

This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 450 – Molecular & Biochemical Adaptations of Animals to the Environment

General Course Syllabus (as of November 2019)

About the Course:

Course Description: BIOL 450 covers the physiological, biochemical, and molecular strategies for animals adapting to environmental challenges. Topics address the evolution of genetic and biochemical systems and their impact on animal structure and function.

Course Format: Lecture

(A portion of each lecture will be set aside for class discussion and student seminars).

Credits: 3

Prerequisites:

- Physiology: One of BIOL 361, BIOL 362, BIOL 364 **and**
- Biochemistry: One of BIOL 201, BIOC 202, BIOC 203.
- (BIOL 457 is recommended.)

Course Learning Outcomes:

The overall goal of this course is to understand how biochemistry adapts to the widely variable conditions that exist on this planet.

By the end of this course, students should be able to:

- Identify the major biochemical systems and how they are both specific and sensitive.
- Explain how temperature, oxygen availability, and water availability impact the major biochemical systems.
- Read primary literature and understand how scientists test hypotheses about biochemical adaptation.

Textbooks and Additional Resources:

Textbook (optional): The course is based on Somero et al. (2017) Biochemical Adaptation. A copy is placed on hold at Woodward Library, which may be helpful for reference, but not required.

Readings (required): A list of primary literature will be provided on the course website on Canvas (canvas.ubc.ca). Students are also encouraged to find any other sources that they might find helpful.

Grading Scheme:

Assessment	Weight
Quizzes	20%
Class participation	10%
Semester project	50%
Final exam	20%

DETAILS OF ASSESSMENTS:

Quizzes: There will be weekly primary literature readings and discussions, and a total of 10 weekly online quizzes about the paper and course material broadly. The purpose of these quizzes is to help students prepare for class discussion, review understanding of the material, and help keep up with the course. Students are free to discuss the questions with their colleagues, consult material, or attend office hours for help during the week.

Class participation: A willingness to contribute to discussion and share ideas is not only essential for success in science, but also in this course. For each lecture, marks will be provided for both a) attending class, and b) actively participating in class discussion. The participation grade will be determined from the top 80% of lectures.

Semester project: The greatest percentage of the marks will come from a semester-long project with several components, including a literature review, two class presentations, data analysis, and a final paper. Each student will study a biochemical adaptation in a protein of their choosing. More detail will be provided on each aspect as the semester progresses. Late assignments will be penalized at 10% a day.

Final Exam: There will be a final, 20 minute oral exam. The goal of the lecture exam is to test students' ability to use the knowledge gained through lecture, not to test their ability to regurgitate facts that they can Google. Also, it is exceedingly important to be able to formulate ideas quickly and communicate those ideas verbally, thus the final exam is an oral exam. The instructor will meet with each student one-on-one to discuss biochemical adaptations, experimental design, and a paper reading assigned ahead of time.

Schedule of Topics:

The course is divided into units that cover the major abiotic challenges to biochemistry—water availability, oxygen availability, and temperature. A sample schedule from 2018W2 is given on the next page:

Week	Lecture Topic	Due
1	Introduction (first class)	
2	Aerobic metabolism	
	Anaerobic metabolism	
3	Oxidative stress	Quiz 1
	Metabolic rates	Pick your protein
4	Metabolic depression	Quiz 2
	Thermal relationships	
5	Temperature effects on proteins	Quiz 3; literature review
	Temperature effects on proteins	Class presentations
6	Temperature effects on proteins	Quiz 4; class presentations
	Temperature effects on proteins	Class presentations
7	Temperature effects on nucleic acids	Quiz 5; class presentations
	Temperature effects on lipids	
8	Endothermy and homeothermy	Quiz 6; introduction
	Compensation	
9	Freezing	Quiz 7
	Inorganic micromolecules	Data analysis
10	Organic micromolecules	Quiz 8
	Protein stability & pH	Paper draft due; class presentations
11	Desiccation	Quiz 9; class presentations
	Anthropocene & oceans	Class presentations
12	Calcification & invasive species	Quiz 10; class presentations
	Genetic resources	Final paper due; class presentations
13	Homeotherms	Class presentations
	Final review	

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.

UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.

UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.

UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).