

Photosynthesis Lesson 1: *The Solve*

Educator's Resource Guide

Objective

In *The Solve*, students will:

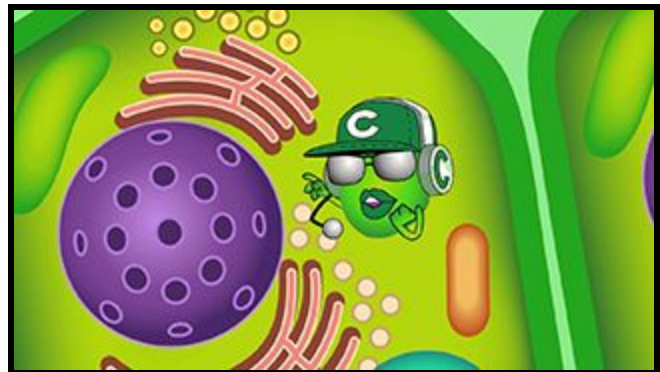
1. Solve a mystery involving photosynthesis.
2. Explore relationships among photosynthesis vocabulary.
3. Engage in critical discussion to determine what factors affect plant growth and how energy flows between the environment and the organism.

Time Required: 45-80 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none">• Student Guide (<i>includes student agenda and Mind Map</i>)• Photosynthesis Episode• Computer with speakers• Scissors• Glue or tape	None	<ul style="list-style-type: none">• Developing and using models• Constructing explanations or arguments from evidence

Episode Description

An unhealthy fern sulks at the bottom of the forest floor. She aspires to grow tall like the tallest tree in the forest, but she realizes something's wrong: she's not growing at all, she can't repair her leaves, and she feels awful. Fern calls Mosa Mack for help. Mosa consults with a wise canopy layer and a singing chloroplast to help her solve Fern's mystery.



Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven *(recommended for grades 4–5)*

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 *(recommended for grades 5–6)*

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 *(recommended for grades 6–7)*

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 *(recommended for grades 7–8)*

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

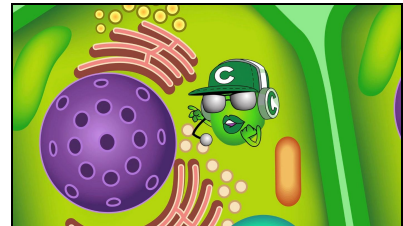
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Agenda

I. Solve the Photosynthesis Video Mystery (20 minutes)

Differentiation Tip: The Video Mystery can be viewed as a class, in small groups, individually, or completed for homework. For additional support, students can view the episode twice: once before completing the questions and once with teacher guidance, pausing the video to discuss each answer.

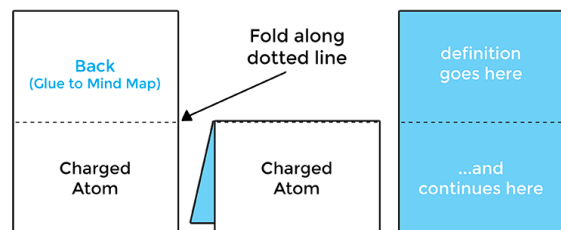
1. Play the animated Mosa Mack Mystery on Photosynthesis.
2. Students answer questions either digitally on the Mosa Mack platform or on paper in the Student Guide as they watch. Encourage students to cite the specific time codes in the episode to promote writing with supporting evidence. Answers can be found in the key below.
3. View the answer video to confirm student understanding.



II. Vocabulary Mind Map Activity (15–45 minutes)

Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework. It can be done digitally or on paper.

1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - a. Go to <https://mosamack.com/home/photosynthesis>
 - b. Select **Lesson 1: The Solve**.
 - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - d. Complete **Part 2**: matching terms and definitions with images on a diagram.
2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - a. Print and pass out the Student Guide: Photosynthesis Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Photosynthesis unit.
 - c. Model the directions carefully, emphasizing the following. Students should:
 - **cut** out the vocabulary cards on the solid lines only
 - **fold** the cards at the dotted lines
 - write the definition of the term on the inside of the card using definitions provided
 - d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.



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- e. Check that the students have matched their cards correctly before moving on.
- f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

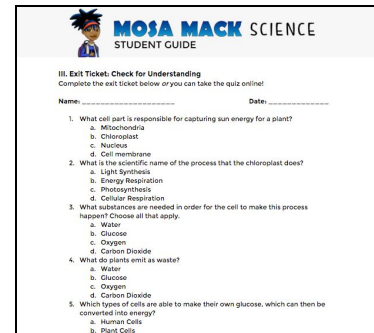
Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups throughout this process. When you see students or groups who have placed their card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or, “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage them to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored Mind Map at the front of the room so that students can reference both images.

