

LAKEHEAD UNIVERSITY

BIOL-1130-FA



Plant Biology
Laboratory Manual
Fall 2016

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A. About the cover

Will you find your balance and succeed in Plant Biology? Attending all lectures, labs, and using your time wisely are keys to success in this course. This term we will cover a substantial amount of material, learn a new vocabulary, and touch on key concepts as we survey the diverse plant kingdom. Upper year botany courses will delve into the details we can only introduce to you this semester.

Photo of Megan Clark, former Plant Biology TA, on a field trip at Hurkett Cove Conservation Area for Wetland Ecology (BIOL4430). The fascinating world of plants awaits your keen interest!

B. About this manual

Although many exercises are original and have a “northern” flavour, the contents of this lab manual are in large part borrowed, expanded, or shortened versions of botany exercises typically presented in first year. I would like to express special thanks to James Schaefer, Diana Abraham and Lynn Ruxton for their efforts on earlier versions of this manual.

Each year students perform a new experiment, providing data for their scientific poster. Assignments, quizzes, and drawings also change year-to-year. Therefore, any older versions of the lab manual for this course should be recycled!

Take time to explore the materials in each lab, rather than just glancing at them and taking a picture. Touch and feel; observe and understand!

Ancient Chinese Proverb:

I hear and I forget,
I see and I remember,
I touch and I understand.

Modern American Proverb:

The illiterate of the 21st century will not be those who cannot read and write,
but those who cannot learn, unlearn, and relearn.

-Alvin Toffler

C. Syllabus

a) Course description

An introduction to plant diversity stressing the evolution of plants. Comparative morphology of vegetative and reproductive structures will be emphasized. Topics will also include functional anatomy, photosynthesis and respiration.

This course consists of **3 hours of lecture** and **3 hours of lab** each week and is worth 0.5 course credits.

b) Textbooks

The required texts are:

- This **2016 Lab Manual**. Old versions are NOT acceptable. Purchase via bookstore. A PDF colour version will be posted on MyCourseLink for download to devices. Black and white bookstore purchase will be more economical than printing it out at home.
- **Stern's Introductory Plant Biology, 13th edition** from McGraw Hill (Bidlack and Jansky, 2014). Older editions or other first year plant biology textbooks will suffice.

The book **A Photographic Atlas for the Botany Laboratory, 7th ed.** from Morton Publishing is highly recommended. Older editions are fine. Compare your edition with those of TAs during your lab sessions. An Errata for the 7th edition is posted on MyCourseLink (D2L).



PLEASE WRITE YOUR NAME AND/OR EMAIL ADDRESS IN ALL YOUR BOOKS. If they are left behind in a lab or lecture we **WILL** contact you.

c) **Laboratory topics for BIOL1130FA**

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Table 1: Laboratory schedule. Labs start the week of September 12; NO labs week of September 5! **Tuesday sections are F1, F2, F3, F5 and Thursday sections are F4.** Fall term courses commence Tuesday September 6 and end Monday December 5. The final date to register is Monday September 19 and the final date for withdrawal is Monday November 7. Quizzes close at 8:30 am on Tuesdays, unless otherwise specified. See MyCourseLink for changes. Assignments and posters are due as scheduled. See this lab manual for details

PART 1	FORM and FUNCTION	Tuesday / Thursday
Lab 1	Field of Plant Biology Be prepared to go outside!	Sept. 13 / Sept. 15
Quiz 1		Closes Sept. 23
Assignment 1	In lab activity	Sept. 20 / Sept. 22
Lab 2	Cells, Tissues, Mitosis, Meiosis	Sept. 20 / Sept. 22
Quiz 2		Closes Sept. 27
Lab 3	Plant Organs (Stems, Roots, Leaves)	Sept. 27 / Sept. 29
Assignment 2	Distributed Sept. 27/29	DUE Oct. 7 4:30 pm
Quiz 3		Closes Oct. 4
	Mandatory Attendance	Oct. 4 / Oct. 6
Lab 4	Practising the Scientific Method	Oct. 4 / Oct. 6
NO LABS	FALL READING WEEK	Oct. 10–14
PART 2	SURVEY of PLANTS and THEIR PREDECESSORS	
Assignment 3	Due during lab	Oct. 18 / Oct. 20
Lab 5	Cyanobacteria and Algae	Oct. 18 / Oct. 20
Quiz 4		Closes Oct. 25
Lab 6	Non-Vascular Plants	Oct. 25 / Oct. 27
	SCIENTIFIC POSTERS DUE AT NOON ON SATURDAY!	Oct. 29
Lab 7	Seedless Vascular Plants	Nov. 1 / Nov. 3
Quiz 5		Closes Nov. 8
Lab 8	Seed Plants: Gymnosperms	Nov. 8 / Nov. 10
Lab 9	Seed Plants: Angiosperms	Nov. 15 / Nov. 17
Quiz 6		Closes Nov. 22
Lab 10	Review lab	Nov. 22 / Nov. 24
Lab 11	FINAL LAB BELL RINGER EXAM	Nov. 29 / Dec. 1
BONUS	TO BE ANNOUNCED!	

