

Elodea Lab

Photosynthesis/Respiration



Name: _____ Period: _____ Date: _____

Group Members: _____

∞ Background Concepts ∞

$C_6H_{12}O_6$ is glucose which is a sugar. Plants are **AUTOTROPHIC** meaning they can make their own food (glucose) from light energy.

CO_2 is Carbon Dioxide, the same chemical we breath out after using up oxygen O_2 which is produced by autotrophic organisms like plants.

Plants can carry out both photosynthesis and respiration simultaneously. However light and the amount of CO_2 available can alter these processes. 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: $6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$

During **respiration**, plants are using this stored energy (glucose), to fuel their metabolic processes. Chemically, the respiratory process looks like this: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$

Remember that plants can carry out respiration all the time! Among other things, the converted energy from 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 "fixed" into glucose molecules. During respiration the opposite is true. As the plant releases the 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 respiration, it can be re-utilized during photosynthesis.)

In this lab, you will try to demonstrate the net change in carbon dioxide when the common fresh water plant Elodea is placed under different conditions. You will be using bromthymol blue (BTB) which is a pH indicator, as a means of determining the presence or absence of CO_2 . A solution of bromthymol blue changes color when CO_2 is introduced 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 the bromthymol blue to change its appearance. Adding CO_2 to bromthymol blue changes the solution to yellow. When the CO_2 is removed, the solution turns back blue.

PURPOSE

Demonstrate that environmental CO_2 is used during photosynthesis in Elodea.

Demonstrate that there is a net production of CO_2 when Elodea respire in the absence of photosynthesis.

What is making the color change? The bromthymol blue is blue when it is free of dissolved CO_2 gas, and is yellow when CO_2 is dissolved in the solution. The process actually causing the shift in color is a pH change (change in the H^+ concentration of the solution.) Carbon dioxide reacts with water in the following way:

