

BIOL 1521: HONORS ORGANISMAL BIOLOGY

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- Prerequisites:** None.
- Description:** This is an active-learning class that introduces students to biology at the organ system and organismal levels, with emphasis on biodiversity, physiological processes and integration of growth and development.
- Textbook:** Campbell, N.A. and Reece, J.B., *Biology*, 7th Edition, Pearson/Benjamin Cummings, San Francisco, CA.
- Lab Manual:** There is no assigned laboratory manual for this course. Detailed hand-outs describing each laboratory exercise will be provided.
- Organization:** The course is organized into five modules, each of which deals with a major area of modern biology. Each module ends with an exam over material included in that module.
- Honor Code:** All students are expected to abide by the Academic Honor Code, which can be viewed online at <http://www.registrar.gatech.edu/rules/18.php>.
- Instructional Model:** Class time is organized around mini-lectures, small-group discussions, and problem-solving exercises. Your instructors will work to create learning opportunities that interest and engage you. We expect, in return, that you participate actively and fully in your learning and that you assist your classmates to learn. Exams will be based on topics and material presented in class and in the assigned readings. As a courtesy to your fellow students, **please turn off your cell phones and laptop computers while in class.**
- Readings:** Come to class prepared by completing each reading assignment as specified in the syllabus before each class.
- Labs:** Laboratory attendance is mandatory, and only one unexcused absence will be allowed. Each additional unexcused absence will lower the final lab grade 5%. Make-up labs cannot be accommodated, and arrangements to make-up work for excused absences will be considered on a case-by-case basis. Excused absences include illness, illness or death in the immediate family, and participation in official university activities. Requests for excused absences must be submitted in writing and include appropriate documentation (e.g. letter from a physician/university health center, letter from Dean of Students Office, letter from Athletic Department). Written notification must be received before the absence or immediately following the missed lab (next day, or as soon as practicable).
- Lecture Exams:** There are four midterm exams and a comprehensive final exam. All lecture exams will be closed-book and will be based on multiple-choice questions. Exams and quizzes will be given in the laboratory as well. Practice quizzes and end-of-chapter practice tests can be found at the web site for the textbook at www.campbellbiology.com. We strongly

recommend students use these web-based tools to help prepare for the lecture-based exams.

Group Presentations: Students will prepare one group presentation during the semester. Students will organize themselves into groups of five (5) members. Students not belonging to a group will be assigned randomly to groups with fewer than five members. Drs. Snell and Hoskinson must be notified of each group's membership no later than Wednesday, January 17. Since there will be many more group presentations than we will have time to hear, groups will be randomly assigned to one of the two presentation topics, each corresponding to a presentation date. All groups will have at least two weeks to complete the project, which involves doing background research and creating a Power Point presentation on the assigned topic. Everyone in the group must contribute to the final effort and all members of the group will earn the same score. Anonymous peer assessments will be made within each group, and any member not participating or contributing fully to the group project will have points deducted from their score.

Of 18-20 groups assigned to each topic, instructors will choose the best seven projects for presentation to the class. All contributing members of the groups chosen to present in class will earn three (3) bonus points on their group presentation score. Each group will be allowed 6 minutes for their presentation. Exam questions will include material covered in group presentations. Detailed instructions for preparing the Power Point presentation and how groups will be selected for in-class presentations will be posted on WebCT.

Bonus Points: There will be two opportunities to earn bonus points, which (if earned) will be added to your next exam grade. You may attempt either or both opportunities once for each exam. Therefore, you have an opportunity to earn up to four bonus points for each exam.

1. We have posted several podcasts from Scientific American on WebCT. Choose one, listen to it, and write a one-page paper, according to the following formats:

<u>Exam</u>	<u>Paper format</u>
1	Opinion piece (describe and soundly justify whether you agree with the podcast)
2	Opinion piece (describe and soundly justify whether you agree with the podcast)
3	Critical review (Critique the podcast)
4	Popular summary (Summarize the podcast for a lay audience unfamiliar with biology)

Choose a different podcast for each attempt at bonus points.

2. Visit the Aquarium, the Atlanta Zoo, the Atlanta Botanical Gardens, and/or the Fernbank Science Center. Write a one-page summary of your visit to describe your observations to someone who has not visited, and attach your admission receipt. You may submit your observational summary once for each location.

Spelling, grammar, punctuation, and style all count toward the determination of whether you earn 0, 1, or 2 bonus points for that attempt.

