BIOC*3570 Analytical Biochemistry

Fall 2017

Sections(s): C01

College of Biological Science

Credit Weight: 0.75

Version 1.00 - September 06, 2017

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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-Requisite(s): (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.

If you have not taken a molecular biology course before, you should read the relevant chapters on DNA and RNA in Lehninger, Voet and Voet, Stryer, or another textbook before week 5.

1.3 Timetable

Tue. - 11:30 a.m. - 12:20 p.m., CrSc116

Thur. - 12:30 a.m. - 12:20 p.m., CrSc116

1.4 Final Exam

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

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2 Instructional Support

2.1 Instructor(s)

Manfred Brauer

Email:	mbrauer@uoguelph.ca
Telephone:	+1-519-824-4120 x53795
Office:	SC1 3520
Office Hours:	Tuesday & Thursday after class, by appointment or e-mail

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3 Learning Resources

3.1 Required Resources(s)

Safety Goggles (Equipment)

3 Ring Binder (Equipment)

Laboratory Notebook (Equipment)

3.2 Recommended Resources(s)

Principles and Techniques of Biochemistry and Molecular Biology (Textbook)

Principles and Techniques of Biochemistry and Molecular Biology, by K. **Wilson and J. Walker**, 7th edition, **2011**.

Lehninger et al. (Textbook)

The latest edition of the text by Lehninger *et al.* (6th edition, 2013)

Voet & Voet (Textbook)

The latest edition of the text by Voet & Voet (5nd edition, 2016)

J. Berg, J. Tymoczko and L. Stryer (Textbook)

The latest edition of the text by J. Berg, J. Tymoczko and L. Stryer (7th edition, 2014)

Available on Reserve.

Mathews, Van Holde and Ahern (Textbook)

The latest edition of the text by Mathews, Van Holde and Ahern (2013)

Youtube (Website)

https://youtube.com
Search: enzyme techniques, electrophoresis molecular biology, recombinant, mass spectrometry, proteomics, fluorescence.

Google Scholar (Website)

http://www.googlescholar.com

scirus.com (Website)

Science Direct (Website)

http://www.sciencedirect.com/
Look for Methods in Enzymology

Pub Med (Website)

https://www.ncbi.nlm.nih.gov/pubmed/

3.3 Additional Resources(s)

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 Resrerve.

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.

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Students will learn modern and classical methods to characterize protein structure and function, including UV-Visible and fluorescence spectroscopy, enzyme assays, peptide sequencing, and mass-spectrometry.
2. Students will learn how to purify a protein from a biological source, using ion-exchange, gel-exclusion and affinity chromatography, electrophoresis, centrifugation and immunological methods.
3. Basic comprehension of chemical principles of acid-base equilibria, buffers, dissociation constants, and binding specificity will be reinforced and expanded.
4. Students will learn how to characterize, isolate, purify, amplify and modify RNA and DNA. This will include up-to-date PCR methods, recombinant DNA methods in prokaryotic and eukaryotic systems, and use of reporter genes.
5. The laboratory will provide hands-on experience in applying concepts covered in lecture, and in scientific writing, including analysis and reporting of experimental results.

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5 Teaching and Learning Activities

In addition to lectures, we will have tutorials/problem sessions, as indicated in the detailed outline. Problem assignments will be given out regularly; solutions will be discussed in the tutorial sessions, and made available at the library Reserve desk.

To obtain benefit from these exercises, it is essential that you attempt the problems on your own before attending the tutorial session.

5.1 Laboratory

SC3101 1:30 - 5:20 pm.

Labs start on the first week with Experiment 1: please be prepared. You will need to read the lab manual and also do the required calculations for protein dilutions. Please see your demonstrator, or lab coordinator Dr. Paula Russel (SC 3115, ext 58220) if you have lab questions.

Attendance at all laboratory periods is mandatory. If a lab (and associated lab quiz) is missed, medical or compassionate documentation must be give to the lab demonstrator as early as possible. If this documentation is not received, a mark of zero will be given for that lab and/or quiz. The laboratory portion of the course is worth 35% of the course grade. This 35% consists of three lab reports worth 9% each, lab performance and notebook worth and lab tests (7 in total) worth the remainder (see lab manual). Lab reports will be handed in to the demonstrator at the time specified by the demonstrator. Late reports will be penalized at the rate of 10% per day. Graded reports and notebooks are kept by the demonstrator at the end of the semester.

Laboratory Manual: Available at course-orientation meeting.

Students should provide their own safety goggles, 3-ring binder, and laboratory notebook.

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6 Assessments

6.1 Assessment Details

Midterm Exam

Date:

Laboratory

Date:

Final Examination (Cumulative)

Date:

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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 College of Biological Science 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.
- 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: Chemistry & Physics Help and 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.
- Student Health Services is located on campus and is available to provide medical attention.
- 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.

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.
