

Lesson 4.11: Life Science – Photosynthesis & Respiration

Weekly Focus: Reading Comprehension
Weekly Skill: Taking Notes from Video/Lecture

Lesson Summary: This week students will watch a video explaining photosynthesis. Students will practice note taking and answering questions while watching the video. Then they will continue to read about photosynthesis and respiration with a passage on the subject.

Materials Needed:

- Video **Unit 4.11 – What is Photosynthesis?** (4:00 min)
- Video Note Sheet **Unit 4.11 Handout 1**
- Main Idea Reading **Unit 4.11 Handout 2**
- Extra Work/Homework **Unit 4.11 Handout 3** (6-way Paragraphs, Middle Level, # 9, pages 18 – 19)

Objectives: Students will be able to...

- Read comprehension passages with vocabulary related to evolution and natural selection
- Practice taking notes from a lecture or video presentation

College and Career Readiness Standards: RI, RST, WHST

ACES Skills Addressed: EC, LS, ALS, CT, SM, N

Notes: Please review and be familiar with classroom routine notes for: reading for fluency strategies (**Routine 2**), summarizing techniques (**Routine 4**), self-management skills (**Routine 1**). The notes for the different activities will help with making a smooth transition to each activity.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be two short answer questions (suggested 10 minutes each) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

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Activities:

Warm-Up: KWL Chart

Time: 10 - 15 minutes

- As students enter the class, have the following written on the board or overhead: **“Photosynthesis is a process that all plant cells go through. What do you know about photosynthesis?”** Have students create a **“KWL”** chart on a piece of notebook paper (below). This helps to activate students' prior knowledge by asking them what they already **K**now (column 1); students (collaborating as a classroom unit or within small groups) set goals specifying what they **W**ant to learn (column 2); and after reading students discuss what they have **L**earned (column 3).
- Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals.

KWL Chart:

K - What (else) do I KNOW?	W - What do I WANT to know?	L - What did I LEARN?

Activity 1: Notes from Video / Lecture (Unit 4.11 Handout 1)

Time: 25 - 30 minutes

- Hand out **Unit 4.11 Handout 1** to students.
- Explain to students they will watch a video about photosynthesis. While watching the video, students should answer questions from the information presented in the video.
- Discuss with students that this is similar to a skill they will need to use in college – taking notes from a lecture.
- Have students preview the questions prior to watching the video. It will give them an idea of what will be presented in the video. They may know the answer to a few of the questions.
- Be prepared to show the video again in order for students to gain a better understanding of the content.
- Review answers as a whole class and make sure students comprehend the main concepts presented in the video. If possible, ask students to summarize the video in 3 – 5 sentences. **Note:** point out to students that they may have to know the chemical equation for photosynthesis for the 2014 GED Science test. Make sure they understand it.
- Students can fill in the **“L”** portion of the KWL chart.

Break: 10 minutes

Activity 2: Comprehension Reading (Unit 4.11 Handout 2)

Time: 45 - 50 minutes

- Hand out **Unit 4.11 Handout 2** to students.
- Explain to students they will expand upon their understanding of photosynthesis with a reading passage. This information is important foundational knowledge for questions that may be on the 2014 GED Science module.
- Discuss with students that when reading for comprehension, there are many strategies to use: read the title to predict what the reading is about; look at the subheadings to get a better idea of

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what each section is about; if there are images, look at them to gain understanding; while reading remember to ask “What is this all about?”

- 4) Have students read the passages independently while answering the questions at the end.
- 5) Circulate class while they are reading to make sure they understand the information presented and see if there are any questions.
- 6) Review answers as a whole class. Ask students to point to the evidence from the reading passage that helped them determine the answer.
- 7) If there is time, students can summarize the reading or write the main idea.

Wrap-Up: Summarize

Time: 5 minutes

Have students turn to a partner (or write in their journals) about what they have learned today about photosynthesis. Ask them to tell a partner one thing they learned today in one or two sentences. *Note: Use Routine 4 Handout*

Extra Work/Homework: Unit 4.11 handout 3

Time: 30 minutes outside of class

Students can continue to read about photosynthesis with another reading passage from 6-way Paragraphs Middle Level. It is an excellent opportunity for students to review the material presented in today's lesson.

