

Eye on Photosynthesis

The process that plants use to capture the energy in sunlight may be complex, but it is actually fairly simple to study. One of the products of photosynthesis is oxygen gas, so if photosynthesis takes place underwater, oxygen gas should form bubbles.



In this lab, the aquatic plant *Elodea canadensis* will be used to determine specific conditions that are required for photosynthesis.

Question

What raw materials and conditions are involved in photosynthesis?

Materials and Equipment

- elodea plants
- wide mouth large beaker
- sodium bicarbonate (baking soda) solution
- 2 test tubes
- wax pencil
- lamp (optional)

Skills Reference 2

Skills You Will Use

- Using appropriate equipment and tools
- Drawing conclusions

Safety



Caution

You will use beakers and test tubes in this activity. Take care when handling glassware.

Wear goggles to protect your eyes from the materials used in this lab.

Procedure

1. Use a wax pencil to label two test tubes "1" and "2". Fill test tube 1 with sodium bicarbonate solution, which provides a source of carbon dioxide.
2. Fill the large wide mouth beaker 3/4 full with sodium bicarbonate solution.
3. Holding your thumb over the opening of test tube 1, turn the test tube over and lower it to the bottom of the wide mouth beaker. Do not let any air into the test tube. If necessary, repeat this step until test tube 1 contains no air bubble.
4. Fill test tube 2 with sodium bicarbonate solution, then place an elodea plant in the tube with the cut stem at the bottom. Holding your thumb over the opening of test tube 2, turn the test tube over and lower it to the bottom of the wide mouth beaker. Do not let any air into the test tube.



5. Place the wide mouth beaker with the two test tubes in bright light. After a few minutes, examine both test tubes for bubbles.

Analyzing and Interpreting

6. If bubbles are produced in test tube 2, observe the elodea stem to see if it is producing the bubbles. These bubbles are oxygen bubbles, which indicate that photosynthesis is taking place.
7. Leave the wide mouth beaker in bright light for 30 minutes. Observe what happens to any bubbles that form. Record your observations in your notebook. If no bubbles are present, review the experimental setup. For example, you may want to be sure that the light is bright enough, and you may want to make a fresh cut in the elodea stem.

Skill Practice

8. Your teacher will supply you with water that has been boiled and cooled. Boiling the water drives off gases that are dissolved in the water, including carbon dioxide.
9. Use the boiled and cooled water to design an experiment to investigate whether or not carbon dioxide is needed for photosynthesis. As a suggestion, you may wish to use a procedure similar to steps 1 through 7.

Forming Conclusions

10. A student performing the procedure steps 1 through 9 collected the following results.

Solution	Test Tube Contents	Observations
Sodium bicarbonate	None	No bubbles
Sodium bicarbonate	Elodea	Bubbles, collecting into a pocket of oxygen above the water over 30 minutes
Boiled and cooled water	None	No bubbles
Boiled and cooled water	Elodea	No bubbles

Based on these results, what is your conclusion regarding the requirements for photosynthesis?

11. A student designs an experiment similar to procedure steps 1 through 9, but sets up the whole apparatus twice, and places one beaker in bright light and the other beaker in dim light. What would you expect for the results of this experiment?
12. Is oxygen the only product of photosynthesis? Explain.