Biology Minute. Once during the semester, you may present an oral “minute paper,” with one PowerPoint slide, to the class. Well-prepared students will earn two points, which will be added to your FINAL grade. Your one-minute presentation should summarize any biologically-relevant current issue or topic from *reputable* news sources (newspapers such as AJC and The New York Times, journals such as Science and Nature, or popular magazines such as Scientific American). We will post a signup on WebCT for you to choose a slot. Because not everyone will be able to take advantage of this opportunity, in the event that you are unprepared for your chosen time, you will have two points *deducted* from your final grade.

Adopt a Plant. You will be given mystery plant seeds to grow. Your assignment is to make observations about the growth and development of your plant, recording and quantifying important features of its life cycle.. Based on its morphological attributes, you should be able to identify the species by the end of the semester. You will turn in a short paper describing your observations consisting of up to one page of text, and three pages of tables/graphs/photos. Depending on how well you perform this investigation, it will be worth up to two bonus points applied to your FINAL grade.

We *strongly* encourage you to take full advantage of these bonus point opportunities. Students who consistently and thoughtfully attempt each opportunity may find their final grades improved to the next higher letter grade.

Grading:	Midterm exams:	40% (four @10% each)
	Group presentations:	10%
	Final exam:	20% (comprehensive!)
	Laboratory:	25%
	In-class quizzes:	5%

Final grades for the course will be normalized according to student performance:

1. Your lab and lecture scores will be combined into a raw score (based on 100 points) using the weights shown above.
2. The average score of students in the top 5% of the class will be used to provide a benchmark, that is, 100%.
3. All student scores will be normalized by dividing their score by the benchmark set by the top 5% (students in the top ~2.5% will therefore have an adjusted score of 100%).
4. Final letter grades will be assigned based on the adjusted scores using the scale where 90% or greater, A; between 80 and 89%, B; between 70 and 79%, C; between 60 and 69%, D; and less than 60%, F.
5. All grading disputes must be settled within one week of the exam's or assignment's return to the class.

BIOL 1521 Syllabus-Spring 2007

Module 1: Biodiversity

<i>Date</i>	<i>Topic</i>	<i>Chapt</i>	<i>Reading</i>	<i>Professor</i>
Jan 8	Life on Earth The story of life. How could something complex arise from simple chemicals?	26	516-531	Snell
Jan 10	The Precambrian Life gets going. Nucleic acids replicate themselves. Prokaryotes, endosymbionts, eukaryotes. Bacteria and algae. The enigma of Ediacaran fauna. The breakup of Pannotia and the Snowball Earth.	27 28	534-546 549-569	Snell
Jan 12	The Cambrian Explosion: The Ordovician and Silurian Periods Was it really an explosion? Why did life take so long to radiate? The diversity of marine life. First terrestrial plants and fungi. The Ordovician extinctions. Coral reefs and bony fish appear in the Silurian, as do the first vascular plants.	29 30	573-588 591-605	Snell
Jan 15	Martin Luther King Day-No Class			
Jan 17	The Devonian The Age of Fishes. Plants, arthropods, and amsipids colonize land. Amsipids diversify. Plants make seeds. Fish diversify. The Devonian extinction.	31 32	608-623 626-635	Snell
Jan 19	The Carboniferous The Age of Amphibians. Pangea coalesces; foraminifera proliferate in the seas. Gymnosperms appear. Amniotic eggs.	33	638-656	Snell
Jan 22	The Permian Conifers, beetles, and flies appear. Cynodonts and archosaurs. The Permian extinction.			
Jan 24 Jan 26	The Mesozoic The Age of Reptiles. Mammals and angiosperms appear. The Triassic and Cretaceous extinctions.	34	671-700	Snell
Jan 29	The Cenozoic The Age of Mammals. Climate change, changes in body plans, angiosperms become dominant, grasses appear. Mammals diversify; the order Primates.	25	491-500 504-508	Snell
Jan 31	Putting it All Together In-class Jigsaw: reconstructing the phylogeny of kingdoms and phyla.			
Feb 2	Midterm Exam 1			

Module 2: Growth & Reproduction

<i>Date</i>	<i>Topic</i>	<i>Chapt</i>	<i>Reading</i>	<i>Professor</i>
Feb 5 Feb 7	Plant development Plant tissue development, differentiation and function: role of meristems, differences in plant vs animal development, secondary growth. Function of leaf.	35	712-735	Snell
Feb 9	Reproduction in Flowering Plants Double fertilization, mate selection, seeds, fruits, asexual reproduction.	38	771-782	Snell
Feb 12	Animal development Development in animal systems: sea urchin, frog, chick, mammal (including some human embryonic development): Fertilization (sperm-egg recognition), cleavage.	47	987-1008	Snell
Feb 14	Animal and Human Reproduction Asexual reproduction – budding and parthenogenesis, sex – gametogenesis, hermaphroditism, estrus, copulation, fertilization, ovipary and vivipary	46	964-978	Snell
Feb 16	Human Reproduction Male spermatogenesis, female oogenesis, ovarian and uterine cycles, hormonal control, sexual behavior, contraception, infertility, sexually transmitted disease	46	978-984	Snell
Feb 19	Group presentations			Snell
Feb 21	Midterm Exam 2			

