Life Science

S7L2. Students will describe the structure and function of cells, tissues and organ systems.

Agenda: Photosynthesis

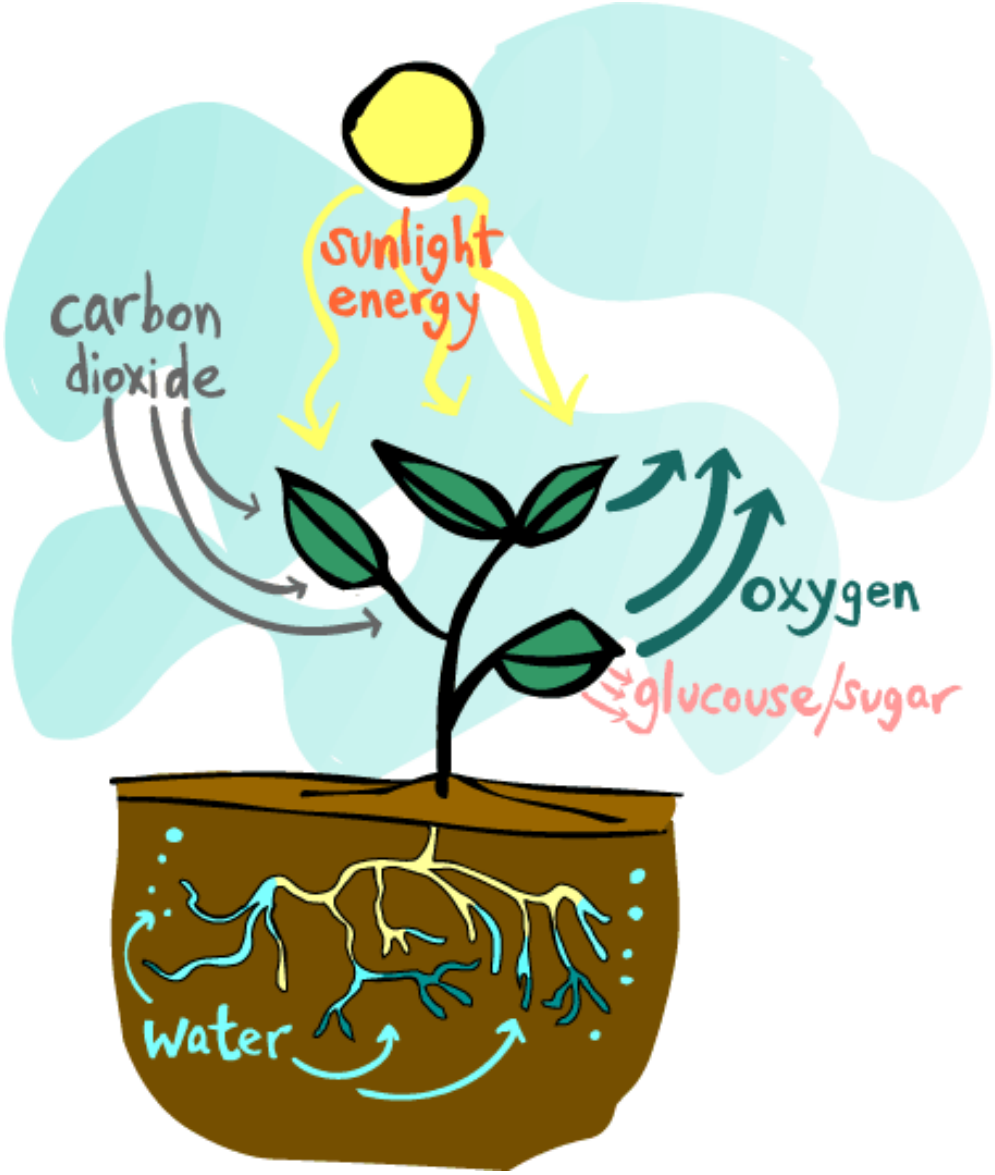
Learning Target: I know how the sun supplies living things with the energy they need, because …

Success Criteria: I can answer at least 70% of the Study Jams self-assessment questions, correctly .

