
BIOL 334

Comparative Biochemistry

Winter Term 2023

CALENDAR DESCRIPTION

A survey of selected topics including: general principles of enzymology; bioenergetics; metabolism and its control; the importance of proteomic and enzyme research in functional genomics and biotechnology; mechanisms whereby animals and plants acclimate at the biochemical level to environmental stress.

NOTE Preference will be given to students registered in a Biology degree program or who require this course for their program.

PREREQUISITE BIOL 103/3.0 and CHEM 112/6.0 and (BIOL 205/3.0 or BCHM 218/3.0).

INSTRUCTOR

Dr. Susan Yates

Email: yates@queensu.ca

Office Hours: Email to arrange a meeting.

Teaching Assistant(s): TBA

COURSE FORMAT AND SCHEDULE

In the Winter 2023 term, BIOL 334 will be delivered in-person.

Lecture Times:

Tuesdays 4:00 PM to 5:20 PM

Thursdays 2:30 PM to 3:50 PM

Location:

Dupuis Auditorium

LEARNING OBJECTIVES

Biochemistry is the study of the chemical basis of life. Traditional undergraduate courses in biochemistry tend to focus on the conserved aspects of metabolic pathways: those established through studying relatively few "model" organisms, typically mammalian.

In contrast, BIOL 334 is intended to give students an appreciation of biochemical adaptation. We survey the myriad of strategies by which diverse organisms from the various kingdoms of life alter the basic biochemical plan to meet the challenges of living in a wide range of environments.

Thus, this course will compare and contrast various aspects of metabolism and its control with an emphasis on: (i) fundamental similarities and distinctions between animal, plant and microbial metabolism, and (ii) examples of how the survival of various species in 'extreme' environments is highly dependent upon key adaptations at the biochemical/metabolic level of biological organization.

LEARNING HOURS

The table below provides an estimate of hours of study. This is for general reference purposes and is not intended as a precise time allocation as the nature of course instruction can vary from year to year. A 3.0-unit course normally requires a total of 110 to 130 learning hours (or hours on task). It is important to note that time commitment will vary among students depending upon individual aptitude, level of background, etc.

<i>Teaching method</i>	<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
Lectures	3	12	36
Group learning	1.5	12	18
Online activity	2	12	24
Private study	2.7	12	32.4
Total hours on task			110.4

OUTLINE OF COURSE TOPICS

Please note: The instructor reserves the right to modify the following list of proposed topics.

1. Metabolism in Animals, Plants & Microbes

e.g. Enzymes as protein catalysts / Thermodynamics, free energy and bioenergetics / Metabolic control / Stimulus-response coupling by cellular 2nd messengers / Major similarities and differences between animal and plant metabolism

2. Applications of Metabolic Biochemistry

e.g. Metabolic biochemistry and functional genomics / Role of metabolic biochemistry in biotechnology and metabolic engineering

3. Biochemical Adaptation

e.g. Introduction to biochemical adaptation / Overview of glycolysis, oxidative pentose-phosphate pathway, TCA cycle, and respiration / Comparative biochemistry of the glycolytic pathway / Metabolic adaptations of life without oxygen (anaerobiosis) / Biochemical adaptations of hibernating mammals / Comparative biochemistry of mitochondrial metabolism / Biochemical adaptations of phosphate-starved plants / Comparative biochemistry of lipid metabolism

TEXTBOOKS/READINGS

No text is required but it will be helpful to have access to an upper-level biochemistry text for the basic pathways. If you want to buy a text, consider Lehninger's Biochemistry (available at the Bookstore).

Any supplemental readings will be made available on onQ. Students will be notified of any supplemental readings through onQ and by announcements.

COURSE TECHNOLOGY

In addition to onQ, students will also be required to have Office 365 Teams.

GRADING SCHEME

Any changes to the following grading scheme will be communicated during class and onQ.

Component	Weight	Due Dates*
Test of Background Knowledge Quiz	5%	TBA
Midterm Exam (In-class)	20%	TBA
Poster Presentation/Conference	5% Proposal	TBA
	25% Poster Presentation	TBA
	3% Peer Review	TBA
	5% Discussion	TBA
	2% Summary & Participation	TBA
Final Exam	35%	During final exam period as scheduled by Registrar's Office

*Exact due dates will be discussed during the term and details posted on onQ and during class time.

GRADING METHOD

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale.

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 (also see <https://www.queensu.ca/artsci/students-at-queens/academic-integrity>), and at Biology's website (<https://biology.queensu.ca/academics/undergraduate/prepare-yourself>) 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 (<https://biology.queensu.ca/academics/undergraduate/prepare-yourself>). 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>). 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 Queen's Student Accessibility Services (QSAS) and register as early as possible.

For more information, including important deadlines, please visit the QSAS website at: <https://www.queensu.ca/studentwellness/accessibility-services>