

Photosynthesis and Cellular Respiration in *Elodea*

Based on the CIBT Photosynthesis and Respiration in Elodea Lab – Cornell & HHMI

Background:

Plants can carry out both photosynthesis and cell respiration simultaneously. During photosynthesis, plants are using the energy of the sun to build molecules, which effectively store this energy (glucose). Chemically, the photosynthetic reaction looks like this:



During cellular respiration, plants are using this stored energy (glucose) to fuel their metabolic processes. Chemically, the cellular respiration reactions look like this:



Remember that plants carry out cell respiration all the time!

Among other things, the converted energy from cell respiration is used to synthesize molecules, move materials around within the organism, grow (create new cells) and reproduce. Notice that in **photosynthesis**, CO_2 (carbon dioxide) is being used up as it is turned into glucose molecules. During **cellular respiration**, the opposite is true. As the plant releases energy stored in glucose by breaking it down, CO_2 is being given off into the surrounding water or atmosphere. The relationship between these two processes is special in that it allows plants to recycle some of their by-products. (While CO_2 is being given off during cell respiration, it can be re-utilized during photosynthesis).

Purpose:

In this lab, you will try to demonstrate the net change in carbon dioxide when the common freshwater plant *Elodea* is placed under different conditions. You will be using a **pH indicator, bromthymol blue (BTB)**, as a means of determining the presence or absence of CO_2 .

The solution of BTB changes color when CO_2 is introduced. BTB changes color due to a change in pH.

- When CO_2 is dissolved in water, it forms carbonic acid. This lowers the pH of the solution and causes BTB to change its appearance. Here is how it works:



BTB pH color scale:

< pH 6 = yellow

pH 7 = green

> pH 7.6 = blue

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David Baud



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