

Physiology of Cells and Organisms

BIO 112

Winter 2015

Syllabus

MWF 8:00-9:05; Karp 105
Course materials posted on Nexus
Office Hours: Tu 10:30-11:30, W 1:30-2:30

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Course Objectives: Students in this course will gain an understanding of how physiological function arises from the interaction of processes across different levels of biological organization and apply this to understand function in cells and in both plant and animal systems; students will also gain experience with the scientific method by learning how to generate and test hypotheses, to evaluate experimental results and to communicate their findings in writing.

Text: We are using Biological Science, 5th edition by Scott Freeman (2014). You will be expected to do the readings before each class and daily online quizzes will be administered to ensure this. You will be tested on material in the readings. You will find that the author's voice and my own are different and that you will likely benefit from two discussions of the same material.

Lab: This course has a mandatory lab that begins during the second week. Labs meet in SWSE room 105. Be sure you know when your lab section meets before the first day of lab. Arrive on the first day with the lab manual that will be available in the bookstore. Older versions of the lab manual cannot be used.

Grading: Grades will be assigned on a straight scale (≥ 93 A, ≥ 90 A-, ≥ 87 B+, etc....) and are derived from the following:

30% Lab	(see your lab instructor for the grade breakdown)	
70% Lecture	2 Exams: 15% lowest, 20% highest	35%
	1 Final Exam: 20%	20%
	3 Quizzes: 3 1/3 rd % each	10%
	Online Quizzes: 5% total	5%

Quizzes will test your understanding of factual content, while exams will include higher levels of understanding (see last page of syllabus). Online quizzes need to be completed before lecture time and are due at each lecture. Students will be allowed to miss three of these during the term (one prior to each exam). Lecture exams and quizzes may include material from the labs. Unexcused absence from a test will result in a zero mark. All grading mistakes on tests must be discussed within a week of getting the test returned. Laboratory attendance is mandatory; missing lab may result in failure in the course.

Academic Honesty: Union College recognizes the need to create an environment of mutual trust as part of its educational mission. Responsible participation in an academic community requires respect for and acknowledgement of the thoughts and work of others, whether expressed in the present or in some distant time and place.

Matriculation at the College is taken to signify implicit agreement with the Academic Honor Code, available at honorcode.union.edu. It is each student's responsibility to ensure that submitted work is his or her own and does not involve any form of academic misconduct. Students are expected to ask their course instructors for clarification regarding, but not limited to, collaboration, citations, and plagiarism. Ignorance is not an excuse for breaching academic integrity.

Support Resources:

Supplemental Instructor: The Supplemental Instruction (SI) program is an additional academic resource to support learning in this class. Tim Sheehan (sheehant@union.edu) will be your SI Leader this term and will conduct weekly review sessions to supplement lectures and help you understand course content and help you learn effective study and test preparation skills. SI is not a re-lecturing of the material and is not intended to replace the lecture. Research shows that students who attend these types of learning support sessions tend to do better in the course.

BIO Back-Up: The Biology Department supports weekly help sessions to assist students with understanding course material or to help with laboratory reports. Sessions will be from 7-9 pm on Monday evenings in the Ryon Room (S322 Science & Engineering).

BIO 112 Tests and Levels of Understanding:

In BIO 112 you are expected to understand and apply the concepts presented in lectures and in the reading. This requires skills other than merely being able to recall the information presented. Educational researchers have identified different levels of cognitive ability (referred to as Bloom's Taxonomy) that range from simple memorization to the ability to develop and defend opinions. Without ever knowing it, you are likely thinking in these different levels already. As you study and learn the material presented in class, it may be helpful to test yourself at all the levels presented below. With each level is a list of words that are often used to construct questions that address that level. The levels are listed from simplest to most complex.

1. **Knowledge**—identify and recall information. Define, distinguish, identify, recall, recognize.
2. **Comprehension**—organize and select facts and ideas. Conclude, demonstrate, differentiate, draw, explain, give in your own words, illustrate, interpret, predict, rearrange, reorder, rephrase, represent, restate, transfer, translate.
3. **Application**—use facts to explain concepts. Apply, classify, develop, employ, generalize, organize, relate, restructure, transfer, use.
4. **Analysis**—separate whole into component parts. Analyze, categorize, compare, contrast, deduce, detect.
5. **Synthesis**—combine ideas to form a new whole. Combine, constitute, derive, document, formulate, modify, organize, originate, produce, relate, specify, synthesize, tell, transmit, write.
6. **Evaluation**—develop and defend opinions. Appraise, argue, assess, decide, evaluate, judge, standardize, validate.