Module 3: Chemical Messengers & Electrical Signals

<i>Date</i>	<i>Topic</i>	<i>Chapt</i>	<i>Reading</i>	<i>Professor</i>
Feb 23	Plant Hormones Hormones regulating plant growth, dormancy, germination, flowering, fruit growth, senescence	39	788-808	Snell
Feb 26 Feb 28	Animal Hormones Hormone effects, production, distribution, insect development, vertebrate endocrine systems, anterior and posterior pituitary Thyroxine, calcitonin, parathyroid glands, insulin and glucagon, adrenal glands, sex steroids, mechanisms of hormone action	45	943-961	Hoskinson
Mar 2	Neurons and Nervous Systems Cells and functions, anatomy, nerve impulses, ion channels, synapses, neurotransmitters, neuromuscular junctions, integration	48	1011-1025	Hoskinson
Mar 5 Mar 7	Sensory Systems Sensory cells, organs, transduction, specificity, mechanoreception, photoreception, retina, information processing	49	1045-1063	Hoskinson

Mar 9	Mammalian Nervous Systems Information flow, medulla, midbrain, cerebrum, Neural networks, sleep, consciousness, learning, memory	48	1026-1037	Hoskinson
Mar 12	Effectors Responding to environment via movement: role of cilia, flagella, muscles.	49	1063-1074	Hoskinson
Mar 14	Effectors Responding to environment via movement: role of skeletons.	49	1063-1074	Hoskinson
Mar 16	Midterm Exam 3	-	-	

Mar 19-23 : Spring Break

Module 4: Nutrition & Transport

<i>Date</i>	<i>Topic</i>	<i>Chapt</i>	<i>Reading</i>	<i>Professor</i>
Mar 26	Microbial Nutrition Nitrogen fixation, denitrification, sulfate metabolism, carnivory, interactions with environment	27	538-540	Hoskinson
Mar 28 Mar 30	Plant transport Uptake and transport of water and minerals: role of xylem, stomata, and role of processes of osmosis, facilitated diffusion, active transport, transpiration. Transport of products of photosynthesis: role of phloem, sieve tubes and role of processes of translocation and pressure flow.	36	738-753	Hoskinson
Apr 2	Plant nutrition Nutrient acquisition and metabolism in plants: autotrophy, chemotrophy, heterotrophy. Photosynthesis,	37	756-768	Hoskinson
Apr 4	Animal nutrition Energy acquisition (carbohydrates, fats, proteins), processing, and utilization: needed nutrients, feeding, digestion	41	844-855	Hoskinson
Apr 6	Animal nutrition Gut function. Control of digestion and metabolism: reflexes, hormones, bioaccumulation.	41	855-864	Hoskinson
Apr 9	Animal circulation Evolution of circulatory system (open system with tubular hearts to closed system with 4-chambered heart; fish->amphibians->reptiles->birds, mammals), function of human heart.	42	867-874	Hoskinson
Apr 11	Animal circulation Function of human vascular system, components of blood, hormone regulation of human circulatory system.	42	874-883	Hoskinson
Apr 13	Midterm Exam 4	-	-	

Module 5: Materials Balance

<i>Date</i>	<i>Topic</i>	<i>Chapt</i>	<i>Reading</i>	<i>Professor</i>
Apr 16	Group presentations			Garton
Apr 18	Gas exchange Mammalian lungs and transport mechanisms of oxygen and carbon dioxide.	42	888-895	Garton
Apr 20	Excretion Adaptations and excretory mechanisms for homeostasis of salts and water in different environments.	44	922-934	Garton
Apr 23	Salt Balance Anatomy and physiology of vertebrate excretory system (kidney structure and function).	44	934-939	Garton
Apr 25	Plant Homeostasis and Responses to Environmental Challenges Water, temperature, wounding, pathogens	39	808-815	Garton
Apr 27	Photosynthesis and Gas Exchange in Plants Intro, leaf anatomy, control of stomatal opening, photorespiration and CAM	10	181-183 195-198	Garton

FINAL EXAM: Tuesday, May 1, 2:50-5:40 pm