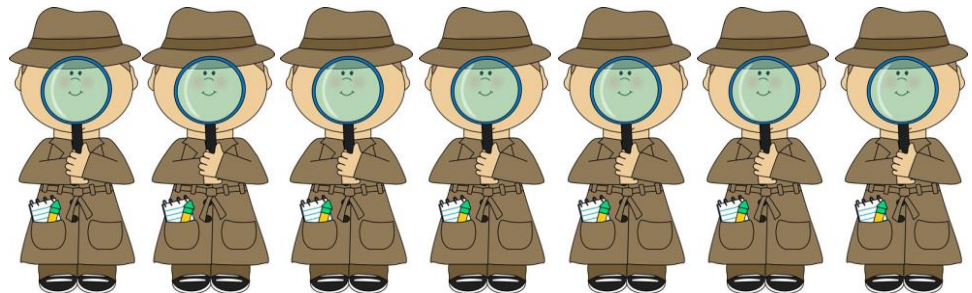


Plants Week 7 Booklet

- Living vs. Non-Living
 - Foss Investigation #5 The Vascular System
 - Part 3: Transpiration & Photosynthesis
- Not in Foss-
- Photosynthesis, Respiration, Transpiration



Photosynthesis, Respiration & Transpiration

2

Word	Definition
1. chlorophyll	A green pigment found in plant cells that absorbs light energy from the sun.
2. chloroplasts	Parts of the plant cells that contain chlorophyll.
3. xylem	Vascular tissue that transports water and minerals from the roots up to the rest of the plant.
4. phloem	Vascular tissue that transports food from the leaves down to the rest of the plant.
5. Photosynthesis (only plants)	Process plants use to make sugar (glucose) this requires carbon dioxide, water and sunlight. $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
6. respiration (plants/animals)	Process in which organisms obtain energy from the food it produces (plants) or consumes (animals) to perform life functions such as growth or repairing. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$
7. Transpiration (only plants)	Water loss (evaporation) through leaves that allows water to travel up the plant against the pull of gravity.
8. stomata	Pores (holes) that allow CO_2 in and H_2O vapor and Oxygen (O_2) out of leaves.
9. root hairs	Tiny extensions of plant roots that increase the surface area of the roots to allow more water and nutrients to be absorbed.
10. guard cells	Cells that open and close the stomata to allow or prevent water loss from leaves.

Focus Question: How is water transported through a plant?

Lab Part 3: Transpiration & Photosynthesis

Collect your bags from outside that were wrapped around a tree or your bag over a plant in the classroom. The bags should be removed carefully and held shut as to not lose any water. What do you observe?

The leaves were dry when the bag was put over the branch. Where did the water come from?

Where is the water that came out of all of the other leaves on the plant/tree you used for the experiment?

Compare the amount of water collected in your bag in milliliters using a graduated cylinder.

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Class Average

Define transpiration-

Even large trees manage to pull water up from their roots. They may lift as much as _____L (Liters) or _____ gal (gallons) of water every day!

Part 3: Transpiration & Photosynthesis (continued)

Think back to our celery stalks and the water loss experiment. Why did the celery stalks with more leaves lose more water?

4

Multicellular Levels of Complexity Questions

[Online Activity: Plant Vascular System](#) (sign in to Fossweb.com to view)

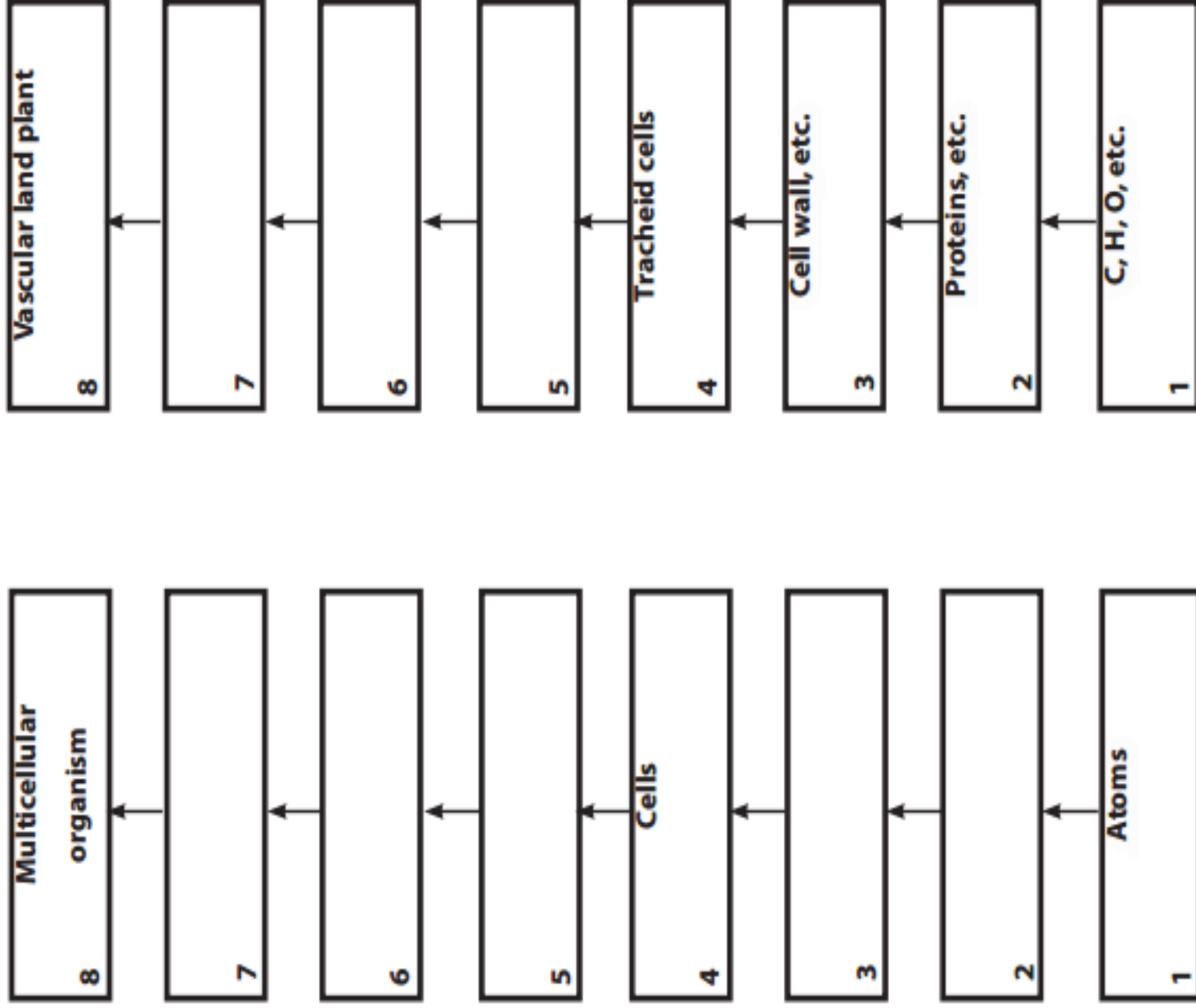
How do single-celled organisms get the water that they need to live?

