



BIOC*3570 Analytical Biochemistry

Fall 2019

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.75

Version 2.00 - September 18, 2019

1 Course Details

1.1 Calendar Description

This course covers the tools and techniques by which biological molecules are isolated, separated, identified, and analyzed. Detailed discussion of experimental methods for macromolecule purification and characterization is included.

Pre-Requisites: (CHEM*2400 or CHEM*2480), BIOC*2580

1.2 Course Description

Students must pass (mark of 50% or better) **both** the laboratory component (35%) **and** the theory component (65%) to obtain a final passing mark in the course. In cases where this standard is not reached, the final mark assigned will be either the mark calculated as given above or 47%, whichever is less. College policy precludes changes to the marking scheme for individual students, except in case of illness.

Introductory biochemistry is a prerequisite for this course. The following aspects of the subject are important background, and familiarity with them will be assumed: basic aspects of protein and nucleic acid structure, including structures of all amino acids and nucleotides; flow of genetic information; basic enzymology. Please take some time to review this material carefully, especially if some time has passed since you took intro. biochemistry.

1.3 Timetable

Tue. - 11:30 a.m. - 12:50 p.m., ANNU Room 156

Thur. - 12:30 a.m. - 12:50 p.m., ANNU Room 156

Labs - 1:30 p.m. - 5:20 p.m. SSC 3101 on your scheduled day of the week

1.4 Final Exam

Friday December 13, 7 - 9 PM

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Matthew Kimber
Email:	mkimber@uoguelph.ca
Telephone:	+1-519-824-4120 x52568
Office:	SSC 2254
Office Hours:	Office hours: By appointment.

Drop in office hours will be scheduled before the midterm and final exam.

Dr. Kimber will teach weeks 1 - 6.

Lab Co-ordinator:	Colin Cooper
Email:	ccoope08@uoguelph.ca
Office:	SSC 3502
Office Hours:	By appointment

Dr. Cooper will be the Lab Co-ordinator and deliver lectures in weeks 7-11.

3 Learning Resources

3.1 Required Resources

Safety Glasses and Lab Coat (Equipment)

Laboratory Notebook (Equipment)

Non-spiral bound

Laboratory Manual (Lab Manual)

Available through the Department of Molecular and Cellular Biology

Dates for purchases to be announced

3.2 Recommended Resources

Principles and Techniques of Biochemistry and Molecular Biology (Textbook)

Principles and Techniques of Biochemistry and Molecular Biology, by K. Wilson and J. Walker, 8th edition, 2018.

This is an excellent reference text for a wide variety of standard experimental techniques. It is relatively inexpensive, and should be a useful reference for any future experimental work.

Lehninger et al. (Textbook)

Any recent edition of the text by Lehninger et al. (e.g. 6th edition, 2013).

This text book is useful for general biochemical background you may need to brush up on.

Youtube (Website)

<https://youtube.com>

Search: enzyme techniques, electrophoresis molecular biology, recombinant, mass spectrometry, proteomics, fluorescence.

3.3 Additional Resources

Biochemistry Lab: Modern Theory and Techniques (Textbook)

Biochemistry Lab: Modern Theory and Techniques, by R. Boyer, 2nd edition, 2011.

Available on Reserve.

Fundamental Laboratory Approaches for Biochemistry and Biotechnology (Textbook)

Fundamental Laboratory Approaches for Biochemistry and Biotechnology, 2nd edition, by A. Ninfa & D. Ballou, 2010

Available on Reserve.

Bioanalytical Chemistry (Textbook)

Bioanalytical Chemistry, by Mikkelsen & Corton, 2004

Available on Reserve.

Experimental Biochemistry (Textbook)

Experimental Biochemistry, by Switzer and Garrity, 1999

Available on Reserve.

Analytical Biochemistry (Textbook)

Analytical Biochemistry, 2nd edition, by D.J. Holme and H. Peck, Longman, 1993

Available on Reserve.

Physical Biochemistry (Textbook)

Physical Biochemistry (2nd edition, 1982) D. Freifelder (QH 345.F72).

