

University of Toronto Scarborough – Department of Biological Sciences
BIOB32 – Animal Physiology Laboratory – Winter 2020

Course Instructor:

Dr. Jason Brown

Email: nysuloem.brown@utoronto.ca

Office: HL320

Office Hours: Mondays 2:30-5:30pm

Wednesdays 9:30am-12:30pm

**I will be also be available after class to answer
questions outside the lecture hall

Laboratory Technician:

Joanne Pearce

Email: pearce@utsc.utoronto.ca

Teaching Assistants:

Jerrica Jamison

Pra5 – Tuesdays 2:10-5pm SW323

Email: jerrica.jamison@mail.utoronto.ca

Simon English

Pra6 – Wednesdays 11:10am-2pm SW321

Pra8 – Wednesdays 2:10-5pm SW321

Email: simon.english@mail.utoronto.ca

Phillip Oelbaum

Pra7 – Wednesdays 11:10am-2pm SW323

Pra9 – Wednesdays 2:10-5pm SW323

Email: phillip.oelbaum@mail.utoronto.ca

Dennison Trinh

Pra2 – Mondays 1:10-4pm SW323

Email: dennison.trinh@mail.utoronto.ca

Erich Eberts

Pra3 – Tuesdays 11:10am-2pm SW321

Pra4 – Tuesdays 2:10-5pm SW321

Email: erich.eberts@mail.utoronto.ca

Saad Muhammad

Pra1 – Mondays 1:10-4pm SW321

Email: saad.muhammad@mail.utoronto.ca

Course Description: This course examines physiological mechanisms that control and coordinate the function of various systems within the body. The laboratory sessions 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, SY110

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

i) to provide students with an overview of several important and/or interesting concepts in animal physiology (usu. related to the topics addressed in the laboratory sessions) but to approach each concept from a different perspective than is typically 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) where possible, 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 Quercus ~48 hours before each lecture. NOTE: I reserve the right to make changes to the lecture notes after they are posted.

Laboratory Sessions: Students must 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, as this is a practical course that places considerable emphasis on the acquisition of hands-on laboratory skills. Content from all laboratory sessions is subject to examination. *Students who miss more than two laboratory sessions may not receive a passing grade in this course, regardless of their overall performance, and students are only permitted to receive a grade for a Laboratory Assignment when they have attended the corresponding laboratory session.*

If a student misses a laboratory session due to illness, they must submit a Self-Declaration of Student Illness Form, which is available at the following link:

<https://www.utoronto.ca/biosci/sites/utoronto.ca/biosci/files/u26/Self%20Declaration%20of%20Student%20Illness%20Fall%202018.pdf>

This form must be submitted to Jennifer Campbell (course coordinator for Biological Sciences; jac.campbell@utoronto.ca) within three days of the missed laboratory session or it may be declined. Students who submit this form will have the weight of the Laboratory Assignment corresponding to their missed laboratory session transferred to the Final Exam. Students who fail to submit this form will receive zero for the Laboratory Assignment corresponding to their missed laboratory session.

If a student misses a laboratory session for some other valid reason, they should contact the course instructor within three days. The course instructor will determine whether the reason given for the absence is acceptable under UofT's policies and, if so, the weight of the Laboratory Assignment corresponding to the missed laboratory session will be transferred to the Final Exam. Students who fail to notify the course instructor regarding their non-illness-related absence will receive zero for the Laboratory Assignment correspond to the missed laboratory session.

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. Students who arrive to their laboratory session late may be denied entry into the laboratory session at the discretion of the teaching assistant. Arriving late for a scheduled laboratory session will not be accepted as grounds for attending another laboratory session later in the week.

Students who are granted permission to attend a different laboratory session must still contribute to their assigned group's Laboratory Assignment, not the group with which they worked to complete the laboratory session. Students who are attending a different laboratory session in a given week should communicate with their group members about their planned absence and make arrangements to contribute to their group's Laboratory Assignment as soon as possible.

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 session, as well as some pertinent background information, will be posted on Quercus one week prior the laboratory session in which it is to be completed. Students must have access to the laboratory procedure throughout each laboratory session, whether in print or via electronic device, and should familiarize themselves with the procedures before coming to the laboratory session. Being unprepared for laboratory sessions may be considered as poor work

ethic by teaching assistants (see below). Students will often be required to record the results of their laboratory session and should have a notebook (paper or electronic) for this purpose.

