# Plants Produce Oxygen!

*A simple experiment with photosynthesis.*

**Grades: K - 6**

**Time: 10 min. set up, several hours to wait, 30 mins to observe**

## Lesson summary:

Students will observe the production of oxygen by a plant by submerging a leaf underwater and observing oxygen bubbles form. In part 2, students will conduct a small experiment to see if the amount of light a plant receives affects the production of oxygen by plants. This experiment can be kept very simple for younger students to observe that plants produce oxygen or can be used as an exploration of photosynthesis for older students. Students can expand on their understanding of photosynthesis.

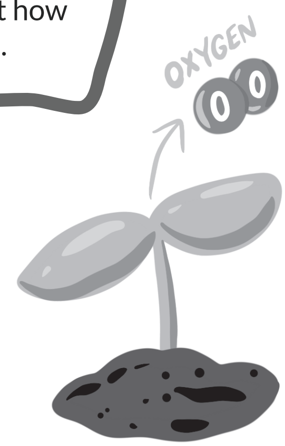
## What's the big idea?

Most of the oxygen in our atmosphere is the result of millions of years of plant performing photosynthesis. Plants form oxygen, which is essential to life on earth!

- How do plants produce oxygen?
- What do plants need to perform photosynthesis?
- Does the amount of light a plant receive affect the amount of oxygen it produces through photosynthesis?

## Outcomes or purpose:

- Students will understand that plants produce oxygen. You may explore further and students will understand that plants produce oxygen through photosynthesis.
- Students will understand that varying light levels will affect how much photosynthesis occurs.




## Teacher background:

Photosynthesis is a process that plants use to convert light energy into glucose, a source of stored chemical energy (like it's food). A plant uses carbon dioxide from the air, as well as water and sunlight to form this glucose and produce oxygen. We observe the production of oxygen when a leaf is submerged under water. Varying levels of light intensity can affect the amount of photosynthesis that occurs by a plant.

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## Materials needed:

- 2 transparent cups
- Water
- 3 green leaves from a house plant, or from a plant outdoors (2 leaves should be a similar size)
- Small hand lens (optional)



## Step by step instructions:

**1.** ***Engage Students.***

Start by asking students to take a deep breath with you. Ask students to raise their hand as they hold their breath, and when they can no longer hold it to drop their hand and breath normally. Once all of the hands are down, ask students ***'why did we need to start breathing again?'***. Elementary students will likely tell you that we need air to breathe but may not know that air contains oxygen or that it contains more than just oxygen.

Ask students again, ***'what exactly is air?'***. Most of the air we breathe (78%) is nitrogen gas, while 21% of the air is oxygen. A small part of air (1%) is made of argon, water vapor and carbon dioxide.

Ask students, ***'what part of the air do our bodies need?'*** Oxygen! Ask again, ***'why do we need oxygen?'***. Oxygen goes into our lungs and into our blood and travels around our body. It is important for the health of our muscles, brain and organs. We can't live without it!

Ask students, ***'where does oxygen come from?'.*** Students may already understand that plants produce oxygen. This would be a good time to explore photosynthesis. The oxygen in our atmosphere is the result of millions of years of photosynthesis by plants.

Let students know that today you will be doing an experiment to observe if plants produce oxygen, and if different levels of light on plants effects the rate of oxygen production (or photosynthesis).

**2.** ***Observe the production of oxygen through photosynthesis.***

**A** Fill the transparent cup with water and submerge your leaf.

**B** You might ask students to predict what might happen.

**C** Place the submerged leaf in the sunlight of a window for several more hours.

**D** Bubbles should appear around your submerged leaf. Students may observe the bubbles with their hand lens. Ask them to observe different parts of the plant. Do bubbles form everywhere?

**E** Ask students what they think these bubbles are made of. Do the bubbles increase or decrease over time? If you shake the glass the bubbles will rise to the surface and burst, because oxygen is lighter than water. This is similar to us releasing a breath underwater.

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**3.** ***Observe the effect of light levels on the rate of photosynthesis.***

**F** Fill two glasses with water and submerge a fresh leaf in each glass of water.

**G** Place one glass in a dark area such as a closet.

**H** Place the other glass in sunlight again for two hours.

**I** (Optional) Ask students to predict by writing or drawing what they think will happen in each glass.

**J** Observe how much oxygen each leaf produced. Are the amounts different for each glass? Why do you think? What does this tell us about light and photosynthesis?

**K** Older students might count the number of bubbles in each light condition, and determine the mean, median and mode for each.

## Discussion questions

- Which leaf produced more oxygen? Why? What does that tell us about photosynthesis?
- What do you think would happen if you left some plants in a completely dark closet for two weeks? Why do you think that? Would they survive?
- Do you think photosynthesis can happen at night? (It only happens when there is sunlight)
- (For Older Students) Do we know for sure that these bubbles were oxygen? There is no way to definitively know if this experiment set-up if the bubbles are actually oxygen. They could be nitrogen or carbon dioxide! However, because we understand the process of photosynthesis and the plants were exposed to life, we can conclude that the bubbles were likely oxygen. This is an important point for students to understand – that researchers must always recognize the difference between what they know and what they assume.

## Journal Prompts:

- Ask students to predict what will happen to the leaf when it is submerged, and what will happen to each leaf in the glass in part 3.
- Older students can graph the data that they collected by counting the number of bubbles in each light condition.
- Ask students to a picture of the results of your experiment and label the different 'things' needed for photosynthesis to occur.

## Expand the learning:

Try experimenting with different colours of light and the rates of photosynthesis. Light has many different wavelengths. In our visible spectrum, these wavelengths range from red (the shortest wavelength) to violet or blue (the longest wavelengths). Plants respond differently to the different wavelengths of colours of light. Try using the same experiment set up and cover the glass with coloured cellophane. Observe what color or colors of light result in the most photosynthetic activity. Blue wavelengths are one of the best wavelengths for most plants so try this colour, as well as red and one other.