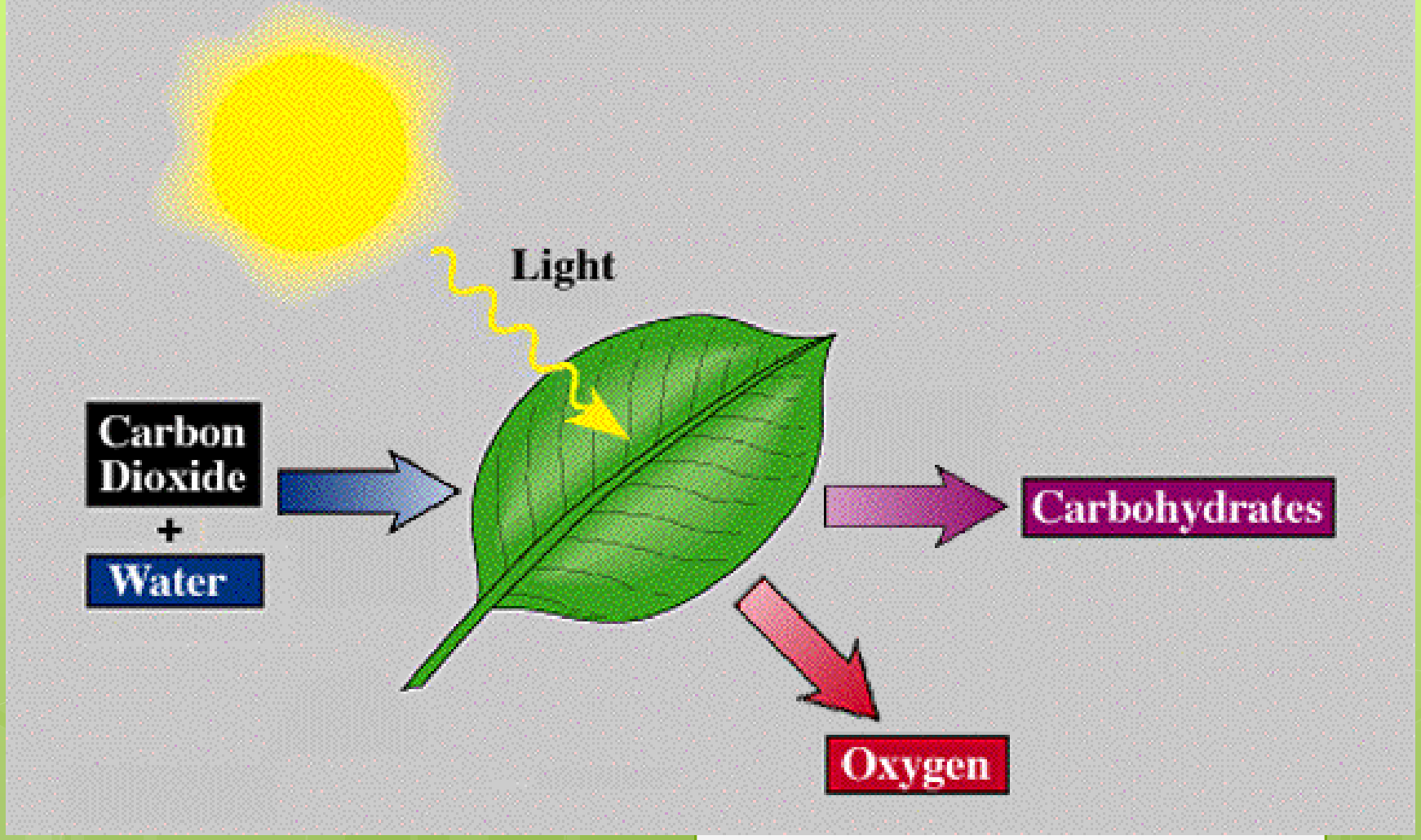
Warm- up: ***Read the following and respond.***

In 1648, a scientist had a hypothesis regarding plants. To test it, he grew a tree in a tub of soil, adding nothing but measured quantities of water for five years. During that time, he kept track of the weight of the soil and the tree. At the end of the experiment, the tree had gained 164 pounds and the soil had lost 2 ounces. **What could the scientist conclude from his experiment?**

Conclusion



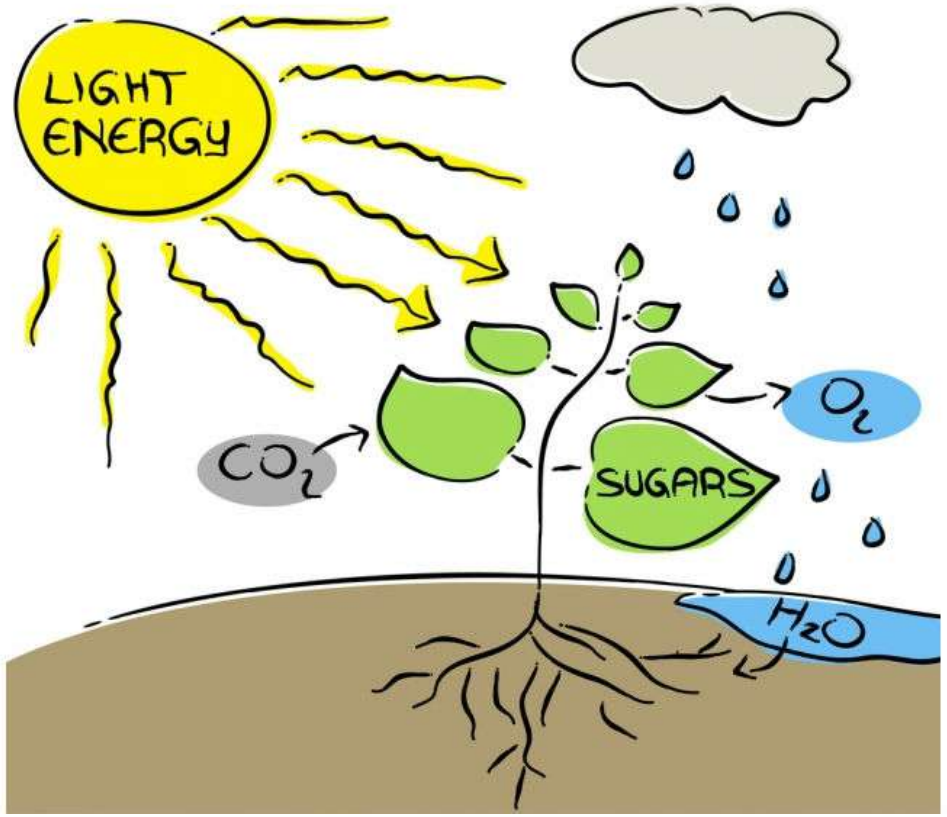
- Most of the tree's increase came from something other than the soil.



