


Student Name: _____



7th Grade Science- Week 2

Complete the following assignments for week 2.

Week	Topic/TEKS	Agenda
2	<p>Photosynthesis</p> <p>7.5(A) recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis</p>	<ol style="list-style-type: none">1. Video: Photosynthesis<ul style="list-style-type: none">• Watch this video for an introduction to Photosynthesis• https://youtu.be/UPBMG5EYdo2. Reading Photosynthesis<ul style="list-style-type: none">• Read the article. While you read, complete the Linking Literacy: Categorize Words• After you read, complete Linking Literacy: Box it.3. Practice: CLOZE-ing in on Science<ul style="list-style-type: none">• Use the word bank to complete the paragraph.4. Math Connection: Photosynthesis<ul style="list-style-type: none">• Analyze the data table and complete the graph and questions.5. Reading in Science: Thanks, Leaves!<ul style="list-style-type: none">• Read and annotate the text and answer the questions.6. Claim-Evidence-Reasoning<ul style="list-style-type: none">• Read the scenario and complete the CER.7. Assessment: Photosynthesis<ul style="list-style-type: none">• Complete the assessment.

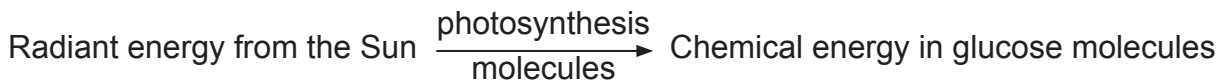
Reflect

Suppose you place a plant on a sunny windowsill and water it regularly. At the same time you place a similar plant in a dark closet and keep it watered, too. The only difference between the two plants is the amount of light they receive. What do you think will happen to each plant after a few weeks?

You probably predicted that the plant on the windowsill would remain healthy, while the plant placed in the closet will wilt. Light is a basic need for many plants. Why is this?



During photosynthesis, energy from the Sun interacts with matter on Earth. Most plants require light to live. There are a few types of plants that can live without light, but most plants will die if they do not receive adequate light. Light is a form of energy that these plants take in and use to carry out photosynthesis. Photosynthesis is a series of chemical reactions that produces glucose, a compound the plant uses as food. In this way, plants use light from the Sun to make their own food. Radiant energy from the Sun is changed to chemical energy in glucose molecules. The following reaction summarizes this process:



Plants differ from animals in being able to use radiant energy in this way. Animals cannot use radiant energy from the Sun to make glucose. They must obtain energy from the environment in the form of food, which contains chemical energy. Animals have to eat in order to survive.

What Do You Think?

A plant called the underground orchid is native to Western Australia. The roots and stem of this plant grow completely underground. Only the flower emerges above the surface. Is it likely that these plants use radiant energy from the sun? If not, what form is it?

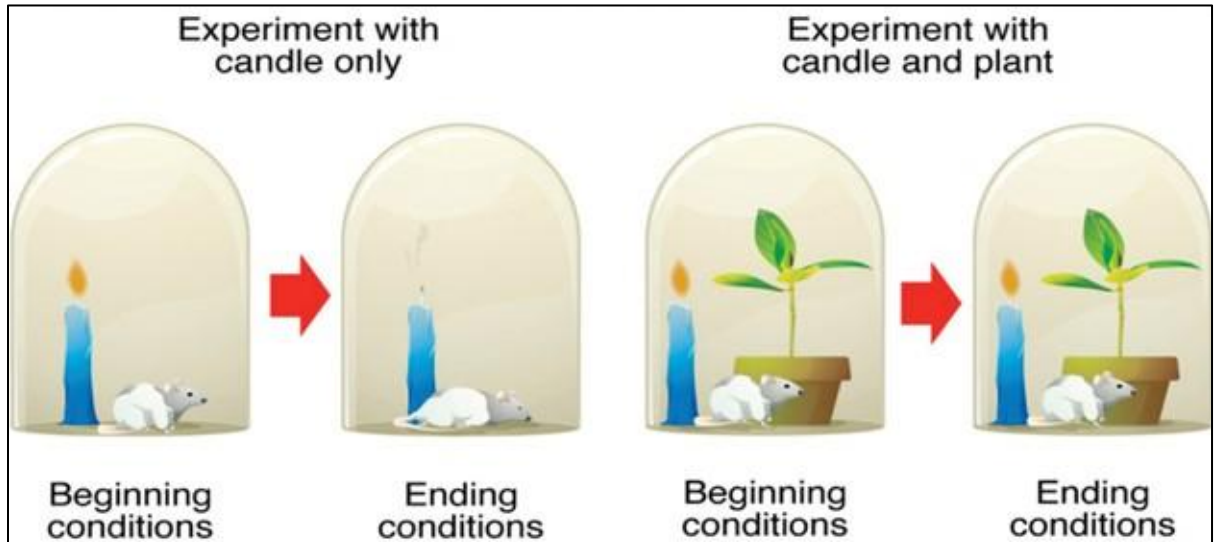
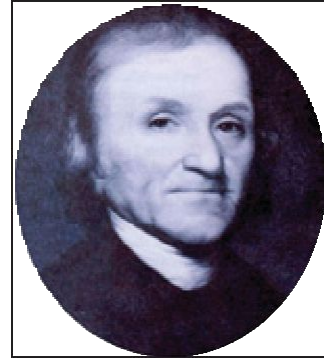


