storage molecules—and so much more life—than others. With more sunlight, producers like plants and algae can do more photosynthesis. They take more carbon out of the atmosphere and turn it into more energy storage molecules to meet their energy needs. As producers make more energy storage molecules, consumers—the animals that eat the producers—get more energy storage molecules from eating the producers. Those consumers use energy from the energy storage molecules to survive and reproduce, increasing in number. Then secondary consumers—the ones that eat animals—are able to get more energy storage molecules from eating the primary consumers that ate the plants.

An ecosystem that gets lots of sunlight can support lots of organisms, while an



The process of photosynthesis takes place in tiny cell parts called chloroplasts—only producers have them, so only producers can do photosynthesis. But in order to get the energy to do photosynthesis, producers need sunlight.

Sunlight is one reason why some ecosystems have so much more glucose—and so much more life—than others. With more sunlight, producers can do more photosynthesis. They take more carbon out of the atmosphere and turn it into glucose they can use for their energy needs. As producers make more glucose, consumers—the animals that eat those plants—are able to get more glucose from eating the producers.

ecosystem that gets less sunlight can support fewer organisms. To find out about other ecosystems where the amount of sunlight has a big effect on the amount of living things, read one of the chapters that follow.

Coral reefs thrive in places where sunlight can shine through shallow, clear water.

Coral Reefs and Clear Water

Coral reefs form in clear, shallow water with lots of sunlight. Reefs may look like they are made of rock, but they're not—reefs are living structures made up of millions of tiny animals called coral polyps. Their hard skeletons stick together to form reefs that may be up to 2,300 kilometers (1,429 miles) long! What's even more amazing about coral reefs is the huge number of different organisms that make their homes in them: fish, sea stars, urchins, shrimp, sponges, crabs, sharks, and more.

Coral reefs depend on sunlight. Why? Coral polyps are animals, not plants—they can't photosynthesize. However, inside each tiny polyp are even tinier algae made of just one cell each. These algae are producers, and it's their ability to do photosynthesis that gives life to the reef ecosystem.

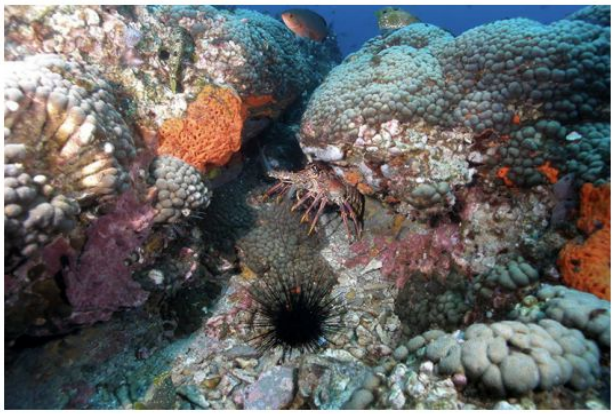
In this close-up photo of coral polyps, you can see the tiny green algae living inside them!

Parrotfish eat coral polyps. If you dive near a reef, you can actually hear parrotfish munching on the coral!

As sunlight filters through the clear, shallow water, the algae perform photosynthesis. They take in water, as well as carbon dioxide that is dissolved in the water, and use the energy from sunlight to change them into oxygen and glucose, a type of energy storage molecule. These energy storage molecules are stored in the bodies of the algae. Because the algae live inside the coral polyps, the polyps are able to use some of the energy storage molecules produced by the algae for their own energy needs.

With a constant supply of energy storage molecules, the coral polyps grow and reproduce, forming huge reefs. Many types of fish eat coral polyps, getting the energy storage molecules they need. Sharks and other large fish prey on the smaller fish that eat coral. With plenty of sunlight, one coral reef can support a huge community of organisms.

Since reefs depend on sunlight, they also depend on clear water that the sunlight can penetrate. If the water above a coral reef becomes too muddy or polluted, the whole reef ecosystem is threatened. Muddy water blocks sunlight, preventing it from reaching the coral reef. Without sunlight, the algae inside the coral polyps can't photosynthesize. The algae run out of energy storage molecules, and they quickly die. Without access to the energy storage molecules from the algae, the coral polyps soon die as well. The fish and other animals that depended on the coral die off or swim away to find other food. A coral reef without access to sunlight becomes a skeletal reef—it can't support the life it did before. Sunlight truly is life to a coral reef.