Photosynthesis

Chapter 3, Sections 3

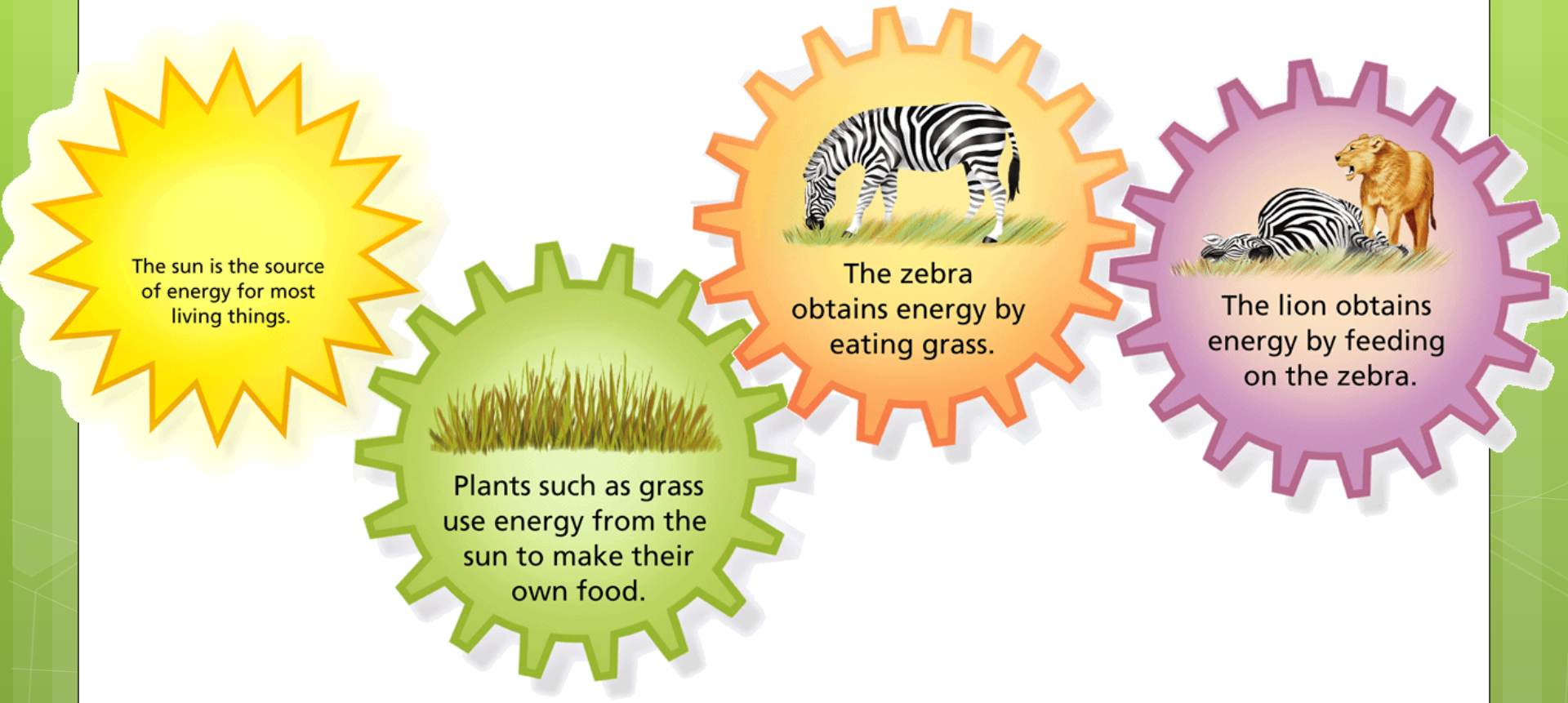
Photosynthesis



In the process of photosynthesis, plants use the energy in **sunlight** to make food.

Sources of Energy

- Nearly all living things obtain energy either directly or indirectly from the energy of **sunlight** captured during photosynthesis.



How Living Things Use Energy From the Sun

Plants manufacture their own food through the process of photosynthesis. ***Remember:*** An organism that makes its own food is called an _____autotroph_____. An organism that cannot make its own food, including animals such as the zebra and the lion, is called a _____heterotroph_____. Many heterotrophs obtain food by eating other organisms. Some heterotrophs, such as fungi, absorb their food from other organisms.

How Living Things Use Energy From the Sun

Living Thing	Autotroph or Heterotroph?	Obtains Energy From the Sun Directly or Indirectly?
Grass	**Autotroph**	**Directly**
Zebra	**Heterotroph**	**Indirectly**
Lion	**Heterotroph**	**Indirectly**

Photosynthesis

Photosynthesis is a process. During photosynthesis, plants and some other organisms use energy from the sun to convert (change):

