

AP BIOLOGY LAB: PHOTOSYNTHESIS

(adapted from AP College Board Photosynthesis lab)

Background and Pre-lab:

Photosynthesis fuels ecosystems and replenishes the Earth's atmosphere with oxygen. Like all enzyme-driven reactions, the rate of photosynthesis can be measured by either the disappearance of substrate, or the accumulation of product.

The equation for photosynthesis is:



To determine the rate of photosynthesis one could measure the production of oxygen, which is released when photosynthesis occurs or the consumption of carbon dioxide.

Leaf Structure and Function

In this investigation, you will use a system that measures the accumulation of oxygen in the leaf. Consider the anatomy of the leaf. The leaf is composed of layers of cells. The spongy mesophyll layer is normally infused with gases, oxygen and carbon dioxide. Leaves (or disks cut from leaves) will normally float in water because of these gases. If you draw the gases out from the spaces, then the leaves will sink because they become more dense than water. If this leaf disk is placed in a solution with an alternate source of carbon dioxide in the form of bicarbonate ions, then photosynthesis can occur in a sunken leaf disk. As photosynthesis proceeds, oxygen accumulates in the air spaces of the spongy mesophyll. The leaf becomes buoyant and floats.



While this is going on, the leaf is also carrying out cellular respiration. This respiration will consume the oxygen that has accumulated and possibly cause the plant disks to sink. In other words, the buoyancy of the leaf disk is actually an indirect measurement of the **NET** rate of photosynthesis occurring in the leaf tissue.

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Pre-lab Questions:

1. What is the function of the stoma (or stomata)?
2. What will happen to the leaf disks if you remove the air from the spongy mesophyll?
3. How will air return to these air spaces?
4. Instead of carbon dioxide, what will be used to as the reactant in this lab?

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**United States. Energy Research and
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