Stomata Diagrams-Honors

Stomata are the openings on a leaf that allow for gas exchange. During photosynthesis plants capture sunlight energy using the chlorophyll pigment in their chloroplast organelles. This pigment absorbs visible light most strongly in the red and blue wavelengths and absorbs very little of the green wavelength. Absorbed sunlight energy is then stored in the bonds of a glucose sugar molecule to be used as food. Stomata are responsible for allowing gas exchange during photosynthesis while preventing excessive water vapor loss due to transpiration (evaporation of gaseous water from the stomata).

Plants will later 'burn' that glucose sugar molecule in the presence of oxygen to get the energy out and use it for cellular processes like growth, cellular maintenance and repair just like animals and humans. The reaction of breaking down the sugar molecules is a combustion reaction much like burning gasoline in your car and requires the presence of oxygen. Stomata again are in charge of regulating gas exchange for this process of breaking down glucose sugar molecules called cellular respiration. The energy is released and transferred to multiple smaller molecules called ATP (adenosine triphosphate) each of which provide the energy currency needed to fuel smaller reactions within the organism.

Prepared Slides:

1. View a leaf epidermis (skin) slide and diagram a stomata (opening created by two guard cells). Label the guard cells, and the stomata (the opening). Annotate the function of each onto your diagram.

2. View and diagram a leaf cross-section. Label the mesophyll, vein (xylem & phloem) and waxy epidermis cells. Annotate the function of each onto your diagram.

Experiment: Does the number of stomata vary on the top vs bottom of the leaf?

Fresh Leaf Samples (Spinach or geranium).

3. Identify the IV, DV and K for this experiment.

4. Get a fresh leaf and tear the leaf in a twisting motion to rip off a clear thin layer of cells (much like an onion skin).

5. Stretch it out on a microscope slide and cover with a drop of water and a cover slip at a 45 degree angle to prevent air bubbles. Mark off 3 1cm circles with a sharpie.

6. Count the number of stomata in each circle and record.

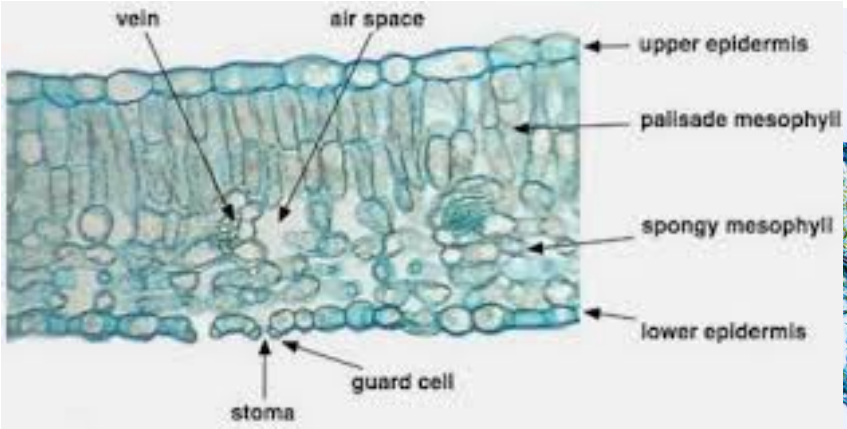
7. Repeat for the bottom of the leaf.

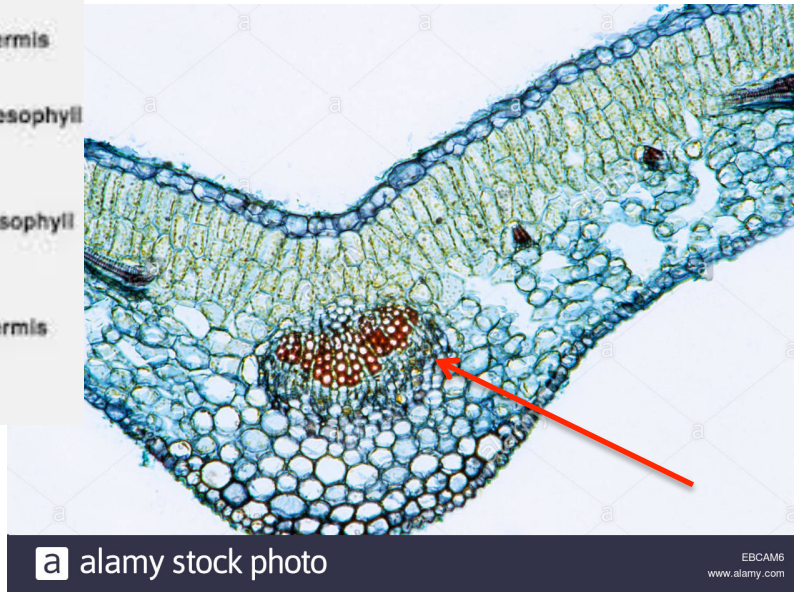
<u>Stomata Questions-Honors (record in your notebook)</u>

1. What is the balanced equation for photosynthesis? What is the difference between reactants and products? Is light a reactant or a product? Explain.
2. What is the organelle in which photosynthesis takes place and what is the role of chlorophyll within it?
3. What is the role of stomata in photosynthesis? How do the guard cells carry out that function and prevent dehydration?
4. Why is the shape of the leaf well suited for its function? In dry climates leaves are smaller and in dark conditions they are bigger. Why are these good adaptations?
5. Leaves look green to the unaided eye but are they consistently green when using the microscope? What gives it that green color? And why green anyway? Explain.