d) Lecture topics for BIOL1130FA

Lecturer: Dr. Peter Lee
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Table 2: Lecture schedule. Lectures are M-W-F, 11:30-12:30 pm, UC2011. Students are responsible for reading material in the chapters indicated. Fall term biology courses commence Tuesday September 6 and end Monday December 5. The final date to register is Monday September 19 and the final date for withdrawal is Monday November 7.

Week of:	Topics	Textbook chapters
Sept. 5	Introduction, Plant Cells	1, 3
Sept. 12	Tissues, Mitosis	3, 4
	Meiosis, Alteration Generations	12
Sept. 19	Roots	5
	Stems	6
Sept. 26	Stems, Leaves	6, 7
Oct. 3	Classification	16
	Origin of Eukaryotes	17
	Selected Algae	18
WEDNESDAY OCTOBER 5: TERM TEST 1		
FALL READING WEEK, NO CLASSES OCT. 10-14		
Oct. 17	Bryophytes	20
Oct. 24	Bryophytes, Seedless Vascular	20, 21
Oct. 31	Seedless Vascular Plants	21
Nov. 7	Gymnosperms	22
FRIDAY NOVEMBER 11: TERM TEST 2		
Nov. 14	Angiosperms	8, 23
Nov. 21	Photosynthesis, Respiration	10
Nov. 28	Water in Plants	9
Dec. 5	Growth	11
As per scheduling: TERM TEST 3		



Quizzes and Assignments are outlined in this lab manual. Check your due dates! Attending your lab session is the best way to keep up with lab requirements.

e) **Marking scheme**

LECTURE:	TERM TEST 1	20.0%
	TERM TEST 2	20.0%
	TERM TEST 3	20.0%
LABORATORY:	ASSIGNMENTS (3)	7.5%
	MyCourseLink QUIZZES (6)	7.5%
	POSTER (1)	10.0%
	FINAL BELL RINGER LAB EXAM (1)	15.0%

Lecture tests MUST be written during the assigned date and time! Term Test 1 DOES NOT include Algae. Term Test 2 covers Algae to Gymnosperms. Term Test 3 covers Angiosperms to end of term. Questions are derived from, but not limited to, material presented in lecture, textbook(s), and labs. Formal paperwork IS required if you miss a test or exam due to illness or family emergency. **DO NOT SCHEDULE EVENTS or TRAVEL DURING TERM TEST DATES OR ANYTIME DURING THE FORMAL EXAM PERIOD!**



Quizzes are administered via D2L. You have sufficient time between labs to complete them, so missed quizzes CANNOT be made up. You are allowed 10 attempts for each quiz and only your highest mark for each quiz recorded. Aim for a perfect score! Quizzes are a great opportunity to test your knowledge of lab material! The style of many questions is VERY similar to those on the bell ringer.

Assignments are given this term DURING the lab section for which YOU have registered. Assignments may vary between lab sections. Assignments cannot be made up. Late assignments are assessed a 10% per day penalty.



Your individual **scientific poster** is worth 10%. The content is based on a research experiment which YOU CONDUCT during lab (i.e. you MUST participate; attendance will be taken!) A PDF copy of your poster is submitted on-line via MyCourseLink (D2L) DropBox. Although experiments are conducted in groups, EACH STUDENT must submit an original presentation of their work. A marking rubric will be provided. Review Lab 4 for additional details. The deduction for a late scientific poster (provided an extension is granted) will be 10% per day (including weekends).

f) **Grading policy****Tests and exams**

- You MUST have your student ID available during all tests and exams. You WILL be asked to show it.
- The final bell ringer **MUST** be written in pen to be eligible for mark revision.
- Drawing assignments may be done in pencil, although labels should be in ink.
- Electronic marking forms (ParSCORE sheets/Scan-Trons) for lecture tests **MUST** be filled in using a soft lead pencil, enabling you to erase and correct any mistakes. The



student must supply both pencil and a suitable eraser. See Fig. A.1 for an example. If you make a mistake that cannot be erased, fill in a new sheet! You should also circle answers on the test paper itself. There is no penalty for incorrect answers (so guess!)

