Biology 1
PHOTOSYNTHESIS INVESTIGATION

Name _____

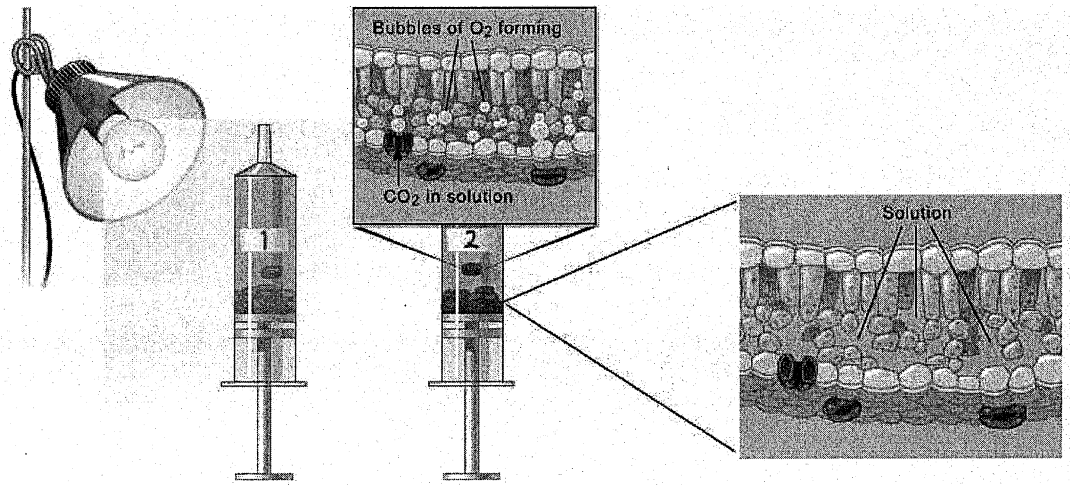
Date _____ Hr ____

The biology behind the procedure

Leaf disks float, normally. When the air spaces are infiltrated (filled with) with solution the overall density of the leaf disk increases and the disk sinks. The infiltration solution includes a small amount of Sodium bicarbonate. Bicarbonate ion serves as the carbon source for photosynthesis. As photosynthesis proceeds oxygen is released into the interior of the leaf which changes the buoyancy--causing the disks to rise. Since cellular respiration is taking place at the same time, consuming oxygen, the rate that the disks rise is an indirect measurement of the net rate of photosynthesis.

Instructions

Read the entire lab (materials, procedure, data and conclusion) and then formulate a hypothesis. Record this on a separate sheet of lined paper. Then begin the procedure.



Materials

- Sodium bicarbonate (Baking soda)
- Liquid Soap
- Plastic syringe (10 cc or larger)—remove any needle!
- Leaf material
- Hole punch
- Plastic cups/Beakers
- Timer
- Light source

Procedure

1. Prepare 300 ml of bicarbonate solution for each trial. The bicarbonate serves as an alternate dissolved source of carbon dioxide for photosynthesis. Prepare a 0.2% solution. (This is not very much it is only about 1/8 of a teaspoon of baking soda in 300 ml of water.)

2. Add 1 drop of dilute liquid soap to this solution. The soap wets the hydrophobic surface of the leaf allowing the solution to be drawn into the leaf.

3. Cut 10 uniform leaf disks for each trial. Avoid major veins.

4. Infiltrate the leaf disks with sodium bicarbonate solution by the following:
   - Remove the piston or plunger and place the leaf disks into the syringe barrel. Replace the plunger being careful not to crush the leaf disks. Push on the plunger until only a small volume of air and leaf disk remain in the barrel (<10%).
   - Pull a small volume of sodium bicarbonate solution into the syringe. Tap the syringe to suspend the leaf disks in the solution.
   - Holding a finger over the syringe-opening, draw back on the plunger to create a vacuum. Hold this vacuum for about 10 seconds. While holding the vacuum, swirl the leaf disks to suspend them in the solution. Let off the vacuum. The bicarbonate solution will infiltrate the air spaces in the leaf causing the disks to sink. You will probably have to repeat this procedure 2-3 times in order to get the disks to sink. **If you have difficulty getting your disks to sink after about 3 evacuations, it is usually because there is not enough soap in the solution. Add a few more drops of soap.**

5. Pour the disks and solution into a clear plastic cup/beaker. Add bicarbonate solution to a depth of about 3 centimeters. Use the same depth for each trial. Shallower depths work just as well. For a control infiltrate leaf disks with a solution of only water with a drop of soap--no bicarbonate.

