



MBG*3350 Laboratory Methods in Molecular

Biology I

Winter 2018

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.75

Version 1.00 - January 04, 2018

1 Course Details

1.1 Calendar Description

This course involves laboratory based instruction in the basic methodologies of Molecular Biology. Students will have the opportunity to develop technical skills and practical knowledge sufficient to perform basic procedures independently, and to diagnose and analyze experimental results obtained with these techniques.

Pre-Requisite(s): BIOC*2580, MCB*2050
Restriction(s): Registration in BSC.BIOC (major or minor), BIOC:C , BTOX, BTOX:C, BPCH, BPCH:C, MICR(major or minor), MICR:C , MBG (major or minor), PBTC, PLSC (major or minor), TOX, TOX:C

1.2 Timetable

- Laboratory: Either Monday & Wednesday or Tuesday & Thursday
 - 1:30 p.m. – 5:20 PM
 - SSC 4101/4108/4109
- Lecture: Friday
 - 1:00 pm – 2:20 PM
 - MCKN 120
- Additional lecture on Mon/Tue of Week 1
 - Monday Labs: Monday 1:30 - 2:30 pm in ALEX 259
 - Tuesday Labs: Tuesday 1:30 - 2:30 pm in MCLN 107

1.3 Final Exam

This course has no final exam during the exam period.

2 Instructional Support

2.1 Instructor(s)

Dr. Steffen Graether

Email: graether@uoguelph.ca
Telephone: +1-519-824-4120 x56457
Office: SC1 2255

2.2 Instructional Support Team

Lab Co-ordinator: Amanda Van Der Vinne
Email: avander@uoguelph.ca
Telephone: +1-519-824-4120 x56189
Office: SC1 3519

3 Learning Resources

3.1 Required Resources(s)

Lab Manual (Lab Manual)

MBG*3350 Laboratory Manual: purchased from SSC 2302 the first three days of the semester.

Laboratory Notebook (Other)

A bound Laboratory Notebook

Lab Coat (Equipment)

Indelible ("Sharpie") marker: ultra-fine point (Equipment)

Computer Software (Software)

ImageLab (PC and Mac compatible) and CFX Manager (PC compatible): software provided by the lab demonstrator for download on your computer

Courselink (Website)

<https://courselink.uoguelph.ca>

This course will use D2L (via Courselink). You are responsible for all information posted on the Courselink page for MBG*3350. Please check it regularly.

3.2 Additional Resources(s)

Library Guide to MBG*3350 (Website)

<https://guides.lib.uoguelph.ca/MBG3350>

Links to online resources (PubMed, protocols, etc.)

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Explain the fundamental principles of practical molecular biology.

2. Recognize and interpret experimental results.
 3. Implement the theoretical principles and apply them in the execution of lab experiments.
 4. Plan, design, monitor, troubleshoot and optimize experiments.
 5. Use online tools to research a particular topic, and read primary research articles in molecular genetics.
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5 Teaching and Learning Activities

5.1 Course Format

- Lecture: One lecture per week on Friday 1:00 p.m. – 2:20 p.m. in MCKN 120. Note that in the first week of class an additional lecture will be presented on Mo/Tue from 1:30 – 2:30 p.m. (i.e. during the first two hours of the first lab) to ensure that you receive relevant information before you do a lab.
- Laboratory: Two lab sessions per week: Monday/Wednesday or Tuesday/Thursday 1:30 p.m. – 5:20 p.m. in SCIE 4101/4108/4109.
- Progress Reports: During the course of the semester you will be required to complete and hand in progress reports (see course outline for due dates). These reports are meant to assist you in continually monitoring the outcomes of your experiments. The reports are designed to have you analyze your results and perform calculations so your formal lab reports are a compilation of results already obtained.
- Literature Review: Before research is conducted one should have a good grasp of what is currently known for the topic/area of study. As such each student will be required to complete a literature review on His-tagged proteins and green fluorescent protein (GFP). Specific details will be presented in lab and on Courselink.
- Formal Lab Report: You are required to write one formal lab report for this course, covering the cloning and analysis of GFP. Although the report will be written in the form of a scientific manuscript, you must remember that the audience and purpose of a formal report is somewhat different than that of a scientific paper. The aim is to show that you understand the principles and significance of the experiments you performed. Remember your data will have been marked already. What is of importance here is your ability to discuss and interpret cumulative data in a manner that demonstrates an understanding of what you have accomplished in the lab and the relevance of the experiments. Further information and guidelines for your lab report will be available in lab and on Courselink.