- Exams papers MAY NOT be taken from the room. The ParSCORE sheet is to be tucked inside the first page of the exam page. Ensure your name is on BOTH pages.
- Lectures and labs are **NOT** separate courses; you are responsible for all material covered for ALL quizzes, tests, assignments, and the poster.
- Addition errors in marking are to be given to the lab technician for correction THE SAME DAY as they are handed back.
- If you feel you deserve additional marks for a question, be prepared to argue why! Submit your written argument to the lab technician for re-marking. **Warning:** Your ENTIRE paper will be remarked and your new mark may end up lower!
- If a quiz, assignment, test, poster or due date is missed, the lab technician or professor (lab or lecture, respectively) must be notified **IMMEDIATELY** before you will be **considered** for any “make up” test, quiz, or assignment! After initially notifying the instructor. A doctor’s certificate may be requested.
- Sleeping in, forgetting or being “too busy” with other work DO NOT warrant consideration for a “make up” test, assignment, or quiz.
- The use of cell phones and other electronic devices (including smart watches/devices) is FORBIDDEN during tests and exams. Please turn them off!
- The use of cell phones and other electronic devices (including smart watches/devices) is FORBIDDEN until you have handed in your paper and you have left the room. Please keep them off!
- During exams and tests, ALL books, water bottles, and miscellaneous paraphernalia MUST be stored in sealed bags and stored UNDER THE DESKS; the desk MUST be cleared before quizzes and tests begin. THIS INCLUDES CELL PHONES and other smart devices. Do not remove ANY items from you bags until the time has ended, TAs have collected all papers or you have handed your paper to an invigilator AND you have exited the room.
- For the lab bell ringer, a writing time schedule will be posted outside the labs (grey cabinets) AND on MyCouseLink AND emailed to you. Your specific writing time occur during your regular lab section, so there will be no conflicts. Arrive 5 min early and line up outside CB3015.
- During the bell ringer all water bottles, jackets, brimmed hats, phones, smart devices, and extraneous materials MUST be stored in a closed bag on the back benches as instructed by TAs. YOU ONLY NEED A COUPLE PENS FOR THIS EXAM!! Valuables should never be left in the hallways. The department is not responsible for lost or stolen items. Leave valuables at home or in a locker.
- Reproduction of online quizzes, tests, or exams (i.e. taking pictures or screen shots) is strictly forbidden as this is an infringement of copyrighted material.

g) Student conduct

With regards to your responsibility as a student, [Code of Student Behaviour and Disciplinary Actions](#) for Lakehead University students. These pages include information for Academic Misconduct and Sanctions. Also review the university policies for <https://www.lakeheadu.ca/current-students/examination>, including those missed due to illness. In the event you are ill, please review the <https://www.lakeheadu.ca/current-students/student-services/tb/health-and-counselling/centre-policies-committees/medical-certificates>.

Assignments and poster

Assignments are due throughout the semester. Some are due **BEFORE** you leave the lab and **MUST** be handed to TAs at the time. Other assignments are reliant on material learned in the lab and will require further refinement. All assignments have due dates that will be strictly adhered to. A 5% per day deduction (including weekends) will be applied to take-home assignments and the poster.

D. Introduction to our laboratory program

a) Welcome

Biology is the **science** of life. This course in Plant Biology (Botany) will familiarize you with the evolution and diversity of plants, bring to your attention their crucial ecological role on this planet, and engage you in the critical thinking practiced by biologists.

Do you consider plants as being quite different from “higher” animals? Why? Perhaps this ASAP Science video (<http://www.youtube.com/watch?v=u2GWd2j3qJ8>) will change your view. Topics explored in labs and lectures generally coincide. However, lab activities provide additional opportunities for you to learn by seeing, doing, and asking questions of yourself, fellow students, and lab instructors.

If you really love plants after this course, watch for a release of the Department of Biology’s new concentration in Plant Sciences (program code=BIPL)!

b) Overview of lab activities

Nine (9) lab sessions, a review session, and a bell ringer exam are scheduled this term (Table 1). All lab material cannot be displayed during the review. However, any material, images, slides, etc. that were accessible during your lab time slot may appear on the bell ringer exam. Therefore, spend YOUR weekly lab sessions wisely! Complete sketches, answer questions, and complete assignments found in this manual. Make summary charts and study cards. Attempt all quizzes multiple times. Add additional notes and drawings to help YOU learn the material. Taking pictures of material and/or leaving early HAS NOT been a