Activity: "Botany II-Microscopes"

Lesson Objectives:	 Students will be able to: Use microscopes to look at specimens Identify plant parts seen under the microscope Make comparisons between specimens Identify what internal components make these plants strong and useful for Hawaiians
Time Required:	1 class period
Materials Needed:	Microscopes (6) Slides and glass cover slips (1 set per scope) Water and stains in dropper bottles Razors Polarizing filters
Standards Addresse	ed: Domain I: 1. Doing Scientific Inquiry 4. Doing Safety Domain II: 4. Unity and Diversity 9. Cells. Tissues, and Organs
Assessment:	 Students who: Can focus the microscope and move through all objectives Label the plant parts they see Make observations and comparisons of their cross-sections Have a good understanding of basic plant anatomy Students will also self-assess their own understanding on worksheets

Teacher Background and Instructions:

Prepare the slides ahead of time so students do not come into contact with razors and chemicals. Seal the slides with clear nail polish and store no longer than 24-hours ahead of class time.

Stains:

- **Phloroglucinol:** stains lignified and suberized cell walls red-orange. The reaction takes several minutes and works best without a coverslip. Add the coverslip after the reaction (10-12 minutes). You can leaves the stain in place or rinse it out with water. This stain contains 20% HCl so clean up any spills, especially on the microscope stage immediately.
- **IKI:** stains starch blue-black to orange, depending on the type of starch present. IKI stains nuclei a golden color. Cell walls can also stain light yellow with IKI. It is not necessary to remove IKI before viewing specimen.

- Sudan IV: stains suberized cell walls and oil in cells with a red-orange color. This stain is dissolved in alcohol, so it is best to add a coverslip immediately. The stain should be rinsed through the specimen before viewing. The stain takes a few minutes to work.
- **Toluidine Blue:** a metachromatic (many colors) stain. This stains lignified walls blue-green. Unlignified walls containing lots of pectin will stain cherry-red. However, if you over stain the specimen (leave the stain on too long before washing through), everything will stain blue. Add 2-3 drops on a slide, quickly add a coverslip and remove excess. This stain will fade over the course of the lab so specimens must be viewed right away.

Samples:

Hau (*Hibiscus tiliaceus*): use the stem of this plant to make sections. Interesting anatomical features include: the bark and inner stem. Hawaiians removed the entire bark to make a crude rope and isolated the inner bark to produce a fine cord. Fibers are lignified and associated with the secondary Phloem (conducting cells for nutrient transport).

Wauke (*Brussonetia papyrifera*): use the stem of this plant to make sections. Interesting anatomical features include: Bark Fibers (associated with the inner stem) and Bast Fibers (looks like butterflies) typically located in the outer part of the stem used to produce kapa and twine. This plant was better to make clothing with because the fibers are individual and easy to spread, flatten, and separate, unlike Hau which has clusters of fibers that feel more coarse.

Ki (Ti, *Cordyline fruticosa*): use the leaf of this plant to make sections. Interesting anatomical features include: the fibrous midrib, the waxy cuticle. Vascular bundles are associated with fibers.

Hala (*Pandanus tectorius*): use the leaf of this plant to make sections. Interesting anatomical features include: waxy and leathery leaves used for thatch, weaving, and sometimes cordage. Fibers are associated with vascular bundles, providing structural support and the basis for its utility. Leaves also contain crystals.

Name: _____

Sample Leaf Cross-section

Microscope Observations of Hau, Hala, Wauke, and Ti

1. Plant Name: _____ Plant part (circle one): leaf stem root Microscope Objective Power (circle one): 40X 100X 400X Sketch (label the parts you know): 2. Plant Name: _____ Plant part (circle one): leaf stem root Microscope Objective Power (circle one): 40X 100X 400X Sketch (label the parts you know):

3. Plant Name: _____ Plant part (circle one): leaf stem root Microscope Objective Power (circle one): 40X 100X 400X Sketch (label the parts you know): 4. Plant Name: _____ Plant part (circle one): leaf stem root Microscope Objective Power (circle one): 40X 100X 400X Sketch (label the parts you know):

5. What part of the stem anatomy makes Wauke a better plant to make kapa out of than Hau?

Use this target to rate your understanding of the following topics. Fill in the area that fits *your own* understanding best.

Bullseye= I can teach someone else this concept or skill **Middle**= I understand it, but not enough to teach it **Outer circle**= I do NOT understand this very well



