

The Structure of a Leaf

By Cindy Grigg

¹ The most numerous parts on most plants are their leaves. Leaves are considered to be a plant organ. An organ is a group of tissues that performs a specialized task. Leaves take energy from the sun and use it to make food—the process of photosynthesis.



² Plant leaves come in all sizes and shapes. Cedar trees, for example, have needle-shaped leaves. Yellow skunk cabbage has oval leaves that can be more than one yard wide. No matter what their size or shape, leaves all perform the same function in a plant.

³ If you were to cut through a leaf and look at the edge under a microscope, you would see different structures. Leaves have three main parts. They are the epidermis, the mesophyll, and the vascular tissue.

⁴ The **epidermis** is the outer layers of cells covering the leaf. People also have an epidermis: their skin. The epidermis is transparent (not green). There is a waxy, waterproof coating covering the surface of the epidermis. This covering is called the **cuticle**. The cuticle is usually thicker on the upper surface of the leaf than on the underside. Cuticles on leaves are usually thicker in dry or windy climates than in wet or calm environments. For example, plants that grow near the ocean often have thicker cuticles to keep the ocean breezes from drying the plant out.

⁵ The epidermis has small openings or pores called **stomata** (singular stoma). The stomata have guard cells that control their opening and closing. The stomata open and close to control when gases enter and leave the leaf. When the stomata are open, carbon dioxide enters the leaf, and oxygen and water vapor go out. There are usually more stomata on the underside of a leaf than on the upper surface.

⁶ The mesophyll is the middle part of the leaf. In fact, that's what the word "mesophyll" means in Greek: "middle leaf." There are several layers of upper leaf cells. These are called **palisade** cells. They are tightly packed with many chloroplasts that trap the energy in sunlight for photosynthesis.

⁷ Lower leaf cells are called the **spongy** layer because they have many spaces between them. The leaf can temporarily store carbon dioxide and oxygen in these spaces. These connect to the stomata on the underside of the leaf where the gases can enter and exit the leaf.

⁸ Between the layers of cells inside the leaf are veins that contain xylem and

phloem. This is the **vascular** tissue. **Xylem** tissue carries water absorbed by the plant's roots up into the leaf. **Phloem** tissue carries the food made during photosynthesis throughout the plant.

⁹ The structure of a leaf is ideal for carrying out the process of photosynthesis. Photosynthesis occurs in the chloroplasts of plant cells. Here's how it happens. The cells that contain the most chloroplasts are located near the leaf's upper surface where they are exposed to the sun. Leaves are typically flat and thin to have more surface area for the chloroplasts and to allow sunlight to reach all the cells.

¹⁰ Carbon dioxide enters the leaf through open stomata. Water, which is absorbed by the plant's roots, travels up the stem to the leaf through the xylem. During photosynthesis, sugar and oxygen are produced from the carbon dioxide and water. Oxygen passes out of the leaf through the open stomata. The sugar enters the phloem and then travels throughout the plant.

¹¹ Because such a large area of a leaf is exposed to the air, water can quickly evaporate from a leaf into the air. The process by which water evaporates from a plant's leaves is called **transpiration**. Transpiration is the plant's way of making the water absorbed by its roots move through the plant. It's a little like drinking liquid through a straw. When the straw is full, no more liquid can come in until some of the liquid leaves the straw, going into your mouth. A plant loses water through its leaves, creating a need for water in the roots to move upward through the plant.

¹² A plant can lose a lot of water through transpiration. One corn plant can lose almost a gallon of water on a hot summer day. Without a way to slow down the process of transpiration, a plant would shrivel up and die. One way plants slow down transpiration is by closing the stomata. The stomata often close when the temperature is very hot. Desert plants have adapted by only opening their stomata at night.

¹³ Even though leaves may look very different, they have the same function and the same types of tissues. These different types of tissues work together in the leaf to make food for the plant.

Name _____

Science Pd _____

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<p>1. What is a leaf's "job"?</p> <p><input type="radio"/> A To absorb water and nutrients</p> <p><input type="radio"/> B To capture sunlight and make food</p> <p><input type="radio"/> C To look pretty</p>	<p>2. A leaf's outer "skin" is called the:</p> <p><input type="radio"/> A Stomata</p> <p><input type="radio"/> B Epidermis</p> <p><input type="radio"/> C Cuticle</p>
<p>3. The waxy, waterproof coating covering the outside of a leaf is the:</p> <p><input type="radio"/> A Cuticle</p> <p><input type="radio"/> B Stomata</p> <p><input type="radio"/> C Epidermis</p>	<p>4. Small openings or pores on a leaf are called:</p> <p><input type="radio"/> A Phloem</p> <p><input type="radio"/> B Xylem</p> <p><input type="radio"/> C Stomata</p>
<p>5. Most chloroplasts are found in the:</p> <p><input type="radio"/> A Vascular tissue</p> <p><input type="radio"/> B Spongy layer</p> <p><input type="radio"/> C Mesophyll</p>	<p>6. When water evaporates from a leaf into the air, the process is called:</p> <p><input type="radio"/> A Xylem</p> <p><input type="radio"/> B Transpiration</p> <p><input type="radio"/> C Phloem</p>