**Do Plants Consume or Release CO2?**

**1. Background**

In this lab, you will use phenol red as an indicator to show whether CO2 is being consumed or produced in a reaction within plants.

It is well known that in the presence of light plants perform photosynthesis. It is less well understood that at the same time plants are also performing cell respiration. To demonstrate this we will determine whether CO2 is consumed or produced as elodea is placed in either a light or dark environment. The change in CO2 will be detected by the pH indicator phenol red.

Think about the chemical equations for respiration and photosynthesis. Which one releases CO2 causing an increase and which one uses up CO2 which will cause a decrease?

Phenol red is yellow under acidic conditions (high H ion concentration), pink under basic or alkaline conditions (low H ion concentration) and orange under neutral conditions. A change in CO2 will cause a directly proportional change in H ion.

* If the CO2 concentration decreases, the H ion concentration will also decrease and the solution will change to **pink,** becoming basic.
* If the CO2 concentration increases, the H ion concentration will also increase and the solution will change to **yellow**, becoming acidic.
* Neutral solutions of phenol red will be **orange**.

**2. Preparation**

You will be given a solution of phenol red mixed with water. Your goal is to make your solution a neutral orange color. You can do this by gently blowing into the solution with a straw. Once you have the solution at an orange color, transfer it to 4 test tubes (they should be filled about 2/3 full with your orange solution).

Place a cut piece of elodea (cut end up) into two of the four tubes. The other two test tubes will not have elodea and will serve as controls. Cover one control and one experimental test tube with parafilm and place in the test tube rack in the light. Cover the other control and experimental test tube with aluminum foil and place in the dark in a test tube rack.

**3. Pre-Lab Questions-**

What is photosynthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What living thing requires photosynthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where does photosynthesis occur in the plant (what part)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is required for photosynthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where does the plant get CO2, water and sunlight? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What are the products of photosynthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the purpose of the glucose? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to plants in the dark? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write a **hypothesis** about what will happen to CO2 levels in a solution if an aquatic plant is **photosynthesizing**.

If \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**4. Data-** Record the colors of the solutions in the test tubes after 30 minutes and 1 day.

|  |  |  |
| --- | --- | --- |
| Sample | 30 Minute Observations | 1 Day Observations |
| Light Control |  |  |
| Light with Elodea |  |  |
| Dark Control |  |  |
| Dark with Elodea |  |  |

**4. Analysis-** In your notebook, answer the experimental question (Do Plants Consume or Release CO2? ). Explain what happened in this lab, use complete sentences and be sure to provide supporting data or statements. Draw what each test tube look like and label them.