

Photosynthesis: A Light Snack

Pre-/Post-Visit Activities



Thank you for registering for the GreenSchool Workshop *Photosynthesis: A Light Snack*. During this workshop, your students will gain a deeper understanding of the process of photosynthesis as well as the functions of the parts of a plant. The following selection of pre- and post-visit activity ideas and recommended resources is designed to support 6–8th grade classroom integration of the plant science concepts addressed in *Photosynthesis: A Light Snack*.

PRE-VISIT ACTIVITY IDEAS

Do plants need sunlight in order to photosynthesize?

Students will conduct an experiment to observe the importance of the sun for plants and become familiar with the concept of photosynthesis.

Materials:

- potted house plants or a tree with green leaves
- paper clips
- aluminum foil

- Discuss the concept of food webs. Be sure to differentiate a food chain from a food web. (A food chain is a linear sequence of organisms, each of which feeds on the preceding organism, whereas a food web is a trophic system composed of interconnected food chains.)
- Plants are primary producers upon which all other life is dependent. Unlike other organisms, plants produce their own food through the process of photosynthesis, which makes them the basis of the food web.

- Review the equation for photosynthesis: $\text{Carbon dioxide} + \text{Water} + \text{Sunlight} = \text{Glucose} + \text{Oxygen} + \text{Water}$

- Highlight the components that must be present for photosynthesis to take place: carbon dioxide, water, and sunlight.
- Discuss that photosynthesis takes place in the leaves of plants. Leaves contain chlorophyll, which is the green pigment found in plants that absorbs sunlight and is essential for photosynthesis.

- Experiment question: *What happens if a plant's leaves do not get sunlight? Can it still photosynthesize?*
- Instruct each student to cut out a one-inch square of aluminum foil. Attach the aluminum square with a paper clip so that it covers a portion of a leaf.
- Place the potted plants in a sunny spot for one week. Water them as needed.

- Ask students to write down their predictions of what the leaf will look like after they remove the foil in one week. *Do they think that the leaf will be able to photosynthesize without sunlight?*

After one week, remove the foil squares. *Were their predictions correct? Do they have chlorophyll in them? How can you tell? Are they green? Can those portions of the leaf still photosynthesize?*

Explain that photosynthesis takes place in the chloroplasts (an organelle that contains the chlorophyll) inside of the leaf. Chlorophyll has to be present in order for the plant to photosynthesize, and the sun is a critical component for this chemical reaction to take place. This experiment will show that if the leaf is denied sunlight over a long period of time, it will not produce chlorophyll and therefore cannot photosynthesize.

POST-VISIT ACTIVITY IDEAS

Chromatography Experiment

Students will conduct an experiment to observe what pigments are present in deciduous leaves and learn the functions of these pigments.

Materials:

- various green leaves
- glass jars
- rubbing alcohol
- shallow tray
- hot water
- plastic spoons
- coffee filters

Review the process of photosynthesis and concepts discussed in the GreenSchool. Chlorophyll is the green pigment found in leaves where photosynthesis occurs. Carotenoids are yellow, brown, and orange pigments present in the leaves throughout the growing season. The red and purple pigments of leaves formed during the summer are called anthocyanins.

- Discuss the concept of paper chromatography, which is a technique used in scientific experiments to separate different solutions/chemicals. For this experiment, students will use paper chromatography to discover which pigments are present in green leaves.
- Divide the class into groups and instruct students to tear the leaves into very small pieces. Place the pieces into a glass jar and label the jar with their group name and the name of the tree the leaf came from.
- Pour rubbing alcohol into the jars

until it covers the leaf pieces. Use a plastic spoon to mix it up and smash the leaf pieces until the liquid turns green.

- Place the jars into a shallow pan of hot water and place the lids loosely on. Replace the water if it cools down. Mix the contents of the jars every 10 minutes for 30 minutes until the liquid is dark.
- Cut the coffee filter into long strips, about 3 inches, and place a strip into each jar so that it touches the liquid. Secure the strips to the sides of the jars with tape. Let the jars sit for 45 minutes and then check the strips for separation of colors.
- Have students share their results. *What do they think happens to the green pigments in the fall? Why don't all plants have the same pigments?*

VOCABULARY KEY

Trophic – Relating to the feeding habits of different organisms in a food chain or web, relating to nutrition

Organelle – A differentiated structure within a cell that is enclosed in its own membrane and performs a specific function

Photosynthesis – The conversion of light energy into chemical energy by living organisms

Photosynthesis Equation: $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Sunlight} + \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$

Chlorophyll – Green pigment found in plants, algae, and cyanobacteria; chlorophyll absorbs the sunlight that will be converted into energy for the organism

Chloroplast – organelles found in plant cells that contain the chlorophyll and conduct photosynthesis.

Carotenoids – Yellow, brown, orange pigments that are present in leaves throughout the growing season

Anthocyanins – Red and purple pigments that are formed in leaves during the summer

Chromatography – Laboratory technique to separate mixtures

Deciduous plants – Plants that lose all of their leaves for part of the year

RECOMMENDED TEACHER RESOURCES

Barron's; Parramon Editorial Team. *Essential Atlas of Botany*. Hauppauge, N.Y.: The Barron's Educational Series, 2004.

Capon, Brian. *Botany for Gardeners, An Introduction and Guide*. Portland, Ore.: Timber Press, 1990.

RECOMMENDED BOOKS FOR CHILDREN

Burnie, David. *Plant*. New York: Dorling Kindersley Limited, 2000.

Silverstein, Alvin; Virginia Silverstein and Laura Silverstein Nunn. *Science Concepts: Photosynthesis*. Minneapolis, Minn.: Twenty-First Century Books, A division of Lerner Publishing Group, Inc. 2008.

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