Introduction to Botany BIOL 154 – Laboratory Manual

Microscopy:

1. eyepieces or oculars
lenses that magnify 10 times
2. objective lenses
low/high-power lenses to be clicked in place by rotation, the magnification is indicated on the side of each lens
3. stage
with clamps and knobs for holding and moving the slides
4. condenser
lens system below the stage to concentrate light in the plane of the object, fixed in place or adjustable (keep near uppermost postion)
5. iris diaphragm
regulates the amount of light that passes through the condenser, adjust with protruding lever
6. fine/coarse adjustment
use coarse and then fine adjustment to focus the image
7. lamp and switch
light source, intensity can be modified on some models

Calculation the total magnification of a viewed object:

Multiply the magnification of the ocular (usually 10 times) by the magnification of the objective lens (variable), for example: 10 (ocular) x 40 (objective) = 400

Handling the microscope:

- Microscopes must be handled with care. Carry the microscope with one hand under the base and one hand grasping the arm.
- When you are done using the microscope remove any slide from the stage and wrap the power cord around the base of the microscope and put the lowest-power objective lens (4x) in place.
- Never touch the lenses. If you think your lenses need cleaning, let me know. Styrofoam and lens paper are available for cleaning. Normal tissue is too course and may scratch the lenses.

Using the microscope:

1. Always begin with the lowest-power objective in place. The high-power objectives are longer and can crack the slide, which will scratch and damage the objective lens.
2. Turn on the lamp (medium intensity).
3. Adjust the distance of the oculars to your eye distance, so that you can use both eyes to look through the oculars.
4. Put your object in place on the stage. Center it over the light hole in the center of the stage.

5. Use the coarse focus knob to find your object on the slide. When it comes into view and is roughly focused, improve the image by using the fine focus.
6. If your condenser is adjustable, move it until the image is the brightest possible. The correct setting will put it near its uppermost position, just below the stage.
7. Set the iris diaphragm. Start by opening it all the way, then gradually close it until the image has the best contrast and detail.
8. When you switch to higher-power lenses, watch from the side to avoid hitting the slide with an objective lens. Repeat steps 5 (6 and 7) to optimize the image. If you lose the specimen you should move back to a lower- powder objective lens and re-focus, then change objective lenses again.

Preparing a wet-mount slide:

- Place a drop of water on the slide.
- Place an extremely thinly-sliced specimen into the water. Reduce your cut to the tissue area of interest. Hold the blade at the correct angle for the section you want to do (90 degree angle to the stem axis for a stem cross section, in parallel to the surface for an epidermis cell layer, etc.). Do several cuts, combine them in the drop of water, and select the best one for your study.
- Hold the cover slip against the water at an angle of 45 degrees, then release. This will reduce the number of air bubbles. Air bubbles may obscure portions of the specimen. Do not squeeze your tissue by applying pressure onto the cover slip.

<u>Drawings:</u>

Material needed:
white blank paper, pencil, eraser

General recommendation:
The larger your drawings the better (easier to grade) they are. Structures should be clearly illustrated and labeled.

Labeling:
Make sure you label your drawings properly so that they can be graded and that they are useful for your study. Drawings can be used to study plant structure for the exam.
Labeling should always include:

- lab date
- your name
- title of your drawing (taken from the lab manual)
- botanical names/terms of the respective cell or tissue parts that you observe and illustrate (taken from the lab manual)

Type:
We distinguish between 2 types of drawings:

- A <u>detail</u> drawing shows <u>individual cells</u> and how they are <u>connected</u> to each other. Your detail drawing can be: single-lined, 2-lined, 3-lined (start with middle

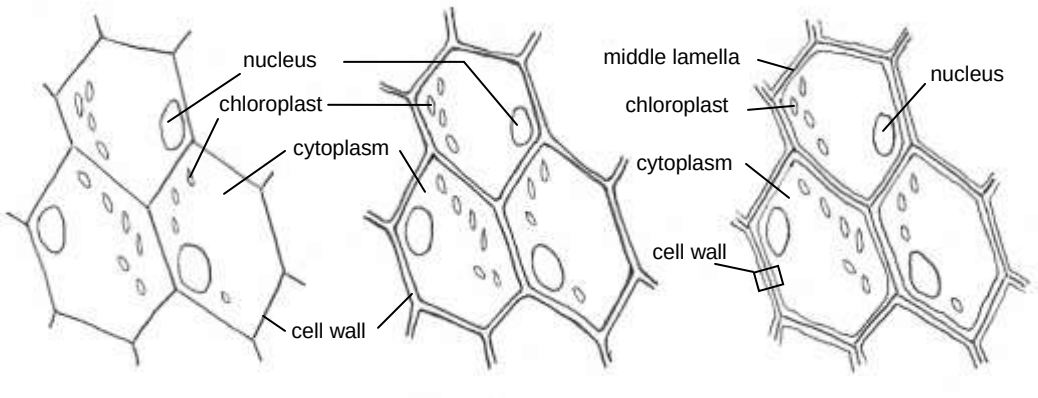
lamella and then add the cell wall line to the inside of each cell). Only a 2- or 3-lined drawing can illustrate the shape and thickness of the cell wall.

- An <u>overview</u> drawing delineates the different types of <u>tissues</u> you can see.

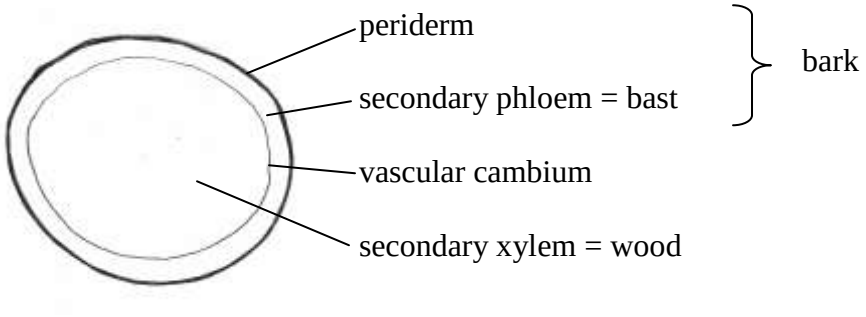
Examples:

<u>PLANT CELLS detail drawings</u>

single-lined: 2-lined: 3-lined:



<u>TREE STEM CROSS-SECTION overview drawing:</u>



Lab 1. Plant cells and tissues

Preparation/reading:

- study the introduction to microscopy and drawings at the beginning of this manual
- be able to recognize and label the following structures: cytoplasm, cell wall, middle lamella, intercellular space, parenchyma, collenchyma, sclerenchyma fiber

a) parenchyma
stem cross section - *Helianthus* sp. (sunflower)

Procedure: prepared slide

Assignment:
draw 3-4 cells (connected to each other), detail/single-lined
label: cell wall, intercellular space, cytoplasm

b) sclerenchyma fibers
stem cross section - *Helianthus* sp. (sunflower)

Procedure: prepared slide

Assignment:
draw 3-4 cells (connected to each other), detail/3-lined
label: cell wall, middle lamella, cell lumen

c) sclerenchyma fibers
stem longitudinal section – *Helianthus* sp. (sunflower)

Procedure: prepared slide

Assignment:
draw 1 cell, detail/3-lined
label: cell wall, cell lumen

d) angular collenchyma
stem cross section – *Medicago sativa* (alfalfa)

Procedure: prepared slide

Assignment:
draw 3-4 cells (connected to each other), detail/3-lined
label: cell wall, middle lamella, cytoplasm