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BIOL 1411- Botany Laboratory Manual

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Botany Laboratory Manual



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Font Size and formatting

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Botany Laboratory Manual

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This manual was reviewed by student editors, Ayanna Montegut and Ineceia Carter.

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The Plant Cell Lab

Introduction

Cells represent the basic unit of an organism. Plant cells are particularly unique because they have plastids like chloroplasts and they have cell walls made of cellulose (see [Plant Cells](#)). The purpose of this lab is to observe cells using the microscope.

Hypothesis – The plant cell will plasmolyze when placed in salt water.

<https://youtu.be/TvQNRyWIKws>

Methods

- a. Draw the microscope in your lab notebook. Label the oculars, ocular head, objectives, coarse focus adjustment knob, fine focus adjustment knob, light source, on/off switch, stage, iris diaphragm, iris diaphragm lever, and x/y axis knobs. You may also wish to review how to use the microscope when viewing a specimen <https://youtu.be/I5AWck2JL58>.
- b. View the Elodea leaf using the microscope - <https://youtu.be/LTglday5zak>. Observe the nucleus, chloroplasts, cell walls, and vacuoles of these above ground cells.
- c. Elodea cells exposed to a salt water or hypertonic solution - <https://youtu.be/FHUK4CIpHAQ>
Now draw this cell.
- d. View the Onion epidermal peel and observe below ground cells.
https://www.kuensting.org/school/bb/special_topics/microscopy/cells/onion.html

Results

In your results section you will have the following drawings. Each drawing will have a caption to tell what it is and why it is important.

- (1) A drawing of your labelled compound microscope.
- (2) A drawing of your Elodea leaf cell. Note the cell wall, nucleus, chloroplasts, and vacuole.
- (3) A drawing of your Elodea leaf cell after it has been exposed to salt water. Note the cell wall, nucleus, chloroplasts, and vacuole.
- (4) A drawing of the onion epidermal cell. Note the cell wall, nucleus, and vacuole.

Discussion/Conclusion

Refer back to the hypothesis first and tell whether the data support or do not support the hypothesis. Then discuss anything significant about your drawings.

Sample Scientific Notebook entry for The Plant Cell Lab

Introduction

The purpose of this lab is to observe cells using the microscope.

Hypothesis – The plant cell will plasmolyze when placed in salt water.

Drawing of Microscope

Methods and Results

1. Placed a drop of water on a slide then placed an *Elodea elegans* leaf on it and covered it with a coverslip (This is called making a wet mount). Then viewed it with the compound microscope and drew it below.
2. Placed a drop of salt water on a slide then placed an *Elodea elegans* leaf on it and covered it with a coverslip (This is called making a wet mount). Then viewed it with the compound microscope and drew it below.
3. Made a wet mount of onion epidermal peel. Then viewed it with the microscope and drew it.

Elodea leaf cell

Elodea elegans leaf as seen with compound microscope at 10x. Note the cell wall, chloroplasts, and vacuole.

Elodea leaf cell

Elodea elegans leaf with salt water as seen with the compound microscope at 10x. Note the cell wall and cytoplasmic material. The cytoplasm, nucleus and vacuole have pulled away from the cell wall.

Onion epidermal cell

Onion epidermal peel as seen with the compound microscope on 10x. Note the cell wall and nucleus. These cells are not exposed to light. Chloroplasts are not visible.

Conclusion – (Refer back to the hypothesis, then discuss details about each drawing.)

Mitosis Lab

Introduction

The purpose of this lab is to determine the time spent in different phases of [Mitosis](#). Complete the [Online Onion Mitosis Assignment](#) and include in your notebook. Be sure to draw the phases of mitosis. (Additional material for review [Multicellularity, Cell Cycle and Life Cycle](#)).

	Interphase	Prophase	Metaphase	Anaphase	Telophase	Total
Number of Cells						
Percent of Cells						100%

Plant Growth and Development Lab

Introduction

The purpose of this lab is to observe the growth and development of soybeans from seed to plant with flower.