- carbon dioxide **(CO_2)** and water **(H_2O)**

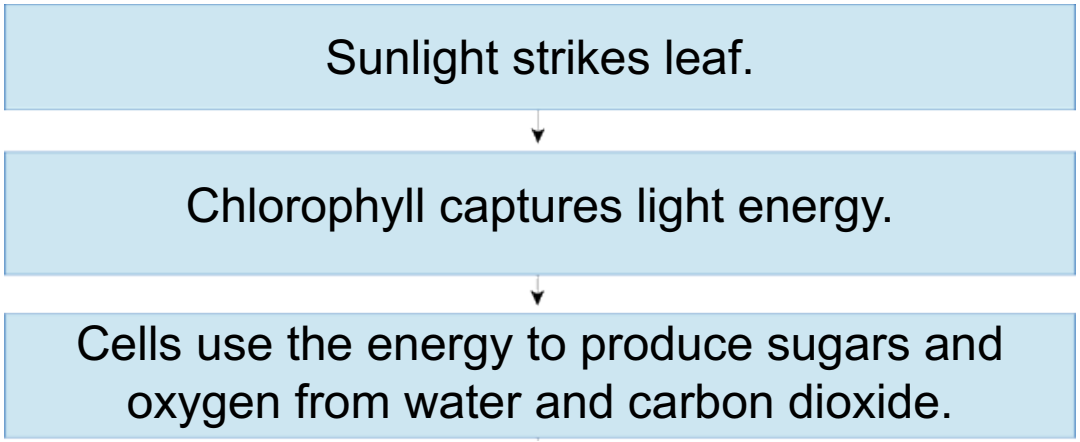
into

- oxygen **(O_2)** and sugar ($C_6H_{12}O_6$)

Sequencing

- Sequence is the order in which the steps in a process occur. Create a flowchart that shows the steps in photosynthesis. Put each step in a separate box in the flowchart in the order in which it occurs.

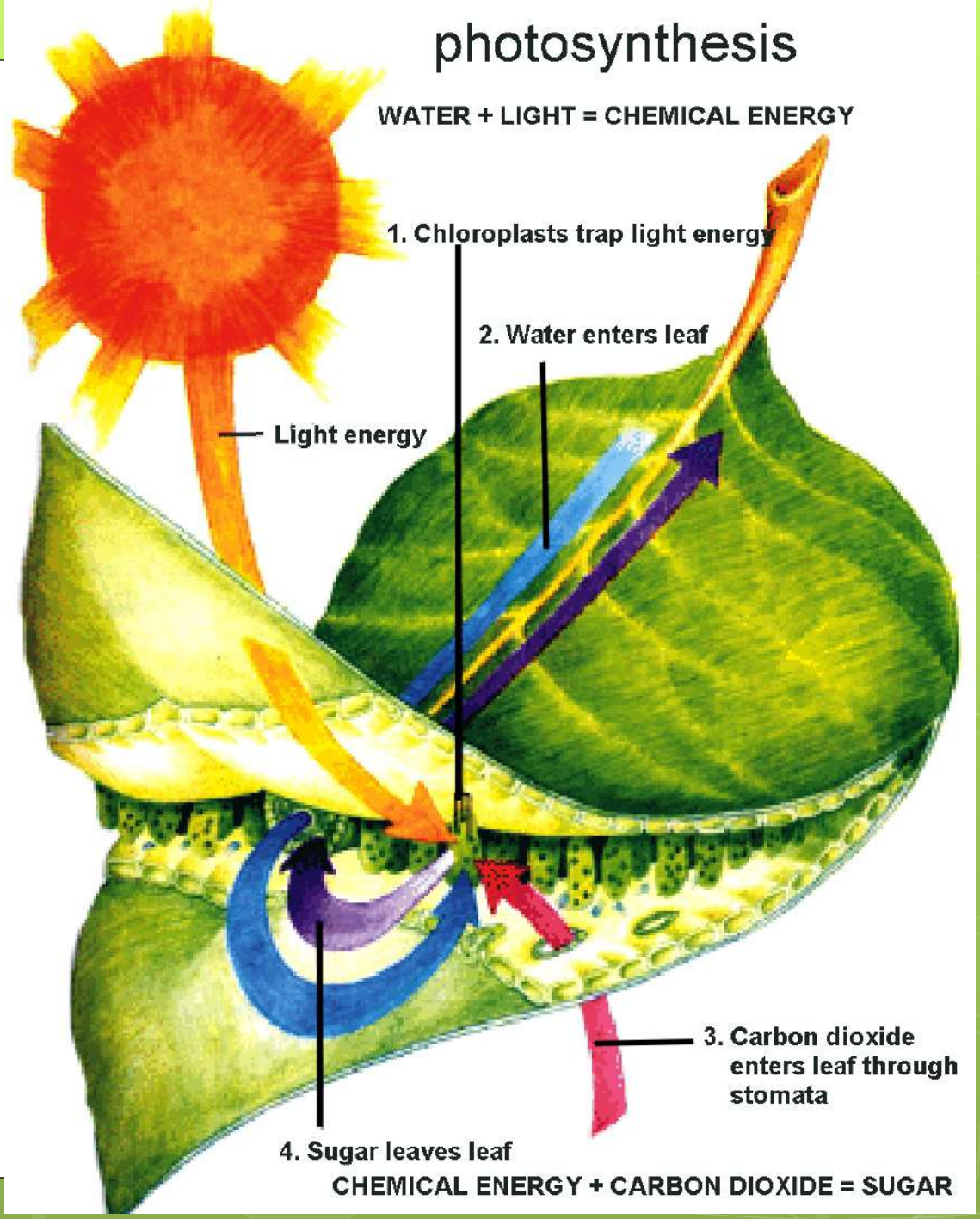
Steps in Photosynthesis



How do plants get the raw materials needed for photosynthesis?

- The cell needs two raw materials for stage 2: water (H_2O) and carbon dioxide (CO_2).
- Plant roots absorb water from the soil, and the water then moves up to the leaves.

- Carbon dioxide enters the plant through small openings on the undersides of the leaves called stomata.



