

LESSON 2 How Do Green Cells Make Food? =====

Objectives

When students have completed this lesson, they will be able to:

- identify the raw materials and products of food-making in green cells;
- explain the role of chlorophyll and sunlight in photosynthesis;
- analyze and interpret word and formula equations for photosynthesis.

Exploring Science

Most of the photosynthesis that occurs on Earth is accomplished by algae in the ocean. This, along with photosynthesis by plants - particularly trees - should be supported, both to grow food and to fight global warming.

For the inference question, **B** is the answer. Students may guess **B** if they think of plants' need for light, or **A** if they think of plants' roots. You might explain that a key function of roots is to obtain water, which surrounds aquatic algae.

How Green Cells Make Food

You may wish to have students look at the plant cell from Unit 2 Lesson 2 (page 42) to remind them that chloroplasts make plant cells appear green. You will need to point out that only a small number of chloroplasts were included in the drawing, but a real cell would have many of these structures.

Have students study the drawing of the plant on page 69. Oxygen exits the plant's leaf. In lesson 3 of this unit, students will see how living things *use* oxygen. Point out that green plants and algae use some of the oxygen that they produce for their own needs. What is in excess exists the cells. In summary, green organisms not only provide food for other organisms, they also provide oxygen.

The term stomates is introduced in the caption of the illustration. [While the simplest terms for these structures are *stomate* for the singular and *stomates* for the plural, in the literature you will sometimes see the Latin terms in use - with a single structure referred to as a *stoma* and the plural as either *stomata* or *stomas*.]

It is easy to locate good images of stomates online. If you did not already have students observe these structures (for example, when introducing the compound microscope), this would be a good time to ensure that students are aware of them - and their role in the exchange of gasses (oxygen, carbon dioxide, and water vapor).

You might elaborate by identifying the guard cells, and explain to students that, by changing their shape, these two cells control the size of the stomate. This is particularly useful as the plant conserves water when conditions are dry (as it is on a hot summer day), and releases water vapor during times of higher humidity (for example, during the night). You might also elicit from students why stomates appear on the underside of the leaves of land plants, but on the top of the leaves of water lilies.

The equation for photosynthesis, and the corresponding equation for cell respiration (that is covered in the next lesson) are such fundamental concepts for an introductory course in biology that it is helpful to have "banner" versions of them continually on display in the classroom. [Full disclosure: the author of this textbook sells such banners online, but similar ones could certainly be "handmade."]

To Do Yourself

While acetone is a better solvent for the extraction of chlorophyll, it is a carcinogen, so alcohol is recommended. Edible ethanol is fine. You may want to complete the same steps - by yourself - using acetone, and then have students observe the difference between your results and theirs.

Questions

1. The liquid was clear, then turned green.
2. The leaf bits were green, then turned pale.
3. Chlorophyll was moved from the spinach leaves to the liquid.

Review

Please note: I have not made the answers available online, on the small chance that a student might discover them. Of course, the answers to these questions will be included in the version of the Teacher's Guide provided to teachers who purchase the text.

Reinforce / Enrich

The first 6:20 of the following video provides a very good, brief overview of the basics of light - then links this with the basics of photosynthesis. Beyond this mark, the information is more advanced (such as the key aspects of the light-dependent and light-independent reactions, but continues to be clearly explained and illustrated).

- [Beverly Biology - Photosynthesis \(in detail\)](#) [17:51]

This brief video provides a very good summary of photosynthesis - including the action of the sun's energy to split water molecules.

- [Ted Ed - Amanda Ooten / The simple story of photosynthesis and food](#) [3:48]

Up to the 5:50 mark, this video goes a bit deeper into the main topic of this lesson, photosynthesis. Teachers might want to save the remaining portion of the video until students have completed the next lesson - which introduces cellular respiration.

- [Crash Course Botany #5 - Photosynthesis and cellular respiration](#) [11:44]

The following brief video provides a clear demonstration of the function of stomates. The plant used is *Tradescantia zebrina* ("Wandering Dude"). An equally good, if not better, view of stomates may be obtained by simply placing a tiny piece of the purple underside of this plant face up (without using a cover slip) under low and then medium power of a typical compound microscope.

- [Science Sauce / Stomata Explained; How to View Stomata](#) [3:09]