Are all of the cells in the multicellular celery and tradescantia (Wandering Jew) plants living?
Circle Yes or No

How do all of those cells: the guard cells, the leaf cells, the cells in the stalks and stems get the water they need?

In what part of the plant is xylem tissue found?

Multicellular Levels of Complexity



Part 3: Transpiration and Photosynthesis

[Online Activity: Plant Vascular System](#) (sign in to Fossweb.com to view)

LAB: Part 3: Transpiration and Photosynthesis Book p. 43-47

Use your close reading skills as you read.



Water, Light, and Energy

It was your chore to water the houseplants, but you forgot! When you finally remembered, it was too late. The plants looked brown and shriveled. Plants need water in order to live. “Needs water” is on the list of life requirements for *all* life.

Have you ever seen houseplants wilt, lose their healthy green color, and die if they don’t get enough light? “Needs light” isn’t on our list. Is light one of the requirements for all life? Should we add it to the list or can we figure out how plants’ need for light fits into the list we already have?



Record in your notebook your ideas about whether “needs light” should be added to the list of requirements for life.

All Plant Cells Need Water

The answer to our question about light has a somewhat unexpected starting point: water. Plants use water for many things: to transport minerals to all their cells, to dissolve substances to make them available for chemical reactions, to cool off in the heat of the day, to give them shape, and to grow. Plant cells are filled with cytoplasm, which is mostly water.

Investigation 5: Plants: The Vascular System 35



1. Number the paragraphs
2. Chunk the text
3. Underline & circle with a purpose
4. Left Margin Notes
*What is the author saying?
5. Right Margin Notes
*Ask questions and summarize the text

Plants get the water they need from the soil. **Root hairs** take up water and pass it into hollow tubes, which make up **xylem** (ZY-lem) tissue, part of the plant's **vascular system**.



Xylem tubes in celery



Veins in celery leaves

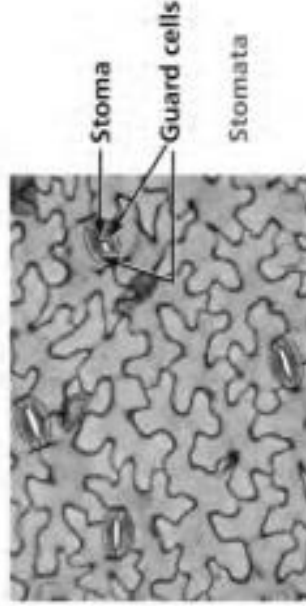
As we saw in the celery investigation, the xylem carries water up through the stem to the smaller **veins** in the leaves. In this way, all the cells in a plant get water and the minerals from the soil that come along with it. Xylem tubes are made of the cell walls of dead xylem cells, which are connected end to end in the stems, like long straws. The tubes form an extensive system of pipes that can end up being extremely long and complex, especially if we are talking about a tree as tall and massive as this giant sequoia.



A giant sequoia tree

Transpiration

What happens when water finally reaches the leaves? What did you observe when you put a bag around a leafy twig? Water! Where did that water come from? It came from the plant. It left the plant through the leaves as water vapor and entered the atmosphere. This process is called transpiration. Water vapor (lots of it!) exits the leaves through small pores called stomata (*stoma* = mouth). Guard cells open and close the stomata to control the movement of gases, including water vapor, into and out of the leaf.



Photosynthesis

You have probably heard that plants and **algae** (and some bacteria) make their own food. How do they do it, and what do water and light have to do with it? The process of photosynthesis is the answer. Thinking about photosynthesis will help us answer our original question about light. Water is involved in this food-making process in at least two ways.

Remember that water dissolves substances to make them available for chemical reactions. One of those substances is carbon dioxide (CO_2) gas. The stomata open during the day to allow gas exchange, allowing carbon dioxide from the atmosphere to enter.

The carbon dioxide dissolves in water in the spaces surrounding the cells. The carbon dioxide enters the nearby cells, where it becomes one of the building blocks of sugar, which provides food energy for the plant. And this could provide food energy for any other living thing that eats the plant. So water makes carbon dioxide available.

The second reason that water is important is that water itself is the *other* building block of sugar. Water combines chemically with carbon dioxide to make sugar.

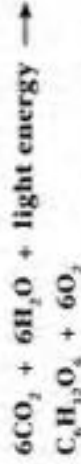
Light and water are both critical in the process of photosynthesis.



Only one thing is missing from this

equation. What do you think it is? The other thing plants need to survive is light.

The overall simplified chemical reaction can be expressed like this.



Carbon dioxide + water + light energy makes sugar + oxygen

There is something very interesting about this reaction. It occurs only in the chloroplasts, the green organelles that you first encountered in **elodea** leaf cells. You can't just dissolve some carbon dioxide, throw it together with water, hit it with light energy, and expect to make sugars. The reaction only happens in the chloroplasts where there is a green chemical pigment called **chlorophyll** that allows the plant to capture and convert light energy into the chemical bonds in sugar.

In order to make their own food, plants need water, carbon dioxide, light energy in the form of sunlight, and chlorophyll. The process is called photosynthesis, which makes sense because *photo* means light, and *synthesis* means putting together.