Chloroplasts

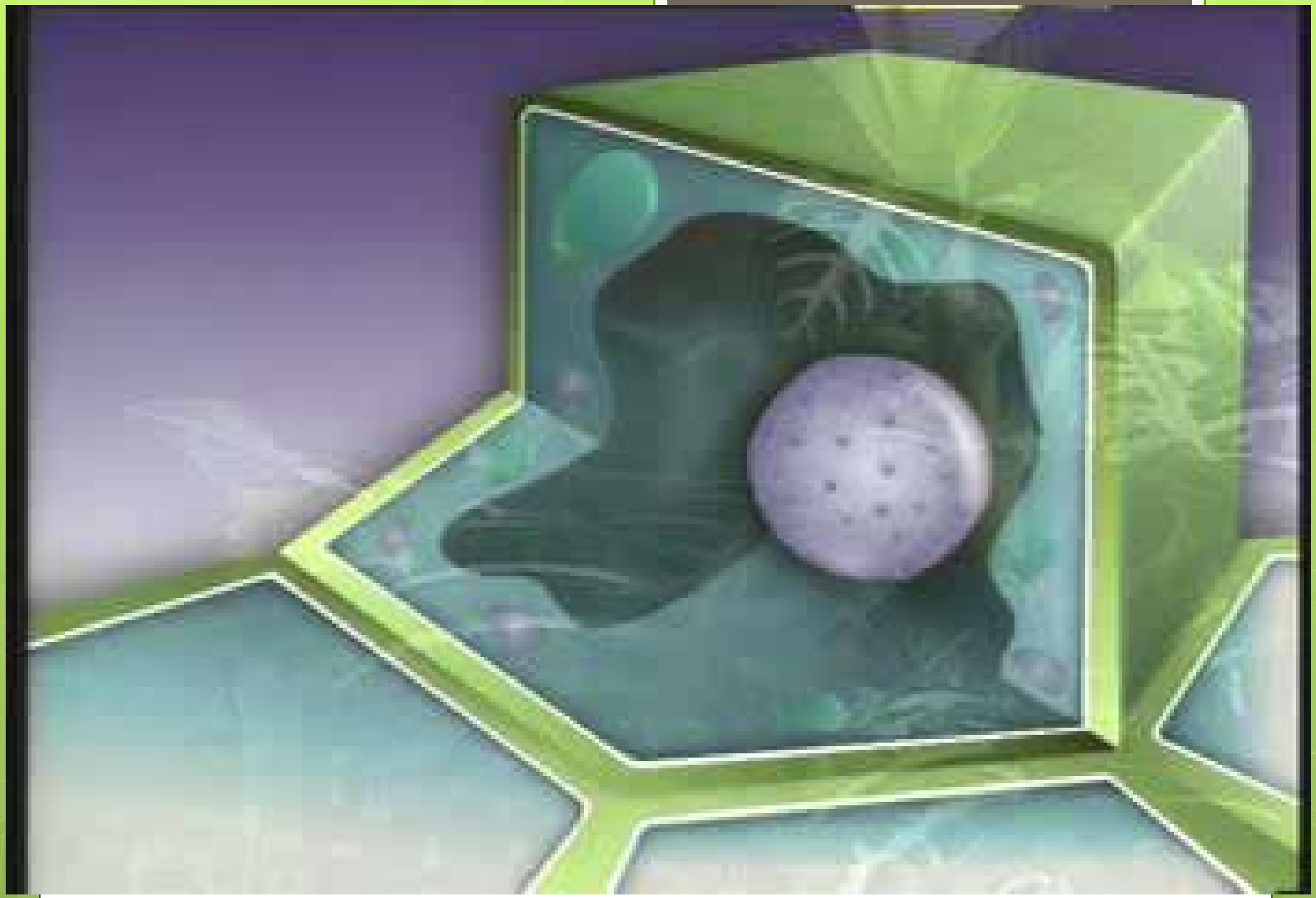
- Once in the leaves, the water and carbon dioxide move into the chloroplasts.

- Inside the chloroplasts, the water and carbon dioxide undergo a complex series of chemical reactions and produce two important products of photosynthesis: sugar and oxygen.

Chloroplasts

- The chloroplasts in plant cells give plants their **green** color. The green color comes from **pigments**, colored chemical compounds that absorb light.

- The main photosynthetic pigment in chloroplasts is **chlorophyll**. Chlorophyll captures light energy and uses it to power the second stage of photosynthesis to produce sugars.



