

University of Toronto Scarborough – Department of Biological Sciences  
**BIOB32 – Animal Physiology Laboratory – Winter 2017**

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**Course Description:** This course examines physiological mechanisms that control and coordinate the function of various systems within the body. The laboratory exercises examine properties of digestive enzymes, characteristics of blood, kidney function, metabolic rate and energetics, nerve function and action potentials, synaptic transmission, skeletal muscle function, and mechanoreception.

**Corequisites:** (BIOB30H3) or BIOB34H3

**Exclusions:** BIO252Y, BIO270H, BIO271H, (ZOO252Y)

**Lectures:** Mondays 11:10am-12pm, HW216

My goal for the lectures in BIOB32 is two-fold:

- i) to provide students with a brief overview of several important concepts in animal physiology (related to the topics addressed in the laboratory exercises) but to approach each concept from a different perspective than is usually taken in an introductory course on the subject (e.g., BIOB34) so that students can contemplate the material in a novel way and, thereby, achieve a more comprehensive understanding of the discipline;
- ii) to place emphasis on non-mammalian species in order to highlight diversity in animal physiology.

Lecture notes will be posted (in PowerPoint format only) on Blackboard ~24 hours before each lecture. **NOTE: I reserve the right to make changes to the lecture notes after they are posted.**

**Laboratories:** Students should be enrolled in one of the following laboratory sessions:

- Pra1 – Mondays 1:10-4pm, SW321
- Pra2 – Mondays 1:10-4pm, SW323
- Pra3 – Tuesdays 11:10am-2pm, SW321
- Pra4 – Tuesdays 2:10-5pm, SW321
- Pra5 – Tuesdays 2:10-5pm, SW323
- Pra6 – Wednesdays 11:10am-2pm, SW321
- Pra7 – Wednesdays 11:10am-2pm, SW323
- Pra8 – Wednesdays 2:10-5pm, SW321
- Pra9 – Wednesdays 2:10-5pm, SW323

**Students are expected to attend all laboratory sessions:** content from the laboratory sessions are subject to examination, and students are only permitted to submit assignments for laboratory sessions that they attended. **Remember, the objective of this course is, in large part, to help students develop laboratory skills; if students are not attending the laboratory sessions, then they are not learning these skills and, as a result, cannot obtain a good mark in this course.**

**Students must attend only the laboratory session for which they are registered** as, for legal and safety reasons, there are limits to the number of students that each laboratory session can accommodate. Students attempting to attend a laboratory session for which they are not registered will be denied entry unless they have previously been granted permission by the course instructor, laboratory technician, or teaching assistant. **Students who arrive to their laboratory session late may be denied entry into the laboratory session at the discretion of the teaching assistant.**

By provincial law, students are required to wear a lab coat and closed-toed shoes whenever they are in the laboratory. Moreover, no food or drink (not even water bottles) is permitted in the laboratory at any time. **If students violate any of these legal requirements, the teaching assistant will rescind their entry into the laboratory immediately.** When necessary, disposable gloves will be provided to students.

The procedure for each laboratory exercise, as well as some pertinent background information, will be posted on Blackboard about one week prior the laboratory session in which it is to be completed. Students should print out the laboratory exercise (but not the background information, unless desired) and familiarize themselves with the procedures before coming to the laboratory session.

Before leaving each laboratory session, students must “check-in” with their teaching assistant, at which time the teaching assistant will review the student’s completion of the laboratory exercise and the student’s attendance at the laboratory session will be noted. *Attendance is being taken solely for the purpose of ensuring that students do not submit laboratory reports for labs that they did not attend.*

## **Textbook:**

I do not “teach from a textbook”. There will be no assigned readings from any textbook, and only material covered in class (both lecture and laboratory) will be subject to examination; however, in my experience, many students enjoy having a textbook to supplement their lecture notes and lab exercises. If you so desire, I would recommend the following textbook, which is available in the campus bookstore:

*Animal Physiology*, 4<sup>th</sup> ed., by Hill, Wyse, and Anderson

\*\*This is the same textbook used in BIOB34 in Fall 2016

I will post suggested readings, where applicable, from this textbook on Blackboard; however, this textbook may discuss material not covered in lecture or laboratory, and we may discuss material in class (both lecture and laboratory) not covered by the textbook. **You are responsible for all material covered in class (both lecture and laboratory) only.**

Additionally, each lecture is inspired by particular review papers from the primary literature, and I will post these papers on Blackboard for those students who may be interested in reading them. **You are not required to read these papers, and, again, you are only responsible for material covered in class (both lecture and laboratory).**

## **Evaluation:**

Term Test	15%
Laboratory Sessions	50% (5% each x 8 lab assignments; 10% work ethic)
Final Exam	35%

## **Important Notes Regarding Evaluations:**

### **Term Test**

There is only one Term Test in this course. The date and time of the Term Test will be determined by the Registrar’s office during the first few weeks of the semester, and I will post this information on Blackboard as soon as it is available.