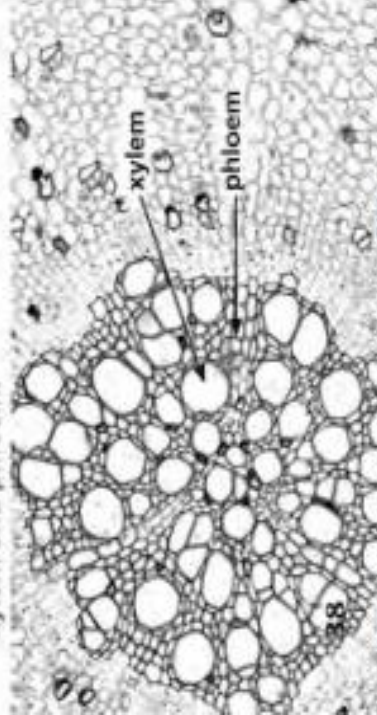


Chloroplasts are even found in guard cells.

Aerobic Cellular Respiration

Now we know how plant cells that have chloroplasts make food. But look at the plant cells below. They are from the root of an elderberry plant and they do not have chloroplasts. How do they get the food they need? The food that was made in the cells with chlorophyll must get to the root cells somehow. Right alongside the xylem is another part of the plant's vascular system called **phloem** (FLO-em) tubes. These tubes carry sugar from the leaves to all the other cells of the plant.

All the cells of a plant get food delivered via the phloem. But the energy stored in sugar is not in a form plants can use to grow, repair damaged tissue, or make new **structures**. In order to change sugar to a form that cells *can* use, plants need oxygen. Cross section of an elderberry root. Note the lack of chloroplasts in the cells surrounding the xylem and phloem.



You know that in photosynthesis, plants use carbon dioxide and give off oxygen. But plants need oxygen, too. Like most living cells, plant cells use oxygen to transform sugars into a usable form of energy. Oxygen and sugar, in the form of a molecule called glucose, combine to release energy, and carbon dioxide and water are given off as waste by-products. This reaction happens in every plant cell, every animal cell, and almost all other single-celled or multicellular organisms' cells.

The chemical reaction can be expressed like this.



Glucose + oxygen makes carbon dioxide + water + energy.

In eukaryotic cells, this process happens in the mitochondria and is called **aerobic cellular respiration** (*aerobic* means it uses oxygen). Notice anything interesting? Compare the equation for photosynthesis and the equation for cellular respiration. The sugar molecules are on opposite sides of the equations, and the light energy was turned into usable energy for the plant. Almost all organisms rely on aerobic cellular respiration to convert glucose into usable energy. But only photosynthetic organisms can capture the Sun's energy to create sugars. How do other organisms get sugars? All other organisms must eat photosynthetic organisms, such as plants, or eat organisms that did so.



How are photosynthesis and aerobic cellular respiration alike? How are they different?

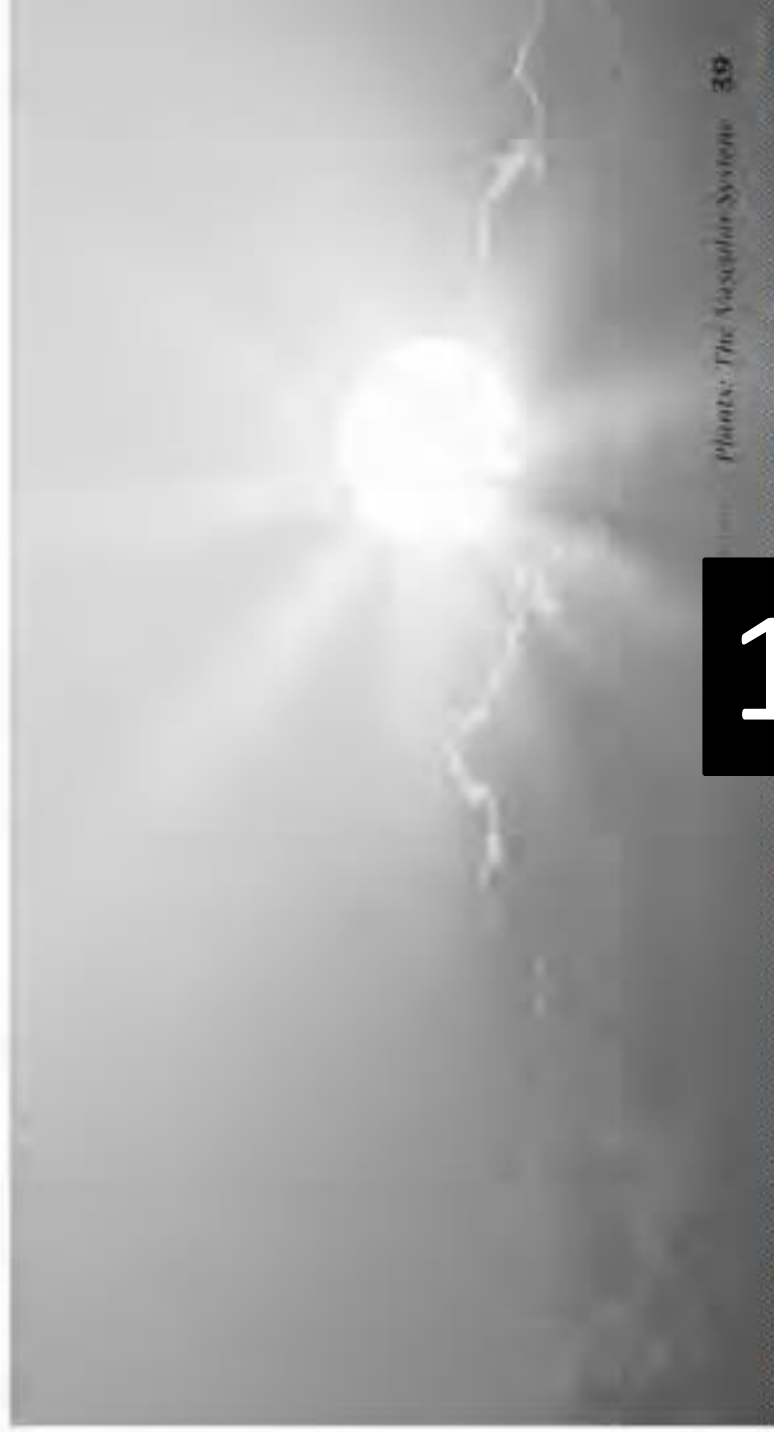
Summary

- Plants need water. They pull water up from soil using transpiration. Plants transport water to all cells, using tubes (xylem) that are part of their vascular system. Water vapor exits leaves through stomata, which are opened and closed by guard cells.
- Plants need food. They make their own food out of water and carbon dioxide, using light and chlorophyll in a process called photosynthesis. The food they make is a sugar (glucose), which stores energy.
- Plants transport sugar to all cells, using tubes (phloem) that are part of the vascular system.
- Plants (and almost all life forms) use aerobic cellular respiration to change food (sugar in the form of glucose) into usable energy to perform all of life's functions.