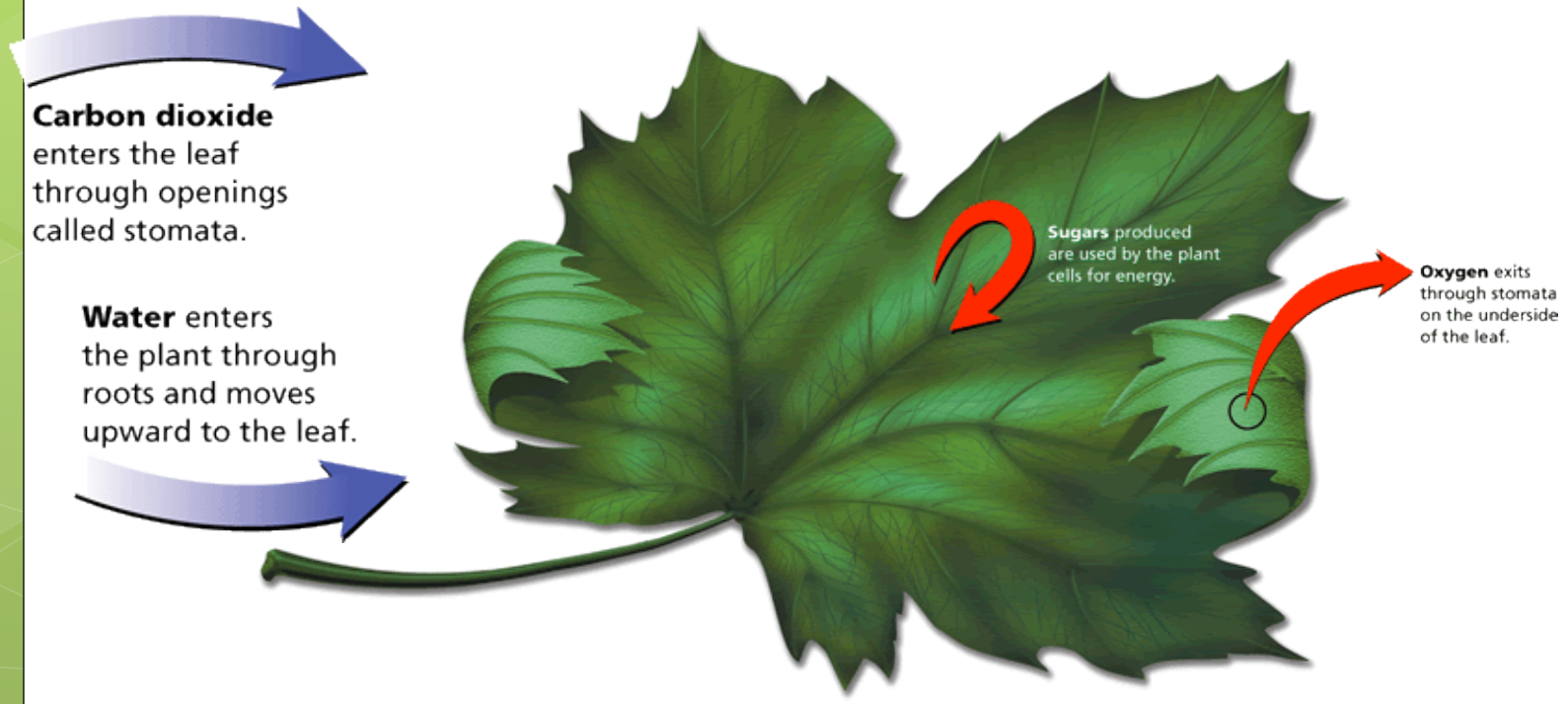
Chloroplasts

- Plant cells use sugar for food and to make other compounds, such as **cellulose**.
- Plant cells also store sugar for later use. Oxygen **exits** the leaf through the **stomata**.
- ***Almost all of the oxygen*** in Earth's atmosphere was produced by living things, like plants, some protists, and some bacteria, through photosynthesis.

The Two Stages of Photosynthesis

- During photosynthesis, plants and some other organisms use energy from the sun to convert carbon dioxide and water into oxygen and sugars.

Stage 2
The captured light energy is used to produce sugars and oxygen from water and carbon dioxide.



The Two Stages of Photosynthesis

3. List the two stages in the process of photosynthesis.

a. Capturing the sun's energy

_____ Producing sugars
___

b.

chlorophyll

_____
____

4. The green pigment in chloroplasts, called _____, absorbs light energy from the sun.

true

5. Is the following sentence true or false? Besides the energy in sunlight, the cell needs water and carbon dioxide to make sugar.

Stomata are small openings on the undersides of the leaves through which carbon dioxide enters the plant and oxygen exits.

_____

6. What are stomata?

_____

Photosynthesis clip:

http://app.discoveryeducation.com/learn/videos/a86a6f01-c6eb-45e3-9e1e-49210bece820

Photosynthesis Summary

Photosynthesis

7. Circle the letter of each product of photosynthesis.

a. water

b. carbon dioxide

c. oxygen

d. sugars

8. Is the following sentence true or false? Photosynthesis produces the carbon dioxide that most living things need to survive.

false

The Photosynthesis Equation

9. Write the chemical equation for the process of photosynthesis.

$$6\ CO_2 + 6\ H_2O \longrightarrow C_6H_{12}O_6 + 6\ O_2$$

(carbon dioxide) (water) (yields) (sugar) (oxygen)

10. What word does the arrow in the chemical equation stand for?

yields or makes

The Photosynthesis Equation

11. Circle the letter of each raw material of photosynthesis.

a. carbon dioxide

b. glucose

c. water

d. oxygen

12. Circle the letter of each sentence that is true about the products of photosynthesis.

a. Plant cells use the sugar for food.

b. Some of the sugar is made into other compounds, such as cellulose.

