

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

# Handout A:

# The Leaf

Directions:

1. Read and Highlight
2. CIRCLE key vocabulary that has to do with photosynthesis
3. Label the picture, (*writing out the words next to the designated letters*)
4. On the bottom of this handout list the functions of the vocabulary (*see below*)

The ability of plants to photosynthesize depends on the exposure of much of their surface to sunlight. Leaves provide this necessary exposure. In gymnosperms, leaves tend to be round and needlelike, while in flowering plants (angiosperms), leaves have flat, thin blades that maximize light absorption and control gas exchange.

The leaf is the major photosynthetic organ of plants. In this plate, we will examine some of the leaf's structural characteristics.

The typical leaf of a flowering plant consists of a thin, flattened area called the leaf blade (A), and the blade is joined to the stem of the plant by a stalk-like extension called the petiole (B). Vascular tissue extends from the stem through the petiole and into the blade to form a branched system of veins in dicots, and parallel veins in monocots. Look at the details of the leaf's interior as seen in the cross section.

The typical leaf blade is covered on top and bottom by a protective cuticle (C). The cuticle is a layer of waxes that helps prevent moisture loss from the internal portion of the leaf. The outermost layer of cells of the leaf is the epidermis; the epidermis is generally only one cell in thickness, and in the diagram you can see an upper epidermis (D) and a lower epidermis (E). The epidermal layers protect the inner tissues of the leaves and secrete the waxy cuticle. Epidermal cells interact with the environment and are permanent tissues in the plant; they vary in structure among plants and are the source of root hairs on growing roots.

At the lower surface of the leaf, we show several openings known as stomates (F), which are also called stomata. On either side of each stomate are two cells, the guard cells (G). These cells are formed from epidermal cells, and you should use bold colors for them. Stomates allow for the diffusion of carbon dioxide, oxygen, and water vapor into and out of the leaf, and these gases must be exchanged continually in order for photosynthesis to

occur. The opening and closing of the stomates is controlled by a complex series of chemical reactions that involve ions and water. Stomates are generally open during the day and closed at night, and an enlarged stomate is shown at the lower right. Notice that stomates are only present on the lower surface of the leaf.

Sandwiched between the upper and lower epidermis are the cells of the mesophyll (H) layer, which include the photosynthetic cells of the plant. This internal region is made up of two types of chloroplast-containing parenchyma cells arranged in layers.