Differentiated Instruction/ELL Accommodation Suggestions

Activity

If some students finish early, they can turn their paper over and summarize the reading passage.

**Activity 1
and
Activity 2**

Teachers should be aware that ELLs could have some difficult time with some of the vocabulary encountered in the video for Activity 1 and in the reading for Activity 2. Encourage them to look for context clues in the reading that will help them with interpreting the main idea of each reading passage.

**Activity 1
& 2**

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Online Resources:

If students have Internet connection, they can try an online interactive activity with photosynthesis (NOVA – click on “launch interactive”)

<http://www.pbs.org/wgbh/nova/nature/photosynthesis.html>

This is a link to a Pearson website with more information on photosynthesis.

http://www.phschool.com/science/biology_place/biocoach/photosynth/overview.html

This is a 4-H created from the Vermont Extension Service with interactive work on photosynthesis.

<http://www.sites.ext.vt.edu/virtualforest/modules/photo.html>

Suggested Teacher Readings:

- GED Testing Service – GED Science Item Sample (to get an idea of what the test may be like)

<http://www.gedtestingservice.com/itemsamplerscience/>

- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

<http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf>

- Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

http://abe.mpls.k12.mn.us/ged_2014_2

- Essential Education's 2014 GED Test Curriculum Blueprint (PDF)

<http://www.passged.com/media/pdf/educators/curriculum-blueprint.pdf>

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Unit 4.11 handout 1

What Is Photosynthesis?

Answer following questions and take notes while watching the video on photosynthesis.

1. What are the raw materials needed by plants for photosynthesis? _____

2. CO₂ is made up of what two atoms and what is its common name? _____

3. What is the first product of photosynthesis and what is it made up of? _____

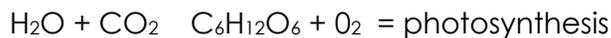
4. What is O₂ made up of and what does it do for us? _____

5. From where do plants get water? _____

6. From where do plants get carbon dioxide? _____

7. Where does photosynthesis begin? _____

8. Write out each part of the following chemical equation for photosynthesis:



9. Where does the oxygen go from inside the plant?

10. What remains in the plant as energy?

11. Where does the process of photosynthesis happen?

Unit 4.11 Handout 1

TEACHER ANSWER KEY

What Is Photosynthesis?

1. What are the raw materials needed by plants for photosynthesis?

Hydrogen & Oxygen = Water

2. CO₂ is made up of what two atoms and what is its common name?

Carbon & Oxygen = carbon dioxide

3. What is the first product of photosynthesis and what is it made up of?

C₆ H₁₂ O₆ = carbon + hydrogen + oxygen = glucose

4. What is O₂ made up of and what does it do for us?

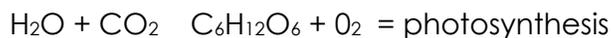
It is made up of oxygen atoms and it is what we breathe.

5. From where do plants get water? **When it rains, plants get water.**

6. From where do plants get carbon dioxide? **From animals when they breathe, they release carbon dioxide.**

7. Where does photosynthesis begin? **Inside the leaves of plants.**

8. Write out each part of the following chemical equation for photosynthesis:



**Water + Carbon Dioxide (with help of sun) → they are broken apart and rearranged to create)
 Glucose = photosynthesis**

9. Where does the oxygen go from inside the plant?

The oxygen goes into the atmosphere for us to breathe.

10. What remains in the plant as energy?

Glucose remains in the plant as energy.

11. Where does the process of photosynthesis happen? **Photosynthesis happens in all plants.**

Unit 4.11 Handout 2 (5 pages total)

How Do Oxygen and Carbon Dioxide Cycle?

Photosynthesis and Respiration

Organisms use oxygen and carbon dioxide over and over. Some of this cycling happens during photosynthesis and respiration. A runner breathes faster and more deeply as she runs because her body needs more oxygen. Green plants and algae make most of the oxygen in the atmosphere.

