BIOLOGY 1520 ORGANISMAL BIOLOGY FALL 2014

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Prerequisites: Good background in high school biology and chemistry.

Description: An introduction to biology at the organ and organismal levels, with an emphasis on physiological processes and integration of growth and development. This course will foster the development of critical scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication. Class meets MWF 9:05-9:55 am in Howey L2.

Textbook, Freeman, S. *Biological Science*. 2011. 5th edition. Pearson.

Mastering Biology: The bookstore sells hardcover and looseleaf-bound texts, each bundled with *Mastering Biology* (MB) and *Learning Catalytics* (LC) codes. If you plan to work solely with the on-line e-book within MB (not downloadable), then you can simply purchase MB access with eText at the bookstore or at the *MB* website, pearsonmylabandmastering.com/northamerica/masteringbiology/. *Mastering Biology* consists of **required** course homework assignments.

Learning Catalytics: We will use *Learning Catalytics* (learningcatalytics.com) for interactive lecture sessions, which along with MB, contributes to your "participation" grade. You may use any internet-enabled device (laptop, tablet, "smartphone") to access LC in class and respond to questions. An LC subscription is included if you purchase the eText and MB through the bookstore, otherwise you must purchase access separately (~$12 for a semester subscription).

Honor Code: All students are expected to abide by the Academic Honor Code, which can be viewed online at http://www.honor.gatech.edu. We take the Honor Code very seriously and are required to report any potential violations. Some specific

examples of Honor Code violations that we've encountered include: copying during exams, accessing in-class activities while not in class, and plagiarism.

Learning Accommodations: If needed, we will make classroom accommodations for students with disabilities. These accommodations must be arranged in advance and in accordance with the ADAPTS office (http://www.adapts.gatech.edu).

Lectures: Lectures are held in Howey L2.Attendance in lecture correlates strongly with performance in Biology 1520, and is the only permissible method for earning points from in-class activities. **Accessing Learning Catalytics during an active session from a location outside of the classroom is a violation of the Honor Code!** Lecture slides will be available via T-Square and you are urged to download and print them for use in studying for exams. The lectures and readings are complementary and some material will be presented only in lecture. Lecture exams will be based on topics, materials, and discussions presented in class and in the assigned readings. **Consumption of food or drink (other than water) during class is not permitted.** You are expected to arrive in class prepared to learn.

Labs: **Labs will begin the week of August 25.** That week, you'll need the combined lab manual/notebook (ISBN 978-0-7380-6023-1), a 100% cotton lab coat, and you must wear closed toe shoes that cover the entire foot. Note that while no labs meet during the first week of classes, you will have a pre-lab assignment due before you meet for lab: part 1 is due on August 21, part 2 is due before your lab section meets (see lab T-square announcements for details). Labs are held in Clough Commons and taught by Teaching Assistants (TAs): your TA contact information is available on the BIOL 1520 Lab T-square site. All communications regarding lab should be directed to your lab TAs. Most FAQ about labs are answered on the lab T-square site and lab syllabus. Laboratory attendance is mandatory and each unexcused absence will lower your final **course** grade (not just your lab grade) by 5%. Details of the absence policy are in the BIOL 1520 Lab syllabus.

Homework: *Mastering Biology* offers animations, videos, interactive tutorials and simulations, as well as practice quizzes and an on-line version of the textbook. Individual access codes for *Mastering Biology* are included with each new textbook, or may be purchased separately from the publisher. Assignments will be due each throughout the semester, including the last week of class. **Check *Mastering Biology* frequently for new assignments!**

Group Projects: Groups of 4-5 students will work together to research a current issue of interest related to content covered in BIOL 1520. His topic will be assigned based on ranked preferences of each group, selected from a list provided by the instructors. Each group will produce one creative video exploring and explaining the assigned topic. Students may choose their groups no later than **October 24**; students not in groups by this date will be assigned to groups by the instructors. Completed videos will be due **November 21**.

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Lecture Exams: Midterm exams will be Thursday evenings at 6:00 pm in Howey L2 (see detailed syllabus schedule). Exams will be multiple choice or a mix of multiple choice and short answer.