Hypothesis

My _____ plant will grow from seed to flower in three weeks.

Methods

Grow your plants at home. Take a small pot and add potting soil. Record the type of soil. Place 4 soybean seeds in moist soil. Make sure the soil is loose and not packed. Place the pot in the windowsill or in a spot where it gets plenty of natural light each day. Record your results in the chart that you create and put in your results section.

Dates of Observation						
Date Planted						
Number of leaves present						
Date of first flower						
Number of flowers present						

Watch this video



[Embryo of Dicot Seeds - MeitY OLABs](#)

You can do the following with your hands and a small container of room temperature water. The plumule and the radicle constitute the plant embryo.

- a. Soak a white lima bean in water for about 4hrs – 6hrs.
- b. Peel off the seed coat.
- c. Open the two white cotyledons to reveal the plant embryo.
- d. Draw and label the cotyledons, plumule, and radicle of the open bean seed in your notebook.

Simple Tissue Lab

Introduction

The purpose of this lab is to observe the three basic cell types found in plants (see [Tissues and Organs](#)) .

Hypothesis – Each cell type will vary in its function, shape, and cell wall thickness.

Methods

View the following links and observe the parenchyma, collechyma and sclerynchyma cells.

<https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookPLANTANAT.html#Parenchyma>

[Plant Structure and Form notes](#) (OpenStax Biology textbook)

Results

Draw and label the **three basic cell types that make up simple tissues** in your notebook.

- a. Parenchyma cell
- b. Collenchyma /cell
- c. Sclerenchyma cell

Leaf Lab

Introduction

The purpose of this lab is to understand the function of and observe the arrangement of tissues in the leaf (see [Tissues and Organs](#)).

Methods

Use your microscope to view slides with cross sections of Monocot and Dicot leaves, or use the links below.

[Draw a cross section a typical Dicot and a typical Monocot Leaf and place in Scientific notebook \(click to see cross sections with included tissues\).](#)

Monocot Leaf

Dicot Leaf

For leaf label where applicable – upper epidermis, lower epidermis, spongy mesophyll, palisade mesophyll, undifferentiated mesophyll, mid vein, vein.
Label each tissue and write the function of each.

[Plant Structure and Form notes.](#)

Stem Lab

Introduction

The purpose of this lab is to understand the function of and observe the arrangement of tissues in the stem (see [Tissues and Organs](#)).

Methods

Use your microscope to view slides with cross sections of Monocot and Dicot stems, or use the links below.

[Draw a cross section a typical Dicot stem and a typical Monocot Stem place in notebook \(click to see cross sections and tissues\).](#)

Dicot stem

Monocot stem

For stem label where applicable - epidermis, cortex, pith, vascular bundle, ground tissue.
Label each tissue and write the function of each

[Plant Structure and Form notes.](#)

Additional Resource. <http://www.biology4friends.org/plant-microscope-exercise.html>

Root Lab

Introduction

The purpose of this lab is to understand the function of and observe the arrangement of tissues in the root (see [Tissues and organs](#)).

Methods

Use your microscope to view slides with cross sections of Monocot and Dicot roots, or use the links below.

[Draw a cross section a typical Dicot root and a typical Monocot root place in notebook \(click to see cross sections and tissues\).](#)

Dicot root

Monocot root

For root label where applicable – epidermis, cortex, pith, vascular bundle, ground tissue, endodermis, phloem, xylem. Label each tissue and write the function of each

[Plant Structure and Form notes.](#)

Additional Resource. <http://www.biology4friends.org/plant-microscope-exercise.html>

Evolution of Land Plants Lab

Click on the link below to review the evolution of land plants. In the video please pay particular attention to the four plant groups on land. Also pay particular attention to the characteristics common to each plant group.

[Plant Evolution](#)

Draw the cladogram showing the relationship between each plant group and their major characteristics. The following link will be helpful.