Plants and algae make oxygen and food through photosynthesis. During photosynthesis, energy from the Sun is used to change carbon dioxide and water into a simple sugar called glucose and oxygen.

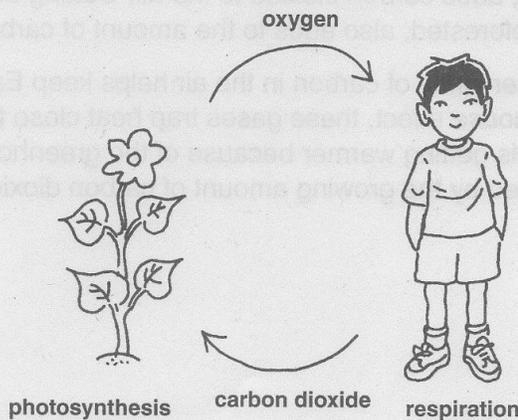
Glucose gives plants energy, which is stored inside food. Animals get the energy when they eat the plants. Animals that eat other animals also get energy from glucose. The oxygen is released into the atmosphere.

Most organisms are able to use the chemical energy in food through respiration. During respiration, oxygen joins with glucose to produce carbon dioxide and water. The stored energy is let go.

Plants, animals, and many other organisms carry out respiration. Respiration is why oxygen is so important to life on Earth, including human life. You take in oxygen with every breath. Your blood carries oxygen to the cells in your body, where respiration is always taking place.

Photosynthesis and respiration work in opposite ways. The things that are used during photosynthesis (carbon dioxide and water) are produced during respiration. The things that are used during respiration (oxygen and glucose) are produced during photosynthesis. This is how oxygen and carbon dioxide cycle through the biosphere.

Just as animals need plants for food and oxygen, plants need animals for carbon dioxide.



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Carbon Cycle and Oxygen Cycle

Carbon is one of Earth's most common elements—materials that cannot be broken down into other materials. It is a basic part of all living things. Carbon is part of every body cell, every sugar, and carbon dioxide gas. Carbon is also part of Earth's outer layer called the crust. Much carbon is underground in fossil fuels such as coal, oil, and natural gas.

Carbon moves through the carbon cycle mostly as carbon dioxide gas. Plants take in carbon dioxide during photosynthesis, and it goes into molecules like glucose. When organisms use the glucose, carbon goes back into the environment as carbon dioxide.

Carbon also moves through the environment in other ways. When organisms die, some carbon stays in their bodies. As bacteria and fungi break down dead organisms, carbon leaves their bodies and returns to the environment. Burning fossil fuels also moves carbon back into the environment.

Living things need oxygen to live. Like carbon, oxygen cycles through the environment. Oxygen is produced during photosynthesis. Some oxygen comes from water vapor in the atmosphere. Oxygen is used during respiration. It is also consumed when metals rust or when something burns.

Because oxygen is one of the substances that make up carbon dioxide, the oxygen cycle is tied to the carbon cycle. Both carbon and oxygen cycle between living and nonliving things in the environment.

Things that happen on Earth can change or harm the carbon and oxygen cycles. When people cut down trees in the rain forests, there is less photosynthesis. This means that less oxygen enters the atmosphere and less carbon dioxide leaves.

Disrupting the Cycle

Each year there is more carbon dioxide in the atmosphere. Burning fossil fuels, such as natural gas, coal, and oil, adds carbon dioxide to the air. Cutting down trees, such as when the rain forests are deforested, also adds to the amount of carbon dioxide.

Carbon dioxide and other kinds of carbon in the air helps keep Earth warm. Through a process called the greenhouse effect, these gases trap heat close to Earth's surface. Many scientists think Earth is getting warmer because of the greenhouse effect. The environment can be damaged by the growing amount of carbon dioxide.

Name _____ Date _____

How Do Oxygen and Carbon Dioxide Cycle?