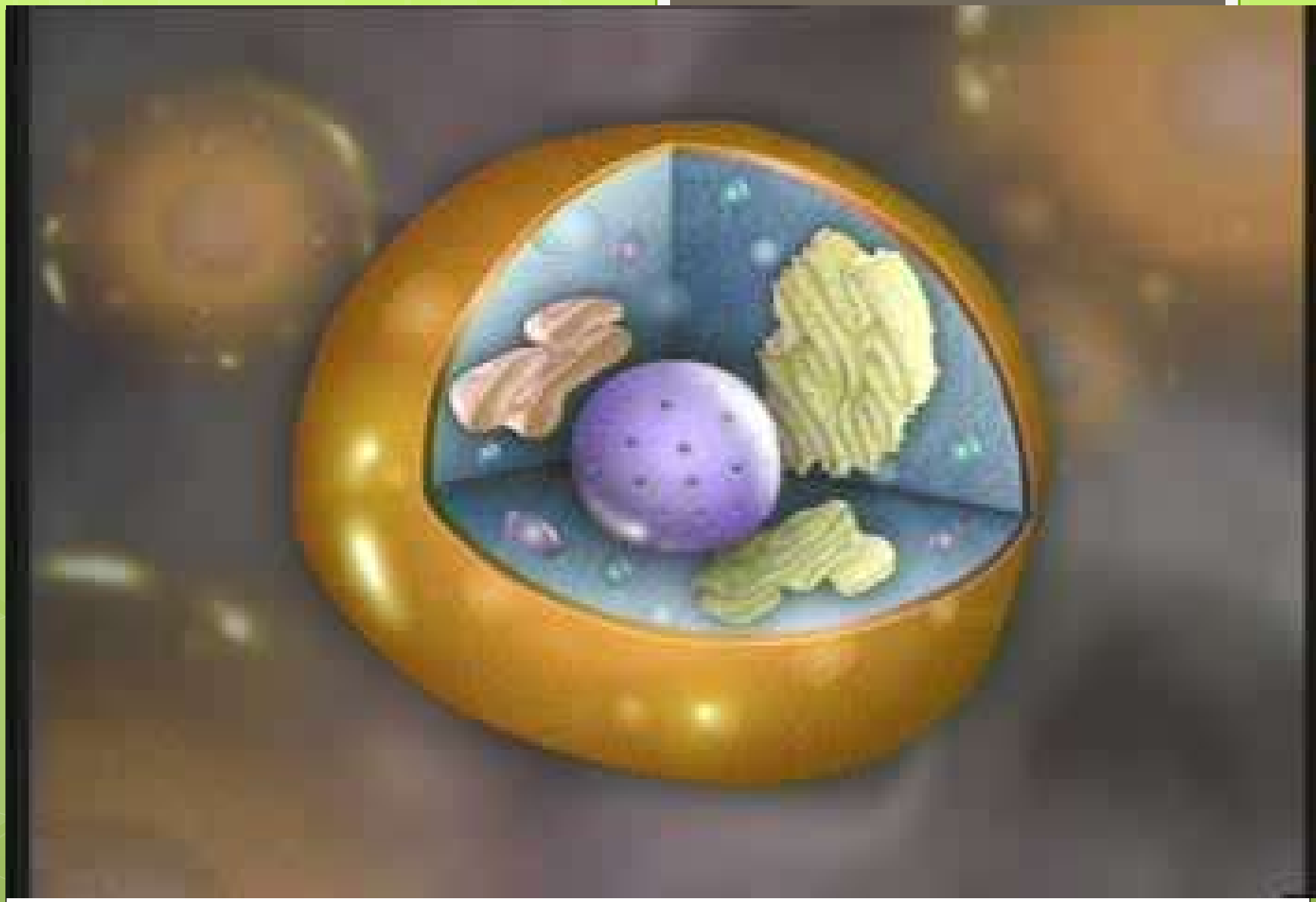
c. Some of the sugar is stored in the plant's cells for later use.

d. Extra sugar molecules pass out of the plant through the stomata.

The Photosynthesis Process Activity

http://www.phschool.com/atschool/phsciexp/active_art/photosynthesis_process/index.html

Click the above link to open a browser window and access Active Art about the photosynthesis process.