Missed Exams: If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you petition for a makeup exam within 24 h of the start of the missed exam, *and* your petition is approved. Your petition must be submitted in writing and must include documentation of a legitimate reason for missing the exam. You may submit your petition before the exam if you know of your scheduling conflict in advance. Examples of legitimate reasons to miss an exam include illness, illness or death in your immediate family, and participation in official university activities. If your petition is approved, the missed exam grade will not be included in calculating your final average. The weighted mean of your other exam scores will substitute for the missed exam, making the missed exam completely neutral in determining your final point total. You may also instead petition for a makeup exam. Makeup exams, if approved, will be administered before the end of the term.

Recitation: The graduate TA will lead a recitation each Thursday 6:05-6:55pm (Howey L2) when we do not have an exam scheduled that day. This is an opportunity for you to discuss lecture material and text readings with the TA. Recitation attendance is strongly correlated with exam performance.

Bonus Points: You have the opportunity to earn bonus points which (if earned) will be added to each midterm exam grade. You may attempt to earn up to three bonus points for each module exam. **There are no bonus point opportunities for the final exam. S**everal podcasts will be posted to T-square that are relevant to each module. You may select **one**, listen to it, and write a one-page paper, according to one of the following formats:

Opinion piece: describe and justify whether you agree with the podcast
Critical review: critique the podcast with factual support
Popular summary: Summarize for a lay audience unfamiliar with biology

Spelling, grammar, punctuation, and style all count toward the determination of bonus points earned for each attempt. Some podcasts will contain multiple stories; restrict your writing to the podcast listed in the TITLE on T-square.

Grading: Your final grade will depend on the following combination of grades:

In-class exams (10% each):	40%
Final exam (Module 5 and cumulative):	20%
Group project:	10%
Participation (*Mastering Biology + Learning Catalytics*):	10%
Laboratory:	25%

Note that these components total 105%. The maximum overall score we will allow in this course is 100%, so this scheme includes 5% of extra credit.

We will use the following procedure in calculating your final grade:

1. We will combine your exam, lab, participation, and group activity scores into a raw composite score (0 – 100%) using the weights shown above.
2. We will use the mean score earned by the top 5% of the class as a gauge of real student performance in the class.
3. We will scale your score to actual student performance by dividing your raw composite score by the mean score earned by the top 5% of the class. If you're in the top 2.5% of the class, your score will be 100%.
4. We will assign final letter grades based on scaled scores as follows:

A:	$\geq 90\%$
B:	$\geq 80\%$ and $< 90\%$
C:	$\geq 70\%$ and $< 80\%$
D:	$\geq 60\%$ and $< 70\%$
F:	$< 60\%$

Biology 1520 Module Themes and Teaching Goals

Module	Major theme	Teaching Goals
1	• Biodiversity	• Evolutionary history of life on Earth • Metabolic diversity • Biological diversity
2	• Growth and Reproduction	• Differentiation • Sexual and asexual reproduction • Reproductive strategies
3	• Chemical and Electrical Signals	• Hormones • Neurons and integration • Sensory systems • Motility
4	• Nutrition and Transport	• Metabolic diversity • Nutrient acquisition • Circulatory systems (plant and animal)
5	• Materials Balance	• Gas exchange • Water, ion, and mass exchange • Homeostasis

Fall 2014	Lecture Topics	Freeman 5th Reading
=> M1	**Start Module 1: Biodiversity**	
18 Aug	Course overview	
20 Aug	Beginnings of Life on Earth Earliest signs of life Prokaryotes as ancient architects Evolution of early animals	28.1: 506-511 and *Bioskills 7* (Appendix B) 28: 511-513 29: 528-530 30: 552-559 33: 636-646
22 Aug	Early Paleozoic (Cambrian - Silurian) Cambrian explosion Evolutionary innovations in fishes Evolution of early land plants End-Ordovician extinction	28: 513-514 35: 686-693 31: 577-590 34: 670: 674
25 Aug	Late Paleozoic (Devonian - Permian) Ancestry of tetrapods Ascomycetes, & Basidiomycetes End-Permian extinction	28: 514-520 35: 693-697 32: 620-628 34: 674-680
27 Aug	Mesozoic Era Life on land: reptiles, early mammals Ancestry of angiosperms End-Triassic and End-Cretaceous extinctions	28: 520-523 35: 697-703 31: 592-597

