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This lab manual belongs to:

______________________________________________________________________________

My lab section: __________ Day: __________ Time: __________

My TA: ________________________________________

*Recent contributions to the Plant Biology (SC/Biol 2010 3.0) lab manual by Milissa Elliott, Deborah Frecle, Christopher Luszczek, Maryam Mouzami-Goudrazi, and Mark Verschoor are gratefully acknowledged.
Course information

Overview
This course provides you with an introduction to the field of botany. The lectures cover plants, algae, fungi and prkaryotes (structure, function, and diversity; life-cycles; ecology; relevance to human society). The laboratories illustrate key aspects of the lectures.

Course Director
Dawn R. Bazely, Room 206 LB, 416 736-2100 ext. 66114
Email: dbazely@yorku.ca
Website: http://moodle.yorku.ca/ login to the 2009-2010 server

Laboratory Coordinator
Chris Laszewczuk
Email: plants@yorku.ca, Office hours by appointment only.

Lectures
MWF 9:30 - 10:30 p.m. Vari Hall B
Website
http://moodle.yorku.ca/ login to the 2009-2010 server
https://moodle09.yorku.ca/moodle/ with your passport York username
http://www.yorku.ca/plants (this is the old website with some useful material)

Clickers
We are using clickers to track participation. Clickers can be bought new (William Small Centre) or used (at the end of the first week of classes).
If you already own a clicker, you can use it here.

Laboratories
M-R 2:30 p.m. - 5:30 p.m; 6:30 p.m. - 9:30 p.m. 124 LB
Mark Distribution
Two Term Tests 25% total (10% for lowest mark, 15% for highest)
Final Exam 30%
Class participation 5%
Laboratory 40%

Textbook

Laboratory Schedule – see public Google Calendar for the course – important dates will be uploaded to it:
http://www.google.com/calendar/embed?src=viduy51u9991moqbqhtlo6u70a%40group.calendar.google.com&ctz=America/Toronto&ust=1309530578451&usetz=1&mode=ics

<table>
<thead>
<tr>
<th>Week</th>
<th>Scheduled lab(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 9 - 13</td>
<td>Lab 1 – Photosynthesis</td>
</tr>
<tr>
<td>Jan 18 - 22</td>
<td>Lab 2 – Algae AND Lab 3 - Fern life cycle*</td>
</tr>
<tr>
<td>Jan 25 - 29</td>
<td>Lab 4 – Fungi**</td>
</tr>
<tr>
<td>Feb 1 - 5</td>
<td>Lab 5 – Bryophytes</td>
</tr>
<tr>
<td>Feb 8 - 12</td>
<td>Lab 6 – Seedless Vascular Plants</td>
</tr>
<tr>
<td>Feb 22 - 26</td>
<td>Lab 7 – Gymnosperms</td>
</tr>
<tr>
<td>Mar 1 - 5</td>
<td>Lab 8 – Pollen Identification</td>
</tr>
<tr>
<td>Mar 8 - 12</td>
<td>Lab 8 – Pollen Identification and Pollen Tube Growth</td>
</tr>
<tr>
<td>Mar 15 - 19</td>
<td>Lab 9 – Angiosperm Anatomy Project Week I ***</td>
</tr>
<tr>
<td>Mar 22 - 26</td>
<td>Lab 10 – Angiosperm Anatomy Project Week II</td>
</tr>
<tr>
<td>Mar 29 - Apr 2</td>
<td>Make-up (may be used for Lab Quiz)</td>
</tr>
</tbody>
</table>

*Note – The Fern life cycle lab extends across several weeks.
**Note – The fungal sex lab is in the lab. manual but is not part of this year’s course.
***You will be required to obtain a flowering plant for study in the Angiosperm Project.

1 In the event of an absence from a term test, please provide a letter stating that you were absent, and acknowledging that the weight of the missed term test (15%) will be added to the weight of the final exam.
Safety Practices

1. Absolutely no eating or drinking is permitted in laboratories. (This includes bottled water!)
2. Safety glasses are **required** for many of the labs.
3. It is suggested that latex gloves be worn when handling preserved or hazardous material. Disposable gloves will be provided when necessary and they should be put in the appropriate garbage bin at the end of each laboratory session.
4. Laboratory rooms are to be left clean and tidy and all waste must be discarded in the appropriate labeled containers.
5. Lab coats should be worn in all laboratories.

Laboratory mark distribution:

Photosynthesis - Write-up (5%)
Algae – Drawing – will be covered in lab quiz
Fern Life Cycles - Write-up (10%)
Fungi - Write-ups (5%)
Bryophytes - Microscope use - will be covered in lab quiz
Seedless Vascular Plants - Drawing – will be covered in lab quiz
Gymnosperms - will be covered in lab quiz
Pollen Identification – (Identification and Pollen Tube Growth Write-ups, – will be covered in lab quiz)
Angiosperm Anatomy Project I
Angiosperm Anatomy Project II – Lab report (10%)
Lab quiz(zes) (10% total)
#1: Algae, Fungi 5%
#2: Bryophytes, SVP, Gymnosperms 5%

*Note: Dates and times of lab quizzes and lecture quizzes to be announced*

TOTAL = 40%
General Information

Introduction

These laboratory sessions are designed to introduce you to a range of organisms which in the past were all recognized as "plants". Today, many of these organisms are known to have little relationship to the kingdom Plantae (some being closer relatives of animals than plants!) but we have included them in this course because of tradition. Even so, they are fascinating and intrinsically interesting - as are the true plants to which this course is mainly devoted. The laboratory exercises are designed to support material introduced in lecture, and provide students with the opportunity to work with actual specimens.