With sunlight and clear water, healthy coral reefs provide homes for many different species of organisms.

Muddy water blocked the sunlight and killed this coral reef. Most of the animals that lived there either died off or left in search of food.

Sunlight and Life Discussion

Take a moment to re-read and annotate **paragraphs 3 and 4** from the introduction to Sunlight and Life. As you read, highlight any information that might help you answer the following question:
Where do the energy storage molecules in an ecosystem come from?
After you finish rereading, please record your thoughts and then share with an elbow partner. Please be prepared to share your ideas also with the class.

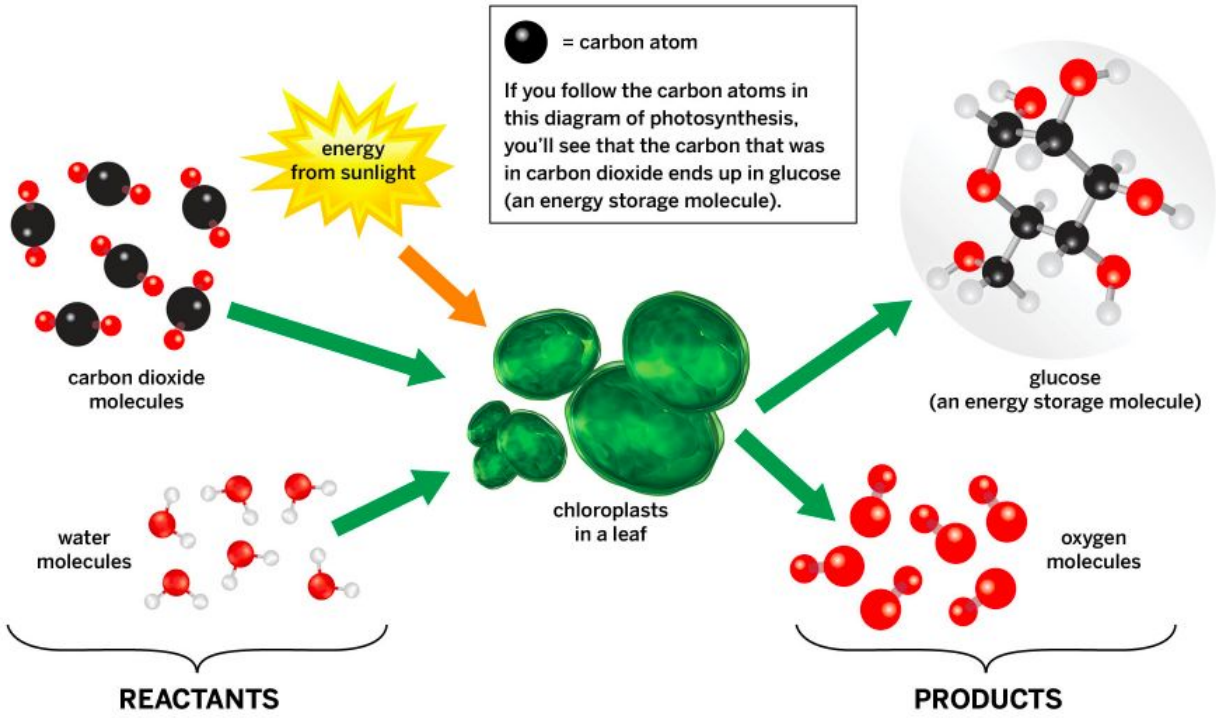
_____

_____

_____

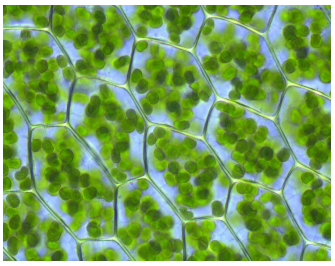
_____

Observing Photosynthesis Up Close



So what's a chloroplast again?

As you're going to see in our Microscope Lesson 5 with *Elodea (an aquatic plant)*, **chloroplasts** are green colored organelles that are only found in plant cells. This is where **photosynthesis** takes place! A green pigment called **chlorophyll** takes in energy from the sun and converts it into energy storage molecules.



What is Carbon? (EXIT SLIP)

Before you read the article, read the focus question. Keep the question in mind, as you read "What Is Carbon?" Highlight or annotate any information that might help you answer the focus question. When you are finished, answer the reading focus question below. ***Reading Focus Question:*** ***Which parts of the biodome contain carbon?***

What Is Carbon?

