The Floating Disk Assay for Investigating Photosynthesis

Name: _____
Date: _____ Period: _____

Purpose

_____

_____

Materials

- ( ) 3-50 ml beakers
- ( ) liquid soap
- ( ) leaf material
- ( ) timer
- ( ) light source
- ( ) 1 g sodium bicarbonate (baking soda)
- ( ) plastic syringe
- ( ) hole punch
- ( ) 400 ml beaker (for mixing sodium bicarbonate solution)
- ( ) forceps

Procedure

1. Your teacher has prepared bicarbonate solution (HCO_3^-) by adding **1 g of baking soda** to **300 ml of water**.

2. Your teacher has also added one drop of liquid soap has also been added to the solution. The soap will attach to the hydrophilic surface of the leaf cells and allow the biocarbonate inside.

3. Cut 10 uniform pieces of leaf material with a hole-punch or straw. Avoid major veins.

4. To infiltrate the leaf material with the bicarbonate solution, do the following:

    a. Remove the plunger and place the leaf disks into the syringe. Replace the plunger being carful not to damage the leaf material.
    b. Push in the plunger so only a small volume of air is left (<10%).
    c. Pull ~2 ml of bicarbonate solution into the syringe and tap until disks are floating in solution.
    d. 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.
    e. After 10 seconds, release your finger and the vacuum. The bicarbonate solution will begin to infiltrate the air spaces in the leaf causing the disks to sink.
    f. You will probably have to repeat this procedure 5-6 times in order to get all disks to sink. **If you have difficulty getting your disks to sink after 6 evacuations, it is usually because there is not enough soap in the solution. Add another drop of soap and try again.**

5. Remove the plunger and pour the disks and solution into a 50 ml beaker. Add more bicarbonate solution to raise the level to 40 ml. Use the same depth for each trial.

6. Decide as a group on at least one control run. Perform that run along side your experimental run. (a run in which you remove one of the reactants of photosynthesis).

7. Place experimental beaker under light source and start a timer. Place control in appropriate location. Record how many disks have risen at the end of each minute. Continue until all disks are floating.

Data Collection

Number of disks floating at:	Control #1	Control #2	Experimental (light and bicarbonate)
1 min			
2 min			
3 min			
4 min			
5 min			
6 min			

Make a drawing below showing gas exchange in a chloroplast within a cell while photosynthesis is occurring.

Discussion Questions:

1. What are two inputs required for photosynthesis to occur? What is your evidence for this?

2. The bubbles you observed coming off the disks were oxygen. Where did the oxygen bubbles come from? Draw (above) and explain.

3. Think back to your past learning regarding photosynthesis (middle school? science museums? science TV shows?) write a possible equation for the process of photosynthesis?

4. What further question would you like to investigate regarding the rate of photosynthesis?