



Lesson Plan: Photosynthesis and Respiration

Grade Level: 7

Subject: Life Science

Duration: 45–60 min

NGSS MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Learning Objectives

By the end of this lesson, students will be able to:

- **Describe** the processes of photosynthesis and cellular respiration, including the reactants and products in each chemical equation.
- **Explain** how photosynthesis and cellular respiration are interconnected, with the products



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uses it to make food during photosynthesis.

- **Chlorophyll:** A green pigment molecule inside chloroplasts that captures energy from sunlight so photosynthesis can take place.
- **Mitochondrion:** A rod-shaped organelle that produces most of the energy a cell uses by carrying out cellular respiration.
- **Glucose:** A simple sugar ($C_6H_{12}O_6$) that stores chemical energy; it is the food made during photosynthesis and broken down during cellular respiration.
- **Autotroph:** An organism, such as a green plant, that makes its own food using the energy of sunlight.



- **Heterotroph:** An organism that cannot make its own food and must eat other living things to get energy.

Materials Needed: (all links are included in this PDF)

- Practice Worksheet 0 (multiple-choice review)
(<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-0.pdf>)
- Practice Worksheet 1 (chemical equations and molecule counts)
(<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-1.pdf>)
- Practice Worksheet 2 (stages of respiration and fermentation)
(<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-2.pdf>)



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Step 1: Introduction (5 minutes)

- Ask students: 'Where does the food you eat get its energy from originally, and how does a plant make its own food without eating anything?'
- Display the photosynthesis and cellular respiration equations side by side and point out that the products of one process are the reactants of the other.
- Explain that today's lesson traces how matter and energy move into and out of living things through these two connected processes.

Step 2: Direct Instruction (15 minutes)



- Use the vocabulary worksheet to introduce and define the key structures and molecules: chloroplast, chlorophyll, mitochondrion, glucose, autotroph, and heterotroph.
(<https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-7-photosynthesis-and-respiration-2046-1.pdf>)
- Walk through the photosynthesis equation ($6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{glucose} + 6\text{O}_2$), explaining that it happens in the chloroplast and that chlorophyll captures the light energy.
- Demonstrate photosynthesis by placing Elodea sprigs in a beaker of water under a bright lamp and having students observe the oxygen bubbles forming on the leaves.

Step 3: Guided Practice (15 minutes)

- Complete the vocabulary matching worksheet together, having students match terms such as autotroph, heterotroph, and guard cells to their definitions.
(<https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-7-photosynthesis-and-respiration-2046-2.pdf>)
- Work through Practice Worksheet 1 as a class, focusing on the chemical equations and the questions about how many molecules of glucose and oxygen photosynthesis produces.



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cellular respiration into usable energy.

Step 5: Assessment (10 minutes)

- Administer Practice Worksheet 0 as a short multiple-choice quiz covering the inputs and outputs of photosynthesis, the cell structures involved, and cellular respiration.
(<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-0.pdf>)



- Have students classify everyday scenarios by process — a leaf in sunlight, a runner's aching muscles, and bread dough rising — identifying whether photosynthesis, aerobic respiration, or fermentation is happening.
- Ask students to explain in one or two sentences why photosynthesis and cellular respiration are described as opposite but interconnected processes.

Differentiation Strategies

For advanced learners:

- Challenge students to balance and compare the photosynthesis and respiration equations and explain what the matching 6:6:1:6 ratio of molecules reveals about the conservation of atoms across both processes.
- Have students research how C4 or CAM plants adapt photosynthesis to conserve water in hot or dry climates and present how this changes the timing of gas exchange.



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- Have students build a physical or digital model that follows one glucose molecule and oxygen from a plant into an animal and back, showing how matter cycles between photosynthesis and respiration.

Complete List of Available Resources:

- NewPathWorksheets: Photosynthesis and Respiration (<https://newpathworksheets.com/science/grade-7/photosynthesis-and-respiration-2046>)



- Practice Worksheet 0 (<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-0.pdf>)
- Practice Worksheet 1 (<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-7-photosynthesis-and-respiration-2046-1.pdf>)
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- Vocabulary Worksheet 2 (<https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-7-photosynthesis-and-respiration-2046-2.pdf>)
- Vocabulary Worksheet 3 (<https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-7-photosynthesis-and-respiration-2046-3.pdf>)



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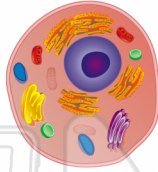


Name _____ Class _____ Date _____

1

What is **cellular respiration**?

- A transporting material
- B talking with someone on a cell phone
- C breaking food down to get the energy
- D storing energy as a lipid



2

_____ builds up when you run as fast as you can for as long as you can because your **cells cannot get enough oxygen**.

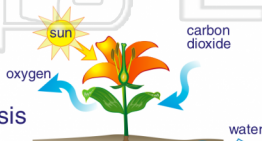
- A Nucleic acid
- B Battery acid
- C Lactic acid
- D Hydrochloric acid



3

Which process requires the **sun's energy**?