What's in diamonds, steel, plastic, plants, and animals—including you? It's carbon! Carbon is a type of atom, and it's all around you.

Carbon is a type of atom, and it's all around you. Carbon is essential to life on Earth. Almost all biotic matter—the matter that makes up living things—has carbon in it. There are carbon atoms in energy storage molecules like glucose, starch, and fats, as well as in proteins and most of the other types of molecules that living things need to survive. Whenever you eat, part of what you're eating is made up of carbon. Carbon helps make up the bodies of animals, plants, bacteria, and all other living things. Carbon is even found in the dead remains of living things, which are another type of biotic matter.

Carbon can be found in many different kinds of matter, both biotic (living) and abiotic (nonliving).

Carbon isn't only found in biotic matter, though. If you've ever used a pencil, you've seen and touched pure carbon—it's the black stuff that makes up the tip that you use to write. People often call this part of a pencil the "lead," but it is actually a substance called graphite, which is made up entirely of carbon atoms. Although the tip of a pencil may break when you use it, pure carbon can also form one of the hardest substances found on Earth: diamond. In addition to graphite and diamonds, carbon is found in many other kinds of abiotic matter, like steel and plastic.

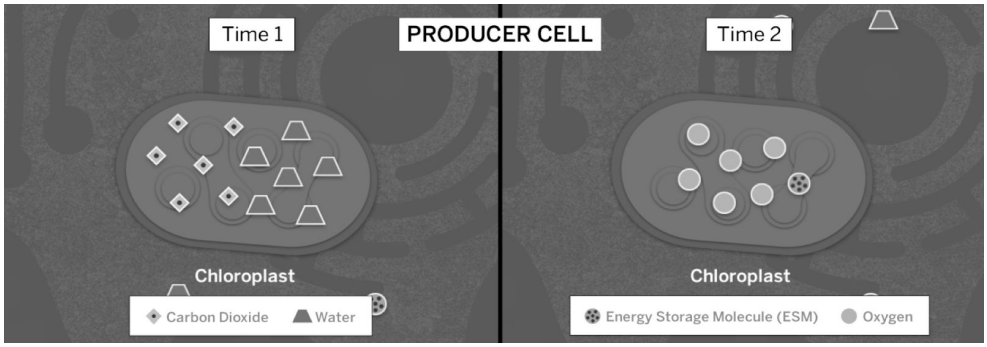
You can see carbon in the form of a pencil or a diamond, but in other forms, carbon is actually invisible. The air all around you contains an invisible gas called carbon dioxide, which—you guessed it—is partly made up of carbon. You add carbon dioxide gas to the air with every breath you take. Whenever you breathe out, you give off carbon in the form of carbon dioxide. This carbon dioxide becomes part of the abiotic matter of Earth's atmosphere.

Why is carbon found in so many different kinds of matter, both biotic and abiotic? It's because carbon atoms are good at joining with each other and with other types of atoms to form molecules. That ability to join with other atoms allows carbon to make up many different types of things, from diamonds to invisible gases to living things like you.

Reading Focus Question: Which parts of the biodome contain carbon?

Lesson 3: Where Energy Storage Molecules are Made

Objective: I can explore different types of energy storage molecules and develop an understanding of how producers use energy from sunlight and carbon dioxide to make energy storage molecules.

Lesson 3 DO NOW	The Econauts are counting on you to discover why the organisms in the biodome did not have enough energy storage molecules. As you investigate today, you'll find out more about what these molecules are and how they are made. Below is a screenshot from the SIM we'll be using, which shows a chloroplast in a producer cell at two different times.  Write a caption for this diagram to describe why you think the chloroplast at Time 1 is different from the same chloroplast at Time 2. _____ _____ _____

The Econauts are counting on you to discover why the organisms in the biodome did not have enough energy storage molecules. As you investigate today, you'll find out more about what these molecules are and how they are made. Soon, you'll be able to explain to the Econauts where these energy storage molecules come from, bringing you one step closer to solving the mystery of the failed biodome.

Exploring Photosynthesis in the SIM

Part 1: Exploring the Simulation

Talk with your tablemates/shoulder partner as you explore the Matter and Energy in Ecosystems Sim. Share what you both notice. Then, answer the two questions below.