29 Aug	Cenozoic Era Grasslands appear Mammals diversify	28: 523-525 35: 704-710 pdf: Coevolution of Grasses and Herbivores; G. L. Stebbins
1 Sept	**Labor Day (no class)**	
3 Sept	Modern Prokaryotes Breadth of morphology, metabolism, habitats Roles in medicine & bioremediation Modern techniques in studying prokaryotes Lineage diversity	29: 536-549
5 Sept	Modern Eukaryotes: Multicellularity Lineage Diversity; Major lineages Diversity in life cycles Metabolic diversity and ecosystem services Structural diversity of protists Structural diversity in plants, fungi, animals	30: 559-575 31 review 32: review
8 Sept	Animal phylogeny: 4 major groups Morphological and metabolic innovations	34 and 35: review
=> M2	**Start Module 2: Growth and Reproduction**	
10 Sept	Intro to reproduction and development Differentiation, colony formation, growth	22: 405-416 30.3: How to protists reproduce, life cycles- haploid vs diploid 566-569
11 Sept	**Module Exam 1**	
12 Sept	Plant Development Alternation of generations	24: 432-443
15 Sept	Tissue development, differentiation, function Role of meristems, secondary growth	37:731-751
17 Sept	Animal Development	23: 419-429
19 Sept	Cleavage patterns, polarity, differentiation Coelom formation and body plans	42.2: 845-850 33:1-2 636-646
22 Sept	Plant Reproduction Double fertilization, seeds, fruits Vegetative growth Animal Reproduction	31.3: Transition to land II 586-596 41:822-839
24 Sept 26 Sept	Asexual reproduction (budding & parthenogenesis) Gametogenesis, hermaphroditism Human Reproduction	33.3: Reproduction, Life cycles 650-651 50.1-50.2: 1013-1021
29 Sept	Spermatogenesis, oogenesis Ovarian and uterine cycles	50.3-50.5: 1021-1034
=> M3	**Start Module 3: Chemical and Electrical Signals**	
1 Oct	Intro to chem signaling and signal transduction Quorum sensing, biofilm formation in microbes Plant Hormones and Defenses	11: 204-214 40: 793-815
2 Oct	**Module Exam 2**	
3 Oct	Hormones controlling growth, dormancy, germination Responses to injury, chemical defenses.	40: 793-815
6 Oct 8 Oct	Animal Hormones Hormone effects, production, distribution Insect development Vertebrate endocrine system	49: 991-1012

10 Oct	Neurons and Nervous System	46: 928-949
13 Oct	**Fall Break-No Class**	
15 Oct	Sensory Systems	47: 952-969
17 Oct	Sensory cells & organs, specificity Mechano- and photoreception Information processing	
20 Oct	Effectors	7: 131-133
22 Oct	Role of cilia, flagella, muscles, skeletons	48: 972-983
=> M4	**Start Module 4: Nutrition and Transport**	
24 Oct	Nutrition - Adaptations & needs Autotrophy, heterotrophy, mixotrophy Microbial role in nutrition	29: 538-541 39: 775-791
27 Oct	Nutrition - Acquisition of nutrients	44: 882-889
29 Oct	Soil processes, N2-fixation	
30 Oct	**Exam 3**	**Module 3**
31 Oct	Digestive organs: structure and function	44:882-889
3 Nov	Plant transport processes	38: 754-772
5 Nov	Uptake of water and minerals Xylem and evapotranspiration Phloem, sieve tubes, and translocation	
7 Nov	Animal circulation	45: 916-925
10 Nov	Evolution of circulatory systems Human vascular system, hormonal regulation	
=> M5	**Start Module 5: Materials Balance**	
12 Nov	Gas Exchange and Transport	45: 902-916
14 Nov	Principles of diffusion	
17 Nov	Lungs and gills Mechanisms for transporting O_2 and CO_2	
19 Nov	Ion and water balance in animals	43: 861-879
20 Nov	**Exam 4**	**Module 4**
21 Nov	Ion and water balance in animals	43: 861-879
24 Nov	Excretory mechanisms and systems Adaptations to different environments	
26 Nov	Photosynthetic strategies Light, water, temperature, wounds, pathogens	10: 190-195 40: 793-814
27 Nov	**Thanksgiving Holiday-No Class**	
1 Dec	Plant homeostasis and responses to the environs	40: 815-819
3 Dec	Animal homeostasis and responses to the environment	42: 853-859
5 Dec	Review	
10 Dec	**Final Exam, 8 am - 10:50 am**	**Comprehensive**