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 See T-square lab site “BIOL 1510”

Section	BIOL 1510 A	BIOL 1510 B
Time	11:05–11:55 am MWF	3:05–3:55 pm MWF
Lecture Location	152 Clough Commons	Howey (Physics) L2
Recitation Location	152 Clough Commons	152 Clough Commons
Test Location	152 Clough Commons	Howey (Physics) L2
Mastering Bio Class ID	MBGT1510F13A	MBGT1510F13B

Prerequisites: Good background in high school biology and chemistry.

Description: This is an **active-learning** class that introduces students to basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution, and ecological relationships. This course will foster the development of critical scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication.

Textbook: Scott Freeman (2011). *Biological Science*, 4th Edition. Benjamin Cummings, San Francisco. We have arranged special pricing through the bookstore for hardcover, looseleaf-bound and e-book versions of the textbook bundled with access to the Mastering Biology website (required as part of course homework assignments).

Lectures: Attendance in lecture correlates strongly with performance in Biology 1510. We will make our lecture slides available via T-Square and urge you to download and print them for use in taking notes during lecture. The lectures and readings are complementary and some materials

will be presented only in lecture. Please complete each reading assignment before class.

LC: We will use Learning Catalytics (<http://lcatalytics.com>) for interactive lecture sessions, which will contribute to the "participation" portion of your course grade. You can use any internet-enabled mobile device (laptop, tablet, cell phone) to access LC and respond to questions.

Lecture Exams: Four midterm exams and the final exam. The midterm exams will be held in the evening, are closed-book and will be made up of multiple-choice questions based on topics, materials, and discussions presented in class, in the assigned readings, and in the Mastering Biology assignments. Exams and quizzes may also be given in the laboratory and on-line on Mastering Biology and/or T-square.

Missed Exams: If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you **petition us to have the exam grade excused within 24 h of the start of the missed exam**, and we approve your petition. Your petition must be submitted in writing (by e-mail) and must include documentation of a legitimate reason for missing the exam. You can, of course, submit your petition before the exam if you know of your scheduling conflict in advance. We will consider each petition individually. Examples of legitimate reasons to miss an exam include illness, illness or death in your immediate family, and participation in official university activities. If we approve your petition, we will remove the missed exam from your grade calculation by using the weighted mean of your other exam scores as your grade for the missed exam.

Quizzes: Short quizzes may be administered in lecture, lab, and online.

Homework: Mastering Biology offers animations, videos, interactive tutorials and simulations, as well as practice quizzes and an on-line version of the textbook (see Mastering's "Study Area" for access to these resources). Individual access codes for Mastering Biology are included with each new textbook, or may be purchased separately from the publisher at masteringbio.com. Throughout the semester you will have assignments in Mastering Biology. The Mastering Biology assignment scores are recorded and will comprise 5% of the overall course grade. We encourage you to complete your assignments on time; however, if you miss a due date you should still complete the assignment and accept a late penalty. Late assignments will be accepted until 5 pm on the last day of classes. Hints are available with no point penalty in Mastering. Homework assignment deadlines are listed on the syllabus and on Mastering Biology's website. Please note that an assignment may be due during the last week of classes and plan accordingly.

Group Projects: For each module, 8–12 groups (of 4-6 students each) will each research an issue of current interest related to the topic of the module. Each student will be assigned to a group and a topic, and each group will complete only one group project. **Group assignments, details and deadlines will be provided once drop/add ends.** Grades will be based on instructors' grades and peer evaluations. The same group project grade will be assigned to all members of a group; each group member is fully responsible for all submitted project work.

Recitations: Lecture recitations occur weekly and are led by the recitation Teaching Assistant. Attendance is optional but strongly encouraged, as it is designed to improve your understanding of the lecture material. Bring your mobile devices to recitation to receive participation credit for your recitation attendance.

Labs: **Labs will begin the week of August 26.** That week, you'll need the combined lab manual/notebook (ISBN 978-0-7380-5217-5), a 100% cotton lab coat, and you must wear closed-toe shoes that cover your 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 22, part 2 is due before your lab section meets (see lab T-square announcement for details).** Labs are held in Clough Commons and taught by Teaching Assistants (TAs); your TA contact information is available on the BIOL 1510 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 1510 lab syllabus.

Honor Code: All students are expected to abide by the Academic Honor Code, which can be viewed online at www.honor.gatech.edu.