- A eating
- B transpiration
- C respiration
- D photosynthesis



4

What **substance** is needed to **start** photosynthesis?

- A nitrogen
- B carbon dioxide
- C oxygen



5



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9

The **first stage** of photosynthesis is using energy to **produce sugars**.

True or false?

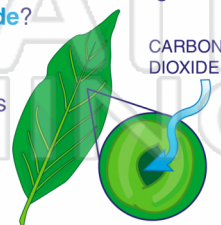
- A True
- B False



10

What structures in a leaf brings in **carbon dioxide**?

- A chlorophyll
- B chloroplasts
- C cuticle
- D stomata



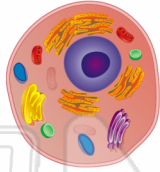


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C

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- A Nucleic acid
- B Battery acid
- C Lactic acid
- D Hydrochloric acid

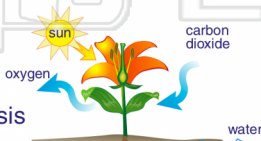


C

3

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D

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B

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B

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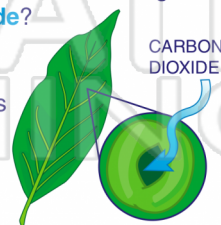


B

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D

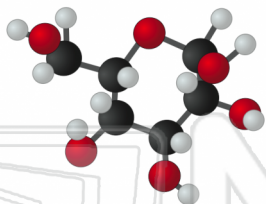


Name _____ Class _____ Date _____

1

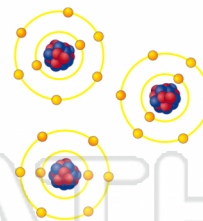
What is the chemical formula for **glucose**?

- A** CO_2
- B** $\text{C}_6\text{H}_{12}\text{O}_6$
- C** O_2
- D** H_2O

**2**

What substance is needed to carry out **respiration**?

- A** oxygen
- B** carbon dioxide
- C** nitrogen
- D** carbon

**3**

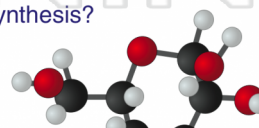
Through which **structures** does the **oxygen** produced by photosynthesis get out of the plant and into the air?

- A** chlorophyll
- B** chloroplasts
- C** cuticle

**4**

How many **molecules** of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) are produced during photosynthesis?

- A** 1
- B** 3
- C** 6

**5**

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9

Match the term with the correct definition.

- | | |
|---|---|
| ☐ chloroplast | A. an organelle where photosynthesis takes place |
| ☐ stoma | B. an opening on the leaf's surface that allows gases to move in and out |
| ☐ chlorophyll | C. a green pigment molecule that captures energy from the sun |
| ☐ pigment | |

**10**

Match the term with the correct definition.

- | | |
|--|---|
| ☐ alcoholic fermentation | A. a process used by yeast to obtain energy |
| ☐ respiration | B. a process that requires energy to produce food |
| ☐ photosynthesis | C. a process that breaks down food to produce energy |
| ☐ lactic acid fermentation | |



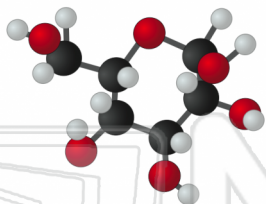


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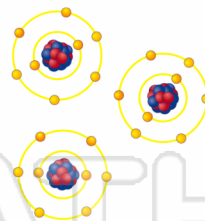


(B)

2

What substance is needed to carry out **respiration**?

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



(A)

3

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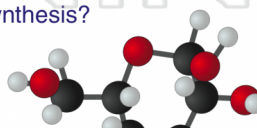


(D)

4

How many **molecules of glucose** ($\text{C}_6\text{H}_{12}\text{O}_6$) are produced during photosynthesis?

- A 1
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- C 6



(A)

5



(B)

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(A)

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Name _____ Class _____ Date _____

1

Match the term with the correct definition.

- | | |
|---|---|
| ☐ heterotroph | A. organism that makes its own food using the sun's energy |
| ☐ autotroph | B. organism that cannot make its own food |
| ☐ chlorophyll | C. cells that are part of a stoma |
| ☐ guard cells | |

2

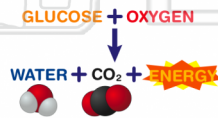
Match the term with the correct definition.

- | | |
|---|--|
| ☐ mitochondrion | A. the location of photosynthesis |
| ☐ cytoplasm | B. the location of the second stage of cellular respiration |
| ☐ chloroplast | C. the location of the first stage of cellular respiration |
| ☐ plant vein | |

3

What are all the **products** of **cellular respiration**?

- A** carbon dioxide
B carbon dioxide and water
C carbon dioxide, water, and energy

**4**

Match the term with the correct definition.

