



## Lesson Plan

# Examining Stomates – Teacher Guide

**Time of Activity:** 45 minute block

**Objectives:**

1. Students practice microscopy and diagramming techniques.
2. Students observe stomates and guard cells.
3. Students infer how the structure of stomates and guard cells is appropriate for their function.
4. Students learn digital imaging applications.

**Science Skills:**

Microscopy (stereo and compound)

**Science Concepts:**

Photosynthesis  
Plant Leaf Anatomy

**Materials:**

Microscope: Stereo and compound  
*Zebrina* plant  
Other plants (optional)  
Prepared slides of leaf cross sections (optional)

**Procedure:**

This is an especially easy, yet highly instructive lab. A *Zebrina* plant can be obtained from any garden store and is easily maintained all year long in the classroom. Give students single leaves to examine, making sure that they are looking at the underside of the leaf since that is where the stomates are. The best stomates are found on the older leaves, not the youngest ones.



**Examining Stomates** – Plants need both water and carbon dioxide for photosynthesis. The challenge for plants is to conserve water while permitting carbon dioxide to enter the leaf where photosynthesis will occur. Stomates are the adaptation that permits carbon dioxide to enter the leaf while allowing most of the leaf to be covered with a waxy cuticle that will conserve water.

**Initial Experimentation** – Take one leaf from a *Zebrina* (*Zebrina pendula* works well due to the purple pigment in the leaves) plant and place it on your stereo microscope's stage plate so the bottom side of the leaf is up. Examine the leaf under the lowest possible power. Notice the stomates which are visible in the green patches. These are easy to see since they stand out against the purple background of the leaf. Increase the magnifying power to the maximum available on the stereoscope.

**Questions to consider:**

1. Why do you look at the underside of the leaf in order to see stomates?
2. Why do you think the stomates are located on the underside of the leaf?



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### Examining Stomates Continued

**Up Close and Personal** – You can also examine the leaf using a compound microscope. Continue to examine the underside of the leaf, first at 40x and then at 100x. Observe that each stomate is surrounded by 2 long, thin guard cells. The guard cells can either open or close the stomate, depending on the availability of water.

3. Draw a diagram of a stomate. Label stomate and guard cell.
4. Under which conditions would you expect the stomates to be:
  - a. open
  - b. closed

#### Digital Microscopy Applications:

Using the capture application of the Swift Imaging software, capture an image of the underside of the leaf, at 40X and then at 100X. Identify the stomate and guard cell(s). Label the stomate and guard cell. Save to a file for future use.

#### Extensions –

1. Once you have seen stomates in *Zebrina*, it should be easier to find them on the undersides of leaves of other plants. This is more difficult since they do not stand out against a purple background.
2. Use a compound microscope to examine prepared slides of cross sections of leaves. Notice how the stomates open into the *spongy mesophyll*, cells that are loosely packed. This loose packing allows the carbon dioxide that enters through the stomates to circulate throughout the leaf, easily reaching the palisade *mesophyll* where most photosynthesis actually occurs.

