

Biology 111

Introduction to Cell and Molecular Biology

Fall 2018

Course Basics

Course Instructor: Dr. Heather Fullerton

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Office hours: W 2:00-3:30pm; R 3:00-4:30pm and by appointment

Lecture: T/R 1:40-2:55pm; Rita Liddy Hollings Sci Center 101

Required Texts: Biological Science, 6th Edition by Scott Freeman *et al.*

Course Learning Goals:

Upon completing this course, you should be able to:

1. Ability to identify the different biological molecules and their functions in living organisms.
2. Describe structure-function relationships of cellular components.
3. Demonstrate knowledge of the mechanisms of information flow in a cell.
4. Describe mechanisms of energy flow and transformation in biological systems, including photosynthesis, cellular respiration and fermentation processes.
5. Demonstrate an understanding of the processes underlying cellular reproduction and development.

Grading

Grades will be assigned as follows:

		A	>93	A-	90-92
B+	87-89	B	83-86	B-	80-82
C+	77-79	C	73-76	C-	70-72
D+	67-69	D	63-66	D-	60-62
F	<59				

Grades will be calculated as follows

Exams (4X)	60%
Final Exam	20%
Assignments	5%
Poll Everywhere quizzes	15%

Exams:

There will be 4 exams throughout the semester and one cumulative final. Each exam is worth 15% of your final grade, whereas the final is 20%. Make-up exams will be provided if there is an emergency at test time, or due a university-sanctioned event, such as participation in a sporting events or academic conferences. **Make-up exams will be**

written & oral and will be given at a time we deem appropriate. If you cannot avoid being gone on an exam day, it is your responsibility to contact me **at least one week** prior to the scheduled test date.

The final exam cannot be taken at another time, unless, as stated in The College Academic Regulations:

1. Two or more exams are scheduled simultaneously.
2. Legitimate and documentable extenuating circumstances prevent the student from completing the examination at the scheduled time (e.g., burial services for an immediate family member).

Assignments:

There will be both in-class and online assignments. The in-class assignments will be due at the end of class and therefore cannot be made up at a later date. You must be in class in order to participate and receive full credit. Any missed in-class activities due to attendance at a university-sanctioned events, such as an away sporting event or scientific presentation, will not be counted against your grade.

Online assignments will be posted in Oaks along with associated due dates.

Poll Everywhere Quizzes

We will have in-class quizzes administered during most lectures that will be given using poll everywhere. If you forget your phone or are unable to answer poll everywhere questions electronically, you can hand in your answers on paper that has your name, date and your answer(s) for that lecture period.

The poll everywhere quizzes will be calculated as:

total points received/ (75% of total available points).

In other words, if we have 48 quiz questions, and you get all of them correct, your quiz grade will be 48/36 or 133%. This means you can miss 12 questions without any grade penalty.

College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive an XXF in the course,

indicating failure of the course due to academic dishonesty. This status indicator will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

Center for Student Learning:

I encourage you to utilize the Center for Student Learning's (CSL) academic support services for assistance in study strategies and course content. They offer tutoring (*including a new walk-in Science Tutoring Lab*), Supplemental Instruction, study skills appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at <http://csl.cofc.edu> or call (843)953-5635.

Supplemental Instruction:

Our section has Supplemental Instruction, which is collaborative learning with a peer biology coach. It is for everyone and is not remedial. <http://csl.cofc.edu/supplemental-instruction/>

The program attempts to improve student performance by providing regularly scheduled out-of-class study sessions facilitated by an SI leader. Sessions are scheduled 3 times per week for 1 hour each. SI Leaders are trained in facilitating collaborative learning activities and study skills/learning strategies. Through pre-planned structured SI Sessions, SI Leaders provide guided study sessions to cover the most difficult class topics being discussed.

General Class Policies

Computers & Cell phones:

Computers can be used for notetaking and other class related activity.

Turn all cell phones to silent before class. No calls, no texting during class.

Please be respectful to your classmates and do not email, text or check facebook, instagram, snapchat, etc. during class. Everyone behind you can see that you are watching netflix.

Email:

Email can be an efficient and effective mode of communication and is best used for things such as setting up office hour appointments or quick questions about content or assignments (longer questions are best answered during office hours).

Office hours:

Office hours are a fantastic way for you to get questions answered and for you to work one-on-one with the instructor. While there are only 2 formally scheduled office hours can set up an appointment for times that might work better with your schedule.

Attendance:

You should be in your seat, prepared for the day and ready to begin class on time. Late entrances are disruptive to your fellow students. **Please be respectful and arrive on time.**

Classroom Climate:

I am committed to establishing and maintaining a classroom climate that is inclusive and respectful for all students. Learning includes being able to voice a variety of perspectives, and classroom discussion is encouraged. While students' expressed ideas may vary and/or be opposed to one another, it is important for all of us to listen and engage respectfully with each other. I am also committed to a classroom and campus environment free of discrimination of all kinds.