Bryophyte Lab

[Bryophyte Mini Lecture](#)

[Bryophyte Life Cycle video](#)

Draw the life cycle and label the major structures in the gametophyte and sporophyte generations.

Fern Lab

[Fern Mini Lecture](#)

[Fern Life Cycle and video](#)

Fern [Life](#) Cycle

Draw the life cycle and label the major structures in the gametophyte and sporophyte generations.

Gymnosperm Lab

[Gymnosperm video](#)

[Gymnosperm notes](#)

Draw the life cycle and label the major structures in the gametophyte and sporophyte generations.

Angiosperm Lab

[Angiosperm Life Cycle](#)

[Angiosperm notes](#)

[Reproduction](#)

Draw the life cycle and label the major structures in the gametophyte and sporophyte generations.

Appendix

The following are resources that may be beneficial for you:

A. Writing a Lab Report -

- a. **Scientific Reporting for the Lab Research Notebook**
- b. Write in pen.
- c. On the outside of the Research notebook put your name, section number, and email address.
- d. Each Lab will have a title page and a date for the experimental exercise.
- e. The first page of the notebook is left blank.
- f. The second page of the notebook will be the table of contents.
- g. Each page following the Table of Contents will have a page number in the bottom right corner.
- h. The first page after the Table of Contents will be page number "1".
- i. Do not write on the back of the page.
- j. Understand what you are to do before you begin writing.
- k. Be sure to include the following sections for each Lab.

The following was modified from this site: <https://writingcenter.unc.edu/tips-and-tools/scientific-reports/>. Additional information can be found by visiting this site.

Section	Scientific method step	As well as...
Introduction	State your hypothesis.	Explain your hypothesis and how it connects to previous research. Give the purpose of the experiment.
Methods	In paragraph form write the steps regarding how you tested your hypothesis.	Clarify why you performed your study in that particular way.
Results	Provide the raw data collected.	Present data in a table or graph or figure. It must be labelled and easy-to-read.
Conclusion and/or Discussion	Tell whether the data you obtained support the hypothesis	Explain and interpret the data. Explore the implications of your findings and potential limitations.
Overall Neatness and order	Write clearly and in order. Include all lab exercises with Table of contents and page numbers. Writing on front page only. Follow instructions.	All pages are neat (colored pencils are extra). Very few mistakes included.

B. How to use the Compound Microscope - https://youtu.be/lo2aC_m2vvyo

- a. [How to focus the microscope.](#)
- b. View the letter “e”. Draw it.
- c. View onion epidermal cells. Draw one.

C. Plants and Their Structure -

<https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookPLANTANAT.html#Table%20of%20Contents>

D. Additional Resources for Botany Lab and Lecture

[Plant Biology Textbook - From Growing to Biology: Plants 1e](#)

[https://bio.libretexts.org/Bookshelves/Botany/Introduction_to_Botany_\(Shipunov\)](https://bio.libretexts.org/Bookshelves/Botany/Introduction_to_Botany_(Shipunov))

<https://labs.plb.ucdavis.edu/courses/bis/1c/text/PLANTBIOLOGY2.htm>

<https://www.learnpick.in/prime/documents/ppts/botany>

[https://bio.libretexts.org/Bookshelves/Botany/A_Photographic_Atlas_for_Botany_\(Morrow\)](https://bio.libretexts.org/Bookshelves/Botany/A_Photographic_Atlas_for_Botany_(Morrow))

[https://bio.libretexts.org/Bookshelves/Botany/Botany_Lab_Manual_\(Morrow\)](https://bio.libretexts.org/Bookshelves/Botany/Botany_Lab_Manual_(Morrow))

https://archive.org/details/elements_of_botany_1805_librivox

https://archive.org/details/elements_botany_1103_librivox

<https://www.gutenberg.org/cache/epub/49211/pg49211-images.html>

<https://youtu.be/HQ6ScNaBX6M> (Meiosis video)