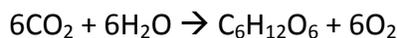


Photosynthesis

Strand	Life Processes
Topic	Investigating plant anatomy and life processes
Primary SOL	4.4 The student will investigate and understand basic plant anatomy and life processes. Key concepts include c) photosynthesis.
Related SOL	4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which g) constants in an experimental situation are identified.

Background Information

The word *photosynthesis* is taken from Latin words meaning “putting together with light.” Photosynthesis is responsible for life on Earth. This process takes place in all green parts of a plant. Within a plant’s cells are oblong structures called chloroplasts, which are filled with chlorophyll. Chlorophyll absorbs light, and the reaction produces sugar (glucose) and oxygen that are stored in fruits, stems, and leaves. The fruits, stems, and leaves are consumed by animals. The chemical formula for this process is as follows:



This chemical equation is read: “Six molecules of carbon dioxide added to six molecules of water combine to produce one molecule of glucose (sugar) and six molecules of oxygen. Plants produce small amounts of carbon dioxide. When there is no sun and the plant cannot photosynthesize, the plant will take in oxygen and release carbon dioxide.

Materials

Per group:

- *Elodea* (water plant available at most pet stores)
- Large clear plastic container
- Small clear plastic water bottles with lids
- Water
- Attached Scientific Investigation on *Elodea* worksheet

Vocabulary

chlorophyll, photosynthesis, oxygen

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

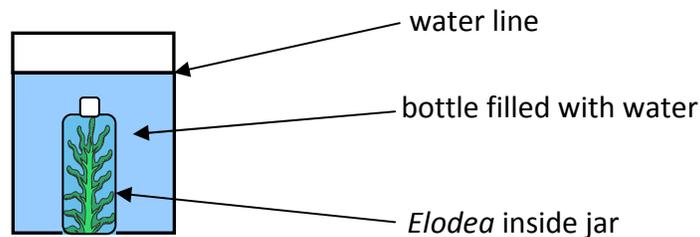
Introduction

1. Ask students to discuss in small groups whether they think plants can live totally underwater. Introduce students to *Elodea*, a common aquatic plant, and ask whether aquatic plants need strong sunlight in order for photosynthesis to take place.
2. Ask: “Where do aquatic plants get the carbon dioxide needed for photosynthesis?”

3. Tell the students that they will be performing an experiment over the next few days to see how plants can produce oxygen and glucose as a byproduct.

Procedure

1. Place the students in groups of three to four students.
2. Walk the students through each of the following steps in each group. Have students fill the large, clear plastic container with water.
3. Ask students to place a three-to-four-inch-long sprig of *Elodea* inside the small clear plastic water bottle with lids.
4. Have students completely submerge the small bottle in the water, keeping it upright so that it fills with water without air pockets. While the bottle is underwater, put the lid on. It is very important that there are not any air pockets in the top of the bottle containing the *Elodea*.



5. Have each group of students place the large container near a sunlit window for observation.
6. Ask students to make predictions on the first part of the Attached Scientific Investigation on Elodea worksheet.

Conclusion

1. Over the next week, have students record their daily observations on the worksheet. Students should see that over time, bubbles form in the water with the plant.
2. At the end of the week, dispose of the Elodea plants. (*Note: After the investigation is completed, students should place the plant in a classroom aquarium or throw it away in a trash can. Do NOT place the plant into a local waterway or where it can be washed into a local waterway.*) Ask students why they should not place the plants in a nearby stream.
3. Have students complete their worksheet and discuss their results in relation to the initial probing question, "Where do aquatic plants get the carbon dioxide needed for photosynthesis?"

Assessment

- **Questions**
 - What happened on the surface of the plant?
 - What are those bubbles? How did they form?
 - What is necessary for plants to photosynthesize?
 - What is the plant producing when it photosynthesizes?

- What waste product results from photosynthesis?
- What happens when one of the necessary items is missing from the photosynthesis formula?
- Why may it be said that the sun is the basis of all life on Earth?
- Would there be any life on Earth without plants?
- **Journal/writing prompts**
 - Photosynthesis is an example of plants and animals supporting each other. Provide an example of this for a specific habitat.
- **Other**
 - Use the students' data sheet to assess the students' understanding.

Extensions and Connections (for all students)

- Students may place one setup in sunlight and one in a dark cupboard and observe the difference in results.
- Students may research the percentage of oxygen produced by phytoplankton in the oceans and the amount produced by the tropical rainforest.

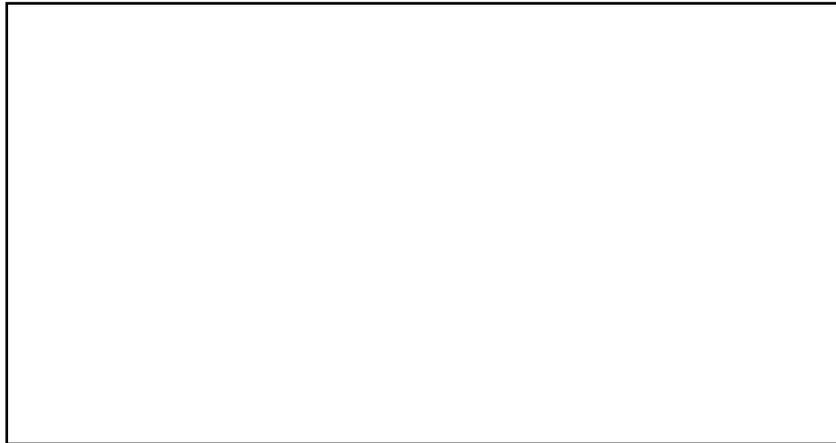
Strategies for Differentiation

- Have your students draw pictures each day of what they see happening in the experiment in their science notebooks.
- Have students take pictures each day of what is happening in their experiment to print them out and glue into their science notebooks as data.
- Your students may reply orally, with words, or pictures to the questions.
- Demonstrate the procedures of the experiment, step by step. Allow students to follow a procedure check list and clarify any questions they have.
- Direct students to create an "Acrostic Poem" for the letters in the word photosynthesis.
- Create illustrations of the steps of photosynthesis using hook and loop material. Direct students to put the pictures of the steps of photosynthesis in the correct order.
- Provide a template (table) for recording observations. Include a space for the date, observation sentence, explanation (why), and a drawing.

Science Investigation on Elodea

Name: _____ Date: _____

We have taken an aquatic plant named Elodea, placed a portion of it in a closed, small, clear bottle inside a larger clear tub. Draw the arrangement in the box below. Include the Elodea, the bottle, the large container, and the water in your illustration.



You will be observing this arrangement for several days. Discuss the setup with your group. What do you predict will happen? Write your prediction below.

Prediction:

You will need to record observations on a sheet of paper. For every day you make an observation, write the date, what you observed (in complete sentences), and a sentence or two explaining why you think it is happening. You may also draw illustrations to help explain your observations.

Date	Time	Observations	Additional questions

What I learned?

What do I still want to find out about photosynthesis?