
BIOL 404
Techniques in Molecular Biology
SPRING/SUMMER Term (2025-26)

CALENDAR DESCRIPTION

**Molecular biology techniques used in fundamental biology research, biotechnologies,
and medical sciences.**

PREQUISITE BIOL 330/3.0 or BCHM 218/3.0

SCHEDULE
selected by student

LEARNING OBJECTIVES

Basic calculations in molecular biology

Enzymes used in molecular biology

Operation of scientific equipment such as pipettes, balances and electrophoresis

DNA extraction

DNA electrophoresis

DNA digestion

DNA ligation

Bacteria cultures

Bacteria transformation

PCR

LEARNING HOURS

<i>Teaching method</i>		<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
In-class hours	Lecture			
	Seminar			
	Laboratory	45	2	90
	Tutorial			
	Practicum	1	1	4
	Group learning			
	Individual instruction			
Other	Online activity			
	Off-campus activity			
	Private study	5	2	10
Total hours on task				104

COURSE OUTLINE

This is an all-day intensive laboratory work (up to 9h/day) to be carried out over two weeks. Final test will be performed once the lab projects are completed on a date and time chosen by the student (Week 2 or 3). Students work in pair but take all tests individually.

Monday Week 1

Laboratory introduction
Equipment training
Pipetting test
Calculations
Plasmid DNA extraction (Project 1)

Tuesday Week 1

DNA electrophoresis (Project 1)
DNA digestion (Project 1)
DNA electrophoresis (Project 1)

Wednesday Week 1

DNA purification (Project 1)
DNA electrophoresis (Project 1)
DNA ligation (Project 1)
Bacterial culture (Project 2)

Thursday Week 1

DNA extraction (Project 2)
DNA electrophoresis (Project 2)
E. coli transformation (Project 1)

Friday Week 1

PCR (Project 2)
DNA electrophoresis (Project 2)

Monday Week 2

Bacterial cultures (Project 1)
Self-directed (Project 2)

Tuesday Week 2

Plasmid DNA extraction (Project 1)
DNA electrophoresis (Project 1)
Self-directed (Project 2)

Wednesday Week 2

DNA digestion (Project 1)
DNA electrophoresis (Project 1)
Self-directed (Project 2)

Thursday/Friday Week 2

Self-directed (Project 2)
Final exam (day/time decided by student)

Monday-Friday Week 3

Final exam (day/time decided by student)

TEXTBOOKS/READINGS

Free and open access course: All course content available worldwide 24/7 with no restrictions of any kind:

<https://130.15.90.125/BioLab/biol404.html>

GRADING SCHEME

Component	Weight (%)	Date
Quiz	15	to be completed by the end of the course
Pipetting test	5	First day of the course
Lab projects	40	to be carried over 2 weeks
Safety and guidelines	up to 5% penalty	
Final (Practical exam)	40	chosen by student

All tests are open-book with no time limit.

Quiz: Each student will have to complete an 18 questions quiz by the end of the course.

Pipetting test: Before a student perform experiments, he will first learn and train how to pipette consistently and accurately (instructions: <https://130.15.90.125/BioLab/equipment/micropipettes.html>) before taking the test. The test requires the student to pipet 3 times a fixed volume and is marked by a balance. Pipetting accuracy assessment: each pipetting within 2% of the expected value will give 75 out of 100% (3 x 25%). Pipetting reproducibility: 3 pipetting within 2% of each other will give 25% out of 100%. Each incorrect handling of the micropipettes may results in 2% penalty.

Taking a lab and lab reports: Student pairs have read and understood theory, material (and how to use equipment) and practical. The lab report is filled and followed to perform experiments and report results (one lab report per project). Student pair analyze/interpret experimental data and give lab report to instructors (one lab report per student pair per project). Student submit the lab reports for each project once they are completed. The marking of the lab reports is made in consultation with the student pairs to ensure transparency.

Final exam: The final examination is practical and is done individually. Students cannot take the final at the same time as their labmate (lab book, equipment and supplies needed to take the final). Students can schedule their final exam at any time Mon-Fri 10am-6pm as soon as they have completed the 2 lab projects.

GRADING METHOD

In this course, components will be graded using numerical percentage marks.

Your course average will then be converted to a final letter grade according to Queen's Official Grade Conversion Scale:

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

ACADEMIC INTEGRITY AND QUEEN'S CODE OF CONDUCT

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and conduct conform to the principles of academic integrity. Information is available in the Arts and Science Calendar (see Academic Regulation 1 - <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations>, on the Arts and Science website (see <http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity>), and at Biology's website (<http://www.queensu.ca/biology/undergrad/integrity.html>) and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulations on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

ACCOMMODATION POLICY, EXAM CONFLICTS, AND OTHER CONFLICTS

Students who feel they need accommodations for disabilities or extenuating circumstances, or have a conflict between exams or other commitments should consult the Biology Department's website for details about how to proceed (<http://www.queensu.ca/biology/undergrad/integrity.html>). In general, the earlier a course coordinator is apprised of an extenuating circumstance, the more likely an accommodation can be made. Students are encouraged to be proactive in anticipating difficulties, when it is possible to do so.

Students may apply to write a make-up or deferred exam if they have an exam conflict as defined in the Academic Regulations of the Faculty (See Arts and Science Calendar Regulation 8 - <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations>)

www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations). In this case, the student should report to the Exams Office first to verify that there is a genuine exam conflict. Biology professors will not consider your situation to be a conflict unless it meets the criteria set out by the Faculty of Arts and Sciences.

Students may request a make-up or deferred exam if they have an exam conflict with off-campus travel associated with a field course (e.g BIOL-307/3.0 or 407/3.0) that is held during the fall or winter terms.

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ACCOMMODATION OF DISABILITIES

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact the Disability Services Office (DSO) and register as early as possible. For more information, including important deadlines, please visit the DSO website at: <http://www.queensu.ca/hcnds/ds/>