Write answers to the questions on the lines below.

carbon dioxide + water + energy → glucose + oxygen

1. What process is shown in the diagram above?

2. What happens during this process?

glucose + oxygen → carbon dioxide + water + energy

3. What process is shown in the diagram above?

4. What happens during this process?

5. What are two causes of the increase in carbon dioxide in the atmosphere?

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Name _____ Date _____

6. Main Idea How do living things depend on the carbon dioxide cycle and the oxygen cycle?

7. Vocabulary Write a sentence that relates the terms *photosynthesis* and *respiration*.

8. Reading Skill: Compare and Contrast Contrast the processes of photosynthesis and respiration.

9. Critical Thinking: Evaluate Will the amount of carbon dioxide in the atmosphere soon be greater than the amount of oxygen? Explain.

10. Inquiry Skill: Predict You blow through a straw into a beaker of water that has algae growing in it. If you then cover the container, will the level of carbon dioxide increase or decrease over time? Explain your answer.

11. Test Prep Which process provides the oxygen you breathe?

- A greenhouse effect
- B deforestation
- C respiration
- D photosynthesis

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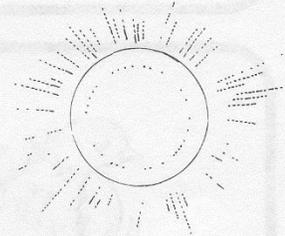
Name _____ Date _____

The Carbon Dioxide-Oxygen Cycle

Matter is continuously cycled between the living and nonliving parts of an ecosystem and between ecosystems. Matter is recycled, no new matter is added to the earth and none is lost. One example of this is in the carbon dioxide-oxygen cycle. Match each term in the word box with its description.

- | | | | | |
|----------------|-----------|----------------|-------------------|--------------|
| carbon dioxide | oxygen | photosynthesis | marine algae | decomposers |
| producers | consumers | aerobic | geologic activity | fossil fuels |

- 1 _____ Carbon is present in Earth's atmosphere in the form of this gas.
- 2 _____ The world's oceans hold most of the carbon in a dissolved form. These organisms use the carbon and release oxygen back into the atmosphere.
- 3 _____ Plants, also called this, use carbon dioxide to make their own food.
- 4 _____ This process, used by producers, releases oxygen into the atmosphere as a byproduct.
- 5 _____ These organisms cycle carbon through their bodies through the foods they eat. After they die and decompose, carbon is released back into the soil and atmosphere.
- 6 _____ The burning of these has put more carbon back into the atmosphere than can be cycled naturally.
- 7 _____ These organisms feed off of dead material and release the carbon back into the cycle.
- 8 _____ This type of respiration uses oxygen and produces carbon dioxide as a byproduct.
- 9 _____ Examples of this include volcanic eruptions and weathering of limestone rock, both of which release carbon into the atmosphere.
- 10 _____ The respiration of consumers uses this gas and releases carbon dioxide as a byproduct.



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Unit 4.11 Handout 2

TEACHER ANSWER KEY

1. photosynthesis
2. *Answer will vary. Suggested answer:* Energy from sunlight is used to change carbon dioxide and water into glucose and oxygen.
3. respiration
4. *Answer will vary. Suggested answer:* Oxygen and glucose are combined to produce carbon dioxide and water. Then stored energy is released.
5. Two causes for the increase are burning fossil fuels and cutting down trees.
6. *Answer will vary. Suggested answer:* both plants and animals need oxygen for respiration and plants need carbon dioxide for photosynthesis.
7. *Answer will vary. Suggested answer:* Photosynthesis is opposite to respiration.
8. *Answer will vary. Suggested answer:* Photosynthesis uses carbon dioxide and releases oxygen; respiration uses oxygen and releases carbon dioxide.
9. *Answer will vary. Possible answer:* No, there is much less carbon dioxide than oxygen
10. *Answer will vary Possible answer:* It will decrease because the algae will use the carbon dioxide for photosynthesis.
11. D

Page 5:

- | | |
|----------------------|-------------------|
| 1. carbon dioxide | 2. Marine algae |
| 3. producers | 4. Photosynthesis |
| 5. consumers | 6. Fossil fuels |
| 7. decomposers | 8. Aerobic |
| 9. geologic activity | 10. oxygen |