BIOL 334
Comparative Biochemistry

Fall Term (2013-14)

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 (a minimum grade of C- in BIOL 205/3.0).

SCHEDULE

Lectures: Tuesday 8:30-9:30, Wednesday 10:30-11:30, Friday 9:30-10:30. Humphrey Aud.

Instructor	**Dr. Wm. Plaxton**
Instructor Contact	plaxton@queensu.ca Phone: 613-533-6150
Office Hours	No formal office hours; please email or phone Dr. Plaxton to arrange an appointment . His office is located in Rm. 3513, Biosciences Complex
TA:	Allyson Hill
TA Contact Information	7ath@queensu.c
Office Hours	Tuesday – 10:00 a.m. to 1:00 p.m.; Rm. 3514, BioSciences Complex Allyson is also available at other times on an *ad hoc* basis. Please email her to set up an appointment if you can't make it during her regular Tues office hours.

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, & (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

Teaching method		*Average hours per week*	*Number of weeks*	*Total hours*
In-class hours	Lecture	3	12	36
	Seminar			
	Laboratory			
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	Online activity	2	12	24
	Off-campus activity			
	Private study	4.2	12	50.4
Total hours on task				110.4

Course Outline

1. Metabolism in Animals, Plants & Microbes
Enzymes as protein catalysts; Thermodynamics, free energy & bioenergetics; Overview of metabolic control; "Coarse vs. Fine Metabolic Control"; Stimulus-response coupling by cellular '2nd messengers'; Phosphodiesterases as human drug targets; Major similarities & differences between animal vs. plant metabolism

2. Applications of Metabolic Biochemistry
Metabolic Biochemistry Helps to 'Close the Gap' in Functional Genomics; Critical Role of Protein, Enzyme, & Metabolic Biochemistry in Biotechnology and Metabolic Engineering

3. Biochemical Adaptation
Introduction to Biochemical Adaptation, Overview of Glycolysis, Oxidative Pentose-phosphate Pathway (OPPP), TCA Cycle, & 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
Required: BIOL-334 course notes package available from Campus Bookstore for $16
Recommended*: Lehninger Principles of Biochemistry* (5th Ed) By: Nelson & Cox (at least 3 copies will be placed on 3 h reserve for BIOL334 in the Engineering & Science Library)

Grading Scheme

Component	Weight (%)	Date
On-line (BIOL-334 Moodle) "*Test-of Background Knowledge*" quiz	5	Deadline for completion = midnight, Weds. Sept. 18
In-class midterm exam (50 min)	25	Friday, Oct. 25 (to be confirmed)
On-line (open book) Moodle 'Quiz' (45 min)	15	Week of Nov. 17; details T.B.A.
Final exam (3 hours)	55	T.B.A.

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 (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). 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/hcds/ds/