

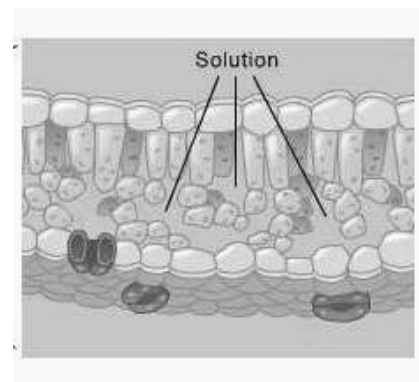
Photosynthesis in Leaf Disks

Teacher Preparation and Background Information

General Information: **Safety:** Goggles should be worn during the experiment. Solutions may be handled without gloves and may be disposed of in sink drains.

In this experiment, students will use a syringe to vacuum the air from the spaces in the spongy mesophyll of leaf disks (do not use thick leaves such as holly). The spaces will then be infiltrated with a sodium bicarbonate (NaHCO_3) solution, which contains a tiny amount of detergent to break down the waxy leaf coating (cuticle).

Note: The amount of sodium bicarbonate is approximate. You may wish to test this prior to the experiment, or measure it for the students. The sodium bicarbonate solution adds carbon dioxide to the solution to stimulate photosynthesis.



As solution enters the leaf spaces and forces the air out, the additional mass causes the disks to sink in the solution. The solution should be vacuumed through the leaf disks several times, shaking the syringe after each attempt.

Caution the students to grasp the syringe firmly and keep one finger over the tip to prevent water from spraying out the opening. If the disks do not sink add a little more detergent to the solution.

The leaf disks are then divided equally into 2 cups, the remaining solution is added equally to each. One cup is exposed to light while the other serves as the control, and is covered. As photosynthesis occurs, oxygen is produced which fills the intercellular spaces. The decrease in density causes the leaf discs to rise and float. Observations are made as the disk cells undergo photosynthesis and students will record the time it takes for leaf disks to rise to the surface.

As an extension you may propose that the floating disks be placed in the dark to determine if the disks will sink after photosynthesis ceases.

After mastering the basic techniques in the controlled lab, each pair of students will design and carry out an Experimental Lab with one variable introduced. You may need to provide suggestions and provide equipment: concentration of sodium bicarbonate solution, pH of solution, temperature of solution, intensity of light, color (wavelength) of light, distance from light, type of leaf, and presence of other chemicals such as herbicides that interfere with photosynthesis. (Use safety precautions with chemicals)

Materials: Per Group

Sodium bicarbonate (baking soda)
1 large plastic cup or beaker (app. 500 mL)
2 clear plastic cups or beakers (app. 250 mL)
Hole punch (can be shared by groups)
Fresh Leaves (spinach, ivy, pansy, other of your choosing)
Large plastic syringes (35-65 mL, 1 per group)

Light sources, 60 watt bulb or higher
Liquid detergent
Plastic spoon or straw
Eyedropper
Timers or a clock with second hand
(Other materials for experimental labs)