

University of Toronto Scarborough – Department of Biological Sciences
BIOB32 – Animal Physiology Laboratory – Winter 2021

Course Instructor:

Dr. Jason Brown

Email: nysuloem.brown@utoronto.ca

Office Hours:

By appointment only:

<https://outlook.office365.com/owa/calendar/UniversityofTorontoScarborough2@utoronto.onmicrosoft.com/bookings/>

****NOTE:** You must book appointment at least 6 hours in advance; appointments are 15 minutes; the link to the BB Collaborate room will be sent in email

Teaching Assistants:

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Pra 1 & Pra 2

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The teaching assistant corresponding to the practical (Pra) in which you are enrolled will evaluate all your weekly assignments; therefore, if you have any concerns about the evaluation of your weekly assignments, please contact your teaching assistant first.

Teaching assistants will be available online via Blackboard Collaborate for a couple of hours each week to provide assistance to students who are having difficulties conducting the at-home experiments or completing the weekly assignments. The schedule will be posted on Quercus.

Course Description: This course examines physiological mechanisms that control and co-ordinate 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: *There will be no live lectures in this course.*

One lecture hour (\pm 15 minutes) will be pre-recorded each week and made available through Quercus. Lecture notes (in PowerPoint format) will be made available at the same time.

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 at-home experiments) 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.

At-Home Experiments: *There will be no in-person laboratory sessions in this course.*

Students are required to complete each at-home experiment during the week indicated on the schedule attached to this syllabus. They are required to upload their data to a shared Google Sheets so that all students can perform data analysis using the large class dataset. They are also required to submit a photograph of themselves conducting some part of the at-home experiment as proof of having completed the experiment; this requirement is in lieu of attendance. Students cannot receive a grade for a weekly assignment for which they have not submitted their photographic proof.

Weekly assignments can be completed individually or you can request to work with one other student. (If requesting to work with another student, please email me **no later than Monday, January 18th** so I can link your grades for these assignments together on Quercus; you must continue to work together throughout the semester unless one person drops the course.) All weekly assignments are to be submitted via Quercus by 5pm on the Friday of the week following that in which the experiment was conducted. These deadlines are clearly indicated on Quercus. *Late submissions may be rejected at the discretion of the teaching assistant and no resubmission will be permitted.* Assignments will be submitted as attached files, which must be either .doc or .pdf files.

Only the best 10 weekly assignments will count towards a student's grade. Therefore, students can elect to skip up to 2 weekly assignments for whatever reason (including illness) without any penalty. (Students are still encouraged to complete the at-home experiment, however, because the content is testable.) If students experience circumstances that prevent them from submitting more than 2 assignments, they should contact the course instructor immediately to discuss their situation.

The procedure for each at-home experiment, as well as some pertinent background information, will be posted on Quercus at least one week in advance.

Textbook: *There is no textbook for this course.*

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 at-home experiments).*

Because there is only a limited amount of lecture time, I will not be reviewing basic physiological concepts in lecture. If you need to refresh your knowledge of these basic concepts, please consult an animal physiology textbook (which you may still have from BIOB34).

Evaluation:

Term Tests	15% (15% best; 0% worst)
Weekly Assignments	50% (5% each x 10 assignments)
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 will be held online via Quercus**. 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 covered in this course, but the lectures emphasized on each Term Test will be announced 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 at-home experiment 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 students prepare for the 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.*

Students will be permitted to collaborate with each other during the Term Tests via Google Docs. Links to these Google Docs will be made available at the start of each test. The purpose of this collaboration is i) to maintain exam fairness by ensuring that all students have access to the same information and ii) to foster community and dialogue among students.

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. Please note that only students writing at the scheduled time will have access to the Collaboration Google Doc.*

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 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%20Biological%20Sciences%20fillable.pdf>

for the second term test only. This form must be submitted to Jennifer Campbell, Biological Sciences Course Coordinator, jac.campbell@utoronto.ca, within three days following the second Term Test.

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.

Weekly Assignments

For each at-home experiment, students will complete a Weekly Assignment. Each Weekly Assignment will consist of one component from each of the three sections listed below. Students will decide for themselves which components to incorporate into their Weekly Assignments.

Section 1

Component 1: Structured Abstract

For this component, students will write a structured abstract (no more than 300 words).

A structured abstract is a concise and factual written description of the at-home experiment. It is clearly subdivided into the following sections: Background & Objectives (i.e., the context and purpose of the at-home experiment), Methods (i.e., the procedures and equipment used to carry out the at-home experiment), Results (i.e., the actual data collected in the at-home experiment), 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 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.).

For examples of structured abstracts, 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/>

Component 2: Graphical Abstract

For this component, students will 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 at-home experiment. It should grab the attention of a general science reader (e.g., teaching assistant) and clearly illustrate the principal results of the experiment 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>

Component 3: Video abstract

For this component, students will create a video abstract, using video footage obtained from their own recording device and/or *original* animations created using computer software. It should be approximately 2 minutes long.

Video abstracts are relatively new in biology. They are a video summary of an experiment, highlighting key background information, what was done, and the significance of the results obtained. They are not an oral presentation and should not include considerable amounts of text. Raw data and figures are usually discouraged. Keep in mind that most journals post these video abstracts on YouTube, so they need to be able to compete for people's attention against cat videos.

