

BIOL 103

Fundamentals of Biology: Organisms to Ecosystems

Winter 2022

CALENDAR DESCRIPTION

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

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Learning Objectives

On successful completion of this course, you should be able to:

1. Identify the roles of the major physiological systems in diverse animals and how they are regulated through electrical and chemical signals to achieve change or maintain homeostasis
2. Describe the structure and function of nerves and muscles and explain how they contribute to physiological and behavioural processes.
3. Apply knowledge of tissue and organ system functioning and integration to diagnose or predict common diseases and organismal dysfunctions.
4. Discuss the mechanisms by which evolution shapes biological diversity, citing examples from the history of life captured in the fossil record, in extant diversity, or through direct observation of evolution in action.
5. Compare the nature of interactions between organisms at the level of the population, the community and the ecosystem.
6. Describe the main cycles governing the flow of nutrients and energy through communities and ecosystems and recognize the importance of ecological interactions and biodiversity in building a sustainable future.

Learning Hours

	<i>Teaching method</i>	<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
Lecture Content	Lecture Preparation ¹	3	12	36
	Lecture Recordings	2	12	24
	Private Study	1	12	12
	Group Learning	1	12	12
Tutorial	Individual Preparation	2	6	12
	Group Activity	1.5	6	9
Assessments	Quizzes	2	4	8
	Review of Content	1	12	12
Totals				125

¹This includes textbook readings and MasteringBiology activities, including DSMs.

Course Outline

A. Evolution

- **Why evolution matters.** The importance of understanding evolution; the evidence for evolution; the pace of natural selection in the wild and in the laboratory.
- **Microevolution and the origin of species.** Sources of variation and the H-W Equilibrium Principle ; the major processes of evolutionary change: natural and sexual selection, drift, migration, mutation; how natural selection interacts with other evolutionary processes.
- **Macroevolution and a history of life on earth.** Species definitions; how evolution causes speciation; the origins of self-replicating entities, cells, and organisms; major patterns and general processes governing changes in assemblages of organisms over Earth's history; evolution of sexual reproduction and multicellularity; diversity of life.

B. Organismal Biology: Hormones, nerves and muscles

- **Homeostasis & Hormones.** The importance of regulation of internal conditions: feedback regulation, hormonal pathways, signaling cascades.
- **Nerves and Muscles.** Roles of nerves and muscles in homeostasis: design of excitable tissues, nature of the membrane potential, evolution of types of myocytes and neurons,
- **Nervous systems and Sensory Biology.** Building nervous systems from neurons and supporting cells, Sensing and responding to the environment

C. Organismal Biology: Homeostasis

- **Nutrition and Osmoregulation.** Regulation of nutrients and water balance: feeding modes, nutrient assimilation, ion balance, osmotic strategies.
- **Internal transport.** Movement of gases, fluids, and nutrients throughout the organism: Cardiovascular physiology, respiratory systems, plant internal transport
- **Immunity.** Defense against pathogens: Evolution of immune systems, innate and acquired immunity, roles of various types of blood cells in immunity
- **Reproduction and Development.** From gametes to organisms and back: regulation of gametogenic tissues, role of life history strategies, developmental patterns, regulation of development

D. Organisms to Ecosystems

- **Behaviour.** The importance of mate choice and competition for mates in shaping sexual organisms; conflicts between the sexes, both physical and genetic; relatedness, kinship and the evolution of cooperation and altruism.
- **Population & Community Ecology.** Life history strategies; population growth; the niche; species interactions (symbioses, mutualism, parasitism); the trophic structure of communities.
- **Ecosystems & Conservation.** Energy and material flow in biological systems; productivity; elemental cycles; biodiversity; biological invasions; climate change; conservation.

Group Sessions

Weekly group learning sessions run the continuum from laboratory to group learning. Weekly pre-lab individual activities are online followed by small group work completed entirely within the group session.

Textbooks/Readings

Course Text: Campbell Biology, Canadian 3rd Edition by Urey, Cain et. al., 2020, published by Pearson. See bookstore for specific details on the different purchase options.

Dates and details of readings will be posted on the course website in OnQ.

Grading Scheme

Component	Weight (%)
Dynamic Study Modules via MasteringBiology (4x2)	8%
In-class quizzes (4x5)	20%
OnQ Quizzes (4x5)	20%
Group Sessions, including Introductory activity via OnQ	34%
Final Exam	18%

Grading Method

In this course, some components will be graded using numerical percentage marks. Other components will receive letter grades, which for purposes of calculating your course average will be translated into numerical equivalents using the Faculty of Arts and Science Letter Grade Input Scheme.

When letter grades are employed, the following scale will be employed for purposes of calculating your course average:

Arts & Science Letter Grade Input Scheme

Assignment mark	Numerical value for calculation of final mark	Assignment mark	Numerical value for calculation of final mark
A+	93	C	65
A	87	C-	62
A-	82	D+	58
B+	78	D	55
B	75	D-	52
B-	72	F48 (F+)	48
C+	68	F24 (F)	24
		FO (O)	0

Your course average will then be 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)	Grade	Numerical Course Average (Range)
A+	90-100	C	63-66
A	85-89	C-	60-62
A-	80-84	D+	57-59
B+	77-79	D	53-56
B	73-76	D-	50-52
B-	70-72	F	49 and below
C+	67-69		

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.

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Accommodation of Disabilities

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact the Disability Services Office (DSO) and register as early as possible. For more information, including important deadlines, please visit the DSO website at: <http://www.queensu.ca/hcds/ds/>