

Introduction to Cell and Molecular Biology
BIOL 111-05 Fall Semester 2020
RITA 101

Contact information:

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Office hours: 2-3pm after each class and by appointment

Course Description: Introduction to Cell and Molecular Biology is a foundation course for potential science majors emphasizing critical thinking skills, and the concepts of structure (molecular and cellular, and function in biological systems. Topics include the scientific method, biochemistry, molecular biology, cellular structure and function, respiration, photosynthesis, and genetics. Completion of Biol 111 and the associated laboratory (Biol 111L) meets a General Education requirement.

Prerequisites/Corequisites: None. BIOL 111L is a co-requisite unless students already have credit for the laboratory portion of the class.

Textbook: [Openstax: Biology 2e](#). This FREE Open Educational Resource (OER). There are numerous options for students to access this textbook (online, PDF, Kindle, print). The [CofC Bookstore](#) is selling/renting print versions of this textbook (cost ranges from \$21-\$45) for students who prefer a physical textbook. There are, however, advantages to using an electronic free version of the text, including embedded clickable links to online external content.

Learning Outcomes: This General Education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students will develop a foundational understanding of core biology concepts to use, and upon which, to expand in upper level courses. Students will also develop the critical competencies that form the basis for the practice of science and for the use of scientific knowledge.

Contact: Students are encouraged to communicate with each other and myself using either the Discussion Board or in-person throughout the semester. While the Discussion Board and email are available 24 hours a day, 7 days a week, please allow me at least 24 hours to respond to questions. Personal questions should not be asked via the Discussion Board, but emailed instead – see above for my email address.

Office Hours: During online instruction I will be available through Zoom immediately after class until 2pm MWF and by appointment. Should we return to in-person instruction and during hybrid instruction my after-class office hours will move to my office (which I still need to find) and I will keep open the zoom meeting from class. Again, you can also make appointments. I will try to accommodate requests when scheduling office hours, but I teach at The Citadel as well and will not be available during my class times there.

OAKS: OAKS is the learning management system that is used by the College of Charleston. It is imperative that you learn to use OAKS, as it will be used by many of your classes as a way to provide material, gives quizzes or tests, as a way to collect assignments, as a way to have class discussions, and as

a way to communicate grades. I will be using OAKS extensively for this course, and will keep a running grade average for you on OAKS. You can log in to OAKS through MyCharleston, and there are many tutorials if you have trouble familiarizing yourself on your own. Here is a link to the OAKS support page, which is an excellent resource and links out to all of the tutorials:

<http://blogs.cofc.edu/oaks/students/getting-started/> .

Expectations:

- 1) Students should make all reasonable attempts to attend lectures – the book will be used for supplemental materials.
- 2) In order to be successful in this class you should expect to spend 6+ hours outside of class reading and studying.
- 3) To make this class interactive and engaging requires you to participate by having read the assignments and by answering or asking questions.
- 4) Do **not** procrastinate on the readings – there is much to cover and you will quickly fall behind.
- 5) **Do** ask questions, **do** ask for help, and **do** use our SI assistant Hayley Killin.

Supplemental Instruction:

Our section has an excellent resource in Hayley Killin. Supplemental Instruction is a collaborative learning approach led by a trained peer to coach you in biology. Supplemental Instruction is **not** remedial and is available free for everyone. I strongly encourage you to use this resource

<https://csl.cofc.edu/supplemental-instruction/>

Attendance: Your grade in this course relies heavily on your participation in class. Excessive absences are guaranteed to affect your grade. Attendance will not be taken in lecture; however, no make-ups will be allowed for missed assignments or quizzes. If you are late to class and miss the quiz, you will not be allowed to take it. Therefore, regular attendance is highly recommended. It is the student's responsibility to find out what was missed in case of unavoidable absence. If you must miss a class due to illness, you may be allowed to complete the missed work or an alternate assignment, but you must obtain an absence memo from the Office of the Associate Dean of Students at 67 George Street. It must be a **documented** absence to be excused; you must talk to me about it, and it is at my discretion. You may access the required forms at the following address: <http://studentaffairs.cofc.edu/services/absence.php>

MISSING 4-5 CLASSES IN A ROW WILL RESULT IN A "WA" GRADE (WITHDRAWN FOR EXCESSIVE ABSENCE) AT MIDTERM AND/OR FINAL GRADE. A FINAL "WA" GRADE IS CALCULATED AS AN "F" IN YOUR GPA . It is the student's responsibility to contact me immediately with any issues. If you have extenuating circumstances, then please speak to me on an individual basis .

