Mr. Ulrich
Biology

Name:.....

Lab#:.....

# The Leaf Lab

## Identifying Leaf Structures

**Background Information:**

The leaf is the plant structure in which most food is made. From the leaves, vascular tissue (analogous to veins and arteries in animals) called phloem carries the food to other parts of the plant. The outer layer of the leaf is the epidermis. (Hmmm. The outer layer of *you* is called……?) The epidermis is covered with a waxy cuticle that protects the leaf and helps reduce the amount of water lost by the leaf. Within the leaf are two layers of cells called the palisade mesophyll and the spongy mesophyll. The cells in these layers are densely packed with chloroplasts: the food making organelles. Located on the lower epidermis are stomata (or stomates) each of which is made of two sausage-shaped guard cells that surround a small opening. These stomata open and close to allow gases to leave and enter. The opening and closing of the stomata are regulated by the guard cells so that the proper amount of moisture stays in the leaf (can you say "*homeostasis*"?) and photosynthesis can continue. As more moisture builds up in the leaf, it causes the guard cells to open the stomata and allow water to evaporate out of the leaf in a process called *transpiration.* The loss of water draws more water up from the roots as well as causes the guard cells to shrink and close off the stomata thereby limiting water loss. This is a great example of *feedback* in plants.

**The Problem**

What are the structures of a leaf?

**Materials**

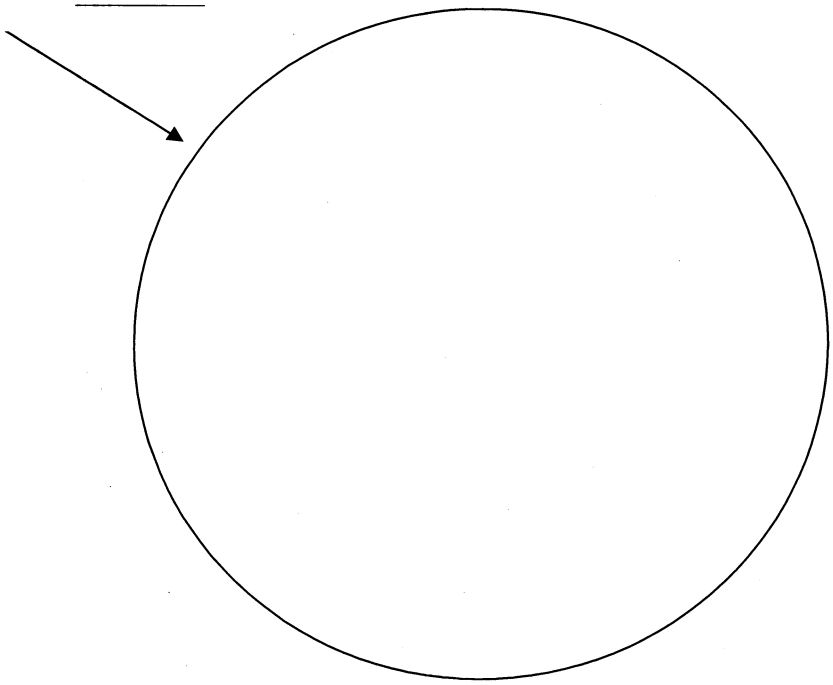
Green leaf
Microscope slide
Coverslip
Microscope
Pre-prepared leaf cross-section slide

**Procedure**

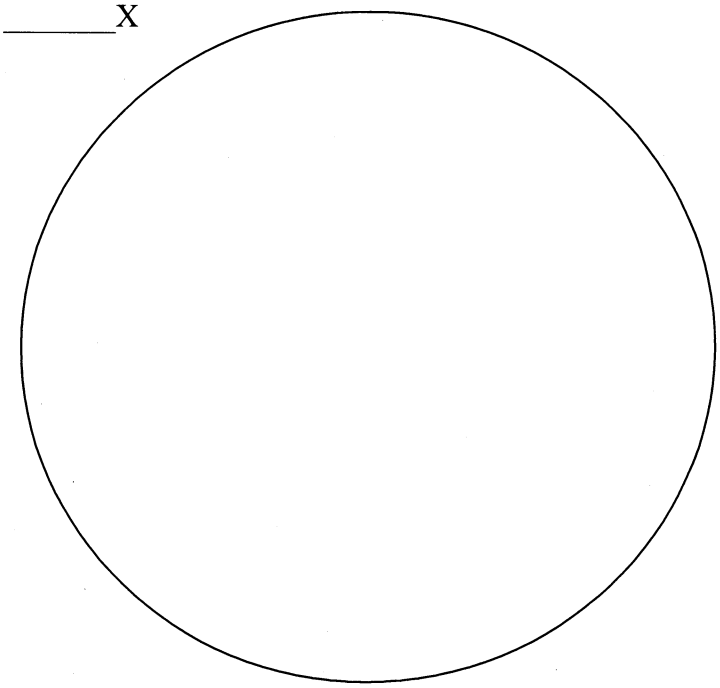
1. Obtain a green leaf from the set-up station and prepare a wetmount of a small section of lower epidermis. Do this by snapping the leaf backwards but not completely in half and peel back the lower, translucent layer of tissue from the bottom of the leaf.
2. Using the microscope, focus under low-power on the lower epidermis and locate a stomata. They look like tiny clams or cheerios or mouths. Center the stomata, switch to high power and refocus.
3. Make a sketch in the appropriate circle on the back of this lab.
4. **Label the sketch: stomata, guard cell and epidermal cell.**
5. Return the slide to the used slide beaker and obtain a pre-prepared slide of a privet leaf.
6. Using the microscope, focus under low-power and find a stomata in the lower epidermis. The guard cells will be stained red while the other epidermal cells should be unstained.
7. Make a sketch in the appropriate circle on the back of this lab.
8. **Label the sketch: Stomate, epidermis (lower and upper), mesophyll (spongy and palisade) as well as any vascular bundles in your sketch.**
9. return the slide to the slide tray, carefully wrap the cord around the microscope and return it with its cover to the microscope cabinet.

## Observations

Lower epidermis at _____X



Leaf cross-section at _____X



**Analysis and conclusions**
Answer the following in complete sentences

1. What is the advantage of the epidermis being transparent?

2. Why do you use the lower part of the leaf and not the upper part?

3. Compare the size, shape and distribution of the cells in the palisade and spongy mesophyll.

4. Does the upper or lower level of the leaf have more chlorophyll? How do you know? Why is this important to the function of the leaf?

5. What happens to the appearance of the guard cells when the stomata are open? When they are closed?

**Critical thinking**

6. In order to keep your house plants healthy, why should you periodically remove the dust from their leaves?

7. A cross-section of a pine needle (a modified leaf) has a thick cuticle. Why might this be an adaptation for colder climates?

8. Would a house plant survive if it were only given water by spraying the leaves with a mist?

9. Why do you think the stomates are open during the day and closed at night?