- | | |
|--|--|
| ☐ alcoholic fermentation | A. process that requires oxygen |
| ☐ respiration | B. process that produces oxygen |
| ☐ photosynthesis | C. process that does |

5

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9

Fermentation is an adaptation to an environment that _____.

- A** has a large amount of oxygen
B has a large amount of carbon dioxide
C has a small amount or no oxygen
D has a small amount or no carbon dioxide

10

Alcoholic fermentation is important to bread rising.

True or false?

- A** True
B False





Name _____ Class _____ Date _____

1

Match the term with the correct definition.

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|--------------------------------------|--|
| ☐ heterotroph | A. organism that makes its own food using the sun's energy |
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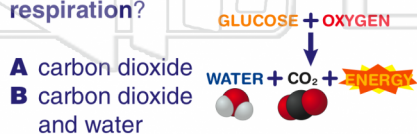
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7

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True or false?

- A True
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Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Chloroplast

ATP

Cytoplasm

Autotroph

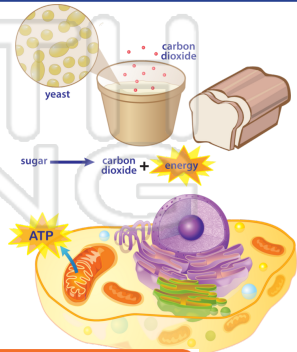
Alcoholic fermentation

Carbon dioxide

Chlorophyll

Cellular respiration

1. - a cellular process used by yeast and other single-celled organisms to obtain energy



2. - adenosine triphosphate; a molecule that provides energy for chemical reactions

3. the lig



4. carbon
atmos

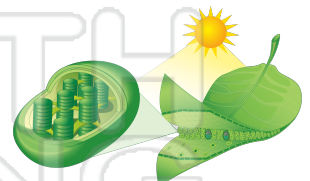
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6. energy

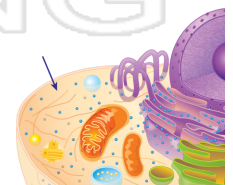
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7. - an organelle that captures energy from the sun and converts it into food



8. - a substance found inside a cell that supports and protects the organelles of a cell





Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Chloroplast

ATP

Cytoplasm

Autotroph

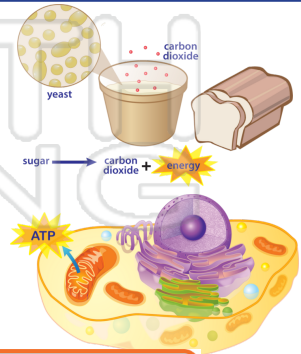
Alcoholic fermentation

Carbon dioxide

Chlorophyll

Cellular respiration

1. alcoholic fermentation - a cellular process used by yeast and other single-celled organisms to obtain energy



2. ATP - adenosine triphosphate; a molecule that provides energy for chemical reactions

3. autotroph - an organism that can make its own food

4. carbon dioxide - a gas that is a byproduct of cellular respiration and is used in photosynthesis

5. cell wall - a rigid layer that surrounds the cell and provides structural support

6. chlorophyll - a green pigment found in chloroplasts that captures light energy

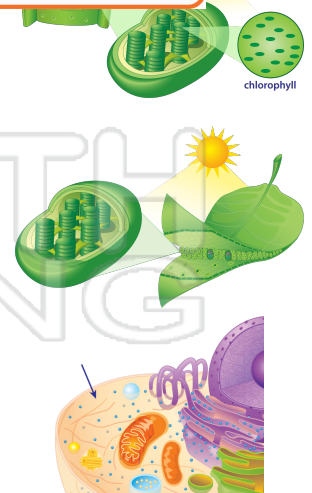


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7. chloroplast - an organelle that captures energy from the sun and converts it into food

8. cytoplasm - a substance found inside a cell that supports and protects the organelles of a cell





Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Energy

Heterotroph

Mitochondrion

Guard cells

Glucose

Lactic acid
fermentation

Chloroplast

Cytoplasm

1. - an organelle that captures energy from the sun and converts it into food



2. - a substance found inside a cell that supports and protects the organelles of a cell



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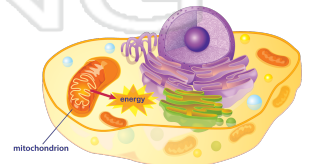
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7. - a cellular process used to gain energy when oxygen cannot be replenished fast enough to support the function



8. - a rod-like organelle that produces most of the energy that is used by a cell





Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Energy

Heterotroph

Mitochondrion

Guard cells

Glucose

Lactic acid
fermentation

Chloroplast

Cytoplasm

1. chloroplast - an organelle that captures energy from the sun and converts it into food



2. cytoplasm - a substance found inside a cell that supports and protects the organelles of a cell



3. ene



4. glu
carb

5. gua
pore

6. het
living

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7. lactic acid fermentation - a cellular process used to gain energy when oxygen cannot be replenished fast enough to support the function



8. mitochondrion - a rod-like organelle that produces most of the energy that is used by a cell