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

In-class exams: 40%
 Final exam: 20%
 Group activities: 10%
 Mastering Biology: 5%
 Participation: 5%
 Laboratory: 25%

Note that these components total 105%, though the maximum overall score we will allow in this course is 100%. This means that class participation or Mastering Biology is effectively a source of extra credit toward the raw score of your final grade.

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

1. We will weight your 4 midterms 6%, 10%, 10%, and 14%, where your lowest midterm score will count 6% and your highest midterm score will count 14% of your final grade.
2. We will combine your exam, lab, and group activity and other scores into a raw composite score (0 – 100%) using the weights shown above.
3. We will assign final letter grades using the following scale:

A: $\geq 90.0\%$
 B: $\geq 80.0\%$ and $< 90.0\%$
 C: $\geq 70.0\%$ and $< 80.0\%$
 D: $\geq 60.0\%$ and $< 70.0\%$
 F: $< 60.0\%$

Organization: The course is organized into five modules, each of which deals with a major area of modern biology.

Module	Major theme	Teaching Goals
Intro	• Course intro	• Scientific method
1	• Evolution	• Earth history • History of life on Earth • Mechanism of evolution
2	• Ecology	• Behavior and evolution

	<ul style="list-style-type: none">• Simple population models• Community structure• Mass and energy flow through ecosystems
3 • Molecules, Membranes, and Metabolism	<ul style="list-style-type: none">• Overview of biomolecules• Introduction to bioenergetics: respiration and photosynthesis.• Chemiosmosis in respiration and photosynthesis• Diversity of metabolic pathways
4 • Genetics	<ul style="list-style-type: none">• Mendelian genetics• DNA and genomics• Gene regulation in prokaryotes and eukaryotes
5 • Biomedicine	<ul style="list-style-type: none">• Recombinant DNA technology & bioethics• Genetic diseases as model biological systems• Immunology• Course synthesis

Fall 2013	Class	Class Topics	Who	Freeman 4th	Mastering Biology *
19-Aug	1	Course overview Introduction to instructors	Both		0.01 Intro to Mastering Biology (ungraded, for practice only)
		Start Module 1: Evolution			
21-Aug	2	What is science? What is the scientific method? What is data?	JC	Platt (1964) 1.5: 8-12	1.01 Scientific method
23-Aug	3	What is life? What is evolution?	JC	1: 1-8	
		An evolutionary framework for biology			
26-Aug	4	Earth history Fossil record & radiometric dating Key events in the history of life	JC	27.1-2: 474-484 Radiometric dating.pdf on T-square	
28-Aug	5	Origin of life RNA world	MG	Origin of life.pdf on T-square	1.02 Earth history
30-Aug	6	History of life on Earth Life and changes in the physical environment Patterns of biological diversity over time Biological classification	MG	27.3-27.4: 484-492 509-510 "The Oxygen Revolution"	
2-Sep		<i>HOLIDAY</i>			
4-Sep	7	Evolution Evidence for evolution Natural selection	MG	24: 414-432	1.03 Evolution and the history of life on earth
6-Sep	8	Mechanisms of evolution	MG	25: 435-455	1.04 Mechanisms of evolution
9-Sep	9	Genetic variation Hardy-Weinberg Mutation, drift, selection	MG		
11-Sep	10	Speciation What is a species Mechanisms of speciation	MG	26: 458-471	1.05 Speciation
12-Sep		<i>Group project 1 videos due (midnight)</i>			
13-Sep	11	Module 1 review activity Start Module 2: Ecology	MG		
16-Sep	12	Intro to Ecology	MG	50: 993-1017	2.01 Ecology Intro

		Physical Environment				
18-Sep	13	Behavioral ecology	MG	51: 1019-1035		2.02 Behaviour
		Foraging and predation				
		Mate choice and sexual selection				
		Kin selection and altruism				
19-Sep		Module 1 Exam (6 pm) covers Module 1 content only.				
20-Sep	14	Population ecology	MG	52: 1037-1055		2.03 Population Ecology
23-Sep	15	Structure, dynamics, & regulation of populations	MG			
		Life histories				
25-Sep	16	Community ecology	MG	53: 1058-1080		2.04 Community Ecology
27-Sep	17	Competition, Predation, parasitism, mutualism	JC			
30-Sep	18	Ecosystems	MG	54: 1083-1102		2.05 Ecosystems
2-Oct	19	Energy and material flow through ecosystems	MG			
3-Oct		<i>Group project 2 videos due (midnight)</i>				
4-Oct	20	Module 2 review activity	MG			
		Module 3: Molecules, Membranes, Metabolism		youtube video 3-1a chemical context 2: 17-21.5, 22, 34-35		
7-Oct	21	Biomolecules	JC	3.2-3.4: 40-51		3.01 Biomolecules
		Small molecules		5: 71-79		
		Major classes of macromolecule				
9-Oct	22	Cellular Structure	JC	6.1-6.2: 82-89		3.02 Cell Biology
		Lipid bilayer membranes				
		Archaeal membranes				
		Serial endosymbiosis and eukaryote evolution				
10-Oct		Module 2 Exam (6 pm) covers Module 2 content only.				
11-Oct	23	Membrane function and transport systems	JC	6.3: 89-99		
		Membrane composition and adaptation				
		Membrane proteins				
		Transport: passive diffusion, osmosis,				