5.2 Lecture & Laboratory Topics & Schedule

Week/Date	Lab Schedule Day 1	Lab Schedule Day 2	Lecture Topic
Week 1 - Jan 8-12	Introduction to the lab, Lab safety, Molecular Biology Review, PubMed Search, Molecular Biology Web Tools	Web exercise assignment (*bring your computer*)	<ul style="list-style-type: none"> • Additional 1 h Lecture (Jan. 8/9): Course introduction. DNA, web resources for analysis of DNA • Lecture 1 (Jan. 12):

			Plasmids, vectors and <i>E. coli</i> . Plasmid isolation. Restriction enzyme digestion and gel electrophoresis
Week 2 - Jan 15-19	Micropipetting, Plating Cultures, Inoculating Cultures	Purification of Plasmid DNA, Restriction Enzyme Digestion of pET-28a, pET-28a Quantification	<ul style="list-style-type: none"> Lecture 2 (Jan 19): PCR, primer design, addition of restriction sites by PCR and fragment cloning. Other applications of PCR. Cloning GFP fusions
Week 3 - Jan 22-26	Agarose Gel Electrophoresis of DNA products. Polymerase Chain Reaction of gfp	Analysis of PCR products. Purification of gfp PCR Product. gfp Quantification	<ul style="list-style-type: none"> Lecture 3 (Jan 26): Ligation and DNA transformation of vectors into bacteria
Week 4 - Jan 29-Feb 2	Preparing pET28a and gfp for Ligation. Ligation of gfp into pET28	Transformation of Ligation Reactions into <i>E. coli</i> DH5 α . PCR Primer design	<ul style="list-style-type: none"> Lecture 4 (Feb 02): Genomic DNA isolation and qPCR. Trouble-Shooting PCR. Contemporary methods for analysis of DNA
Week 5 - Feb 5-9	PCR to Determine Presence of Insert. Isolation of pET28gfp	Isolation of pET28gfp. Restriction Enzyme Digest and gel	<ul style="list-style-type: none"> Exam #1 (Feb 09) on Lectures 1-4 & Labs 1-4 (15%). SA, MC and problem solving questions
Week 6 - Feb 12-16	qPCR – Isolation of DNA from a Soy sample	qPCR – GMO detection	<ul style="list-style-type: none"> Lecture 5 (Feb 16): Recombinant protein expression and purification. Protein Analysis by SDS-PAGE
Feb 19 - 23	Reading Week - No Lab	Reading Week - No Lab	Reading Week - No Lecture
Week 7 - Feb 26-Mar 2	Amplification of your <i>E. coli</i> gene (set up reaction)	His-GFP Purification Ni-NTA resin. Amplification of your <i>E.</i>	<ul style="list-style-type: none"> Seminar (Mar 2): Science

		coli gene (gel)	beyond the lab
Week 8 - Mar 5-9	Amplification of your <i>E. coli</i> gene (continue until successful)	SDS-PAGE and Coomassie Stain	<ul style="list-style-type: none"> Lecture 6 (Mar 09): Western, Northern and Southern blotting
Week 9 - Mar 12-16	SDS-PAGE and Western Immunoblotting	SDS-PAGE and Western Immunoblotting	<ul style="list-style-type: none"> Lecture 7 (Mar 16): RNA isolation, RT-PCR, measuring and comparing gene expression. Advanced contemporary methods for the analysis of RNA
Week 10 - Mar 19-23	qRT-PCR. RNA Isolation from Arabidopsis	qRT-PCR. Arabidopsis Gene Expression Assay	<ul style="list-style-type: none"> Exam #2 (Mar 23) on Lectures 5-7 & Labs 6-9 (15%). SA, MC and problem-solving questions
Week 11 - Mar 26-30	No Lab	No Lab	Holiday (Mar 30): No classes scheduled
Week 12 - Apr 2-6	No Lab	No Lab	No Lecture (Apr 6)

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Web-based Assignment	3.00
Literature Review	10.00
Progress Report #1	4.00
Progress Report #2	4.00
Exam #1	15.00
Progress Report #3	4.00
GMO Assignment	4.00
Progress Report #4	4.00
Progress Report #5	4.00

Name	Scheme A (%)
PCR Report	4.00
Lab Report	10.00
Exam #2	15.00
Arabidopsis Assignment	4.00
Lab Performance	15.00
Total	100.00

6.2 Assessment Details

Web-based Assignment (3.00%)

Date: Jan 10/11

- Course Content:
 - Lab Weeks 1-10

Literature Review (10.00%)

Date: Jan 24/25

- Course Content:
 - Lab Weeks 1-10

Progress Report #1 (4.00%)

Date: Jan 29/30

- Course Content:
 - Lab Weeks 2-3

Progress Report #2 (4.00%)

Date: Feb 5/6

- Course Content:
 - Lab Weeks 4

Exam #1 (15.00%)

Date: Fri, Feb 9

- Course Content:
 - Lectures/Labs Weeks 1-4

Progress Report #3 (4.00%)