6. Place under the light source and start the timer. At the end of each minute, record the number of floating disks. Then swirl the disks to dislodge any that are stuck against the sides of the cups. Continue until all of the disks are floating.

7. Clean-up.

Pre-Lab Prediction

Identify the independent variable: _____

Identify the dependent variable: _____

Write a H_0 : _____

_____

Write a H_A : _____

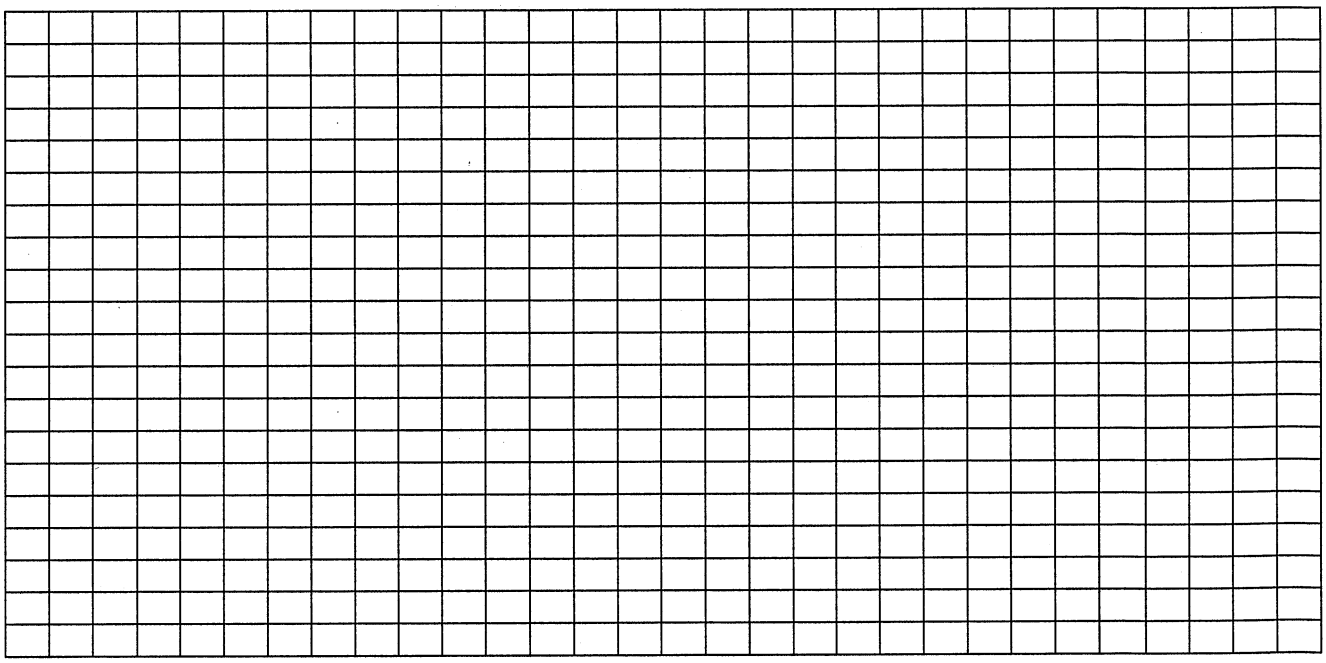
_____

Data Collection and Analysis

- Record the number of floating disks each minute for 15 minutes for both the sodium bicarbonate solution and the control solution.

Time (min)	# of disks (control group)	# of disks (experimental group)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

- Create a graph representing data from both treatments.



Conclusion

Be sure to include:

- General explanation of your findings
- Restated hypothesis
- Was the hypothesis proved or disproved?
- WHY? Support your statements with actual data. What happened and why? What factors were in effect here?
- Possible errors. This isn't just what you did wrong, but is what to watch out for (like contamination) and what could be done to make the experiment/data more valid (like more trials). Were there any confounding variables? Describe ways that you could use a similar procedure to test another aspect/variable related to plants and photosynthesis or possible changes to this procedure to make it more effective.