

# BIOL 2910 WA: Laboratory Biology

Department of Biology, Lakehead University

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**Lab/Lectures:** Thursdays and Fridays, 2:30-5:30 (6 hours per week)  
Centennial Building, CB3012

This syllabus is valid for the course offered on the Thunder Bay campus, 2023 Winter Term.

## Course Outline

### Rationale

This is a laboratory course intended to provide the students with a broad background in Biology including microbiology and molecular biology laboratory practices, and theory. The course will cover major laboratory methods including basic microbiology techniques, development of basic laboratory skills, various techniques in molecular biology, reporting scientific research with statistical application, and visiting research Labs.

### Objectives of the Course

- Provide students with an understanding of important facts, concepts, and the investigative procedures of a microbiology and molecular microbiology laboratories.
- Train students in the proper use and maintenance of the research grade laboratory equipment.
- Train students in aseptic technique, prophylaxis, and the proper methods relating to the safe manipulation and maintenance of microorganism.
- Train students in fundamental laboratory methodology to include the use of different media, metabolic/enzymatic testing and associated reagents.
- Fundamental concepts and practical usage of instrumentation for chromatographic and molecular analysis.
- Preparation of written reports with basic analysis
- Provide students with a hands-on familiarity with basic research procedure and associated critical and investigative thinking skills utilizing identification of unknown microorganism's specimen and protein using molecular techniques.
- Become proficient in laboratory skills and safety protocols. •
- Learn to follow experimental procedures.
- Apply the scientific method: formulate testable questions/hypotheses, predict expected results, make careful observations, collect and analyze/interpret data, and draw appropriate conclusions.
- Begin to gain proficiency in scientific writing (laboratory reports and notebook entries)
- Embark in active learning opportunities in the laboratory.
- Demonstrate good lab citizenry and the ability to work with others.

### Course Contents

An introduction to the basic and essential techniques of biology Lab. Principles and methods of microbiology, analytical and molecular biology will be introduced. In this course we will discuss on the introduction to basic laboratory techniques, laboratory note keeping,

reporting/presenting scientific research findings, pipetting & solution preparation, pH & buffer, and information searching. Students will learn the basic techniques in microbiology/biotechnology including preparation of media & sterilization, aseptic technique, enumeration of microorganisms and their culturing, molecular identification of bacteria (DNA isolation, amplification and purification), quantification & purification of proteins, chromatography techniques, tissue culture and immunoassays. We will also visit highly reported research Labs.

**Course structure:**

Class lectures (1hr/week)

Lab: 2 – 3 hrs, twice a week

**Text book:**

1. Basic Bioscience Lab Techniques: A pocket Guide (2<sup>nd</sup> ed) by Philip L. R. Bonner and Allan J. Hargreaves

2. Making Sense in the Life Sciences: A student's guide to Research and Writing (3<sup>rd</sup> ed.) by Margot Northey and Patric von Aderkas.

Others books and papers will be cited in the class time to time

## Tentative Schedule

<b>DATES- 2023</b>	<b>EXPERIMENTS</b>	<b>LECTURES</b>
<b>Jan 12-13</b>	<b>Lab 1 THURS:</b> Lab Expectations & Scientific Method Intro to Reports  <b>Lab 2 FRI:</b> Lab Safety & Equipment. Go through their carts; assignment	Syllabus Lectures on Note Keeping, Lab Books, Science Research, Writing in Biological Sciences, Citations and Literature. Working in Groups
<b>Jan 19-20</b>	<b>Lab 3 THURS:</b> Accuracy & precision for various pipettes and aspirators  <b>Lab 4 FRI:</b> Solutions preparation: Liquid from liquid and liquid from solid	Units, balances, math for preparation of solutions, including dilutions (M, %, etc)
<b>Jan 26-27</b>	<b>Lab 5 THURS:</b> pH standardization and acid/base titrations  <b>Lab 6 FRI :</b> Excel tutorial with data from pipette lab, report format (Lab 7) if extra time.	pH and buffers for biosciences
<b>Feb 2-3</b>	<b>Lab 7-8 THURS:</b> Plant pigments extract only; Report formats  <b>Lab 8 FRI:</b> Plant pigments continued, absorbance spectra and chlorophyll concentrations	Spectrophotometry methods

<b>Feb 9-10</b>	<b>Lab 9 THURS: Day 1</b> Bacterial isolation, purification, quantification and storage of DNA (kit).	Extraction methods for biological materials. Demonstration of the bacterial isolation technique (start of BBLT 8).
	<b>Lab 10 FRI: Day 1</b> Protein extraction for SDS-PAGE work - different species of germinating seeds.	Centrifugation, buffers, etc.
<b>Feb 16-17</b>	<b>Lab 10 THURS</b> Day 2 Bradford assay,	Spectrophotometry plate reader
	<b>Lab 9 Part 2 FRI:</b> Prepare bacterial DNA for PCR (kit) Help with calibration curves in Excel as required	Can add Friday lecture with any additional/missing information for bacteria lab.
<b>March 2-3</b>	<b>Lab 10 THURS Day 3</b> SDS-PAGE Make gels	Electrophoresis methods; there is time for more theory when gels are running
	<b>Lab 10 FRI Day 4</b> SDS-PAGE run gels	
<b>March 9-10</b>	<b>Lab 9 THURS Part 3</b> Horizontal agarose gel DNA	A short intro to chromatography and TLC
	<b>Lab 11 FRI</b> Thin layer chromatography	TLC theory while running
<b>March 16-17</b>	<b>Lab 12</b> Size exclusion chromatography	Additional chromatography methods -
	<b>THURS Day 1</b> Make columns <b>FRI Day 2</b> Run columns	
<b>March 23-24</b>	<b>Lab 13</b> Plant tissue and/or seeds -	Tissue culturing (media prep) and apparatus such as autoclave safety and use, laminar flow hoods
	<b>THURS Day 1</b> Prep media <b>FRI Day 2</b> Aseptic cultures	
<b>March 30-31</b>	<b>Lab 14</b> Dot blots stuff Western Blot equipment.	Antibody basics and immunoassays- Dot blots as a simplified method to Western blots.
	<b>THURS Day 1</b> - start <b>FRI Day 2</b> – finish	
<b>April 6 &amp; April 11</b>	<b>Lab 13</b> Plant cultures take-down	Applied vs basic research and opportunities
	<b>Lab 15</b> Lab tours	

**THE FINAL LECTURE THEORY EXAM  
WILL BE HELD DURING THE WINTER  
EXAM PERIOD AS SCHEDULED BY  
LAKEHEAD**

**Evaluation**

**Lectures: Theory Exam** **25%**

**Labs:** **75%**

Ethics (see lab manual)	5%
Lab Books (group)	10%

Early assignments (5)	20%
Lab reports (3)	30%
Poster (1)	10%

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<b>FINAL GRADE</b>	<b>100%</b>
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