Date: Feb 12/13

- Course Content:
 - Lab Weeks 5

GMO Assignment (4.00%)

Date: Mar 5/6

- Course Content:
 - Lab Weeks 6

Progress Report #4 (4.00%)

Date: Mar 12/13

- Course Content:
 - Lab Weeks 7-8

Progress Report #5 (4.00%)

Date: Mar 19/20

- Course Content:
 - Lab Weeks 8-9

PCR Report (4.00%)

Date: Mar 21/22

- Course Content:
 - Lab Weeks 4-10

Lab Report (10.00%)

Date: Mar 28/29

- Course Content:
 - Lab Weeks 1-10

Exam #2 (15.00%)

Date: Fri, Mar 23

- Course Content:
 - Lectures 5-7, Labs 6-9

Arabidopsis Assignment (4.00%)

Date: Apr 4/5

- Course Content:
 - Lab Week 10

Lab Performance (15.00%)

Date: Mon, Jan 15 - Fri, Mar 23

- Course Content:
 - Lab Weeks 2-10

6.3 Note

Bonus Assignment - Beyond the Lab

- 2% bonus
- Course Content: March 2
- Due date: March 23

6.4 Assessment Details

- You will receive information for the Week 1 Web-based assignment in the lab and the Week 7 bonus assignment in the class.
- All other assignments and reports are due at 1:30 pm on your scheduled lab day. Late Progress Reports are not accepted. All other reports/assignments will be accepted without penalty only for medical or compassionate reasons with documentation. Late assignments without documentation will be penalized 10% per day up to 50%. A grade of zero is assigned after 5 days late.
- Assignments must be typed, double-spaced, 12-point font.
- Progress Reports are submitted on your first lab day of the week and are returned on the second lab day of the week. This is to provide you with immediate feedback as to whether your analysis, interpretation and conclusion of your experimental results are correct.
- The lab performance grade is determined by your performance in the lab. Of this, 10% is based on your actual results (success of your experiments). The other 5% is based on your day to day performance in the lab: punctuality, attendance, attitude, preparedness, independence etc.

6.5 Exams #1 & #2

Exams #1 and #2 will be held during regular lecture time; if you fail to write the Exam #1 a grade of 0% will be assigned unless an acceptable and documented cause such as sickness or family emergency is documented. In the situation where academic consideration is given, Exam #2 will be adjusted to 30%. For missed Exam #2 an Incomplete grade will be submitted with a recommendation of 0% unless academic consideration is granted for a deferred exam.

7 Course Statements

7.1 You must come to lab prepared and ready to start working by 1:30

pm

It is disrespectful to arrive late as this interrupts the TA, your partner and your fellow classmates. Additionally, you will miss out on specific announcements for the day that the TA is not obligated to repeat. If you miss specific safety announcements you may be asked to leave. During the course of the lab there may be times where you can get a coffee as you have a gel running. Feel free to do so, however, if any announcements or discussions take place during your absence you will be responsible for obtaining the information from a fellow classmate.

7.2 Lab Attendance is mandatory

This is a lab based course where the majority of your final grade is assigned based on the laboratory component rather than the lecture component of the course. The nature of the lab exercises also build on one another. As such there is no opportunity for make-up labs. Lab absence is only acceptable for medical or compassionate reasons.

7.3 You must keep a lab notebook

- Before coming to lab you must record in your lab notebook: What are you doing in lab today?
- What are the expected results? You must have completed all calculations that are required to carry out the experiments.
- In addition, you should record the variables of the experiment (reaction conditions), insert the actual results you obtained, in table format or gel image (labelled) and a statement of whether or not the experiment was successful. Your lab notebook will be graded for the PCR assignment.

7.4 All Assignments have to be completed

ALL lab assignments are an important part of the course. Failure to complete an assignment will lead to an “incomplete” at the end of the semester.

7.5 Academic Misconduct

It is the nature of undergraduate labs to complete experiments with a partner. Your results should be discussed with your partner as this is expected in all scientific research. However, ALL assignments must be completed INDEPENDENTLY.

7.6 Grading

- All assignments are due at 1:30pm and are submitted electronically to Dropbox on Courselink.
- Students who wish to have their assignments re-graded must submit the request to the Lab Demonstrator within 5 class days of their return. The entire assignment will be re-graded so the mark may go up, down or remain unchanged.

7.7 Turnitin

- In this course, your instructor will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph.
 - All submitted assignments will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site.
 - A major benefit of using Turnitin is that students will be able to educate and empower themselves in preventing academic misconduct. In this course, you may screen your own assignments through Turnitin as many times as you wish before the due date. You will be able to see and print reports that show you exactly where you have properly and improperly referenced the outside sources and materials in your assignment.
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8 Department of Molecular and Cellular Biology

Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or

compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

9.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be

recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

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