What Do You Think?

We can observe photosynthesis using a simple experiment.

Photosynthesis is a chemical process. Because this process takes place at the level of molecules and atoms, we cannot observe it directly. However, we can observe the results of photosynthesis.

Joseph Priestley was one of the first scientists to observe a product of photosynthesis. He ran an experiment in which he placed a burning candle and a mouse under a glass dome. After a few minutes the flame went out. Priestley showed that the gases in this dome could not keep the mouse alive. However, if the experiment was repeated with a plant present under the dome, the mouse remained alive. What change had the plant made to the dome?



The plant replaced the oxygen that had been used up by the burning candle. Oxygen is a colorless, odorless gas that humans cannot observe directly. However, its presence is required for animals such as mice to live. Priestley demonstrated that the plant could produce oxygen. Oxygen is one of the products of photosynthesis.

What Do You Think?

Photosynthesis involves three elements: carbon, hydrogen, and oxygen.

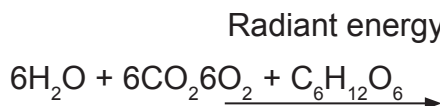
You have seen that the products of photosynthesis are oxygen and glucose. Their chemical formulas are shown below. What elements make up these molecules?

Products of Photosynthesis		
Name:	Oxygen	Glucose
Chemical formula:	O ₂	C ₆ H ₁₂ O ₆

Only three elements are present in the products of photosynthesis: oxygen, carbon, and hydrogen. These same elements are present in the reactants of photosynthesis.

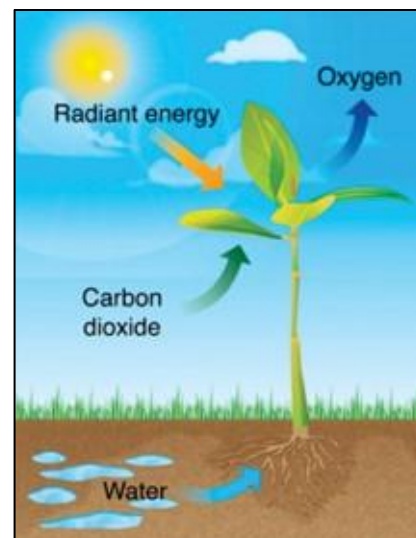
Reactants of Photosynthesis		
Name:	Water	Carbon dioxide
Chemical formula:	H ₂ O	CO ₂

Photosynthesis involves water and carbon dioxide reacting to form oxygen and glucose. The chemical equation showing this process is:



Notice that it takes six molecules of water and six molecules of carbon dioxide to make one molecule of glucose.

The inputs and outputs of photosynthesis are shown in the diagram at right. Carbon dioxide in the air enters a plant through its leaves. Water in the soil enters through a plant's roots. Oxygen exits from the leaves. Glucose stays behind to serve as the plant's food.



Look Out!

