

What Plants Do With Sunlight

Pre-Lab Discussion

The energy used by living things ultimately comes from the sun. Plants produce food by changing radiant energy to chemical energy. Plants do this in a process called photosynthesis. Photosynthesis captures light energy and stores it in glucose molecules. The glucose molecules are then almost immediately bound together into chainlike molecules of starch. You can test for the presence of starch by using iodine solution, which turns blue or blue-black in the presence of starch.

In this investigation, you will observe what plants do with sunlight. You will use the starch test to compare the contents of the leaves of plants that have grown with and without the presence of light. The covered leaves will be the experimental leaves and the uncovered one the control leaf.

Problem

What do plants do with sunlight?

Materials (per group)

Geranium or other green plant that has been in the dark for 2 days	150 mL 95% ethyl alcohol
Aluminum foil	200 mL tap water
Dark construction paper	Hot plate
Scissors	Medicine dropper
1000-mL beaker	Forceps
250-mL beaker	Iodine solution
	Paper clips
	3 petri dishes

Safety

Put on a laboratory apron if one is available. Put on safety goggles. Alcohol is flammable. Do not expose it to heat or flames. Do this laboratory investigation in a well-ventilated room. Always use special caution when working with chemicals, as they may irritate the skin or cause staining of the skin or clothing. Never touch or taste any chemical unless instructed to do so. Note all safety alert symbols next to the steps in the Procedure and review the meanings of each symbol by referring to the symbol guide on page 10.

Procedure

Part A. Preparing the Plant

1. Completely cover one of the leaves on the plant with aluminum foil. You may need to secure the foil with a paper clip. On a second leaf, paper clip a piece of construction paper that has been cut in the shape of the letter X. See Figure 1.
2. Identify each leaf you are using with a masking-tape label that gives your group number or name and your class period. Wrap the masking tape loosely around the petiole of the leaf. See Figure 1.
3. Place the plant in bright light for 2 to 3 days.

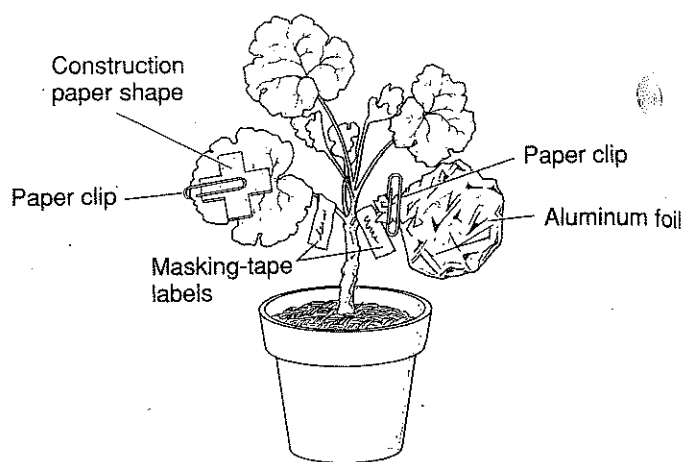




Figure 1

Part B. Testing the Leaves

1. After 2 to 3 days, remove 3 leaves from the plant: the 2 experimental leaves (1 covered with aluminum foil and 1 with paper shape attached) and 1 control leaf (leaf that has had no treatment). Remove the masking-tape labels, but in order to identify the leaves, cut their petioles different lengths according to the following:

- no petiole—control leaf (no treatment)
- half petiole—leaf with paper shape attached
- full petiole—leaf covered with aluminum foil

2.  Your teacher has set up a water bath in which the alcohol is heating. Remove the aluminum foil and the paper shape from the 2 leaves. Then drop all 3 leaves into the boiling water in the larger beaker of the water bath. Allow the leaves to remain in the boiling water for 1 minute.  **CAUTION:** Do not remove the beaker containing alcohol from the water while you use the water around it. See Figure 2.

3. Remove the leaves from the boiling water with forceps and drop them into the hot alcohol in the inner beaker. Keep them in the hot alcohol until they have lost most of their color.

4. When the leaves have lost most of their color, remove them from the alcohol with forceps and dip them into the hot water again for a few seconds.

5. Place the leaves into three different petri dishes.

6. Use the medicine dropper to cover each of the leaves with iodine solution. After one minute, pour off the excess iodine solution and record your observations in the Data Table.

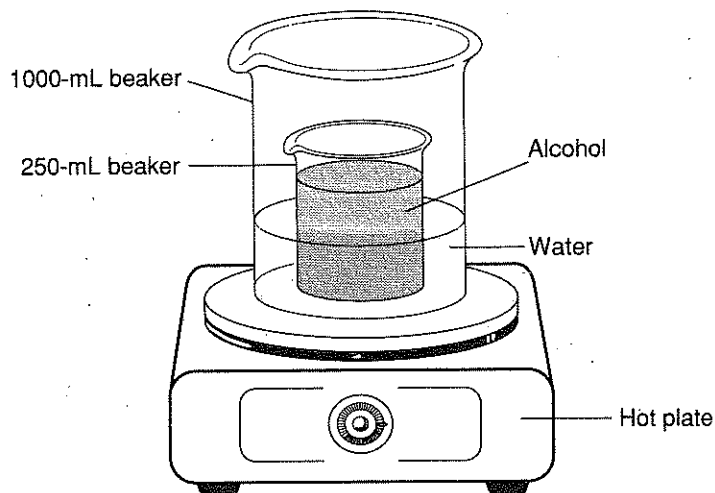


Figure 2

Observations

Data Table

Leaf	Treatment	Effect of iodine
1	covered with aluminum foil	
2	covered with paper shape	
3	no covering—full light	

Analysis and Conclusions

1. What does a positive iodine test (blue or blue-black) indicate is present in the leaf?

2. Which leaves showed a positive iodine test? _____

3. What environmental factor is necessary in order to get a positive iodine test?

4. Can a plant store energy in its leaves in the absence of light? _____

5. In those leaves in which you observed a negative iodine test, what can you say about the process of photosynthesis? _____

6. What do plants do with sunlight? _____

Critical Thinking and Application

1. Photosynthesis produces glucose. What is the relationship between glucose and starch?

2. Explain the importance of plants to the survival of animals. _____

3. Does photosynthesis occur at night? Explain. _____

4. Some paleontologists hypothesize that dinosaurs became extinct after the impact of a huge meteorite darkened the atmosphere of the Earth with dust. Using knowledge gained in this laboratory investigation, explain how this darkening could affect animals.

Going Further

Investigate starch production in plants by varying the color or intensity of the light used on the plants, rather than the presence or absence of light.