Lakehead University

BIOL-1130-FA

Plant Biology

Laboratory Manual

Fall 2017

Course Instructor:
TBD

Laboratory Technician:
Dr. Susanne E. Walford

STUDENT'S NAME

Contents

A. About the cover

The first section of the course introduces you to plant form and function. The second section part goes through the major groups of plants and their predecessors. By the end of the course (i.e. the bell ringer exam) you should be able to recognize and classify each of the specimens on the front cover! Which is a bacteria and which are plants (kingdom Plantae)? All photos copyright S.E. Walford.

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 and collect data for a scientific poster. Assignments, quizzes, and drawings also change year-to-year. Therefore, any older versions of the lab manual for this course should be discarded!

Take time to explore the materials in each lab rather than just glancing at them and taking pictures. 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 21^{st} 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) Required materials

The required texts are:

- This **2017 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, 14th edition** from McGraw Hill (Bidlack and Jansky, 2018). Older editions or other first year plant biology textbooks will suffice.
- iClickr 2 remotes.

BRING YOUR LAB MANUAL, TEXTBOOK, and iClickr REMOTE TO EVERY LAB! Bring your iClickr to ALL LECTURES!

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

Lab Technician: Dr. Susanne E. Walford
Office: CB3014A
Phone: 343-8593
Email: swalford@lakeheadu.ca

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 courses begin Tuesday September 6 and end Monday December 5. Final registration date is Monday September 19, withdrawal date is Monday November 7. Quizzes close at 8:30 am on Tuesdays, unless otherwise specified. 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. 12 / Sept. 14
Practice Quiz	(no marks)	Closes Sept. 22
Assignment 1	In lab activity	Sept. 19 / Sept. 21
Lab 2	Cells, Tissues, Mitosis, Meiosis	Sept. 19 / Sept. 21
Quiz 1		Closes Sept. 25
Quiz 2		Closes Sept. 26
Lab 3	Plant Organs (Stems, Roots, Leaves)	Sept. 26 / Sept. 28
Assignment 2	Distributed Sept. 26/28	DUE Oct. 6 4:30 pm
Quiz 3		Closes Oct. 3
	Mandatory Attendance	Oct. 3 / Oct. 5
Lab 4	Practising the Scientific Method	Oct. 3 / Oct. 5
NO LABS	FALL READING WEEK	Oct. 10–14
PART 2	**SURVEY of PLANTS and THEIR PREDECESSORS**	
Assignment 3	Due during lab	Oct. 17 / Oct. 19
Lab 5	Cyanobacteria and Algae	Oct. 17 / Oct. 19
Quiz 4		Closes Oct. 24
Lab 6	Non-Vascular Plants	Oct. 24 / Oct. 26
Lab 7	Seedless Vascular Plants	Oct. 31 / Nov. 2
SCIENTIFIC POSTERS DUE AT NOON ON FRIDAY!		Nov. 3
Quiz 5		Closes Nov. 7
Lab 8	Seed Plants: Gymnosperms	Nov. 7/ Nov. 9
Lab 9	Seed Plants: Angiosperms	Nov. 14 / Nov. 16
Quiz 6		Closes Nov. 21
Lab 10	Review lab	Nov. 21 / Nov. 23
Lab 11	**FINAL LAB BELL RINGER EXAM**	Nov. 28 / Nov. 30
BONUS	TO BE ANNOUNCED!	

d) Lecture topics for BIOL1130FA

Lecturer: TBD
Office: TBD
Phone: TBD
Email: TBD

Table 2: Lecture schedule. Lectures are M-W-F, 8:30-9:30 am, AT1003. Students are responsible for reading material in the chapters indicated. Fall term biology courses commence Tuesday September 5 and end Monday December 4. The final date to register is Monday September 18 and the final date for withdrawal is Friday November 3.

Week of:	Topics	Textbook chapters
Sept. 4	Introduction, Plant Cells	1, 3
Sept. 11	Mitosis, Tissues	3, 4
	Meiosis, Alteration Generations	12
Sept. 18	Roots and Soils	5
	Stems	6
Sept. 25	Stems, Leaves (intro photosynthesis)	6, 7
Oct. 2	Classification	16
	Origin of Eukaryotes	17
	Selected Algae	18
WEDNESDAY OCTOBER 4: TERM TEST 1		
FALL READING WEEK, NO CLASSES OCT. 9-13		
Oct. 16	Bryophytes	20
Oct. 23	Bryophytes, Seedless Vascular	20, 21
Oct. 30	Seedless Vascular Plants	21
Nov. 6	Gymnosperms	22
FRIDAY NOVEMBER 10: TERM TEST 2		
Nov. 13	Angiosperms, Flowers, Fruits	8, 23
Nov. 20	Water in Plants	9
Nov. 27	Metabolism	10
Dec. 4	Growth and Development	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)	10.0%
PARTICIPATION:	iClicker quizzes (TBD)	5%

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 MyCourseLink. 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 DURING the lab section for which YOU have registered. Assignments may vary between lab sections and most are due BEFORE you leave the lab. Assignments cannot be made up. All assignments have due dates that will be strictly adhered to. 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 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 poster due dates will be strictly adhered to. The deduction for a late scientific poster (provided an extension is granted) will be 10% per day (including weekends).

The **bell ringer** exam is held during the last week of classes. You MUST write during your scheduled lab section.

Participation marks via iClickr 2 remotes will held randomly during the labs and/or lectures. These assessments cannot be made up. Obtaining another students iClickr and using it to obtain them marks, or providing your remote to another student to obtain you marks is considered academic dishonesty. Other courses in the Department of Biology use the same remotes, so you can use the device for multiple courses during your academic career.

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 on the ParSCORE/Scan-Tron sheet 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 COVER PAGE of the exam. 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 **s**hould 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 is an infringement of copyrighted material.

g) Student conduct

With regards to your responsibility as a student, https://www.lakeheadu.ca/faculty-and-staff/policies/student-related/code-of-student-behaviour-and-disciplinary-procedures for Lakehead University students. These pages include information for Academic Misconduct and Sanctions.

Review the university policies for Student Examinations at https://www.lakeheadu.ca/current-students/examination.

If you become extremely ill or incapacitated and cannot write an exam, review the Certificates of Illness or Incapacity Guidelines. .

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