

## LIGHT AND STARCH PRODUCTION IN PHOTOSYNTHESIS

### Information for teachers

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#### Overview

This lab should be done during a unit that covers photosynthesis. This lab provides students with the unique opportunity to see the products of photosynthesis (starch).

#### Subject and Audience

This lab is written specifically for ninth and tenth grade living environment classes. However, it can be used in any biology class that covers photosynthesis.

#### Time required

Two consecutive days. Additional one day for Part 2 in which students design their own experiment (optional). This day should come after day 1 of the lab.

- Introduction and set up should take less than a class period, 20-30 minutes.
- Time necessary for checking results and drawing conclusions will vary, depending on whether the teacher or the students bleach the leaves. Either way, however, it should take less than 30 minutes.
- If students are to complete part two of the lab they should set up their experiment on the second day of the lab. A third day will then be required for students to check their results and draw conclusions.

#### Background

Knowledge of photosynthesis is fundamental to a students' understanding of the living environment. Unfortunately, due to the abstractness of photosynthesis, and the cognitive abilities of most high school students, students are often left with misconceptions and at the most, superficial understandings of this process.

This lab provides students with the unique opportunity to see the contrast between parts of a leaf that have photosynthesized and parts of the leaf that have not. This visual image will help students see the results of this biological process. At the same time, students will understand that areas of a leaf that receive light photosynthesize to produce the glucose (and eventually starch), while areas of a leaf that do not receive light cannot photosynthesize and thus do not produce glucose.

#### Learning Objectives

Students will:

- Follow a procedure to set up an experiment to test the relationship between light and starch production.
- Apply their knowledge of photosynthesis to interpret the results.
- Design and carry out a controlled, scientific experiment based on a biological process.

#### National Science Education Standards Addressed

- Life Science: The Cell

- Plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment. This process of photosynthesis provides a vital connection between the sun and the energy needs of living systems.
- Science as Inquiry
  - Design and conduct scientific investigations

#### Assessment Strategy

- Discuss students' answers to the discussion questions.
- Collect and read the lab worksheets that students have filled out.
- If students do part 2 of the lab, a formal lab write up is an excellent way to gauge their grasp of the overall concepts of photosynthesis and the scientific process.

#### Teaching Tips/Potential Problems

- Be sure to use plants that do not have a waxy layer. Ethanol does not do a good job of dissolving the waxy layer and therefore the leaves become difficult to bleach and subsequently stain. I recommend bean plants or geraniums. The leaves are heated to break down the cellulose in the cell walls so ethanol can penetrate and break down the chlorophyll and other pigments.
- Ethanol is a chemical that must be treated with caution. Depending on the maturity of the class, the teacher may want to set up a station by her desk where she alone bleaches the leaves of students. This can be done in the beginning of day two, while students work on the discussion questions or begin to think about part 2.
- Students really enjoy cutting out their own shapes to attach to the plants. ☺

#### Work Cited

Procedure modified from:

Reiss, J. *Experiments in Plant Physiology*, Lab Manual, page 23.