

Name: _____

Lab: Exploring the Rate of Photosynthesis

Photosynthesis is the process by which plants take carbon dioxide from the atmosphere, add water, and use the energy of sunlight to produce sugar.

Photosynthesis occurs in the chloroplast, an organelle in plant cells that contains the molecule chlorophyll. Chlorophyll absorbs the energy of sunlight. That light energy is converted to chemical energy through the steps of photosynthesis.

The reactions of photosynthesis can be divided into two major types: light-dependent reactions and light-independent reactions. The light-dependent reactions convert energy from the sun into a form that the chloroplast can then use to make sugar from carbon dioxide, in the process producing oxygen as a waste product. The light-independent reactions use that energy to make glucose from carbon dioxide and water.

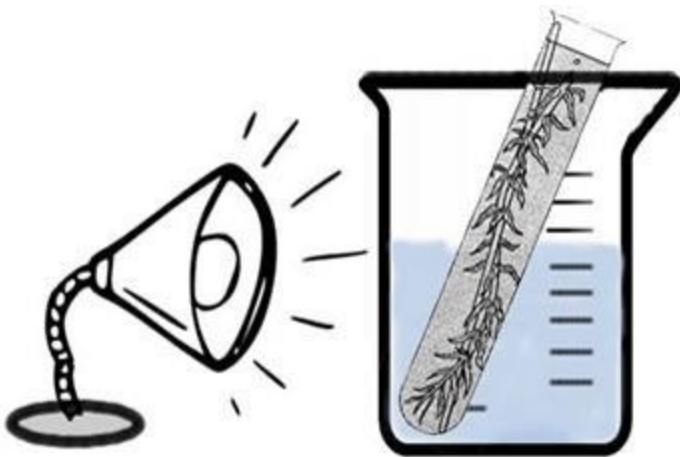


Materials: test tube, Elodea cuttings, sodium bicarbonate (baking soda), beaker with water, lamp

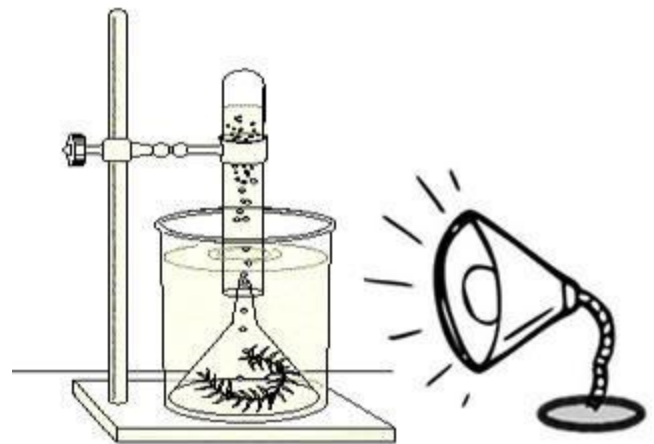
Part 1: Measurement of Photosynthesis

There are two possible set-ups that can be used to measure the rate of photosynthesis, both rely on counting the bubbles produced during the reaction. To improve results, add a pinch of baking soda to the water in the test tube. Cut elodea stems at an angle and use your fingers to crush the end of the stem. The water in the beaker is meant to absorb the heat from the light.

Design 1



Design 2



Heat sinks (beaker with water) may not be necessary if using CFL bulbs.

A marker can be used to measure the amount of oxygen in the test tube rather than measuring bubbles.

If you do not see bubbles right away, re-cut and crush the stems, experiment with moving the light closer to the apparatus or remove the heat sink if using CFL bulbs.

Practice measuring the rate of photosynthesis to get a baseline for you plant. _____

Part 2: Conditions for Photosynthesis

1. With the members of your group, brainstorm variables which may affect the rates of photosynthesis.
2. Form a hypothesis to test your variable.
3. Design an experiment to test your hypothesis. (check with instructor about available materials)
4. After discussing your plan with your instructor, perform your experiment.
5. Record all data and determine if your data supports or refutes your hypothesis.

Part 3: Carbon Dioxide Use

Phenol red is used as an indicator for a base. With excess carbon dioxide, the phenol red will be yellow, as the carbon dioxide is removed, the solution becomes more basic, turning back to red.

Procedure:

1. Remove the elodea from your test tube and rinse to remove any sodium bicarbonate from the plant and the test tube.
2. Place dilute phenol red in the test tube.
3. Use a straw to bubble breath into the tube until the solution turns yellow
4. Place the tube in front of the lamp, observe the tube and note any changes in color.
5. After gathering data on the color change, reset your test tube back to yellow and then cover it in foil. Store this overnight and check the color the next day.

Lab Report

Include the following sections in your lab report, which should be typed. You may also include photos of your experiment.

- Introduction: Explain photosynthesis and include the chemical equation. Discuss the experimental set-up and how it can be used to measure the rate of photosynthesis.
- Photosynthesis Experiment: Describe your experiment; include your hypothesis and data collected. Answer your experimental question or hypothesis by using your data to support or refute your claim (conclusion).
- Carbon Dioxide Experiment: Explain why phenol red can be used to measure carbon dioxide use. Explain any differences you saw between the plant exposed to light and when it was left in the dark.
- Conclusion: This section should summarize your overall findings and discuss any experimental errors or problems you encountered. This is also a good place to include any personal thoughts about your learning experience.