III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the Answer Key section below.



The image shows a student guide page for an exit ticket. At the top, there is a logo for 'MOSA MACK SCIENCE' with a cartoon character. Below the logo, it says 'STUDENT GUIDE'. The main heading is 'III. Exit Ticket: Check for Understanding'. Below this, it says 'Complete the exit ticket below or you can take the quiz online!'. There are two lines for 'Name: _____' and 'Date: _____'. The exit ticket consists of five multiple-choice questions about cell biology. The questions are: 1. What cell part is responsible for capturing sun energy for a plant? (a. Mitochondria, b. Chloroplast, c. Nucleus, d. Cell membrane). 2. What is the scientific name of the process that the chloroplast does? (a. Light Synthesis, b. Energy Respiration, c. Photosynthesis, d. Cellular Respiration). 3. What substances are needed in order for the cell to make this process happen? Choose all that apply. (a. Water, b. Glucose, c. Oxygen, d. Carbon Dioxide). 4. What do plants emit as waste? (a. Water, b. Glucose, c. Oxygen, d. Carbon Dioxide). 5. Which types of cells are able to make their own glucose, which can then be converted into energy? (a. Human Cells, b. Plant Cells).

Answer Key

Episode Questions

1. What did the healthy fern notice about the sick fern that caused her concern?

The healthy fern noticed that the sick fern's leaves were yellowing, breaking, and having trouble repairing themselves. (0:20)

2. "I make energy for the plant" – Chloroplast. Describe the role of the chloroplast in making energy for plants? Include the inputs (what goes in) and outputs (what comes out) of photosynthesis in your explanation.

The chloroplast is where photosynthesis takes place. Chloroplasts use carbon dioxide, water, and sunlight to make glucose, or energy, for the plant. The chloroplast also releases oxygen through photosynthesis. (2:25)

3. Billy, the toolbox, took out a bag of sugar when he heard that the fern was in need of glucose. But the chloroplast said there was no need. Why?

Humans need to eat glucose to get it to their cells, but plants have evolved to make it on their own through photosynthesis. (3:20)

4. What are the similarities between how plants and humans use glucose?

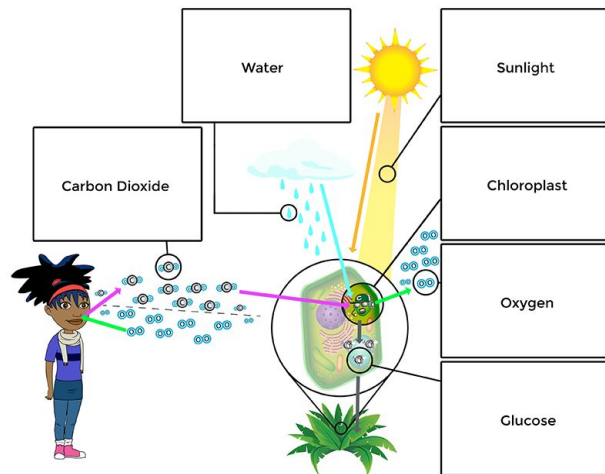
Humans and plants use glucose for energy: to repair cells and to create new cells. (3:20)

5. From where does the fern get the carbon dioxide required for photosynthesis?

Carbon dioxide is in the air. (4:35)

6. Mosa tells the sick fern that in order for her to thrive, she needs one more ingredient. Identify that ingredient. How do you know what it is?

Mosa learned that plants create glucose, or sugar, through photosynthesis, a process that converts carbon dioxide and water to glucose and oxygen with the help of sunlight. The fern has access to water and carbon dioxide, but is completely shaded from the sunlight.



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Quiz:

1. What cell part is responsible for capturing sun energy for a plant?
 - a. Mitochondria
 - b. **Chloroplast**
 - c. Nucleus
 - d. Cell membrane

2. What is the scientific name of the process that the chloroplast does?
 - a. Light Synthesis
 - b. Energy Respiration
 - c. **Photosynthesis**
 - d. Cellular Respiration

3. What substances are needed in order for the cell to make this process happen? Choose all that apply.
 - a. **Water**
 - b. Glucose
 - c. Oxygen
 - d. **Carbon dioxide**

4. What do plants emit as waste?
 - a. Water
 - b. Glucose
 - c. **Oxygen**
 - d. Carbon dioxide

5. Which types of cells are able to make their own glucose, which can then be converted into energy?
 - a. Human cells
 - b. **Plant cells**

6. What key ingredient is the sick fern missing?
 - a. Water
 - b. **Sunlight**
 - c. Oxygen
 - d. Carbon Dioxide