

## Topic 7: Plants – 7d. Stomate Lab

Resources: Campbell et al. *Biology: Exploring Life*. Prentice Hall, pp. 466-467.  
Campbell et al. *Biology: Concepts and Connections*. Pearson, p. 630.  
Miller and Levine. *Biology*. Prentice Hall, pp. 596-597.

Building on: Cell structure and function  
Photosynthesis  
Gas exchange, transpiration

Links to Chemistry: Chemical reactions  
Photosynthesis reactions

Links to Physics: Conservation of energy

Stories: Prepared slides work well for showing various plant parts, but the students are one step removed from the process and may not realize how these slides are obtained. This makes the viewing of slides under the microscope no different than looking at pictures in the textbook or on the Internet; it is very passive. By preparing their own slides, students can ask real questions and hypothesize about the answers: “Are there more stomata on the upper or lower surface of a leaf?” “What types of leaves have more stomata?” “Do the stomata of monocot and dicot plants differ?” All of these simple questions can be answered by this simple procedure using materials that the students themselves may have collected.

### Lab Instructions and Materials for the Teacher:

Do some trial and error tests for the lower epidermis of various plants to which you have access. Many house plants provide an excellent source of stomata to view. “Cheap” clear nail polish seems to work as well as the more expensive brands. The students may need some help peeling the nail polish off of the leaf; it tends to fold and crumple before you can place it on the slide.

# Biology

## Stomate Lab

**Introduction:** Stomata are the tiny openings on the leaves that allow for gas exchange. They also enable the plant to partially control water loss.

**Hypothesis:** You will take a sample impression of the top and bottom sides of a leaf. On which side of the leaf do you expect to find more stomata, the top or the bottom? Explain your reasoning.

**Procedure:**

1. Obtain a piece of leaf from your teacher. Paint an area of clear nail polish, about the size of your “pinkie,” on each side of the leaf.
2. Allow the nail polish enough time to thoroughly dry!!!! This is very important.
3. Take a small piece of Scotch tape and apply it to the edge of one of the nail polishes on one side of the leaf. **DO NOT COVER ALL OF YOUR NAIL POLISH WITH TAPE.**
4. Carefully peel up the tape and the nail polish should peel up too. Place the nail polish on a microscope slide and flatten it out gently with your finger.
5. View the nail polish under the microscope starting on low power and working your way up. The nail polish is now like a relief map of the surface of your leaf. You should be able to see a lot of details.
6. Draw and label one stomate from the field of view. Be sure to record the microscope power setting and use information in your textbook (p. 597) to help you label.
7. Count and record the number of stomata in one field of view. Note if the stomata are open or closed.
8. Repeat steps 3-7 with the nail polish on the other side of the leaf.

**Evidence Table:**

Drawings:

Location on Leaf	Microscope Magnification	# of Stomata	Open or Closed
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**Questions:**

1. On which side of the leaf did you find the most stomata?
  
2. Does your answer to #1 have more to do with photosynthesis or with water loss? Explain your answer!
  
3. What type of cells make up the stomata?

4. Do the cells that make up the stomata contain chloroplasts?

5. How do stomata open and close?

**Conclusion:** Restate your purpose, review your results, interpret those results, and state whether the data supported or refuted your hypothesis.