We don't need to add "needs light" to our list of life requirements. The light plants need is a part of "needs food." So be sure to water those plants and make sure that they get the light they need!

Think Questions

1. Explain why water is necessary for plants to make food.
2. How do all the cells in a plant get the water they need? Explain.
3. Do all plant and animal cells photosynthesize? Explain.
4. Do all plant and animal cells use aerobic cellular respiration? Explain.
5. Is light a requirement for life? Explain.



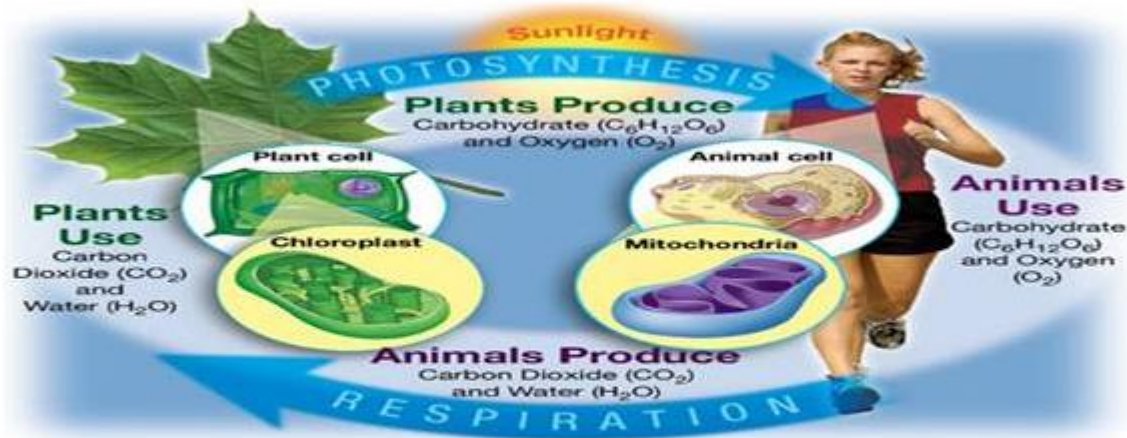
10

Think Questions after Reading

1. Explain why water is necessary for plants to make food?
2. How do all the cells in a plant get the water they need? Explain.
3. Do all plant and animal cells photosynthesize? Circle Yes or No
Explain.
4. Do all animal and plant cells use aerobic respiration? Circle Yes or No
Explain.
5. Is light a requirement for life? Circle Yes or No
Explain.

Comparison of Photosynthesis and Respiration

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Photosynthesis	Respiration

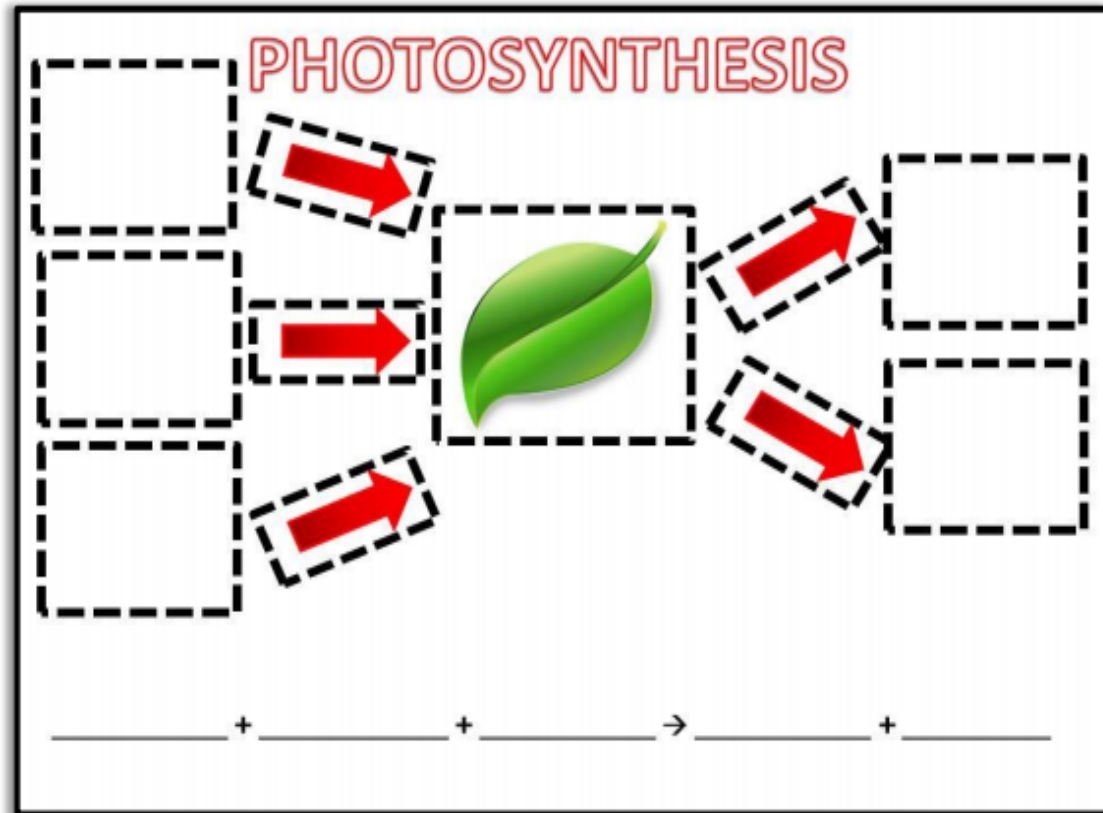
Photosynthesis, Respiration & Transpiration

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Video

Photosynthesis Notes

- _____ is the process that occurs in the _____ of plants. This process makes _____ which is also known as glucose.
- Here's How:
 - Leaves take in _____ from the air through _____ (holes) in the leaves called _____.
 - The stomata control when air can travel in and out of the leaf by using _____.
 - Leaves also take in _____ through the _____ of the plant.
 - Special cells in the leaves called _____ use sunlight to combine water and carbon dioxide to make _____ and release _____ through the stomata.

