

Study Photosynthesis with the Floating Leaf Disk Assay

Name: _____

Date: _____

Student quiz — *Answer key*

1. What do plants produce during photosynthesis?

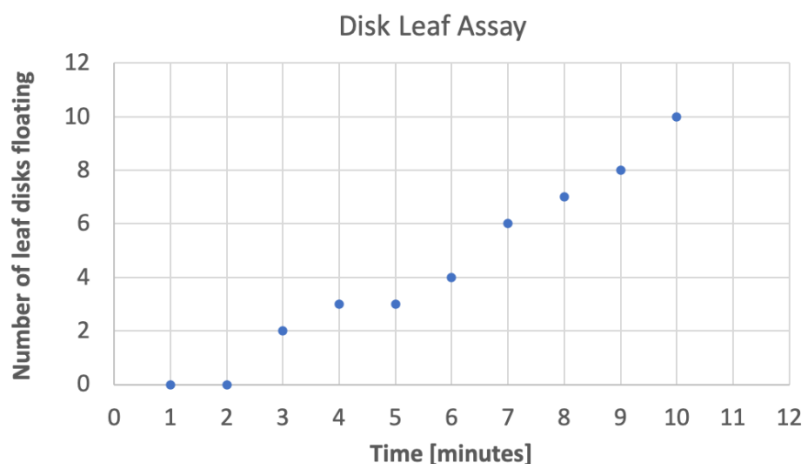
- a. Water and sugar
- b. Sugar and oxygen gas
- c. Light, carbon dioxide gas, and water
- d. Sugar, oxygen gas, and carbon dioxide gas

2. In your own words, explain why the leaf disks started to float during the leaf disk assay.

As the leaf disks start to photosynthesize, oxygen gas was produced. This oxygen gas accumulated as tiny bubbles on the surface or sides of the leaf disks. The gas bubbles changed the buoyancy of the leaf disk. The more oxygen that attached to the leaf disks, the more buoyant the leaf disks became. Eventually the leaf disks' density became less than the water density and the leaves started to float.

3. The graph below (right) shows the results of a leaf disk assay with 10 leaf disks. What is the approximate Effective Time (ET_{50}), or the time at which 50% of the leaf disks floated, for this experiment?

- a. 1/6.5 min
- b. 3 min
- c. 10 min
- d. 6.5 min



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Student quiz — *Answer key*

4. Imagine you use the leaf disk assay to investigate photosynthesis in different plants. All conditions for the experiment stay the same, except the plant type. The table below (right) shows a summary of your results. Which plant photosynthesizes the fastest?

- a. Spinach
- b. Ivy
- c. Rose bush
- d. Oak tree

Plant type	(1/ET ₅₀) [minutes ⁻¹]
Spinach	0.33
Ivy	0.1
Oak tree	0.22
Rose bush	0.15

5. In the leaf disk assay, the baking soda provides the leaf disks with carbon dioxide (CO₂). How would you set up an experiment to measure the effect of carbon dioxide on the rate of photosynthesis? What results would you expect in that experiment? Explain the reasoning for your answer.

To measure the effect of carbon dioxide on the photosynthesis rate, one could conduct the floating leaf disk assay with different baking soda concentrations (the amount of baking soda added to the cup per 100 mL of water). In the assay, the baking soda provides the leaf disks with the carbon dioxide they need for photosynthesis. Thus, changing the baking soda concentrations changes the amount of CO₂ available to the leaf disks. You can measure the time it takes for the leaf disks to float to the surface. The sooner the leaf disks float to the top, the faster the leaf disks photosynthesize.

As carbon dioxide is a reactant in the photosynthesis reaction, it is expected that increasing the amount of baking soda increases the rate of photosynthesis. Once the concentration is high enough that the amount of carbon dioxide is no longer a limiting factor, the rate will no longer be affected by the amount of baking soda.