

# Observing the Relationship between Photosynthesis and Respiration using Bromothymol Blue

## Introduction

Green plants bask in sunlight. They use the energy in the sun's rays to make food in the form of glucose. The production of this glucose requires raw materials. When plants make glucose, a sort of carbohydrate, they require carbon dioxide, water, and sunlight. The process of making carbohydrates with the aid of the energy in light is known as photosynthesis. Both plants and animals use the glucose that plants make as an energy source. To release the energy in the bonds of the carbohydrate molecules, the chemical reactions of photosynthesis must be reversed. The process in which energy is released from food is called cellular respiration. Cellular respiration also produces waste products, carbon dioxide and water, which are the raw materials for photosynthesis.

In water, carbon dioxide dissolves to form a weak acid called carbonic acid. As a result, an acid-base indicator can be used to show the presence of carbon dioxide. In this activity, you will use an acid-base indicator called bromothymol blue to determine the presence or absence of carbon dioxide. Bromothymol blue reacts to weak acids and bases from a range of 6-8. Bromothymol blue turns blue in the presence of a base; it turns yellow in the presence of an acid.

## Materials Needed:

- test tube rack
- three test tubes
- 3 parafilm squares
- 250 mL beaker
- straw
- 2 sprigs of *Elodea*
- Light source
- Bromothymol Blue indicator

## Procedure:

1. Take the masking tape and label the four test tubes with your group member's initials and the following:
  - a. Test tube # 1
  - b. Test tube # 2
  - c. Test tube # 3
  - d. Test tube # 4
2. Obtain 50 mL of bromothymol blue indicator solution.
3. Take a straw and blow in the solution in the beaker until you notice a color change.
4. Evenly distribute the solution to the three test tubes.
5. Put a sprig of *Elodea* in test tubes #2 and #4. Test tube #1 and 3 will not have any *Elodea* in it.
6. Place parafilm wax over the top of each test tube.
7. Test tube #1 and 2 are going to go under the light source, Test tube #3 and 4 are going to be wrapped in foil. Write the test tube number on each of the foil pieces. Using this setup, make predictions about what you expect to happen in your experiment and record in your data table.
8. Place all four test tubes under the light source and wait 24 hours to check.
9. After 24 hours, make observations and record in your data table.
10. Answer all the post-lab questions on your handout.

## Word bank for Question #8: ALL TERMS WILL BE USED!

- ADP + P
- ATP
- Calvin Cycle
- CO<sub>2</sub> (carbon dioxide)
- Grana
- H<sub>2</sub>O (water)
- Light
- Light reaction
- NADP<sup>+</sup>
- NADPH
- O<sub>2</sub> (Oxygen)
- Stroma
- Sugar
- Thylakoid membrane