The process of photosynthesis is actually a complex series of many different chemical reactions. The equation shown above represents the overall reaction. Only the beginning and ending chemical compounds are shown in this equation. There are many more steps in between.

Look Out!

Photosynthesis is necessary for life on Earth.

Humans require oxygen to survive. Many other animals also require oxygen. However, Earth's atmosphere has not always contained oxygen gas. During its first 2.3 billion years of existence, Earth had an atmosphere that contained water vapor, nitrogen, carbon dioxide, sulfur dioxide, and hydrogen sulfide. What changed that led to oxygen gas becoming part of the atmosphere?



A scientist takes a sample of cyanobacteria from the surface of a lake. When cyanobacteria populations grow too quickly in a water body, they can harm other organisms in the ecosystem. This situation is called an algal bloom.

The answer is that microorganisms capable of photosynthesis arose on the planet. These microorganisms are called cyanobacteria. Cyanobacteria live in both freshwater and saltwater environments. Millions and millions of these tiny creatures produced enough oxygen to change the composition of Earth's atmosphere. Oxygen became established in the atmosphere as a result of photosynthesis. Since this shift, many organisms have evolved to depend on oxygen. Photosynthesis is necessary to continue supplying oxygen for these organisms.

In addition, all life forms need photosynthesis as the mechanism for capturing and using radiant energy. Plants benefit from this directly because they use photosynthesis to make the glucose molecules that are their food sources. Animals benefit indirectly because they, too, must have sources of food. Animals either eat plants to obtain chemical energy in the form of glucose or they eat other animals that ate plants. Energy moves from the Sun to plants to animals. Photosynthesis is necessary for that energy flow.

Looking to the Future: Can humans make use of photosynthesis to produce fuels?

The same microorganisms that created our oxygenated atmosphere could be used to develop new fuels. Think about it. Food is a kind of fuel that we use to run our bodies. If photosynthesis can produce the kind of fuel that our bodies use, it should be able to produce the kinds of fuels that vehicles such as cars or airplanes use, too.

This scientist is studying the production of organic compounds by cyanobacteria. If successful, she will be able to use photosynthesis to produce fuels for cars, planes, and trains.



Look Out!

These fuels would not contain glucose, but they would contain other carbon-containing compounds. Such biofuels have been produced from corn, sugar cane, soybeans, and sunflowers.

To make biofuel from cyanobacteria is not hard to do. However, the process is expensive. Right now it costs too much to develop biofuel from the strains of cyanobacteria available. Each cell produces a very small amount of the compounds that serve as the raw material for biofuel production. It is also costly to provide the large quantities of water needed to grow the microorganisms. In all, the cost of making the biofuel is greater than the price at which the fuel can be sold. Much research is being done to find ways to bring costs down so that the process is economical.

Try Now

What do you know?

Read the following statements below. Fill in each blank with the correct word from the following list: Sun, photosynthesis, radiant energy, food, chemical energy, water, glucose, carbon dioxide, oxygen.

1. All organisms need glucose or a source of _____ to carry out basic life functions.
2. Many plants obtain glucose through the process of _____.
3. Animals obtain glucose from _____.
4. Photosynthesizing organisms use _____ to produce glucose.
5. The reactants of photosynthesis are _____ and _____.
6. The products of photosynthesis are _____ and _____.
7. The _____ is the source of energy used in photosynthesis.



Linking Literacy

Name: _____ Date: _____

Categorize Words

Look at the words below. Write each word in the category it belongs. Each word should be used one time.

carbon dioxide	CO ₂	roots	products	water
C ₆ H ₁₂ O ₆	radiant energy	oxygen	cyanobacteria	O ₂
microorganisms	leaves	elements	H ₂ O	algal bloom
atoms	chemical reaction	reactants	glucose	biofuel
Reactants	Products	Chemical Reaction	Microorganisms	Plant Structures

Summary:

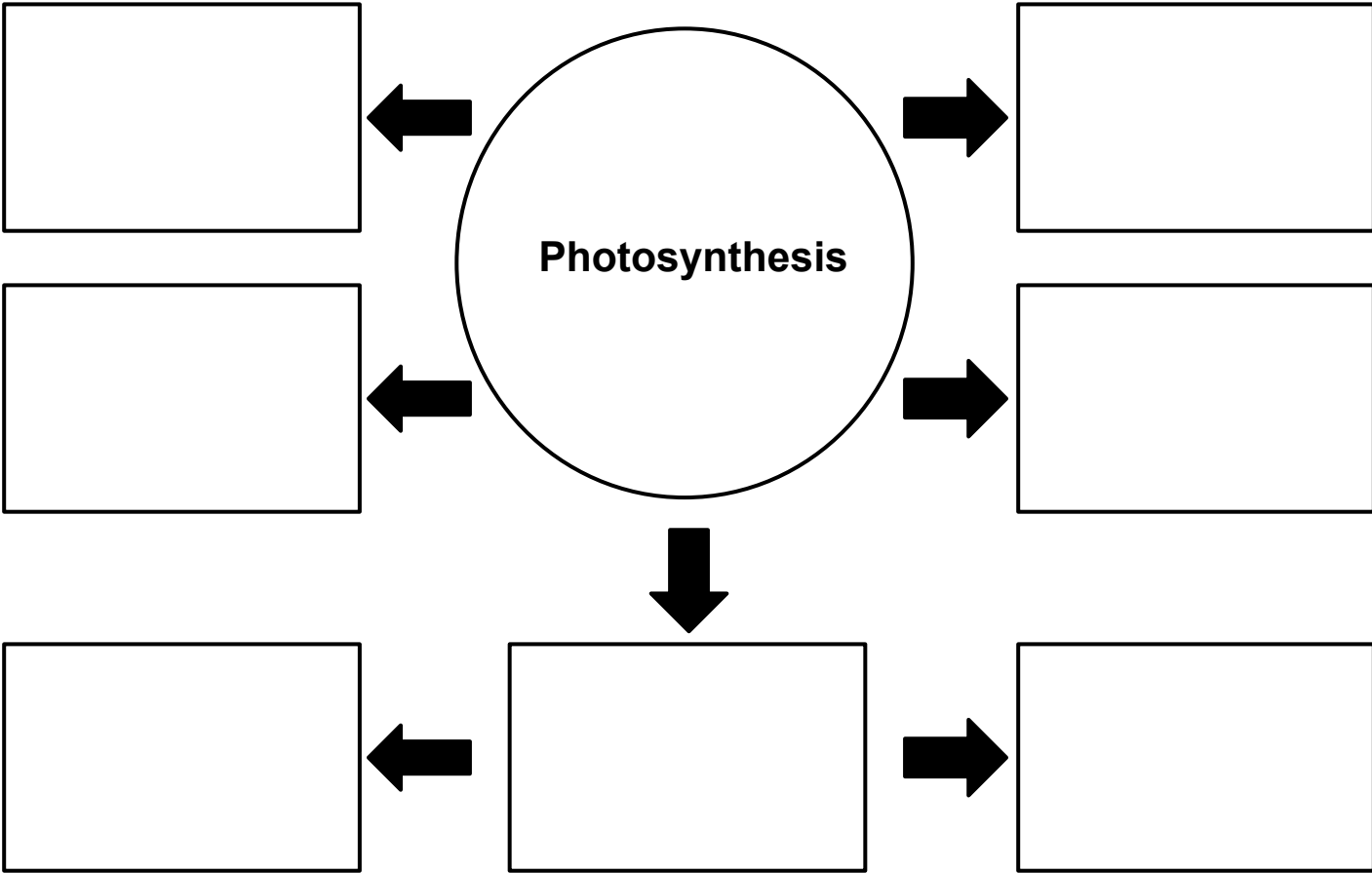


Linking Literacy

Name: _____ Date: _____

Box It

The main idea is recorded in the center circle. Use the boxes to record details and facts about the topic. Use the space below to record additional notes.





CLOZE-ing in on Science

Name: _____ Date: _____

INSTRUCTIONS: Use the words in the box below to fill in the blanks based on what you have learned about photosynthesis. Words may be used more than once or not used at all.