If you feel that the classroom climate does not reflect my commitment as expressed above, I would encourage you to contact me so that we can discuss this. Also, if you have experienced any harassing or discriminatory behavior, to include sexual harassment or sexual violence, I can provide you with information about support resources and reporting options, including those that are confidential, since I am not a confidential reporting source. Like other employees at the university (except counselors and medical staff), I am obligated to report instances of sexual harassment and sexual violence to the university's Title IX Coordinator, as part of our university's commitment to preventing and eliminating this behavior.

Confidential support for students who are affected by violence and abuse and/or sexual assault is available from the Counseling Center ((843) 953-5640 <http://counseling.cofc.edu/>) or the Office of Victim Services ((843) 953-2273, <http://victimservices.cofc.edu/>)

Accommodations:

Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the **first two weeks** of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged.

The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services / SNAP, located on the first floor of the Lightsey Center, Suite 104. **Students approved for accommodations are responsibility for notifying me.** The best time to do this is during my office hours.

Students are also responsible for making test accommodation one week before the scheduled exam as detailed here

<http://disabilityservices.cofc.edu/cds-resources/alternate-testing-site-ats/testing.php>

This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, (843) 953-1431, so that such accommodation may be arranged.

Tentative Lecture and Exam Schedule

	Dates	Topic	Readings
Week 1	Aug 21	Course Overview	Syllabus Bioskill 15, 17 & 18
	Aug 23	Life: Chemical, cellular & Evolutionary Foundation	Chapter 1
Week 2	Aug 28	Biological Chemistry	Big Picture pg. 16-17 Chapter 2 Bioskill 14
	Aug 30	Nucleic Acids	Chapter 4 Bioskill 13
Week 3	Sept 4	Nucleic Acids	Bioskills 6, 10
	Sept 6	Proteins	Chapter 3 Bioskill 7
Week 4	Sept 11	Exam 1	
	Sept 13	Carbohydrates Lipids & Membranes	Chapter 5 Chapter 6.1, 6.2 Big Picture pg 140-141
Week 5	Sept 18	Passive and Active transport	Chapter 6.3, 6.4
	Sept 20	Cell Structure & Function	Chapter 7 Bioskills 8, 9
Week 6	Sept 25	Cell Structure & Function	Chapter 7
	Sept 27	Cell to cell interactions	Chapter 11
Week 7	Oct 2	Exam 2	
	Oct 4	Enzymes & Energetics	Chapter 8
Week 8	Oct 9	Respiration	Chapter 9
	Oct 11	Respiration	Chapter 9
Week 9	Oct 16	Photosynthesis	Chapter 10
	Oct 18	Photosynthesis	Chapter 10 Big Picture 232-233

Week 10	Oct 23	Exam 3	
	Oct 25	Cell Division	Chapter 12
Week 11	Oct 30	DNA Replication & Repair	Chapter 15
	Nov 1	Meiosis	Chapter 13
Week 12	Nov 6	Fall Break – No Class	
	Nov 8	Heredity	Chapter 14 Big Picture 396-397
Week 13	Nov 13	Exam 4	
	Nov 15	Central Dogma	Chapter 17
Week 14	Nov 20	Bacterial Gene Expression	Chapter 18
	Nov 22	Thanksgiving Break – No Class	
Week 15	Nov 27	Eukaryotic Gene Expression	Chapter 19
	Nov 29	Biotechnology	Chapter 20
Finals Week		Final Exam Thursday December 6, 7:05 AM	

General Education Student Learning Outcomes

Introduction to Cell and Molecular Biology/Evolution, Form, and Function of Organisms

BIOL 111 & 111L/BIOL 112 & 112L

Department: Biology

Learning Goals & Objectives

This general education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core concepts to use and on which to expand in upper level courses. They also develop the critical competencies that form the bases for the practice of science and use of scientific knowledge.

Core Concepts

This 2-semester course sequence in general biology addresses fundamental principles in biology to prepare students for sophomore and upper level courses in biology:

- **EVOLUTION:**
The diversity of life evolved over time by processes of mutation, selection, and genetic change. The theory of evolution by natural selection allows scientists to understand patterns, processes, and relationships that characterize the diversity of life.
- **STRUCTURE AND FUNCTION:**
Basic units of structure define the function of all living things. Structural complexity, together with the information it provides, is built upon combinations of subunits that drive increasingly diverse and dynamic physiological responses in living organisms. Fundamental structural units and molecular and cellular processes are conserved through evolution and yield the extraordinary diversity of biological systems seen today.
- **INFORMATION FLOW, EXCHANGE, AND STORAGE:**
The growth and behavior of organisms are activated through the expression of genetic information at different levels of biological organization and depend on specific interactions and information transfer.
- **PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER:** Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamic and will be explored to understand how living systems operate, how they maintain orderly structure and function, and how physical and chemical processes underlie processes at the cellular level (i.e. metabolic pathways, membrane dynamics), organismal level (i.e. homeostasis) and ecosystem level (i.e. nutrient cycling).
- **SYSTEMS:**
Living systems are interconnected and interacting and biological phenomena are the result of emergent properties at all levels of organization, from molecules to ecosystems to social systems. The course will explore the dynamic interactions of components at one level of biological organization to the functional properties that emerge at higher organizational levels.