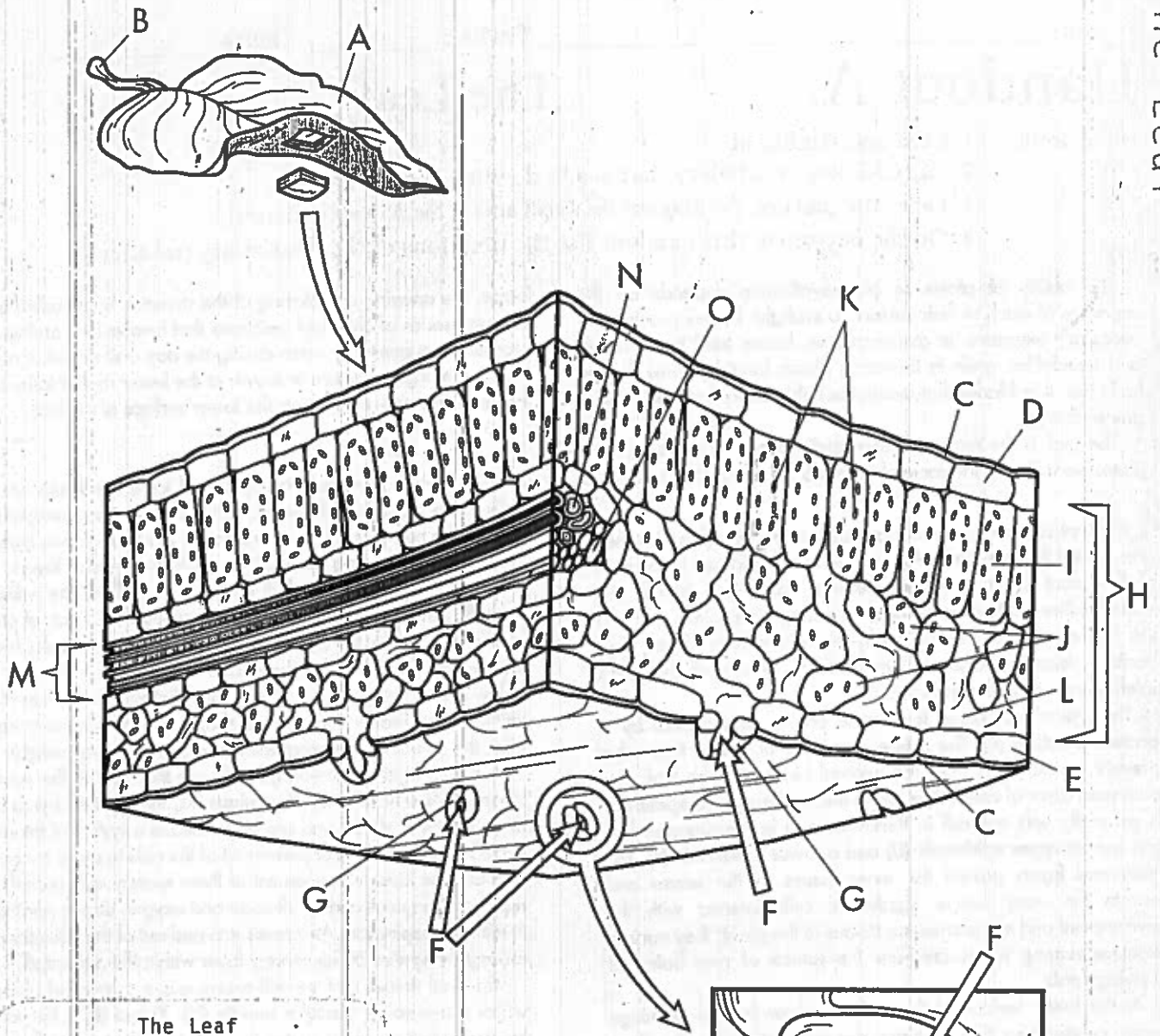
The first layer of mesophyll contains the cells of the palisade layer (I), which contain numerous chloroplasts (K). Spots of green should be used for the chloroplasts, and a light green color is recommended for the cells. These columnar cells are situated just below the upper epidermis. Most plant photosynthesis takes place within the palisade cells, whose shape and arrangement maximize the number of chloroplasts that are exposed to sunlight.

The next layer of mesophyll cells are the cells of the spongy layer (J). Also filled with chloroplasts (K), these parenchyma cells are irregular in shape and are suspended in a system of interconnected air spaces (L) that permits all of the cells to come in contact with air. The loose arrangement of these spongy cells permits the rapid exchange of carbon dioxide and oxygen during photosynthesis and respiration. Air passes into and out of the stomates and among the spaces of the spongy layer within the mesophyll.

The final tissues that we will examine are xylem and phloem, which comprise the vascular bundle (M). Xylem (N) is the vascular tissue that conducts water through the plant and transports dissolved minerals from the soil, while phloem (O) transports the sugars that are produced during photosynthesis (in the mesophyll), bringing them to the nonphotosynthetic areas of the plant, such as the stem and root.

## FUNCTIONS:

1. Cuticle \_\_\_\_\_
2. Epidermis \_\_\_\_\_
3. Stomates \_\_\_\_\_
4. Guard cells \_\_\_\_\_
5. Mesophyll- (*two types of cells make up the mesophyll*) \_\_\_\_\_
6. Cells of Palisade layer \_\_\_\_\_
7. Cells of the Spongy layer \_\_\_\_\_
8. Chloroplasts \_\_\_\_\_
9. Xylem \_\_\_\_\_
10. Phloem \_\_\_\_\_



The Leaf

- Leaf Blade ..... A
- Petiole..... B
- Cuticle..... C
- Upper Epidermis..... D
- Lower Epidermis ..... E
- Stomate..... F
- Guard Cells..... G
- Mesophyll..... H
- Cells of Palisade Layer ..... I
- Cells of Spongy Layer ..... J
- Chloroplasts ..... K
- Air Space..... L
- Vascular Bundle..... M
- Xylem..... N
- Phloem ..... O

