

Biology 364 : Animal Physiology Spring, 2018

Course Description: This course will provide an overview of animal physiology (how animals work) with a comparative approach whenever possible. The concepts of homeostasis and feedback-mediated regulation will be central themes of the course, and we will also discuss the functional organization of organ systems with particular attention to the ways in which they may interact to maintain a relatively stable internal environment in the face of fluctuating external conditions. We will also pay special attention to the cellular and subcellular mechanisms that provide the foundation for physiological processes at the multicellular organism level.

Learning Outcomes: Students completing this course will have a foundational understanding of physiological processes and their cellular underpinnings. They will have an appreciation for physiology and will want to learn more about it. They will have sufficient understanding and knowledge to explain to others a number of physiological processes including the following:

- How neurons transmit signals rapidly across long distances and how they transmit chemical signals rapidly across short distances.
- How animals regulate volume, osmolarity, and ionic concentrations in plasma and intracellular fluid.
- How temperature affects physiological processes and how animals either compensate for changes in temperature or else regulate their temperature.
- How the heart generates pressure gradients and how those gradients generate flow.
- How blood pressure is perceived and regulated.
- How muscles work and how the nervous system controls them.
- How energy metabolism works and how animals use energy to perform.
- How animals sense their environment and their internal state.
- How animals exchange oxygen and carbon dioxide with the environment and how those gases are transported within the body.

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Office Hours: Monday, Wednesday, 11:30 – 12:30; Friday, 10:30 – 11:30, or by appointment.

Class Meetings: Monday, Wednesday & Friday, 1:30 – 2:20 p.m., ISC 115

Lab Meetings: Thursday, 10:00 a.m. – 12:50 p.m. & 2:30 – 5:20 p.m., ISC 203

Course Texts: Required: 1) Hill, Wyse & Anderson (2016) *Animal Physiology*, 4th edition. Sunderland, MA: Sinauer Associates.
2) *Biology 364 Lab Manual*, available on Canvas (soon)

Schedule of Topics (Tentative)

Class Date	Topic of Discussion
Wed Jan 17	Introduction and overview (Chapter 1, pp. 3-32)
Fri 19	Molecules, Membranes & Epithelia (Ch. 2, pp. 35-48)
Mon 22	Enzymes, Receptors & Cell Signaling (Ch. 2, pp. 49-69)
Wed 24	Transport of Solutes & Water (Ch. 5, pp. 101-114)
Fri 26	Transport of Solutes & Water (Ch. 5, pp. 115-128)
Mon 29	Osmoregulation: Introduction & Mechanisms (Ch. 27, pp. 723-740)
Wed 31	Osmoregulation in Aquatic Environments (Ch. 28, pp. 741-762)
Fri Feb 3	Osmoregulation in Terrestrial Environments; Overview of Kidneys (Ch. 28, pp. 763-777)

Grading: Exams = 39%; lab reports = 37% (group reports together = 25%, individual report = 12%); Quizzes and homework assignments = 7%; Term paper = 17%.

Term Paper: The term paper will be a literature investigation of some animal physiology topic of your own choice, six to ten pages in length (double-spaced with 1" margins). Its sources will include at least four primary literature articles. We will discuss more details of the assignment in class, and I will help you to identify interesting topics, of which there are many!

Exam weighting: Each exam counts 13%. The final exam will be cumulative, divided between old and new material, but with more emphasis on the new material (about 70% new to 30% old).

Exam Schedule: First Exam: Friday, February 23th
Second Exam: Friday, April 6th
Final Exam: Tuesday, May 8th, 12:00 – 2:30 p.m.

Students with Disabilities: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Students should contact the Director in the Office of Disability Services (Tabitha Buggie-Hunt, Erwin Hall 106, tbuggieh@geneseo.edu) and their course faculty as early as possible in the semester to discuss needed accommodations.

Animal Physiology Laboratory

The physiology laboratory has several purposes in this course. One objective is to expose you to some of the variety of available physiology research techniques and the range of questions they can be used to answer. Another objective is to give you some direct experience of how animals work, because nothing brings home the facts like actually seeing them for yourself. Perhaps the most important objective, however, is to encourage you to think critically about how physiological knowledge is gathered and to develop your own skills in the design and implementation of physiological experiments.

Writing is a vital part of science (and almost any other field you are likely to enter), so during the semester you will generate a series of laboratory reports in the form of short scientific papers. Most of these reports will be group-written and one will be individually written. These reports will be evaluated according to your ability to extract information from the data at hand, the quality of organization, clarity of writing, and adherence to the style of a scientific report. Naturally I would like you all to develop into careful experimentalists, but please do not be excessively concerned about whether you got the "right" results in your data. One of the big differences between biology experiments and those in chemistry or physics is that there is a lot more variability inherent in biology. Your data represents your *own* collection of observations and I am more interested in what *you* can do with it than I am in whether or not it meets any preconceived notion of the "correct" experimental outcome (although at the same time, it is important that you practice good lab technique and strive for accuracy and precision in your recordings and measurements). The Biology 364 lab manual contains a brief description of the style and format for the lab reports.

Lab reports will usually be due two weeks after the data collection is completed (check the schedule below for due dates). Late submissions are generally discouraged and are liable to suffer a penalty unless you discuss the matter with me in advance. However, if you have a genuine need for an extension you will

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find that I am sympathetic. I think you will also find that the deadlines are a useful way to schedule your work (and avoid pile-ups). It also helps me when evaluating the reports because it allows me to have most if not all of the papers in hand at the time I sit down to read them. I will endeavor to read your reports and return them to you as quickly as possible, so that you may consider the comments made on one as you prepare the next.

Schedule of Laboratory Activities (Tentative)

Lab Date	Activity	Report Due
Jan 18	No lab meetings this week	--
25	Laboratory on heat transfer	--
Feb 1	Osmoregulatory behavior in frogs	--
8	Osmoregulation experiment: analysis of data	Heat Lab
15	Metabolic rate measurement	--
22	Metabolic rate measurement, cont'd.	Osmoreg. Lab
Mar 1	Membrane potentials: intracellular recordings	--
8	Membrane potential recordings, cont'd.	Metabolic Lab
15	<i>Spring Break! No Labs!</i>	--
22	Action potentials and their conduction along the axon	--
29	Action potentials and their conduction, continued	Memb. Pot. Lab
Apr 5	Muscle physiology and neuromuscular transmission	--
12	Muscle physiology : temperature effects	Action Pot. Lab
19	Immunocytochemistry of muscle proteins	--
26	Immunocytochemistry, cont'd.	Muscle Lab
May 2	<i>Immunocytochemistry report is due on Wednesday, May. 3rd</i>	<i>ICC Lab</i>