		facilitated diffusion, active transport			
14-Oct		<i>Fall Break</i>			
16-Oct	24	Energetics and enzymes	JC	2.3: 27-31	3.03 Energetics
		Thermodynamics and free energy		3.5: 51-56	
		Catalysis and kinetics, and enzymes		9.1: 148-152	
		feedback regulation			
		Redox reactions			
		Membrane potential			
18-Oct	25	Cellular respiration	JC	9.2, 153-154; 9.5- 9.6: 160-166	3.04 Respiration and Ox Phos
		Oxidation of food and reduction of an e- acceptor			
		chemiosmosis			
		oxidative phosphorylation			
21-Oct	26	Metabolic pathways	JC	9.3-9.5: 155-159	
		Glycolysis			
		Pyruvate oxidation			
		Citric acid cycle			
23-Oct	27	Fermentation	JC	9.7 and 9.8: 166-169	3.05 Fermentation
		Protein and lipid metabolism			
25-Oct	28	Photosynthesis	JC	10: 172-184	
		Overview: reduce CO ₂ to organic C			
		Pigments and light absorption			
		Origin of photosynthesis:			
		single PS, cyclic photophosphorylation			
28-Oct	29	Carbon fixation	JC	10: 184-186	3.06 Photosynthesis
30-Oct	30	Photosynthetic strategies	JC	10: 186-189	
		C ₃ , C ₄ , and CAM photosynthesis			
		Recap: compare and contrast respiration & photosynthesis, mitochondria & chloroplasts.			
31-Oct		<i>Group project 3 videos due (midnight)</i>			
1-Nov	31	Module 3 review activity	JC		
		Module 4: Genetics			

4-Nov	32	Chromosomes and Cell Division Mitosis Meiosis	MG	11.1, 11.2 (194-202) 12.1, 12.2 (211-223)	4.01 Meiosis
6-Nov	33	Mendelian genetics	MG	13: 230-252	4.02 Mendelian Genetics
7-Nov		Module 3 Exam (6 pm) covers Module 3 content only.			
8-Nov	34	Genetic analysis Monohybrid and dihybrid crosses	MG		
11-Nov	35	Sex-linkage and pedigree analysis Probabilities of genetic outcomes Genetics of human disease	JC		
13-Nov	36	DNA as the basis of inheritance Experimental evidence for role of DNA DNA structure Semi-conservative replication of DNA	JC	14.1-14.3: 258-268 4.1-4.2: 59-66	4.03 DNA
15-Nov	37	Gene expression: DNA to protein Basics of transcription and translation	MG	15: 276-287 16: 289-304	4.04 Gene Expression
18-Nov	38	Prokaryotic and eukaryotic genomics Genome organization	MG	20.1-20.3: 359-370	4.05 Genomics
19-Nov		<i>Group project 4 videos due (midnight)</i>			
20-Nov	39	Module 4 review activity Start Module 5: Biomedicine	MG		
21-Nov		Module 4 Exam (6 pm) covers Module 4 content only.			
22-Nov	40	Gene Regulation & lac operon	JC		
25-Nov	41	Recombinant DNA	JC	19.1-19.2: 338-346	5.01 Recombinant DNA
27-Nov	42	Stem cells, cloning and bioethics	JC	21.2: 377-378	
29-Nov		Thanksgiving holiday			
2-Dec	43	Immunology and infectious diseases	JC	49.1-49.4: 973-990	5.02 Immunology
4-Dec	44	Human health and evolution Balancing selection	JC		

Sickle cell, Thalassemia, Cystic
Fibrosis

6-Dec 45 Course wrap-up and review Both

TBA **Final Exam (lecture hall)**

*Mastering Biology
assignments due by
11:59 pm on day before
lecture.