BIOL 103
Introductory Biology of Organisms
Winter 2019

CALENDAR DESCRIPTION

An introduction to the basic themes and concepts of modern biology spanning organizational levels from organisms to ecosystems in an evolutionary context.

SCHEDULE

Lectures: See the BIOL103 Course Home page in onQ

Labs: See SOLUS for a list of various lab times and locations

CONTACT INFO

Instructors	**Profs Virginia Walker and Adam Chippindale**
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Office Hours	See Course Home page in onQ
Lab Instructor and Course Administration	See Course Home page in onQ

Learning Objectives

Just as eukaryotic cells are complex and integrated machines, organisms are built around the specialization of cells into tissues and organs that grow, differentiate and communicate in order to compete and achieve reproductive success as an integrated unit. Biology 103 develops a solid understanding of how an animal is built and interacts with the abiotic and biotic environment; how its tissues and organs work together to maintain a steady state or adapt in the face of challenges from stress and infection. Evolution is key to understanding both the history of life and organismal function, and the Biology of Organisms is steeped in evolutionary principles at each level of biological organization, including the forces that drive change in gene frequencies within populations. Finally, recognizing how populations of different species interact in communities and ecosystems is vital to understanding and protecting biotic diversity from local to global scales. Thus, although Biology 103 is titled *Introductory Biology of Organisms*, understanding the organism requires zooming in and out from genes to ecosystems, and travelling back in time so we may predict the future.

Learning Hours

The table of learning hours is only a rough estimate of the time required for the course. A 3.0 unit course would normally require a total of 110 to 130 total learning hours and this course will fall within that range, but of course, is dependent upon individual variation.

Teaching method		*Average hours per week*	*Number of weeks*	*Total hours*
In-class hours	Lecture	3	12	36
	Seminar			
	Laboratory	2	12	24
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	Online activity	2	12	24
	Off-campus activity			
	Private study	3	13	39
Total hours on task				123

Course Outline

A. The Making of Organisms from Cells (Dr. Walker)

(Duration: the first 6 weeks of lectures; 18 lectures total)

1. Intracellular and Extracellular Digestion
   A general introduction to the course, guidelines, expectations and lab announcements will be made. In addition, intracellular and extracellular digestion will be examined with examples from protists, fungi and more complex metazoans.

2. Digestion and Absorption
   Enzymes important for digestion will be explored, as well as the specificity of action of selected proteases, with most examples from humans.

3. Digestion and Problems
   The discussion of digestive enzymes will be continued, and some human diseases associated with digestion will be explored.

4. Excretion and Ion Transport I
   The nitrogenous waste problem will be presented using examples from fish, insects, developing birds and humans).

5. Excretion and Ion Transport II
   The human kidney and excretory diseases will be highlighted. Knowledge of kidney function crucially depends on the understanding of osmotic regulation and ion transport. Examples of pumps relevant to this section include drug pumps, bile salt export pumps and the cystic fibrosis transmembrane conductance regulator.

6. Movement and Muscle Control
   An introduction to movement (plants, protists, cultured cells) with emphasis on the vertebrate skeletal muscles will be presented.

7. Neural Transmission and Nervous Control I
The class will investigate the transmission of a signal down a neuron and classes of neural transmitters using the vertebrate as a primary model.

8. Neuroscience
Further understanding of synaptic transmission of the signal will be amplified by practical applications of neuroscience (e.g. insecticides, neurological diseases and their treatments, poisons produced by snakes, fish and plants). An overview of the comparative physiology of nervous systems (e.g. cnidarians, annelids, mollusks and vertebrates) and of the brain will also be presented.

9. Circulatory Systems
A general introduction to circulatory systems in diverse organisms will be presented but with an emphasis on mammalian circulatory system. The blood clotting cascade and various genetic diseases associated with the circulatory system will be discussed.

10. Respiration and Gas Exchange
The transport of oxygen to the tissues in vertebrates using red blood cells, and transport of waste carbon dioxide is the focus of the lecture. Adaptations to high altitudes and embryonic development will be explored as well as additional diseases of the circulatory system.

11. Defence and Immunity I
An introduction to the recognition of self and defence against pathogens (innate vs. adaptive) will be presented. The humoral response in mammals is emphasized in this first lecture of the series.

12. Immunity and Immunogenetics
The cellular response to pathogens (T cells and the assembly of T receptors, MHC proteins etc) will be presented, as will the concepts of immune tolerance and human diseases of the immune system.

13. Immunity and Cancer
Genome rearrangements (e.g. Burkett's lymphoma) in lymphocytes follow from perturbations of the immune system. There will be a general review of the causes of cancers with a section devoted to retroviruses.

14. Evading the Immune System
A case study of HIV will be presented including the viral life cycle, its epidemiology and the social responsibilities of the disease. The skirmishes in the battle between HIV and the immune system as well as tested therapies, and HIV resistance mechanisms make for a fascinating exploration.

16. Defence in Other Organisms and an Introduction to Hormones
Immunity in insects and plants is explored, as well as an introduction to hormones important in development.

17. Hormones and Endocrine Systems
Development will be further explored as an orchestration of steroid and peptide hormone synthesis by endocrine glands. Practical applications of hormone studies including cheating in athletic performance and anti-doping monitoring, fish behavior, osmoregulation in humans, and mineral balance in humans will be used as examples.

18. Putting it All Together: Homeostasis and Review
Hormone-associated diseases, and a brief overview of homeostasis and its importance, will be discussed. Participation in a guided review of the course will follow with examples taken from recent news items associated with the subjects covered by the course.

B. Organisms to Ecosystems (Dr. Chippindale)

(the 6 weeks of lectures following Reading Week)

Week 7. Introduction
The relevance of evolution; the evidence for evolution; natural selection in the lab and in the wild; the pace of evolutionary change; evolution & diversity.

Week 8. Genes in Populations
The forces of evolutionary change (selection, drift, migration, mutation); detecting evolution

Week 9. Evolutionary Enigmas
Sex and multicellularity; origins of sex; origins of different mating types and gametes; consequences of separate sexes; sexual selection & conflict; the origin of organisms.

Week 10. Species and Speciation
Species definitions; modes of speciation; hybrid zones; micro- versus macroevolution.

Week 11. Population & Community Ecology
Life history strategies; population growth; the niche, species interactions – symbioses, mutualism, parasitism etc.

Week 12. Ecosystems & Conservation
Energy flow; productivity; elemental cycles; biodiversity; conservation biology.

C. Laboratory Exercises:

Information on the laboratory exercises is available in the laboratory manual, but is likely to include muscle physiology, respiration physiology, and evolution

Textbooks/Readings

Course Text (required; second-hand older editions fine or use library texts):
Campbell Biology, Second Canadian Edition by Reece, Urry, Cain et. al., 2018, published by Pearson.

*Note: Access to the publisher's website is associated with the text (provided with purchase of new text)

Department of Biology website: http://biology.queensu.ca
Dates and details of readings and assignments will be announced in class and/or posted on the course website in OnQ. Dates and details for lab activities session assignments will be presented in OnQ and/or the labs.

Grading Scheme

Component	Weight (%)	Date
OnQ tests/quizzes/assignments/ activities (e.g. Mastering)	19%	TBA
Lab: Quizzes and Assignments	35%	TBA
I Clicker use: most lectures	3% (1.5% each half term)	
Final Exam	43%	April exam period

Grading Method

Most components (e.g. exams, online quizzes) 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. Other components will receive letter grades, which will be translated into numerical equivalents using the Faculty of Arts and Science approved scale. Students' course average is then 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

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