1. What do you notice about changes you can make in the Sim?

_____
_____
_____

2. How do you think the energy storage molecules are affected by the changes?

_____
_____
_____

Part 2: Observing Energy Storage Molecules in an Ecosystem

Observe the Sim and see if you can get any evidence to help you answer the question

Discussion Questions:

1. Where do energy storage molecules first appear in the ecosystem?

   _____

   _____

   _____

2. What ideas do you have about where energy storage molecules in an ecosystem come from?

   _____

   _____

   _____

Part 3: Observing Photosynthesis Up Close

Watch the sim model of photosynthesis from the box labeled producers. Record any observations.

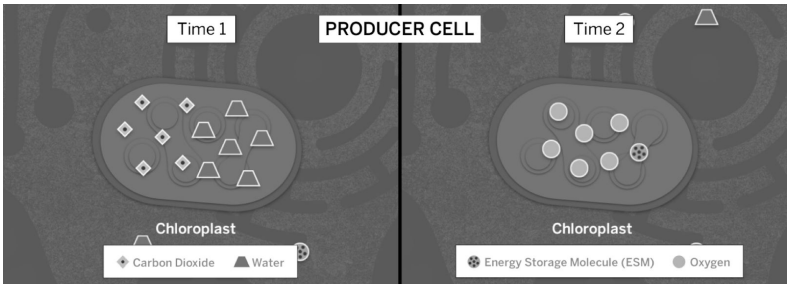
_____

_____

_____

Revisiting Initial Ideas

Look at the screen shot from the SIM. Using what you learned in the reading and the Sim, write a new caption or revise your first caption to describe what you now think about why the chloroplast looks different at Time 1 than at Time 2.



Complete the following sentences about photosynthesis, using words from the Word Bank. (Not all words will be used.)

producers	consumers	biotic	abiotic	
energy storage molecules	carbon dioxide	energy	oxygen	carbon

Photosynthesis is done by _____. This process requires

_____ from sunlight and _____ from abiotic

matter. Photosynthesis makes _____ for an ecosystem.

Key Concept

Carbon is part of carbon dioxide, which is *abiotic* matter. Carbon is also part of energy storage molecules, which are *biotic* matter.

During the process of photosynthesis, producers make energy storage molecules, using carbon from carbon dioxide and energy from sunlight. This moves carbon from abiotic to biotic matter.

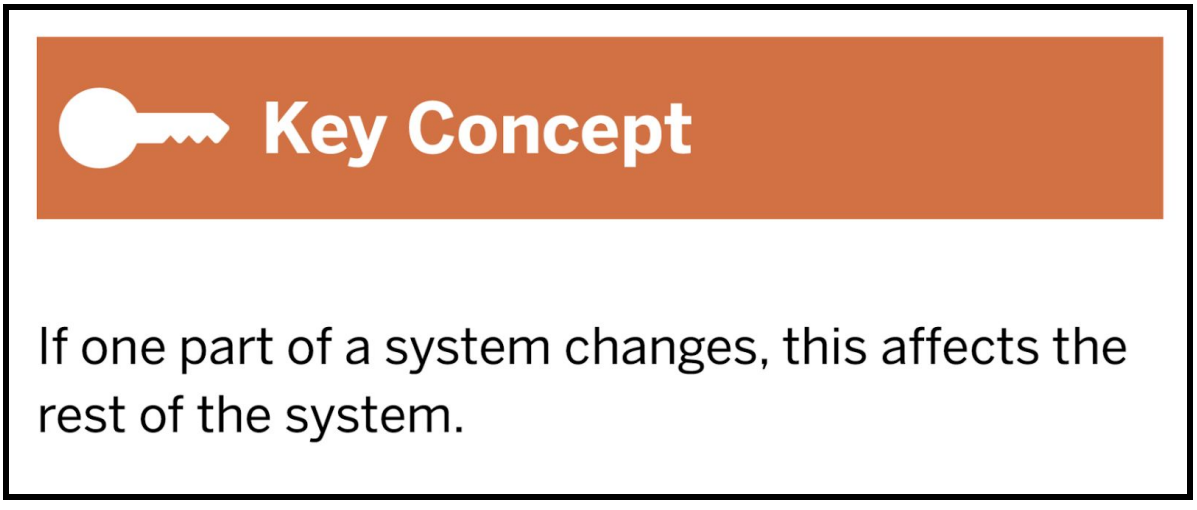
Lesson 3 EXIT SLIP	Elodea is a producer that lives in freshwater. It is a popular choice as a plant for aquariums. Learn more about what can affect the process of photosynthesis by watching the video, Photosynthesis and Elodea. After watching the video, answer the question below. In the experiment, *what factors affected the number of energy storage molecules that the Elodea plant can make?* _____ _____ _____

Lesson 4: Photosynthesis in Ecosystems, Examining data

Objective: I can discover factors that can decrease and increase the energy storage molecules in living things.
Objective: I can use evidence and reasoning to construct an explanation for the Econauts about the decrease in energy storage molecules in the biodome.

Lesson 4 DO NOW	After the failure of their biodome, the Econauts are searching for answers. Why do some ecosystems support so much life, while others are relatively lifeless? As student ecologists, you know that organisms need energy to survive and that this energy comes from energy storage molecules. Think about the different types of plants found in an ecosystem and respond to the questions below. Could you have an ecosystem without plants? (circle one) yes no Explain your answer, using at least 2 sentences. _____ _____ _____

Student ecologists, you've learned so far that producers are important because they are the only organisms that perform photosynthesis, the process of making the energy storage molecules that all living organisms need to survive. To explain the failed biodome to the Econauts, however, you'll need to dig deeper into what factors affect how many energy storage molecules can be produced in an ecosystem. Today, you'll use the Sim to see how some different changes can affect an entire ecosystem.



Key Concept

When there is *more* carbon (in the form of carbon dioxide) in abiotic matter, *more* carbon is available to producers for making energy storage molecules.

When there is *less* carbon (in the form of carbon dioxide) in abiotic matter, *less* carbon is available to producers for making energy storage molecules.

Key Concept

When there is *more* sunlight, producers can make *more* energy storage molecules from the carbon in carbon dioxide.

When there is *less* sunlight, producers cannot make as many energy storage molecules from the carbon in carbon dioxide.

Why did the biodome fail? The Econauts need answers from the Biodome Investigation Team in order to begin planning for their next biodome. Today, you'll get some new evidence that will help you figure out what went wrong. Then, it will be up to you to explain the decrease in energy storage molecules to the Econauts. Good luck, student ecologists!

Bryan Corry
To: Student Ecologists
Re: Claims About the Biodome

Based on your investigations so far, it seems like there are two possible explanations for the plants and animals in the biodome not having enough energy storage molecules:

Claim 1: A change in the amount of **carbon dioxide** led to a decrease in the amount of energy storage molecules made by producers in the biodome.

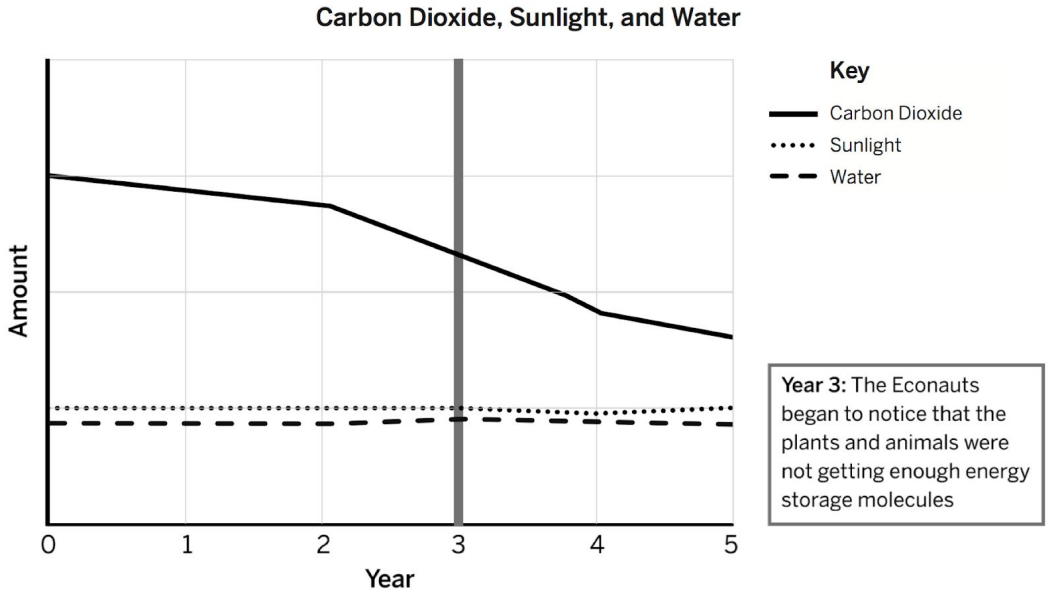
Claim 2: A change in the amount of **sunlight** led to a decrease in the amount of energy storage molecules made by producers in the biodome.