The specific topics covered in each course include:

Biology 111 & Biology 111L

- Chemical and physical properties of life
- Cell form & function
- Energetics, metabolism, and photosynthesis
- The cell cycle (1) Mitosis and cell reproduction (2) Meiosis and sexual reproduction
- Mendelian genetics / Patterns of inheritance
- Human Inheritance

- The molecular basis of inheritance
- DNA and protein production
- Regulation of gene expression
- Some aspects of biotechnology

Biology 112 & Biol 112 L

- The development of evolutionary thinking
- Basic evolutionary processes
- Comparative plant form & function
- Comparative animal form & function

Core Competencies

Nature of Scientific Knowledge

- Understand the intellectual standards used by scientists to establish the validity of knowledge, evidence, and decisions about hypothesis & theory acceptance. These standards include: 1) science relies on external and naturalistic observations, and not internal convictions; 2) scientific knowledge is based on the testing of hypotheses and theories, which are under constant scrutiny and subject to revision based on new observations; 3) the validity of scientifically generated knowledge is established by the community of scientists through peer review and open publication of work.
- Understand that new ideas in science are limited by the context in which they are conceived; are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly, through contributions from many investigators.
- Understand that science operates in a world defined by the laws of chemistry and physics.
- Understand the differences and relationships among scientific theories, hypotheses, facts, laws, & opinions.
- Understand the differences between science and technology, but also their interrelations.
- Understand the dynamic (tentative) nature of science.

Scientific Methods of Discovery

- ¹Understand the methods scientists use to learn about the natural world (observing; questioning; formulating testable deductive hypotheses; controlled experimentation when possible; observing a wide range of natural occurrences and discerning (inducing) patterns).
- Apply physical/natural principles to analyze and solve problems.

Develop a Scientific Attitude

- Develop habits of mind that foster interdisciplinary and integrative thinking (within biology; between biology and other sciences; between science and other disciplines).
- Develop an appreciation for the scientific attitude - a basic curiosity about nature and how it works.

Develop scientific analysis and communication skills

- Develop quantitative reasoning skills (quantitatively expressing the results of scientific investigations, or patterns in nature and using knowledge of biological concepts to explain quantitatively-expressed data or patterns).
- Understand the probabilistic nature of science and the use/application of inferential statistics to test hypotheses.

¹ This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: *Students can apply physical/natural principles to analyze and solve problems.*

- Develop scientific information literacy (library, internet, databases etc...); find and evaluate the validity of science-related information.
- Communicate scientific knowledge, arguments, and ideas in a variety of different contexts (scientific, social, cultural), utilizing a variety of different media (scientific articles, policy statements, editorials, oral presentations etc.).
- Develop cooperative problem-solving skills (working effectively in teams), but also habits of mind and skills that foster autonomous learning.

Develop an appreciation for the impact of science on society.

- Develop an appreciation of humans as a part of the biosphere and the ²impact of biological science on contemporary societal/environmental concerns.
- Knowledge of the history of the biological sciences and the influences of politics, culture, religion, race, and gender on the scientific endeavor.

Signature assignments for measuring learning outcomes

Learning Outcome 1: Students apply physical/natural principles to analyze and solve problems.

This learning outcome is assessed using the poster (or scientific article) generated in Biology 112 lab as part of the multi-week student-directed independent research project. In this project students use data they collect (or has been collected in actual research investigations) to test a hypothesis of their choosing. These projects may be themed, with all student groups addressing different aspects of a larger question, emphasizing the interdependence of various research groups needed to address complicated problems. This multi-week project begins the class identifying what questions need to be addresses in the larger problem. Individual student groups then become experts in these areas of the larger problem. The smaller research teams develop a hypothesis, and write a research proposal to test their hypothesis. Students collect (or use already collected data), summarize and statistically analyze the data, and draw conclusions.

Learning Outcome #2 - Students demonstrate an understanding of the impact that science has on society. **Biology 112 lab** Students produce a written document based on one of the case-based labs (examples - policy statement, article, stake-holder professional letter or poster) that requires them to research and apply biological knowledge or evidence to defend or critique a proposed solution to a biology-related societal issue. Although the choice of the specific issue or proposed solution is course-section specific, some examples of potential issues include

- exploring environmental/health impacts of genetically modified organisms
- the use of performance enhancing drugs in sports
- the development of antibiotic resistance in disease organisms

² This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: *Students can demonstrate an understanding of the impact that science has on society.*