In BIO 112, you will not be tested on the level of evaluation. However, you will need to prepare for all other levels of understanding. Oftentimes, higher-level questions require you to recall knowledge as well as perform higher-level thinking.

Some Differences Between High School and College Biology

Issue/Topic	High School	College
in class hours per semester	>90	30
percent of material reviewed or reinforced in class	90-100	10-20
student reliance on textbook as source of information and/or explanation	little	heavy
number of hours per week outside of class for reading and/or review	2-4	8-12
percentage of test questions at knowledge level of understanding	60-90%	40-60%
number of distracters in test question responses	1-3 out of 5	0-1 out of 5
note taking	important notes presented on board	important notes presented verbally
attendance	mandated by state	encouraged and expected

Sample multiple choice test questions:

High school:

Mitochondria are often called the powerhouse of the cell because they _____

- A) are the site of cellular respiration B) contain chromosomal DNA
 C) function in making proteins D) perform exocytosis

College:

The energy of electron transport serves to move (translocate) protons to the outer mitochondrial compartment. How does this help the mitochondrion to produce energy?

- A) The hydrogen ions (protons) are transferred to oxygen in an energy-releasing reaction.
 B) The translocation of protons sets up the electrochemical gradient that drives ATP synthesis in the mitochondria.
 C) The protons pick up electrons from the electron transport chain on their way through the inner mitochondrial membrane.
 D) The protons receive electrons from the NAD⁺ and FAD that are accepted by electrons in glycolysis and the Krebs cycle.

Winter BIO 112 Readings for Freeman 5th Edition

Date	Topic	Reading 5 th Edition	Laboratory
Jan 5	M Introduction, Biochemistry Essentials	Ch 2, Bioskills 6 & 11	No Lab
	<u>Biochemistry</u>		
7	W Proteins	Ch 3	
9	F Carbohydrates	Ch 5	
12	M Lipids	Ch 6: 84-91	Cells and Microscopy
14	W Membrane Transport	Ch 6: 91-101	
	<u>Cellular Physiology</u>		
16	F Cellular Structure and Function	Ch 7: 106-117	
19	M Dynamic Cells	Ch 7: 118-130	Jumping
21	W QUIZ I ; Energetics	Ch 8: 136-144	
23	F Enzymes and Metabolic Control	Ch 8: 144-152	
26	M Cellular Respiration: Glycolysis	Ch 9: 154-162	Metabolism I
28	W EXAM I (Ch. 2, 3, 5, 6, 7, 8)		
30	F Cellular Respiration: Krebs & ETC	Ch 9: 162-172	
Feb 2	M Fermentation and Cell Resp. Review	Ch 9: 172-173	Metabolism II
4	W Photosynthesis I	Ch 10: 176-189	
6	F Photosynthesis II	Ch 10: 190-195	
9	M Cell-Cell Interactions	Ch 11: 200-214	Plant Structure
	<u>Plant Form and Function</u>		
11	W QUIZ II ; Plant Form and Function	Ch 37: 731-748	
13	F Plant Water Transport	Ch 38: 754-766	
16	M Control of Water Loss	Ch 40: 793-796, 810-812	Photosynthesis I
18	W Plant Sucrose Transport	Ch 38: 766-771	
20	F EXAM II (Ch. 9, 10, 11, 37, 38, 40)		
	<u>Animal Form and Function</u>		
23	M Animal Form and Function	Ch 42: 842-854	Photosynthesis II
25	W Thermoregulation	Ch 42: 854-858	
27	F Gas Exchange and Blood	Ch 45: 902-905, 909-916	
Mar 2	M Circulatory Systems	Ch 45: 917-925	Animal Structure I
4	W QUIZ III ; Neural Anatomy and Action Potentials	Ch 46: 928-938	
6	F Synapse and Sensory Processing	Ch 46: 938-942, Ch 47: 960-963	
9	M Muscle Form and Function	Ch 48: 972-983	Animal Structure II & Lab Practical
11	W Neuromuscular Junction	Ch 48: 976-977	
13	F Exercise Physiology: Integrating Organ Systems		
	FINAL EXAM: During Exam Week		