The student’s attitude to laboratory study is an important factor in determining how well the session will go. If the student is interested in learning, is willing to put in time and effort, and take ownership of their learning, it will be a rewarding and enjoyable experience. Many of the laboratory exercises are self-directed, and students have found that their performance in the lab component is correlated with the time and effort put into the lab.

Laboratory Administration

The laboratory sessions are under the general supervision of the laboratory coordinator. This is the person you should see about any questions or problems associated with the administration of the lab or about any other situation that you cannot resolve with your demonstrator.

There are only a few rules that are necessary for the smooth functioning of the lab.

1. You will not be excused from labs except for valid documented reasons. If you miss a session you might be able to make it up, but you must see the laboratory coordinator, for written permission if such an arrangement becomes necessary. A student may change their lab day only if space is available at another time.

2. Follow standard laboratory safety precautions as outlined on page 10 and as indicated in certain specific lab exercises, or as instructed by your demonstrator.

3. Always consider others and leave the room at least as neat as you found it. Do not wait for your demonstrator to ask you to clean up; take the initiative to do this yourself and make sure that your microscope lenses and stage are perfectly clean and that equipment is returned to its proper storage place.

Additionally, always make sure that you dispose of paper, tissue, utensils, etc. appropriately in the correctly labeled container - paper, sharps, glass, etc.
Laboratory Procedure

1. Prompt and regular attendance at the laboratory sessions is essential to allow adequate time to complete the activities.

2. Always prepare for the lab exercise by reading through the protocol and then come to the lab with questions about anything which you do not understand.

3. Please feel free to consult with your lab colleague and to exchange information about the lab exercise with other students and with your instructor and demonstrator. However, do not expect them to be able or willing to answer everything you ask. Some questions may be unanswerable. Additionally, we expect you to think independently and to do your lab work mostly on your own.

Laboratory Assessment

It is important to arrive at the lab session prepared, having read the appropriate lab manual content. In some labs, there will be a pop quiz at the beginning of the lab. (If you have prepared for the lab, you should not have a problem with the pop quizzes!)

For those laboratories devoted to the study of diversity of organisms (labs 2 through 6), your knowledge of this material will be assessed in the lab write-ups, drawings, and quizzes. During the labs dealing with diversity (2-6) you should concentrate on observation, including drawings, diagrams and note-taking about the organisms you are studying. Take advantage of the opportunity to practice your drawing (dealt with below under Techniques). You may be expected to identify organisms using a key, so make sure that you are familiar with the use of keys prior to the lab exam.

Labs 8-9 and 10-11 are not to be written up as “formal” lab reports but they should have an Introduction, a Methods and a Results section. The Results section should describe your findings and your interpretation of your results. More details are provided in the lab protocol.

The laboratories form a very important part of the course, being worth, in total 40% of your final overall grade.

A student who is not satisfied with the grading of a laboratory submission should first speak with the TA. If satisfaction is not achieved, the student should submit the work to the lab coordinator for independent reappraisal, including a note (signed by the TA) attesting that the work has been discussed with the TA. This MUST be done within 14 days of the work being returned to the student. Please note: reappraisal may result in the original grade being raised, lowered or confirmed.
Techniques

There are several techniques that you will need to learn if you are to do well in this course.

a) The Microscope. Review the use of the microscope and make sure that you know the correct way to operate both the compound and the dissecting microscope, including the use of an oil immersion objective.

Operation of the Microscope: Kohler Illumination

1) Move the condenser upwards until it is a few millimeters below the stage.
2) Use the 10x objective to do this procedure.
3) Place a slide on the stage and focus on the edge of it.
4) Close the field diaphragm (it is on the base of the microscope) until there is a tiny circle of light. You may need to close the condenser diaphragm (using the lever on the side of the condenser) to see the circle of light.
5) Focus the condenser (using the small knob to the left of the stage). Focus until the circle of light has a sharp outline.
6) Open the field diaphragm a small amount, then use the two keys on the front of the condenser to center the circle of light in the field of view.
7) Open the field diaphragm until the light fills the entire field of view.
8) The microscope should now be ready for use. You may have to focus and center the condensor as you move from one objective to another.

b) Preparing a wet mount. Using a pipette, place a few drops of your sample on a cleaned glass slide. Then place a cover slip over the liquid, being careful to put one edge of the cover slip down in the liquid first. Then let the other end down slowly so that you drive out most of the air bubbles. It often helps to lower the cover slip with forceps. (It also helps to learn to recognize air bubbles so that you do not spend valuable time looking at and drawing them!) Sometimes you might want to stain a specimen already mounted on a slide. You can do this by placing a drop of the preferred stain at an edge of the cover slip and then by drawing the stain across the specimen droplet by placing absorbent paper at the opposite side of the cover slip.

c) Drawings - There are a number of very good reasons for making drawings as part of a biology laboratory exercise. Probably the most important reason is that before you can make a useful drawing you must observe your specimen closely and accurately. Secondly, your drawings will form an important record of what you have seen and will be invaluable as study aids. Drawings are infinitely preferable to photographs, as a drawing can be a composite representation of your cumulative experience with your specimen whereas a photograph represents the appearance of the specimen at a single moment in time.

Although we will not be marking your drawings every week, you may be required to submit your drawings on occasion for grading and feedback. Also, you will be given marks for quality of your drawings in the lab write-ups.