The lectures and laboratory exercises covered on the Term Test will be announced in class and on Blackboard. The Term Test will be 2 hours and will comprise of short answer questions only. **Students will be evaluated based on the reasonableness and clarity of their written answers to the questions** Students will have some choice with regards to which questions they answer (e.g., answer 1 of the 2 short answer questions provided). **The Term Test questions will require students to think critically and creatively about the lecture and laboratory content by applying it to novel situations and problems; this reflects how important I believe it is that students learn to develop competency for thinking, reasoning, and scientific inquiry.**

To help students prepare for the Term Test, at the end of each week, an *optional* quiz (here *optional* means not worth any marks) will be posted on Blackboard. These quizzes will allow students to i) assess their understanding of the lecture and laboratory content, and ii) think critically and

creatively about lecture and laboratory content by applying it to novel situations and problems. *Students are strongly encouraged to discuss these quizzes with the course instructor when they encounter any difficulties, either by email or during office hours (preferred).*

If you know **in advance** that you cannot write the Term Test at the scheduled time because it conflicts with some other **valid activity**, please notify me as soon as possible so that we can make arrangements for you to write the Term Test at an alternative time. **Any such alternative time must be before the scheduled date of the Term Test.**

If you miss the Term Test due to medical illness, then you must submit a detailed UTSC Medical Certificate filled out by the physician who saw you on the day of the Term Test. This note must be submitted to the course instructor as soon as possible following the Term Test, whether in person or via email. Other medical notes will not be accepted, and if the UTSC Medical Certificate is not completed to the satisfaction of the course instructor, it may be refused. The UTSC Medical Certificate can be found via the following link:

[http://www.utsc.utoronto.ca/~registrar/resources/pdf\\_general/UTSCmedicalcertificate.pdf](http://www.utsc.utoronto.ca/~registrar/resources/pdf_general/UTSCmedicalcertificate.pdf).

If you miss the Term Test for any other valid reason, please consult with the course instructor as soon as possible. The course instructor will determine whether the reason given for a missed Term Test is valid in accordance with university policies. Also, the course instructor may ask for any documentation required to verify the reason given.

Students who miss the Term Test for a valid reason (medical or otherwise) will not be permitted to write a make-up Term Test; rather, the weight of the Final Exam will be increased to 50% of their final grade. Students who miss the Term Test for any invalid reason will receive a grade of zero for the Term Test.

## **Laboratory Sessions**

### ***Lab Assignments***

After having completed a laboratory exercise—and prior to the commencement of the next laboratory exercise in the subsequent week—students must submit an assignment for the laboratory session that they completed. Reflecting that science is a collaborative discipline, **these assignments must be completed in groups of 2-3 people.** Each group must consist only of members from the same laboratory session.

Although there are 10 laboratory sessions (plus one in which students will learn how to use BIOPAC), **students may only submit 8 assignments.** All assignments are submitted via **Blackboard**. Only one student should submit the assignment, but the name and student number of all contributing students should be noted in the “Comments” box on the submission page. As noted above, assignment submissions are due before the commencement of the following laboratory exercise (i.e., in one week). **Late submissions will not be accepted for any reason.**

There are three different types of assignments that students can complete. For each laboratory exercise, students will select for themselves which particular type of assignment to complete, but each student must complete at least 2 of each different assignment type by the end of the course. Detailed guidelines for each assignment type follow:

### 1) Structured Abstract:

A structured abstract is a concise (**300 words maximum**) and factual written description of the laboratory exercise. It is clearly subdivided into the following sections: Background & Objectives (i.e., the context and purpose of the laboratory exercise), Materials & Methods (i.e., the procedures and equipment used to carry out the laboratory exercise), Results (i.e., the actual data collected in the laboratory exercise), and Conclusions (i.e., your interpretation of the meaning and/or significance of the results). A structured abstract must be able to be understood by a general science reader (e.g., your teaching assistant) without any reference to other sources (including the laboratory procedure posted on Blackboard). To this end, references are not necessary, and abbreviations should be avoided unless necessary or common, in which case they must be defined at their first mention (e.g., Oxidative phosphorylation (OXPHOS) is the major source of ATP in the cell.). **Structured abstracts should be submitted as attached .doc or .pdf files only.**

For examples of structured abstracts, please consult:

<http://ijbap.weebly.com/uploads/1/3/1/4/13145127/72-77-12.pdf>

[https://www.nlm.nih.gov/pubs/techbull/ja10/ja10\\_structured\\_abstracts.html](https://www.nlm.nih.gov/pubs/techbull/ja10/ja10_structured_abstracts.html)

### 2) Graphical Abstract:

A graphical abstract is a concise, single-panel pictorial representation of the laboratory exercise. It should grab the attention of a general science reader and clearly illustrate the principal results of the laboratory exercise as well as their meaning and/or significance (i.e., the “take-home message”). Only simple labels should be used; that is, the graphic itself should be easily interpretable without any caption or complex written descriptions. No additional text/abstract is required for this assignment. **Graphical abstracts should be submitted as attached .jpeg, .gif, .tiff, or .pdf files only.**