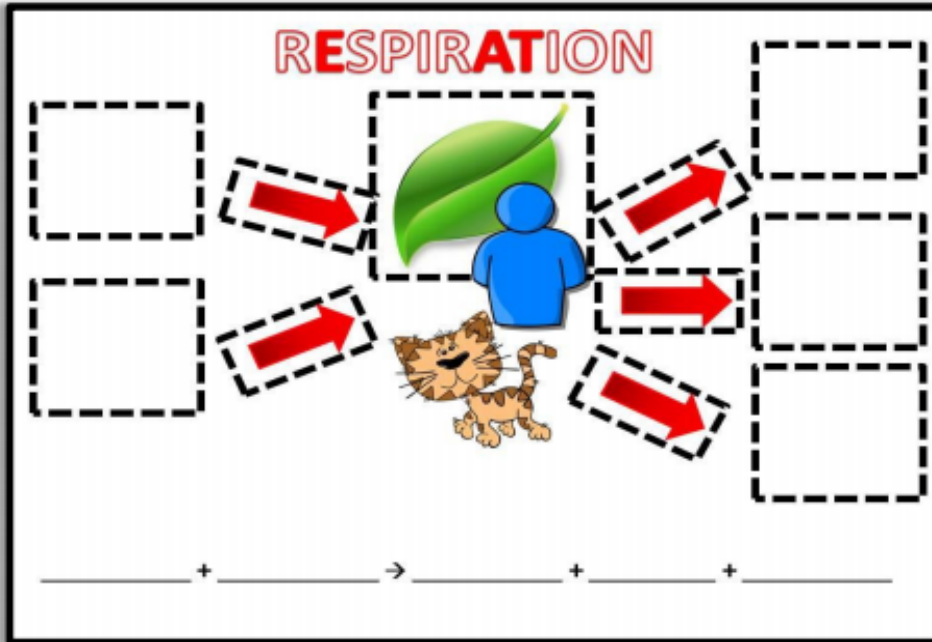


Photosynthesis, Respiration & Transpiration

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Cellular Respiration Notes

RESPIRATION



- _____ is a process that occurs in the _____ of plants or in the cells of _____ and people. This is the process that allows living things to _____ and use _____ for energy.

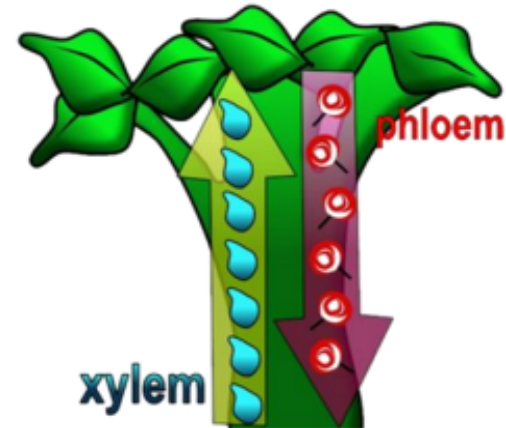
- R_spir_ion is the _____ in almost _____ living things. During respiration, living things will eat _____ and breathe in _____.

- After living things eat food (sugar) and breathe in _____, they obtain

energy and will release _____ and water.

Transpiration Notes

- The process that occurs when plants release water from their leaves is called _____.
- Plants **lose water** through the _____ (holes) in their leaves.
- The "tubes"/vessels that carry **water** through the stem are called _____. The vessels that carry _____ through the stem are called **phloem**.
- _____ is carried UP from the _____ in plants to the stems and leaves.
- _____ is carried down from the _____ to the rest of the plant.



Photosynthesis, Respiration & Transpiration

The PRT News Report

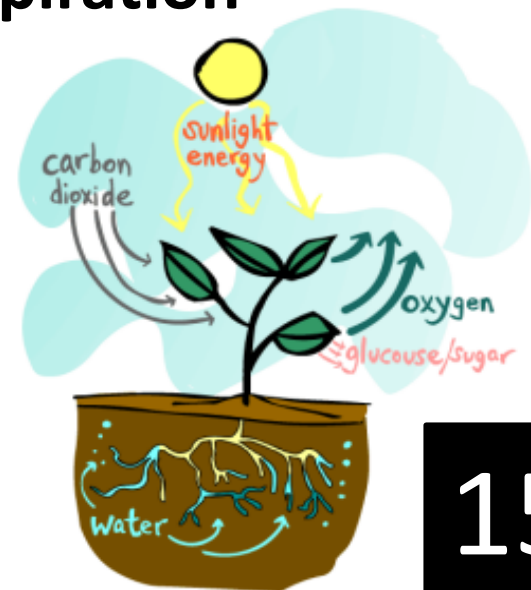
Use the word bank before each paragraph to learn about **PHOTOSYNTHESIS**, **RESPIRATION**, and **TRANSPIRATION** in this breaking news report.

autotrophs	carbon dioxide	chlorophyll	chloroplasts	leaves	oxygen
photosynthesis	stomata	sugar	sunlight	water	

We are here with our buddy, **C**_____ (also known as Phyll). Phyll is located in **C**_____ found within the plant cells of **L**_____. Phyll works hard every day by taking three simple materials: **W**_____ from the roots of the plant, **C**_____ through the **S**_____ (holes in the leaves), and **S**_____; and converting them into two things we all need- **S**_____ to eat and **O**_____ to breathe. Phyll is called an **A**_____ because he allows plants to make their own food in the process we call **P**_____.

carbon dioxide	energy	heterotroph	oxygen	respiration
stomata	sugar	sugar	transpiration	water

Now, coming on the scene is Bubba Bear who wants to eat the plant. He eats the **S**_____ from the plants and breathes in **O**_____. In each of his cells, the oxygen is breaking down the **S**_____ to produce the **E**_____ he needs to be an active bear in the forest. In this process called **R**_____, other products that are produced include **W**_____ and **C**_____. Since Bubba can't make his own food and he has to eat the plant for sugar, he is called a **H**_____. **UPDATE:** The plant is losing water through the **S**_____ in the leaves. Is it crying because Bubba is eating the leaves? Nope, it's just the process of **T**_____. Leaves don't cry, silly. Well, that's it for this news report.



