Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_

** OBSERVING GUARD CELLS AND STOMATA**

Plants and animals both have a layer of tissue called the **epidermal layer**. Two bean-shaped cells called guard cells surround a tiny opening on the outer surface of the plant leaf. This opening is called a **stoma**. A stoma lets carbon dioxide (CO2) into the leaf and releases oxygen (O2) and water (H2O) into the air. **Guard cells** control the size of the stoma. When the guard cells swell, the stoma opens. When the guard cells shrink, the stoma closes. **Most guard cells and stomata are located on the underside of a leaf.** Unlike other plant epidermal cells, the guard cells contain chlorophyll to perform photosynthesis. The number of stomata on the epidermal surface can tell you a lot about a plant. Usually, a high concentration of stomata indicates fast growth and wet climate. Lower concentrations of stomata indicate lower rates of photosynthesis and growth or adaptations for dry weather.

**MATERIALS**:

2 leaves clear tape clear nail polish scissors glass slide

**PROCEDURE**:

1. Obtain 2 leaves from the plants provided (Schefflera and Oxalis).

2. Paint a thick patch (at least one square centimeter) of clear nail polish on the underside of each leaf surface.

3. Allow the nail polish to dry completely.

4. Tape clear cellophane tape to the dried nail polish patches.

5. Gently peel the nail polish patches from the leaves by pulling on a corner of the tape and "peeling" the

fingernail polish off the leaves. These are the leaf impressions you will examine.

6. Tape your peeled impressions to a very clean microscope slide. Use scissors to trim away any excess tape.

Be sure you keep straight which leaf impression belongs to which plant.

7. Examine the leaf impressions under a light microscope at 400X.

8. Search for areas where there are numerous stomata and where there is no dirt, thumbprints, damaged areas,

or large leaf veins. Count the number of stomata in the field of view:

|  |  |  |
| --- | --- | --- |
|  | Leaf #1 - Schefflera | Leaf #2 - Oxalis |
| # of stomata in field of view on HIGH power |  |  |

CALCULATION OF # OF STOMATA PER CM2 (which is about the size of your fingernail)

|  |  |  |
| --- | --- | --- |
| Measurement (high power) | Leaf #1 | Leaf #2 |
| Diameter (cm) of field of view | .045  | .045  |
| Radius (cm) of field of view |  |  |
| Area for field of view |  |  |
| # of stomata/area of field of view (cm)2 |  |  |
| # of stomata/ 1 cm2 |  |  |

\*Remember: Area = pi(r)2, so take your radius, square it, and then multiply by 3.14 unless you have a calculator with pi.

**QUESTIONS**:

1. Why are the stomata of a leaf typically open during the day and closed at night?

2. Which plant leaf would you expect to have more stomata, that of a desert plant or that of a water plant?

Explain.

3. If the guard cells on your leaves appeared to be swollen, then…………….

……….the stoma were OPEN / CLOSED (circle one)

 If the guard cells appeared NOT to be swollen, then………………..

…….....the stoma were OPEN / CLOSED (circle one)

4. Why do you think nature created stomata on the UNDERSIDE of the leaf?

5. What is **transpiration**? (Hint: see p. 681)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Why does transpiration occur? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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7. What 2 gases move in and out of the leaf stomata? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. Would you expect to find the stomata of a floating water lily on the top or bottom of the leaf?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Explain.

Sketch EACH leaf surface to show the stomata you identified. Follow the microscope drawing guidelines you know so well (plant name above the field of view, magnification data below it). On your drawings, label ***one stoma*** (open or closed), ***2 guard cells***, and the ***epidermis***.

Plant 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Plant 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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