Before leaving each laboratory session, each group must “check-in” with their teaching assistant, at which time the teaching assistant will review the group’s completion of the laboratory session and attendance at the laboratory session will be noted.

Textbook:

Each lecture in this course has been inspired by one or more review papers from the primary literature, and I will post these papers on Quercus for those students who may be interested in reading them. *You are not required to read these papers, and you are only responsible for material covered in class (both lecture and laboratory sessions).*

Because there is only a limited amount of lecture time, I will not be reviewing basic physiological concepts in class. If you need to refresh your knowledge of these basic concepts, I would recommend the following textbook, which is available in the campus bookstore:

Animal Physiology, 4th ed., by Hill, Wyse, and Anderson

**This is the same textbook used in BIOB34 in Fall 2019 and is available at the UTSC Bookstore.

I will not be posting any suggested readings from this textbook. It is the responsibility of the student to locate the relevant background information in the textbook, if desired.

Evaluation:

Term Tests	15% (15% best; 0% worst)
Laboratory Assignments	40% (3.6% each x 11 assignments)
Laboratory Work Ethic	10%
Final Exam	35%

**NOTE: *Students must pass at least one exam in order to receive a passing grade in this course, regardless of their overall performance.*

Important Notes Regarding Evaluations:

Term Tests

There are two Term Tests in this course, which are held outside of class time. The dates and times of the Term Tests will be determined by the Registrar’s Office during the first few weeks of the semester, and I will post this information on Quercus as soon as it is available.

Term Tests may cover any material taught in this course, but the lectures emphasized on each Term Test will be announced in class and on Quercus. Term Tests will be 2 hours and will comprise of short answer questions only. Students will be evaluated based on the reasonableness, clarity, and conciseness of their written answers to the questions. Students will have some choice with regards to which questions they answer (e.g., answer 1 of 2 short answer questions). *The Term*

Test questions will require students to think critically and creatively about the lecture and laboratory session content as students will be expected to explain novel observations and solve problems. This reflects my belief that undergraduate students need to develop not only their scientific knowledge but, more importantly, their competency for thinking, reasoning, and scientific inquiry.

To help student prepare for Term Tests, optional quizzes (here optional means not worth any marks) will be posted on Quercus each week. 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 a Term Test at the scheduled time because it conflicts with some other valid activity, please notify the course instructor as soon as possible so that arrangements can be made 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 one Term Test for any reason, then the missed Term Test will be automatically considered as your Worst Term Test, which is not worth any marks. No documentation is required.

*If you miss both Term Tests 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, *for the second term test only*. This note must be submitted to the Jennifer Campbell within three days following the second Term Test, whether in person or via email. Other medical notes will not be accepted, and if the UTSC Medical Certificates are not completed to Ms. Campbell's satisfaction, 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

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

For students who miss both Term Tests for valid reasons (medical or otherwise), their final exam will be worth 50% of their final course grade.

Students who miss both Term Tests for invalid reasons will forfeit the portion of their final grade allocated to Term Tests.

Laboratory Assignments

During the first laboratory session (January 13-15), students will be organized into groups of approximately 4-5. Each group will be assigned a laboratory bench and will choose a group name, which will be used organize groups on Quercus. *Reflecting that science is a collaborative discipline, students will perform all laboratory sessions and submit all Laboratory Assignments in these groups.*

There are 11 laboratory sessions. Groups will complete a Laboratory Assignment for each laboratory session, and each assignment is worth approximately 3.6% of the final course grade. *All assignments will be submitted via Quercus, with only one submission required per group. Assignments will be submitted as attached files, which must be either .doc or .pdf files. Assignments are due before the commencement of the following laboratory session. Late submissions may be rejected at the discretion of the teaching assistant.*

Each Laboratory Assignment will consist of three of the following six sections. For each Laboratory Assignment, groups can choose which three particular sections they wish to incorporate.

Detailed guidelines for each section follow:

1) Title, Structured Abstract & Keywords

For this section, groups must write a title (no more than 100 characters, including spaces), a structured abstract (no more than 300 words), and 4-6 keywords for their laboratory session.

A title must convey the topic of the laboratory session, highlight the importance of the topic to the field of animal physiology and/or animal physiology education, and attract the reader's attention.