Word Bank

atmosphere	light	change	energy	storing	plants	Earth's	substances
evidence	oxygen	process	water	glucose			

CLOZE 1

The Sun radiates energy toward _____ surface, and some of this radiant energy is in the form of _____. Photosynthesis is the _____ of converting _____ energy into chemical energy and _____ it through the bonds of sugar. This chemical process occurs in _____. During photosynthesis, _____ from the Sun, carbon dioxide from the _____, and _____ absorbed from the soil are transformed into chemical _____. This chemical energy is stored in the form of a sugar also known as _____. During this process, _____ is produced and released into the atmosphere. The importance of photosynthesis lies in the fact that the _____ stored in plants is what sustains life on Earth.



Math Connections

Name: _____ Date: _____

Photosynthesis

Photosynthesis is a chemical reaction that occurs in plants by using radiant energy from sunlight. In this chemical reaction, carbon dioxide from the atmosphere and water from the soil are combined to produce sugar (glucose) that contains stored chemical energy.

A science class conducted an experiment to test the effects of artificial light on a plant's rate of growth. All plants used for the experiment originally measured 5 cm in height. Throughout the three week experiment, each plant received the same amount of water and time under its assigned wattage of light each day.

Hypothesis: Plants exposed to brighter light will experience a higher rate of growth through photosynthesis than those exposed to dim light.

Effects of Light Intensity on Plant Growth

	Plant A (25 watts)	Plant B (50 watts)	Plant C (75 watts)	Plant D (100 watts)
Week 1	5.5 cm	6.4 cm	6.8 cm	7.5 cm
Week 2	6.0 cm	6.8 cm	7.2 cm	8.0 cm
Week 3	6.2 cm	7.2 cm	7.5 cm	8.8 cm



Math Connections

1. Create a scatterplot to represent the data in the table above. Use a different-colored line to represent each plant.

9			
8			
7			
6			
5			
4			
3			
2			
1			
0			
	Week 1	Week 2	Week 3

Key

- Plant A
- Plant B
- Plant C
- Plant D

2. Calculate the percent increase in height for each plant over the three week period.
(Difference in growth / original height x 100 = percent increase)

Plant A: _____ Plant B: _____ Plant C: _____ Plant D: _____

3. Does the data support the hypothesis? Why or why not?
4. Which plant showed a constant rate of growth? _____
5. Create an equation to describe the height of the plant you named in question four.



Reading Science

Name: _____ Date: _____

Thanks, Leaves!



- 1 Have you ever taken the time to thank a leaf? It may seem silly to thank leaves, but we need them to survive. In fact, we could not survive without the energy made by leaves through the chemical change called photosynthesis. Life on Earth relies on light energy captured from the Sun. Photosynthesis changes this energy to the form vital for humans. This is how we get energy from food. Some forms of energy used by humans also come from photosynthesis. There are other benefits to the process. Photosynthesis helps maintain the level of oxygen in the air the humans need to survive. All of this occurs in leaves!
- 2 During photosynthesis, the chlorophyll in leaves captures energy from the Sun. Photosynthesis changes this radiant energy to chemical energy. Chemical energy is the form used by all living organisms. Photosynthesis changes water and carbon dioxide with radiant energy. A form of sugar called glucose is made. Plants need glucose to live and grow. Extra glucose is stored in the plant as a carbohydrate called starch. When animals eat plants, they get energy from the stored carbohydrates in the plant. Therefore, all energy that animals get from food comes first from photosynthesis. This is true even for animals that are carnivores, or meat-eaters. The energy is passed to them through the food chain. Without photosynthesis, there would be no food. Animals, including humans, would not survive.
- 3 Some forms of energy come directly from photosynthesis. Have you ever sat around a campfire or the fireplace in your home on a wintry evening? If so, you have felt heat energy from photosynthesis. Wood and other hard plant material are carbohydrates made from glucose. Burning changes the chemical energy stored in wood into heat. Another form of energy that comes from photosynthesis is ethanol. Ethanol is made from sugars and starches. Ethanol is used in gasoline in Brazil and the United States.
- 4 During photosynthesis, carbon dioxide is taken from the air. Plants make oxygen as a by-product. Humans, and many other organisms, can only survive in environments with oxygen. Through respiration, we take in oxygen and release carbon dioxide into the air. Humans need the oxygen made by plants to live. We also make carbon dioxide that plants need for photosynthesis.
- 5 For humans, it is essential that photosynthesis changes energy from the Sun into chemical energy. Our lives rely on the results of photosynthesis. That's why the next time you see a leafy green tree, or a leafy plant, you might want to say, "Thank you!"