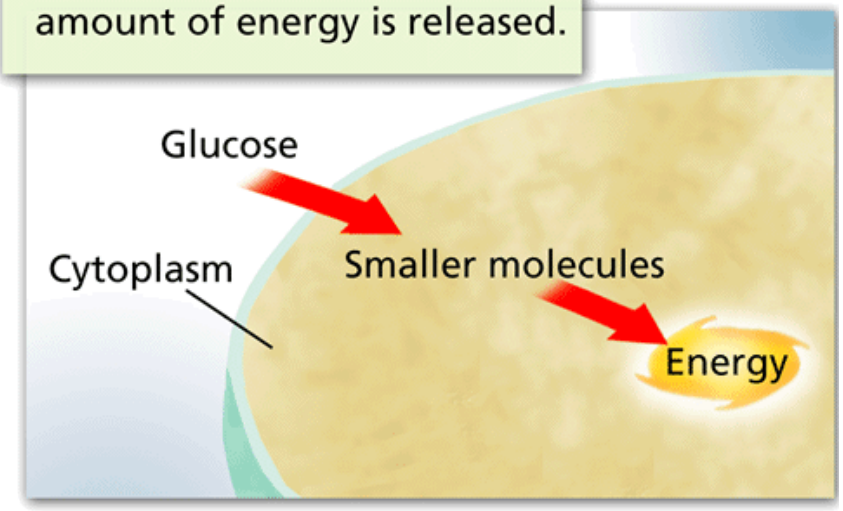


Mitochondria's role in Photosynthesis

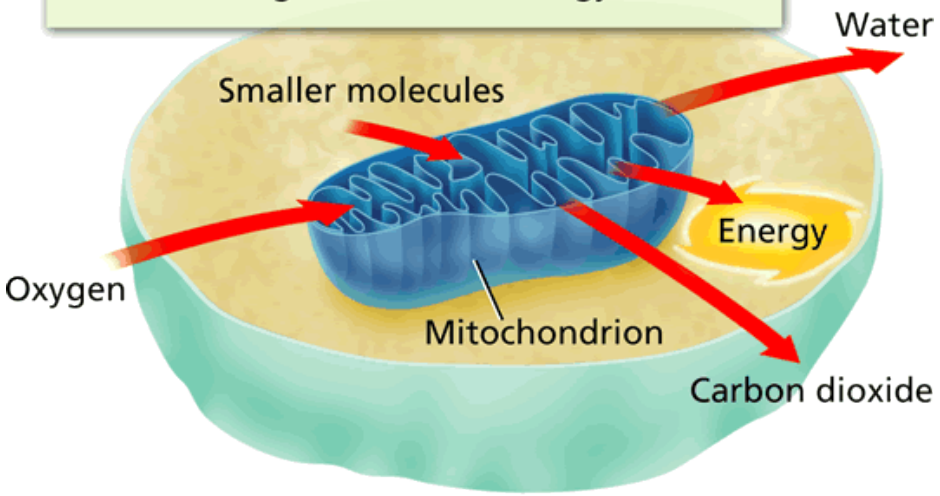
Two Stages of Respiration

During respiration, cells break down simple food molecules such as sugar and release the energy they contain.

Stage 1 In the cytoplasm, glucose is broken down into smaller molecules. A small amount of energy is released.

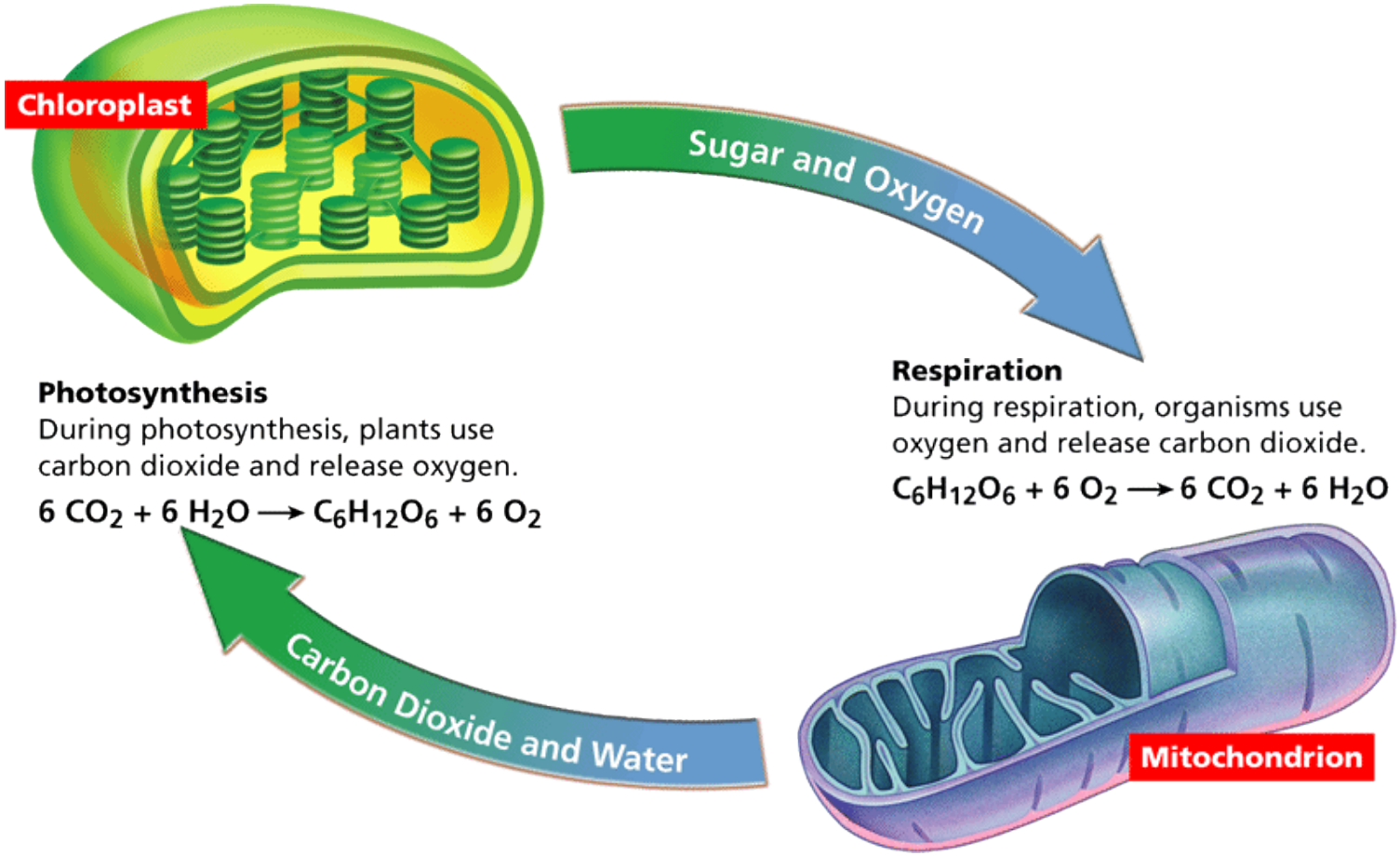


Stage 2 In the mitochondria, the smaller molecules combine with oxygen to produce water and carbon dioxide. This reaction releases a large amount of energy.



Photosynthesis and Respiration

You can think of photosynthesis and respiration as opposite processes.



After completing the PowerPoint and questions, go to the following website:

http://studyjams.scholastic.com/studyjams/jams/science/index.htm?topic_id=ecosys

Select the tab on ***plants***. View each of the following videos, and complete each self-assessment (Test Yourself) after viewing.

Study Jams: Photosynthesis, Gymnosperms, and Angiosperms

Did you meet your success criteria? _____