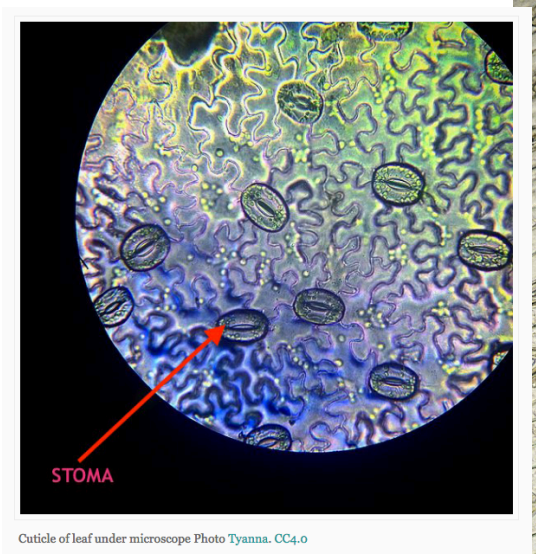
Images to help complete your diagrams

Cross section (draw and label the vein, epidermis cells, mesophyll cells and chloroplasts within them)

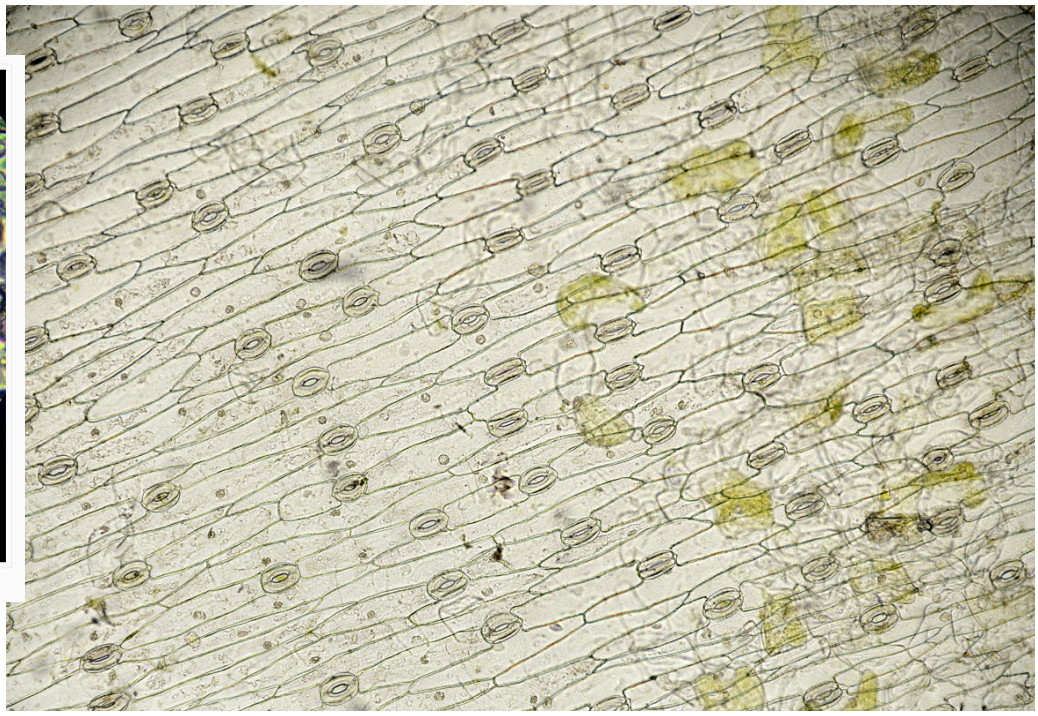




Epidermis (Draw and label the two guard cells, the stomata, and an adjacent epidermis cell)



Cuticle of leaf under microscope Photo Tyanna. CC4.0



Data For Stomata Experiment:

- Use the images as the data source for the number of stomata.
- Create a graph from the averages (on graph paper from class or in Google using this tutorial: https://www.youtube.com/watch?v=713apMgym-w
- Write a CER analysis of your experimental results (claim from the results, quantitative evidence to support your claim and reasoning for your results that includes an explanation of vocabulary concepts).

Sample	# of Stomata -Top	# of Stomata - Bottom
A		
B		
C		
D		
Average