A structured abstract is a concise and factual written description of the laboratory session. It is clearly subdivided into the following sections: Background & Objectives (i.e., the context and purpose of the laboratory session), Methods (i.e., the procedures and equipment used to carry out the laboratory session), Results (i.e., the actual data collected in the laboratory session), and Conclusions (i.e., your interpretation of the results and their significance to the field of animal physiology). A structured abstract must be able to be understood by a general science reader (e.g., teaching assistant) without any reference to other sources (including the laboratory procedure posted on Quercus). 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.).

Keywords provide an additional way for individuals searching the literature to identify relevant papers. Choosing appropriate keywords will increase the chances of readers engaging with a paper. Keywords cannot appear in the title, as this would be redundant.

For examples of titles, structured abstracts, and keywords, please consult:

<https://www.springer.com/gp/authors-editors/authorandreviewertutorials/writing-a-journal-manuscript/title-abstract-and-keywords/10285522>

https://www.nlm.nih.gov/pubs/techbull/ja10/ja10_structured_abstracts.html

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6121046/>

2) Graphical Abstract

For this section, groups must create an *original* graphical abstract; that is, it is permissible to incorporate images obtained online, but the overall image created must be unique and not copied entirely or mostly from any other source.

A graphical abstract is a concise, single-panel pictorial representation of the laboratory session. It should grab the attention of a general science reader (e.g., teaching assistant) and clearly illustrate the principal results of the laboratory session 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.

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

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

3) Captioned Figure

For this section, groups will create a graph that depicts in detail the results from one particular part of the laboratory session. 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., teaching assistant) without any reference to other sources (including the laboratory procedure posted on Quercus). All symbols used on the figure should be explained (either in the caption or in a legend), and it is preferred that groups use open or filled bars, circles, triangles, squares, or diamonds, where possible. Groups are not required to conduct any statistical analysis of their data. [NOTE: Captioned figures may have multiple panels (A, B, C, etc.).]

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>

4) Literature Search and Comparison

For this section, groups must find two primary (i.e., non-review) articles, published in peer-reviewed scientific journals, that investigated a research problem similar to that of the laboratory session, whether in the same or a different species. For each article, students must briefly describe the results and whether they are consistent with the results of their laboratory session. Where the results are consistent, students should explain the general principle(s) that we, as animal physiologists, can extrapolate from these results. Where the results are inconsistent, students should provide a reasonable hypothesis to explain the discrepancy.

The primary articles used for this section must be cited using the reference format employed by the *Journal of Experimental Biology*: <http://jeb.biologists.org/content/manuscript-prep#ref>

The word limit for this section is 500 words (not including references).

5) Research Proposal

For this section, groups must propose a novel research question that arises from the results obtained in the laboratory session. In doing so, they must clearly demonstrate the relationship between their novel research question and the results of their laboratory session, which they should briefly

mention. They must also provide a hypothesis (i.e., what they believe the answer to their question will be, based on what they have learned in completing the laboratory session and the results of at least one published scientific study, which must be referenced as above.) They must also briefly outline a suitable experimental approach that could be employed to test this question/hypothesis.

For assistance with writing a research proposal, please consult:

https://uwaterloo.ca/graduate-studies-postdoctoral-affairs/sites/ca.graduate-studies-postdoctoral-affairs/files/uploads/files/fall_2018_wcc_triagency_scholarship_research_proposal_writing_0.pdf

The word limit for this section is 500 words.

6) Press Release

It is important for scientists to be able to communicate the results of their experiments to the general public, especially since most experiments are funded publicly through taxation.

For this section, groups should write an article that could be displayed on the UTSC Homepage. Students should consult the UTSC Homepage to familiarize themselves with the format and style of the articles featured there. The article must have a catchy title and brief description, as well as photo image, that would appear on the rotating banner on the UTSC Homepage. The article must also have a body (word limit = 500 words) that describes the laboratory session in a manner i) suitable for consumption by prospective students and the general public and ii) that will excite people about the work being conducted by students at UTSC. Students must also provide a second, different photo image that could appear when someone clicks on the banner to read the article. All photo images used for this section must have been taken by the students during the laboratory session. Stock images from the Internet are not permitted due to copyright laws.

Grading:

All Laboratory Assignments will be evaluated by the teaching assistants via Quercus. There are only three possible grading outcomes for each submitted Laboratory Assignment:

1) *Accepted*: This means that the Laboratory Assignment has been done very well. Assignment receives 10/10. TA will not provide any feedback.

