Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_ Block:\_\_\_\_\_\_\_

**The Rate of Photosynthesis**

**Objective:** The first day of the lab, you will work on technique and carrying out the control by following the procedure below. The second day of the lab, you will change ONE variable to test ; this will be your experimental group. After taking data and doing an analysis, you must type a formal lab report according to Reagan Lab format.

**Safety:** Goggles must be worn throughout this experiment.

**Problem Question:** What affects the rate of photosynthesis?

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Variables:**

Independent Variable:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent Variable:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Controls:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Materials:**

* 1.5 g sodium bicarbonate (baking soda)
* Liquid dish soap
* Eyedropper
* Plastic syringe without needle (20mL)
* Plastic spoon or straw (for string)
* Leaf material
* Hole punch
* 1 large beaker or plastic cup
* 2 small beakers or plastic cups
* Time or clock with second hand
* Light source
* Paper towels

**Procedure:**

1. Using a one-hole punch, cut 10 leaf disks from spinach leaves.
2. Remove the plunger from a large clean syringe. Place 10 leaf disks into the body of the syringe. Be sure the leaf disks are near the tip pf the syringe as you re-insert the plunger so as not to damage the disks. **(See figure A)**
3. Insert the tip of the syringe into the beaker of sodium bicarbonate solution (your teacher will have this prepared for you!) and draw 15-20 mL into the syringe. The leaf disks should be floating at this time.
4. Hold the syringe tip upward and expel the air by depressing the plunger carefully. **Stop** before the solution comes out the tip.
5. Seal the tip of the syringe using the index finger of your left hand and hold tightly. Pull back on the plunger creating a partial vacuum within the syringe. If you have a good seal, it should be hard to pull on the plunger and you should see bubbles coming from the edge of the leaf disks. Hold for a count of ten. **(See figure B)**
6. Simultaneously, release your index finger and the plunger. Some of the leaf disks should start to sink. Tap the side of the tube or shake gently to break and bubbles on the edges of the disks.
7. Repeat steps 6 and 7 until all the disks sink. Do not overdo these steps! You have been successful if the disks sink to the bottom. Don't repeat "just to be sure" as it is possible to damage the cells of the leaves.
8. Remove the plunger from the syringe and pour the solution containing the disks into a plastic cup or beaker and **add the remainder** of your solution to the beaker. Make sure they sink to the bottom.
9. Begin timing once all leaves are in the beaker. Record the number of floating disks each minute in the data table.
10.  Notice what is happening to the leaf disks as photosynthesis proceeds. Continue to record your observations in the data table. After each time check, tap the side of the beaker to make sure the disks are not "sticking" to the container walls. **Note:** *When instructed, clean the lab experiment and dispose of solutions in the sink drains.*

**Figures:**

**Data:**

Data Table: Number of Leaf Disks Floating

|  |  |
| --- | --- |
| **Time (minutes)** | **Number of Floating Disks (control)** |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |
| **4** |  |
| **5** |  |
| **6** |  |
| **7** |  |
| **8** |  |
| **9** |  |
| **10** |  |
| **11** |  |
| **12** |  |
| **13** |  |
| **14** |  |
| **15** |  |

**Day 2- You will now design and carry out the experimental group for this lab.**

1. You will choose ONE factor to change in your groups. Think about another factor you could test to determine its effect on photosynthesis. Set up a piece of loose leaf that lists your hypothesis, materials, procedures, data charts and conclusions. Ask your teacher for any extra materials you might need to be sure they are available. Be sure to follow all safety guidelines.

After you are done with the experimental group for this lab, you will compare it to the control group (Day 1) and write a formal lab report according to Reagan format.