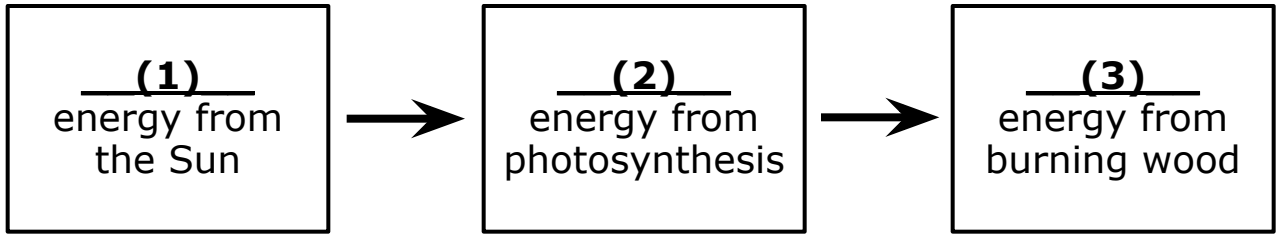


Reading Science

- 1** In paragraph 1 of this passage, which clues help you figure out the meaning of the word **vital**?
- A** “Changes this energy”
 - B** “Captured from the Sun”
 - C** “Chemical change called photosynthesis”
 - D** “Need them to survive”
- 2** Which is the best summary of the selection?
- A** Leaves are something to be thankful for because they produce carbohydrates.
 - B** Leaves conduct photosynthesis, which converts energy from the Sun into chemical energy that is useful and important to humans.
 - C** Photosynthesis is a vital part of the food chain.
 - D** Radiant energy is the most important part of photosynthesis. It is energy from the Sun, which leaves are thankful for.



Reading Science



- 3** The above flow chart traces the energy transformations for the process described in paragraph 3. Which of the choices below in the order of (1), (2), (3) will correctly fill the blanks in the chart?
- A** Heat, Chemical, Light
 - B** Heat, Light, Chemical
 - C** Light, Chemical, Heat
 - D** Chemical, Heat, Light
- 4** How is ethanol made?
- A** By fermenting sugars and starches
 - B** By composting grass cuttings and dinner table scraps
 - C** By boiling water and corn oil
 - D** By releasing carbon dioxide into the atmosphere



Reading Science

- 5** What is the main point of paragraph 2?
- A** how photosynthesis affects humans' food supply
 - B** how carbohydrates cause weight gain in humans
 - C** how humans and other animals use radiant energy from the Sun
 - D** how carnivorous animals hunt and get energy from their prey



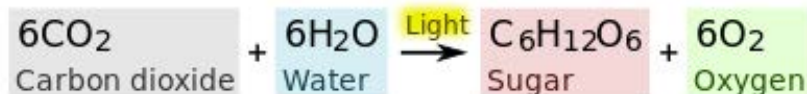
Claim-Evidence-Reasoning

Name: _____ Date: _____

Scenario

Below is the equation of photosynthesis. Photosynthesis is a process that takes place in plants. Notice that CO_2 and water are converted into sugar and oxygen.

External Data



Prompt:

When you go home tonight, your mother asks you to explain to her what happens during the process of photosynthesis. Your mother is a science teacher, so make sure you use scientific terms to give her a scientific explanation of how energy is stored as sugar in plants through photosynthesis.