Before you share your findings with the Econauts, you'll need to decide which explanation is best. I'm sending along some data that might help you decide. After you examine the data, send a message to the Econauts to explain why there wasn't enough energy storage molecules in the biodome. Please clearly explain the process by which energy storage molecules are added (aka. photosynthesis).

Bryan
Dr. Bryan Corry, Head Ecologist
Biodome Investigation Team

Examining Data from the Biodome

Dr. Corry has given you some data about the biodome that will help you write your explanation to the Econauts. Examine this graph and use the questions to discuss it with your partner.



Discussion Questions:

1. How has the amount of carbon dioxide changed over time?

   _____

   _____

2. How has the amount of sunlight changed over time?

   _____

   _____

3. How has the amount of water changed over time?

   _____

   _____

4. Does this data help in understanding why the plants and animals in the biodome were not getting enough energy storage molecules? Why or why not?

   _____

   _____

   _____

Reasoning About the Data

Use the Reasoning Tool to connect a piece of evidence from the graph to the claim you think is best.

Claim 1: A change in the amount of carbon dioxide led to a decrease in the amount of energy storage molecules made by producers in the biodome.

Claim 2: A change in the amount of sunlight led to a decrease in the amount of energy storage molecules made by producers in the biodome

Evidence	This matters because . . .	Therefore, . . . (Claim 1 or Claim 2)

Final Report for the Econauts

You are now ready to send a written explanation to the Econauts. Your **written explanation** should help them understand why the plants and animals in the biodome were not getting enough energy storage molecules.

- Explain to the Econauts why the plants and animals in the biodome were not getting enough energy storage molecules.
- Use your Reasoning Tool to help you as you write.
- Please use evidence (*at least three pieces!*) from the Biodome files, the article Sunlight and Life (including the diagram below), the SIM and any key concepts.

CER Writing Assessment Rubric - Adapted for Science					
Rubric Categories	**4**	**3**	**2**	**1**	**0**
CLAIM **TOTAL /4**	Writes a one-sentence claim that is clearly communicated, uses the language from the question, and accurately responds to the writing prompt. **Does not contain an "I" statement.**	Writes a correct one sentence claim that accurately responds to the writing prompt but **does not fully use the language from the writing prompt.**	Writes a claim sentence that **somewhat** responds to the writing prompt, but is **incomplete or disorganized.**	Writes a claim sentence that **does not respond to the writing prompt.** Claim may be **confusing, unclear, or inaccurate.**	*Claim is missing entirely.*
EVIDENCE **TOTAL /4**	Selects multiple pieces of scientific evidence (facts, concepts, theories) or evidence from the prompt to **strongly** support the claim. The source of **each** piece of evidence is provided.	Selects multiple pieces of scientific evidence (facts, concepts, theories) or evidence from the prompt to **adequately** support the claim. The source of **most** pieces of evidence is provided.	Selects scientific evidence (facts, concepts, theories) or evidence from the prompt that **incompletely or vaguely** supports the claim. **Some evidence might be incorrect or inappropriate for the claim.** The source of evidence is **rarely provided or missing entirely.**	Selects evidence that **does not support** the claim.	*Evidence is missing entirely.*
REASONING **TOTAL /4**	**Clearly** explains the main idea of **each** piece of evidence in your own words using **precise** scientific language. **Clearly** explains how **each** piece of evidence supports the claim.	Explains the main idea of **each** piece of evidence in your own words using **scientific language.** Explains how **each** piece of evidence supports the claim.	Explains the main idea of **some** pieces of evidence in your own words. **Weakly** explains how **some** evidence supports the claim.	Reasoning is **unclear or confusing.** Reasoning **does not discuss the connection to the claim.**	*Reasoning is missing entirely.*
CONVENTIONS **TOTAL /2**	X	X	**Adequate use** of correct sentence formation, organization, punctuation, capitalization, grammar usage, and spelling	**Limited use** of correct sentence formation, organization, punctuation, capitalization, grammar usage, and spelling	*CER is missing entirely.*
TOTAL /14					