For examples of video abstracts from biological journals, please consult:

<https://www.cell.com/video/video-abstracts>

<https://www.sciencedirect.com/science/article/pii/S0896627314011416>

Section 2

Captioned Figure (This is the only component of this section.)

Create a graph that depicts in detail the results from one particular part of the at-home experiment. 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 at-home experiment 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 students use open or filled bars, circles, triangles, squares, or diamonds, where possible. [NOTE: Captioned figures may have multiple panels (A, B, C, etc.).]

Because all students will have access to a large class dataset, it is expected that students will conduct rudimentary statistical analyses of the data and indicate the results of statistical tests on their figure.

For examples of captioned figures, please consult the following papers:

<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>

For assistance with conducting statistical tests using Excel, please consult:

<https://www.youtube.com/watch?v=q0ckcKsSPXU> (t-tests)

https://www.youtube.com/watch?v=tPGPV_XPw-o (ANOVA and post-hoc t-tests)

<https://www.youtube.com/watch?v=vFcxExzLfZI> (correlation and regression)

For assistance with summarizing statistical tests on figures, please consult:

<http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWstats.html>

Section 3

Component 1: Literature Search and Comparison

For this component, students must find one primary article, published in a peer-reviewed scientific journal, that investigated a research problem similar to that of the at-home experiment but in a non-human animal species. After having chosen the article, students must briefly describe the results and whether they are consistent with the results of the at-home experiment. 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 article 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 component is 500 words (not including the reference).

Component 2: Equipment Grant Proposal

In completing the at-home experiment, students were quite limited in terms of the experimental tools available to investigate the research question at hand. Consequently, for this component, students must write a proposal (word limit = 500 words) in which they request that UTSC provide all currently-enrolled BIOB32 students with grant money for the purchase of a specific piece of scientific equipment that could improve the quality of the at-home experiment. The proposal should i) describe the function of the equipment; ii) articulate how the equipment would improve the experiment; iii) state the cost and supplier of the equipment; and iv) justify the cost of the equipment, keeping in mind that the university has many competing financial priorities.

Component 3: Media Release

There has been a lot of media interest in how universities have managed to keep students learning in the midst of the pandemic. See this article in The Varsity: <https://thevarsity.ca/2020/05/15/at-home-experiments-and-virtual-labs-how-u-of-t-moved-lab-courses-online-due-to-covid-19/>

For this component, students will write an article, suitable for display on the UTSC Homepage, that hypes up the particular at-home experiment completed and discusses its pedagogical value. 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 a 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 at-home experiment in a manner i) suitable for consumption by prospective students and the general public and ii) that will excite people about the education quality that UTSC can provide its students even during the pandemic. 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 must have been taken by the students themselves. Stock images from the Internet are not permitted due to copyright laws.

Grading

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

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

- 2) *Accepted But Revisions Required*: This means that the 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. Students are only permitted one opportunity for revision and resubmission.)

- 3) *Rejected*: This means that the assignment has been done incorrectly or does not meet the expectations of a second-year undergraduate student at UTSC. Assignment receives 1/10. 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. Students are only permitted one opportunity for revision and resubmission.) *Please note that, in rejecting a Weekly 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 can only be addressed through major revisions.*

Final Exam

The Final Exam (3 hours) will be scheduled by the Registrar's Office (April 13-23). The Final Exam will cover all material taught in the lectures and at-home experiments 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	"AT-HOME EXPERIMENT"
Jan 11	Taste Perception in Mammals	Effect of Artificial Sweeteners on Taste Perception
Jan 18	Comparative Digestive Physiology	Effect of Physical Activity on Gut Transit Time
Jan 25	Discontinuous Gas Exchange in Insects	Effect of Posture and Yoga on Vital Capacity
Feb 1	Comparative Physiology of the Heart	Effect of Music on the Autonomic Response to Stress
Feb 8	The Origins of Specific Dynamic Action	Effect of Meal Composition on Specific Dynamic Action
Feb 15	FAMILY DAY & READING WEEK	
Feb 22	Recent Advances in Our Understanding of Metabolic Scaling	Scaling Relationship Between Saliva Production Rate and Body Mass
Mar 1	Understanding the Resting Membrane Potential	Effect of Stimulus Location on Reaction Time
Mar 8	Understanding the Action Potential	Effect of Chewing Gum on Typing Performance
Mar 15	The Physiology of Superfast Skeletal Muscles	Force Recordings of Frog Gastrocnemius Muscle
Mar 22	Factors Influencing the Cost of Locomotion	Effect of Gait Characteristics on the Cost of Locomotion
Mar 29	Comparative Physiology of Body Fluid Regulation in Vertebrates	Effect of Beverages on Urine Production Rate and pH
Apr 5	Diving Physiology of Marine Mammals	An Investigation of the Factors Contributing to the Mammalian Dive 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. UTSC AccessAbility Services staff are available by appointment to assess specific needs, provide referrals, and arrange appropriate accommodations. Contact them at (416) 287-7560 or ability@utsc.utoronto.ca, or visit their website for more information: <https://www.utsc.utoronto.ca/ability/welcome-accessability-services>

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, they 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.