Claim:

Evidence:

Reasoning:

Rebuttal:



Claim-Evidence-Reasoning

Photosynthesis CER Rubric for Writing a Scientific Explanation

Points Awarded	2	1	0
Claim	Claim is complete and accurate.	Claim is incomplete or inaccurate.	Student does not make a claim or does not answer the question.
Evidence	Evidence cites data and patterns within the data and uses labels accurately.	Evidence cites data from the data source but not within the context of the prompt.	There is no evidence, or changes are cited but do not use data from the data source.
Reasoning	Student cites the scientifically accurate reason using correct vocabulary, connects the reason to the claim, and shows accurate understanding of the concept.	Student cites a reason, but it is inaccurate or does not support the claim. Reasoning does not use scientific terminology or uses it inaccurately.	There is no reasoning, or student relies on a restatement of the claim.
Rebuttal	Rebuttal provides reasons for different data or outliers in the data, offers relevant real-world cases, or suggests other uses for the findings.	Rebuttal is not connected to the data, or it is not accurate.	Student does not offer a rebuttal.

Assessment: Photosynthesis

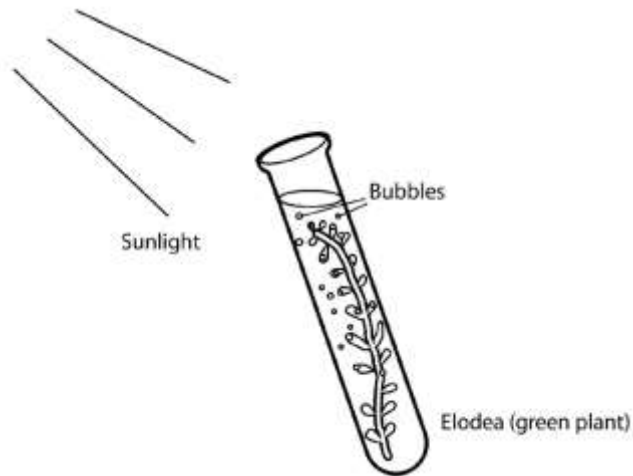
1 In photosynthesis, plants convert what type of energy into what other type of energy?

- A Light energy into mechanical energy.
 - B Radiant energy into chemical energy.
 - C Chemical energy into heat energy.
 - D Mechanical energy into light energy.
-

2 The energy plants gain through photosynthesis is stored in –

- A oxygen.
 - B nitrogen.
 - C carbon dioxide.
 - D glucose.
-

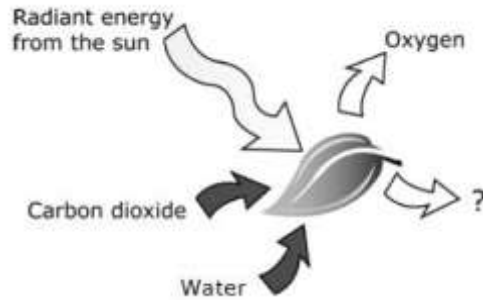
3 A test tube is filled with water and a green plant called elodea. When the plant is exposed to sunlight, it begins to produce bubbles.



Which of the following is the most likely conclusion for the identity of the gas in the bubbles?

- A Carbon dioxide
- B Oxygen
- C Nitrogen
- D Hydrogen

- 4 The diagram provided illustrates the process of photosynthesis, including the substances used by and produced by plants.



What is the identity of the chemical represented by the question mark in the diagram?

- A Hydrogen
- B Carbon
- C Glucose
- D Nitrogen

- 5 Three *Anacharis* plants were placed inside inverted test tubes filled with water. One test tube was exposed to low light, another to medium light while another was exposed to high light. The table provided shows the results of this experiment. Notice that more oxygen was produced by the *Anacharis* in high light.

	Oxygen Production (mL)		
Time (min)	<i>Anacharis</i> in Low Light	<i>Anacharis</i> in Medium Light	<i>Anacharis</i> in High Light
0	0	0	0
15	0.4	0.8	0.9
30	1.2	1.7	1.8
45	1.4	2.0	2.5
60	1.8	2.2	3.2

Based on the information provided, what is the difference in volume (in mL) of oxygen produced between the low light and high light plants after 45 minutes? Record your answer in the grid provided.

				.		
0	0	0	0		0	0
1	1	1	1		1	1
2	2	2	2		2	2
3	3	3	3		3	3
4	4	4	4		4	4
5	5	5	5		5	5
6	6	6	6		6	6
7	7	7	7		7	7
8	8	8	8		8	8
9	9	9	9		9	9

6 Which of the following provides the energy needed for photosynthesis?

A Water

B The Sun

C Plants

D Atoms