For examples of graphical abstracts from published biology papers, please consult:

<https://www.elsevier.com/authors/journal-authors/graphical-abstract>

### 3) Captioned Figure:

A captioned figure is a graph (or set of graphs) or image that depicts in detail the results from one particular part of the laboratory exercise. It should have the appearance of a figure as it would be presented in a scientific publication (e.g., black-and-white, no gridlines, complete axes labels, etc.) and should have a complete and proper caption (whose first sentence is the figure title; thus, the figure title should not appear on the figure itself) that allows for it to be understood by a general science reader (e.g., your teaching assistant) without any reference to other sources (including the laboratory procedure posted on Blackboard). All symbols used on the figure should be explained (either in the caption or in a legend). **Captioned figures should be submitted as attached .doc or .pdf files only.**

For examples of captioned figures, please consult:

<http://jeb.biologists.org/content/jexbio/219/16/2469.full.pdf>

<http://jeb.biologists.org/content/jexbio/219/18/2802.full.pdf>

For assistance with plotting data in Excel, please consult:

<https://www.youtube.com/watch?v=uH4RuuVQKLI>

Grading:

All assignments will be evaluated via Blackboard. There are three possible grading outcomes for each submitted assignment:

1) **Acceptable in its present form:** This means that the assignment has been done well. Assignment receives 10/10. TA will not provide any feedback.

2) **Acceptable with revisions:** This means that the assignment has been done reasonably well done but that there is significant room for improvement. Assignment receives 7/10. TA will provide feedback. Students can then choose to accept the current grade or revise the assignment in accordance with the TAs feedback and resubmit. The TA will then review the resubmitted assignment and, if the changes made make the assignment acceptable, the TA will change the student's grade to 10/10. (All resubmitted assignments are due one week from the date and time that the TAs feedback is posted to Blackboard. It is the student's responsibility to check Blackboard to see when the TA's feedback has been posted. **Late resubmissions will not be considered.**)

3) **Unacceptable:** This means that the assignment has been done incorrectly or does not meet the expectations of a second-year undergraduate student. Assignment receives 0/10. TA will provide feedback to help improve future assignments. **No revision/resubmission is permitted. (Unacceptable assignments do not count as submitted assignments [i.e., do not count towards the maximum of 8 assignments that can be submitted]).**

### ***Work Ethic***

The Work Ethic mark will be awarded by the teaching assistants at their discretion and will be based on how well the student contributes to the laboratory exercises during the laboratory sessions. Students are encouraged to discuss expectations for their laboratory performance with their TA.

### **Final Exam**

The Final Exam (3 hours) will be scheduled by the Registrar's office (April 5-22). The Final Exam will cover all material covered in the lectures and lab sessions throughout the course, though it will place emphasis on the material covered after the Term Test. It will have the same format as the Term Test.

**Tentative Schedule:**

WEEK	LECTURE	LAB SESSION
Jan 2	Introduction to the Course	<b><i>No Lab Exercise</i></b>
Jan 9	Comparative Digestive Physiology	Properties of Digestive Enzymes
Jan 16	Evolution of Gas Exchange in Animals	Blood: A Comparison Between Two Vertebrates
Jan 23	Comparative Physiology of Body Fluid Regulation in Vertebrates	Water Diuresis/Osmoregulation
Jan 30	Comparative Physiology of the Heart	Heart Function in <i>Daphnia</i>
Feb 6	Nervous Physiology: Membrane Potential and Interneuron Signalling	Extracellular Recordings of Action Potentials in the Earthworm
Feb 13		Extracellular Recordings of Compound Action Potentials in a Crab Nerve
Feb 20	FAMILY DAY & READING WEEK	
Feb 27	Comparative Neuroendocrinology	Compound Action Potentials in Frog Sciatic Nerve
Mar 6	Physiological Mechanisms of Thermoregulation in Ectotherms	Introduction to BIOPAC Software <b><i>(no assignment)</i></b>
Mar 13	Basal Metabolic Rate: Allometric Scaling and Mass- Independent Variation	Metabolic Rate of an Invertebrate and Scaling of SMR
Mar 20	Contraction and Relaxation of Smooth Muscle	Vertebrate Skeletal Muscle
Mar 27	Why Do Animals Have So Many Sensory Receptors?	Insect Mechanoreceptors and Mammalian Diving Response

## Accessibility Needs:

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca).

## Academic Integrity:

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters* (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

- In papers and assignments:*
- using someone else's ideas or words without appropriate acknowledgement
  - submitting your own work in more than one course without the permission of the instructor
  - making up sources or facts
  - obtaining or providing unauthorized assistance on any assignment.
- On tests and exams:*
- using or possessing unauthorized aids;
  - looking at someone else's answers during an exam or test
  - misrepresenting your identity
- In academic work:*
- falsifying institutional documents or grades
  - falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. There are other offences covered under the Code, but these are the most common. ***Please respect these rules and the values that they protect.***