



How Plants Make Food: Investigating Photosynthesis

GRADE Grade 7

SUBJECT Science

DURATION 44 min

🎯 Objectives

- Describe the basic steps of **photosynthesis** and write the simplified equation using CO_2 and H_2O .
- Explain how **light** and **carbon dioxide (CO_2)** affect the rate of photosynthesis.
- Design and carry out a controlled experiment to measure a photosynthesis indicator (oxygen bubbles) from an aquatic plant.
- Collect and plot data, then draw a conclusion that connects the evidence to the role of light in photosynthesis.
- Use a simple model to show where photosynthesis happens in a leaf and the inputs/outputs of the process.

🧰 Materials

- Fresh sprigs of aquatic plant (Elodea or pondweed), one per group
- Clear test tubes or small clear cups (3 per group)
- Baking soda (sodium bicarbonate) to provide dissolved CO_2
- Lamp with LED bulb or strong classroom light (one per group or shared with rotation)
- Stopwatch or classroom timer
- Ruler or measuring tape (for distance from lamp)
- Paper and pencils for data recording and drawing
- Graph paper or printed data table
- Thermometer (optional) to check water temperature
- Beakers or pitchers for water
- Stirring rod or spoon
- Safety goggles (one per student)
- Paper towels
- Colored pencils (for model drawing)
- Permanent marker (to label cups/test tubes)

🕒 Warm-Up

Show students two clear cups with water and a sprig of Elodea in each. Ask: “If both plants have the same water, which one will produce more bubbles if one is placed under a lamp and the other in shade? Why?” Give students 3 minutes to discuss with a partner and share one prediction and one reason using the words **light** or **carbon dioxide**.

Activities

1 Mini Lesson: What is Photosynthesis? 6 min

Teacher presents a 6-minute explanation using a diagram: plants take in **CO₂** and H₂O and use **light** energy to make sugar and release O₂. Write the simplified equation on the board and highlight **inputs** and **outputs**. Ask 1–2 short questions to check prior knowledge.

2 Set Up Experiment: Measuring Oxygen Bubbles 8 min

Students work in small groups. Teacher demonstrates first. Each group: fill three clear test tubes with room--temperature water, add a small pinch of baking soda to each (same amount), place an Elodea sprig inverted in each tube, cap or cover to trap bubbles, and label tubes A, B, C. Tube A: bright light close to lamp; Tube B: dimmer light farther away; Tube C: covered with a black cloth (dark control). Record setup details on the data sheet.

3 Collect Data: Count Oxygen Bubbles 10 min

Run three timed trials of 3 minutes each. For each tube, count and record the number of visible bubbles released from the cut tip of the Elodea during each trial. Rotate roles: timer, counter, recorder. Note water temperature and distance from lamp.

4 Analyze Data and Graph Results 8 min

Groups calculate the average bubbles per minute for each light condition, then plot a simple bar graph (x-axis: light condition; y-axis: average bubbles per minute). Students look for patterns and write one sentence stating which condition produced the most bubbles.

5 Explain: Connect Data to Photosynthesis 6 min

Class discussion: each group shares their graph and conclusion. Teacher guides students to explain why more bubbles indicate higher photosynthesis rates (oxygen as a product) and how light intensity and available CO₂ influence the rate. Teacher asks students to restate the photosynthesis equation in their own words.

6 Modeling Activity: Leaf Diagram 6 min

Students draw a labeled cross-section model of a leaf on paper, showing where chloroplasts would be and arrows for inputs (CO₂, light, H₂O) and outputs (sugar, O₂). They color-code inputs and outputs and write one sentence explaining how the model matches the experiment results.

Assessment

Formative: Teacher checks each group's data table and graph for accurate averaging and clear labels, and listens during the sharing for correct use of **photosynthesis** vocabulary (CO₂, H₂O, light, O₂). Summative (exit ticket): each student writes one sentence answering: "Which factor you tested (light intensity or darkness) changed the photosynthesis rate most in your experiment, and give one data-based reason." Collect exit tickets as students leave — mastery requires a correct factor and a linked piece of evidence (e.g., average bubbles per minute).

Homework

Short extension: Students find one indoor plant at home, observe it for five minutes, and write one paragraph predicting how moving it closer to a window might change its photosynthesis rate. Ask them to include at least one reason using **light** or **CO₂**.