Photosynthesis, Respiration & Transpiration

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PHOTOSYNTHESIS STUDY JAM

As you watch the video, write 3 facts that you learned from the video.

[Teacher Video](#)

[Student Video for iPad](#)

1.

2.

3.

Questions	Feedback Notes
1. Which ingredient is necessary for photosynthesis? <input type="checkbox"/> water <input type="checkbox"/> carbon dioxide <input type="checkbox"/> sunlight <input type="checkbox"/> all of the above	
2. Which part of the plant work as its "nostrils"? <input type="checkbox"/> stoma <input type="checkbox"/> guard cells <input type="checkbox"/> chloroplasts <input type="checkbox"/> all of the above	
3. Where does photosynthesis take place? <input type="checkbox"/> in the roots only <input type="checkbox"/> under the leaves <input type="checkbox"/> in chloroplasts <input type="checkbox"/> in chromosomes	
4. What part does chlorophyll play in photosynthesis? <input type="checkbox"/> It transports sugar and water to a plant's leaves. <input type="checkbox"/> It uses the Sun's energy to "cook" water and carbon dioxide. <input type="checkbox"/> It drinks water from the soil around the roots of a plant. <input type="checkbox"/> It breathes the air around a plant and gets carbon dioxide.	
5. What are water and carbon dioxide converted into by the end of photosynthesis? <input type="checkbox"/> air and sunlight <input type="checkbox"/> water and air <input type="checkbox"/> sugar and water <input type="checkbox"/> sugar and oxygen	
6. Where do people and animals get the oxygen they breathe? <input type="checkbox"/> from plants <input type="checkbox"/> from other animals <input type="checkbox"/> from water <input type="checkbox"/> from the Sun	
7. What do plants do with the sugar? <input type="checkbox"/> release it through the stoma <input type="checkbox"/> eat it for energy <input type="checkbox"/> convert it into oxygen <input type="checkbox"/> convert it into water	

Review

1. _____ chlorophyll
2. _____ chloroplasts
3. _____ xylem
4. _____ phloem
5. _____ photosynthesis
6. _____ respiration
7. _____ transpiration
8. _____ root hairs
9. _____ stomata
10. _____ guard cells

- A. A green pigment found in plant cells that absorbs light energy from the sun.
- B. Tiny extensions of plant roots that increase the surface area of the roots to allow more water and nutrients to be absorbed.
- C. Process plants use to make sugar (glucose) this requires carbon dioxide, water and sunlight. $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- D. Cells that open and close the stomata to allow or prevent water loss from leaves.
- E. Vascular tissue that transports water and minerals from the roots up to the rest of the plant.
- F. Process in which organisms obtain energy from the food it produces (plants) or consumes (animals) to perform life functions such as growth or repairing. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$
- G. Parts of the plant cells that contain chlorophyll.
- H. Pores (holes) that allow CO_2 in and H_2O vapor and Oxygen (O_2) out of leaves.
- I. Vascular tissue that transports food from the leaves down to the rest of the plant.
- J. Water loss (evaporation) through leaves that allows water to travel up the plant against the pull of gravity.

First let me start with pho-to-syn-thesis
If you don't have a clue, just listen to this
Heterotrophs gotta find food to eat
But autotrophs can make their own treats
Get it, Got it, Good!

Plants take in CO₂ through stomata in the leaves
Chlorophyll absorbs the light, that's what makes a plant green
The roots take up the water, and that's the recipe
They make food for the plant and oxygen for you and me.
Get it, Got it, Good!

How does the plant break down the food for energy?
A process called Respiration babe!
Transpiration is water loss through the leaves
But guard cells open and close the stomata when they please.
Get it, Got it, Good!

A quick recap, just so you don't forget,
Photosynthesis is a plants food making process
Respiration takes that food and breaks it down for energy
But avoid transpiration, water loss through the leaves.
Get it, Got it, Good!



Rap Questions

1. Living organisms that must hunt, find food to eat, or can't make their own food are known as _____.
 - A. autotrophs
 - B. heterotrophs
 - C. producers
 - D. protists
2. Living organisms that can make their own food are called _____.
 - A. autotrophs
 - B. heterotrophs
 - C. consumers
 - D. monerans
3. Which of the following is correct?
 - A. Both plants and animals are autotrophs
 - B. Both plants and animals are heterotrophs
 - C. Plants are heterotrophs and animals are autotrophs
 - D. Plants are autotrophs and animals are heterotrophs
4. What is the name of the process where plants use CO₂, water and light to make oxygen and food?
 - A. photosynthesis
 - B. respiration
 - C. transpiration
 - D. Precipitation
5. Plants take in CO₂ through tiny holes in the leaves called _____.
 - A. stomata
 - B. chloroplast
 - C. openers
 - D. closers
6. The green pigment found in the chloroplast that helps the plant to absorb light for photosynthesis is called the _____.
 - A. stomata
 - B. chlorophyll
 - C. guard cell
 - D. closers
7. The process where plants and animals break down food for energy is called _____.
 - A. photosynthesis
 - B. respiration
 - C. transpiration
 - D. Precipitation
8. The process where water is lost or evaporated through the leaves of a plant is called _____.
 - A. photosynthesis
 - B. respiration
 - C. transpiration
 - D. Precipitation
9. The stomata has _____ to help it open and close to prevent water loss through the leaves.
 - A. stomata
 - B. chlorophyll
 - C. guard cell
 - D. Closers
10. Which of the following does NOT belong?
 - A. grass
 - B. mosquito
 - C. sunflower
 - D. blue green algae