2) *Revisions Required*: This means that the Laboratory Assignment has been done well but there remains significant room for improvement. Assignment receives 7/10. TA will provide feedback. Students can choose to accept the current grade or revise the assignment in accordance with the TA's 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 students' grade to 10/10. (All resubmitted assignments are due within one week from the date and time that the TA's feedback was posted to Quercus. It is the students' responsibility to check Quercus to see when the TA's feedback has been posted. Late submissions may be denied at the discretion of the teaching assistant.)

3) *Rejected*: This means that the Laboratory Assignment has been done incorrectly or does not meet the expectations of a second-year undergraduate student at UTSC. Assignment receives 0/10. TA will provide feedback. Students can choose to accept the current grade or revise the assignment in accordance with the TA's 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 students' grade to 7/10. (All resubmitted assignments are due within one week from the date and time that the TA's feedback was posted to Quercus. It is the students' responsibility to check Quercus to see when the TA's feedback has been posted. Late submissions may be denied at the discretion of the teaching assistant.) *Please note that, in rejecting a Laboratory Assignment, we are not discounting the amount of work that students may have put forth in the preparation of the assignment; rather, we are expressing that the assignment has considerable shortcomings that could not be easily corrected through minor revision.*

When students receive a 7/10 or 0/10 for a Laboratory Assignment, they are encouraged to carefully read and reflect upon the feedback provided to improve future submissions rather than protesting their grade. The objective of these assignments is help students develop a broad array of scientific skills, and one of the best methods for learning a new skill is to learn from failure. If students wish to protest the grading outcome of their Laboratory Assignments, they should contact their teaching assistant first. They should only contact the course instructor after having failed to resolve their concerns with the teaching assistant.

Laboratory Work Ethic

This mark will be awarded by the teaching assistants *at their discretion* and will be based on preparedness for and contribution to laboratory sessions. During the first laboratory session, each teaching assistant will communicate to their students any specific expectations that they have with regards to the demonstration of work ethic. *The course instructor will not entertain any disputes by students with regards to this grade.* Students are encouraged to maintain an open dialogue with their teaching assistant throughout the semester so that any problems with a student's laboratory work ethic can be addressed early.

Final Exam

The Final Exam (3 hours) will be scheduled by the Registrar's office (April 8-25). The Final Exam will cover all material taught in the lectures and laboratory sessions throughout the course, though it will place emphasis on the material taught after Term Test 2. It will have the same format as the Term Tests.

Tentative Schedule:

WEEK	LECTURE	LABORATORY SESSION
Jan 6	Taste Perception in Mammals	<u>No Laboratory Session</u>
Jan 13	Comparative Digestive Physiology	Properties of Digestive Enzymes
Jan 20	Discontinuous Gas Exchange in Insects	Blood: A Comparison Between Two Vertebrates
Jan 27	Comparative Physiology of the Heart	Effects of Pharmacological Agents on <i>Daphnia</i> Heart
Feb 3	Recent Advances in Our Understanding of Metabolic Scaling	Metabolic Rate of a Crayfish and the Q ₁₀ Effect
Feb 10	The Origins of Specific Dynamic Action	Specific Dynamic Action in Cockroaches
Feb 17	FAMILY DAY & READING WEEK	
Feb 24	Understanding the Resting Membrane Potential	Extracellular Recordings of Action Potentials in the Earthworm
Mar 2	Understanding the Action Potential	Extracellular Recordings of Compound Action Potentials in a Crab Nerve
Mar 9	The Physiology of Superfast Skeletal Muscles	Force Recordings of Frog Gastrocnemius Muscle (video)
Mar 16	Factors Influencing the Cost of Locomotion	Excitation of Crustacean Muscle
Mar 23	Comparative Physiology of Body Fluid Regulation in Vertebrates	Hemolymph Glucose Regulation in Crustaceans
Mar 30	Diving Physiology of Marine Mammals and Birds	Mechanoreceptors (Cricket Sensory Neurons 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.

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.***

Copyright in Instructional Settings:

If a student wishes to audio-record, photograph, video-record, or otherwise reproduce lecture presentations, course notes, or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an

infringement of copyright and is absolutely prohibited. In the case of private use by students with disabilities, the instructor's consent will not be unreasonably withheld.