This is a particularly good reference text for spectroscopy, centrifugation, electrophoresis, and other physical techniques.

Available on Reserve.

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. understand the theoretical underpinnings and practical aspects of applying biochemical analysis methods.
 2. understand modern approaches to protein quantitation and characterization, including using chromogenic dyes, UV-Visible and fluorescence spectroscopy, electrophoresis, enzymatic assays, and mass-spectrometry.
 3. understand how proteins are purified from biological or recombinant sources, including diverse centrifugation approaches, and chromatographic methods that rely on ion-exchange, size-exclusion, hydrophobic exchange or affinity resins.
 4. demonstrate improved laboratory skills, including both fundamental biochemistry methods but also improved planning, analysis, record-keeping, and trouble-shooting.
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5 Teaching and Learning Activities

5.1 Lecture

Lecture 1

Topics: Introduction

Lecture 2

Topics: Protein quantitation

Lecture 3 - 7

Topics: Protein purification: principles and practicalities, ion exchange chromatography, hydrophobic interaction chromatography, gel filtration chromatography, affinity chromatography and constructs.

Lecture 9 (October 8th)

Topics: midterm # 1 - in class

Lecture 8; 10 - 12

Topics: Electrophoresis: theory, techniques, antibodies and western blotting, 2D electrophoresis and proteomics

Lectures 13 - 16

Topics: Centrifugation: theory, techniques; analytical ultracentrifugation

Lecture 17 - 18

Topics: UV visible spectroscopy: theory, instrumentation and applications

Lecture 19 - 20

Topics: Fluorescence spectroscopy: theory, instrumentation and applications

Lecture 21

Topics: Midterm # 2

lecture 22 - 24

Topics: Mass spectrometry: theory, isotopes, protein mass and proteomics

5.2 Laboratory

Labs will be held in SSC 3101 from 1:30 - 5:20 pm.

Labs start on the second week of classes (September 9-13). You will need to purchase and read the lab manual. Please contact Dr. Colin Cooper (SSC 3502, ccoope08@uoguelph.ca) if you have lab related questions.

Attendance at all laboratory periods is mandatory. If a lab is missed, medical or other documentation must be given to the lab coordinator as early as possible. Please see the current undergraduate calendar section VIII: Undergraduate degree regulations and procedures.

The laboratory portion of the course is worth 35% of the course grade. This 35% consists of two lab reports; report 1 worth 10% report 2 worth 15%, and your lab notebook which is worth 10%. Please see the lab manual for further details. Lab reports will be subjected to anti-plagiarism software.

Lab Manuals may be purchased from the Molecular and Cellular Biology Department at date and times to be announced. Students must provide their own safety glasses, lab coat, and non-spiral bound laboratory notebook.

6 Assessments

6.1 Assessment Details

Frist in class midterm (15%)

Date: Tue, Oct 8

First in class midterm, worth 15 % of the final grade

Laboratory (35%)

Lab Report 1 - 10%

Lab Report 2 - 15%

Lab Notebook - 10%

Second midterm (15%)

Date: in class

Second in class midterm, worth 15 % of the final grade

Final Examination (Cumulative) (35%)

Date: Fri, Dec 13

The Final exam will be Friday, Dec 13th 7:00 to 9:00 p.m.

7 Course Statements

7.1 Policy on Missed Examinations

Only valid medical or compassionate reason will prevent a grade of zero for any missed examination. It is the student's responsibility to obtain the necessary documentation from Medical or Psychological Services or the Director of Student Affairs. Make-up tests will not be given.

7.2 Course Evaluation

As part of the faculty evaluation process in the Department of Molecular and Cellular Biology, students are reminded that written comments on the teaching performance of the lecturer may be sent to the Chair at any time. Such letters must be signed; a copy, with the signature removed, will be made available to the instructor. Your comments and feedback are always appreciated.

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.selfregulationskills.ca/>

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 grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester.

This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

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 can be found on the SAS website

<https://www.uoguelph.ca/sas>

9.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, 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 that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