PHOTOSYNTHESIS SORT MAT

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Reactants →

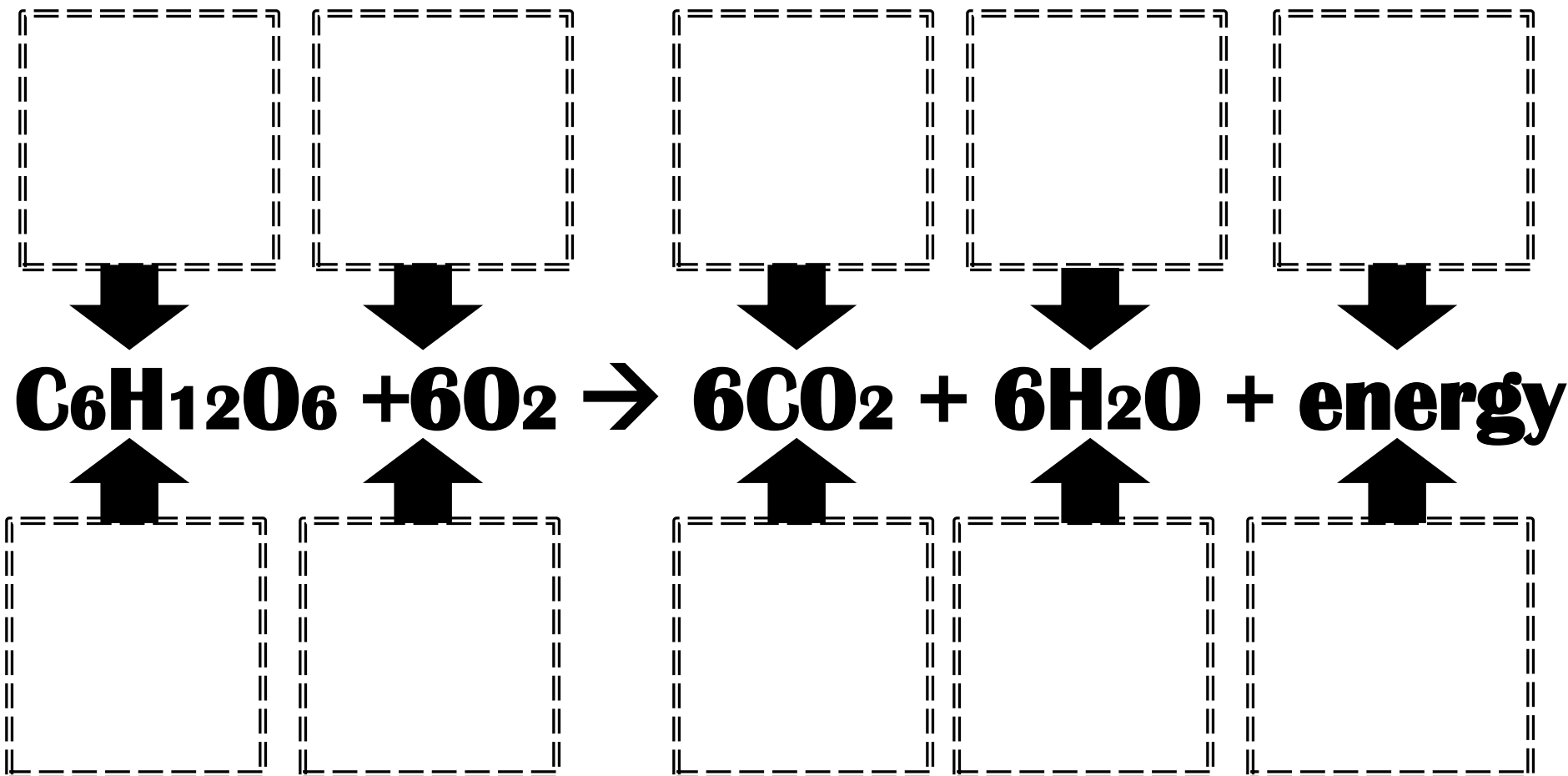
Products

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<div data-bbox="119 548 266 651">↓</div>	<div data-bbox="471 548 618 651">↓</div>	<div data-bbox="826 548 973 651">↓</div>	<div data-bbox="1278 548 1425 651">↓</div>	<div data-bbox="1646 548 1792 651">↓</div>
$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$				
<div data-bbox="119 753 266 856">↑</div>	<div data-bbox="471 753 618 856">↑</div>	<div data-bbox="826 753 973 856">↑</div>	<div data-bbox="1278 753 1425 856">↑</div>	<div data-bbox="1646 753 1792 856">↑</div>
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AFTER YOU ARE DONE SORTING THE SORT MAT WITH YOUR TABLE GROUP, FILL IN THIS SORT MAT TO STUDY!

RESPIRATION SORT MAT

Reactants → Products

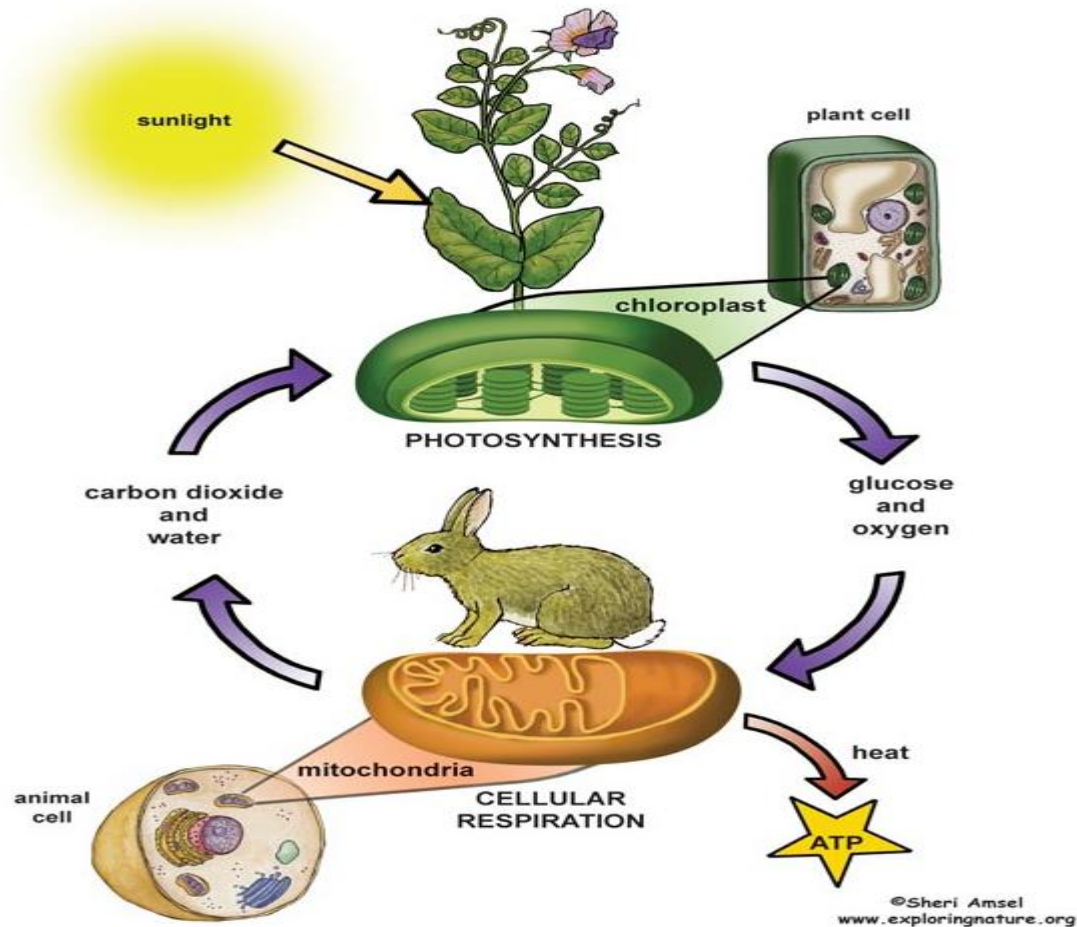


AFTER YOU ARE DONE SORTING THE SORT MAT WITH YOUR TABLE GROUP, FILL IN THIS SORT MAT TO STUDY!

Scientific Argument: Claim, Evidence, Reasoning

6.E.2A.2

Photosynthesis and Cellular Respiration



Using the graphic, use your scientific argument skills to make a claim, find evidence and reasoning about the concepts of photosynthesis, respiration and transpiration.

Claim: _____

Evidence: _____

Reasoning: _____

Find a fact: According to this Photosynthesis and Cellular Respiration Graphic, the graphic is evidence that plants and animals both complete what process?

How to Solve One-Step Dimensional Analysis Problems

The distance from North Myrtle to Surfside is 26 miles. What is the distance in cm?

Steps to Dimensional Analysis

- Step 1: Write out your problem.
- Step 2: Write all conversion factors as fractions.
- Step 3: Include all units with all numbers.
- Step 4: Arrange conversion factors, so that units cancel diagonally (what goes up, must come down).
- Step 5: Numbers on top are multiplied.
- Step 6: Numbers on bottom are divided.

Conversion

$$1 \text{ mi} = 160,934.4 \text{ cm}$$

Photosynthesis, Respiration & Transpiration

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6.L.5B.2 Analyze and interpret data to explain how the processes of photosynthesis, respiration, and transpiration work together to meet the needs of plants.

Essential Knowledge

It is essential for students to know that plants are organisms that perform certain processes necessary for survival.

Photosynthesis

- Plants are organisms that make their own food, a simple sugar, for survival.
- The process by which they make this sugar is called photosynthesis.
- Plant cells require sunlight, carbon dioxide and water to undergo photosynthesis.
- Chloroplasts, found in the cells of the leaf, contain chlorophyll, a green pigment that absorbs light energy from the sun.
- Carbon dioxide is taken in through openings, or pores, in the leaf called stomata and water is absorbed through the roots.
- Simple sugar (glucose) and oxygen gas are produced. The plant uses the glucose for food and the oxygen gas released into the air through the stomata.

Photosynthesis provides the oxygen gas in the atmosphere that most living organisms need.

Photosynthesis, Respiration & Transpiration

Respiration

- The glucose created through photosynthesis is used to provide energy needed by the plants to perform life functions such as growing and repairing.
- To obtain the energy from the food it produces, plants must break down the sugar in the cells throughout the plant in a cellular process called respiration.
- Cells require glucose and oxygen gas to undergo respiration.
- Oxygen gas from the air (taken in through the stomata) combines with the glucose, which is then broken down producing carbon dioxide and water.
- During this process, energy is released. This energy will be used by the plant to perform life functions such as growth and repair.
- The carbon dioxide gas and water that are formed are then given off through the stomata in the leaves.

Note: All organisms undergo respiration to release energy from food.

Transpiration

- Some of the water taken in through the roots of plants is used in the process of photosynthesis.
- Plants store water inside of their cells.
- Plants lose water through the leaves. This process is called transpiration.
- Without a way to control transpiration, plants would wither up and die.
- Guard cells, mostly on the underside of the leaf, open and close the stomata and allow plants to control transpiration.
- When the stomata are closed, water cannot escape from the leaf.

Photosynthesis, Respiration & Transpiration

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Extended Knowledge

- The chemical equation for photosynthesis is $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.
- The chemical equation for respiration is $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$.
- Photosynthesis and respiration are chemical reactions that have chemical equations.
- The reactants are at the beginning of the reaction (left side of the arrow) and the products are the substances that are formed (right side of the arrow).
- Students may want to analyze the overall chemical equations for photosynthesis and cellular respiration so they are able to see the complementary relationship between the two processes.

Assessment Guidance

The objective of this indicator is to analyze and interpret data to explain how the processes of photosynthesis, respiration, and transpiration work together to meet the needs of plants. Therefore, the primary focus of assessment should be for students to analyze and interpret data from informational texts, observations, measurements, and investigations to support claims that photosynthesis, transpiration, and respiration are processes that are necessary for plants to survive. This could include but is not limited to students using data from informational texts to describe how photosynthesis and respiration are inverse processes that help to ensure survival of the plant. Students can also conduct experiments in order to collect data that shows that photosynthesis or respiration are occurring (increasing amounts of carbon dioxide for photosynthesis or the presence of water for transpiration). Students should use this data to show how these processes are helping the plant to survive. In addition to analyze and interpret data, students should ask questions; plan and carry out investigations; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models; obtain, evaluate, and communicate information; and construct devices or define solutions.