Food insecurity: Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. Furthermore, please notify me if you are comfortable in doing so. This will enable me to provide connections to any resources of which I may be aware.

Extra help: The Center for Student Learning (CSL) now has a walk-in science tutoring lab. You may use the walk-in lab during the scheduled times of operation which can be found at <http://csl.cofc.edu/labs/> .

Inclement Weather: It has become tradition at the College of Charleston to cancel classes in observance of tropical storms and/or hurricanes that might make landfall within the neighboring coastal states. Please be considerate to the challenges faced by the Department and College to reschedule the missed course meeting times. If lectures are cancelled due to inclement weather, we reserve the option to reschedule missed lectures, modify the course content, or require students to learn course material outside the scheduled lecture times. **Should this occur, a revised syllabus and schedule for the lectures will be distributed to all students.**

Student Conduct:

- a. There is to be no talking during the instruction period. If you have a question, please raise your hand prior to asking the question. While answering a student's question, please remain quiet so that the student and other class members can hear the reply.
- b. There is to be no talking during quizzes or exams. If you have a question, please raise your hand and remain quiet until the instructor can come to you.
- c. Please turn off all cellular phones before entering the classroom. If you use your cell-phone during class you will be asked to leave the room.
- d. Remember you are attending classes to learn and apply the material/principles covered in the lecture. Reading newspapers/magazine, sleeping, or distracting the instructor or the other students will not be tolerated.
- e. If you have a documented disability that may require assistance, you will need to contact the Center for Disability Services for coordination in your academic accommodations. If the CDS will be involved in administering an exam, we request that you inform us in advance (e.g. the day before the exam is not acceptable). The CDS is located in the Lightsey Center in Suite 104. The CDS phone number is (843) 953-1431. For more information about disabilities, see <http://disabilityservices.cofc.edu>. Reasonable efforts will made to accommodate any disability.
- f. No College of Charleston employee or student should be subject to unwelcome verbal or physical conduct. It is expected that students, faculty and staff will treat one another with respect. Individuals who violate this policy are subject to disciplinary action up to, and including, termination and/or expulsion from the College and the possibility of civil and criminal prosecution.
- g. 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 by both 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 a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. 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. No collaboration during the completion of the quizzes, assignments, or exams is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://www.cofc.edu/generaldocuments/handbook.pdf>

Writing Assignments: Students will pick three general topics from those listed (unless agreed on beforehand) to write a 2-page (double spaces) assignment. Topics are: Evolution in Education, Genetically Modified Organisms (GMOs), Gene Therapy, Genetically-enhanced humans, Human Cloning, Conservation, Invasive Species Control, Climate Change, and Environmental Pollution. Shape your writing as a persuasive ‘Policy Brief’ to convince a national policy-making committee to adopt your recommendations or viewpoint.

Assessments:

Participation	50 pts
Exam 1	100 pts
Exam 2	100 pts
Exam 3 (Final)	100 pts
Writing Assignments (3 Topics)	150 pts
Total	500 pts

Grading Scale:

- A 93-100 %
- 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 0 –59 %

General Education Learning Outcomes

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

BIOL 111 & 111L/BIOL 112 & 112L Department: Biology

Learning Outcomes:

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

- Mitosis and cell reproduction

- 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.*

TENTATIVE LECTURE SCHEDULE

Week	Dates	Topic	Book Chapters	Notes
1	8/24 M	Course Overview, Introduction to Biology	1	
	8/26 W	Cell Theory and Tree of Life	1,2	
	8/28 F	Biological Chemistry and Water	2	
2	8/31 M	Biological Chemistry, pH and buffers	2	Add/Drop Deadline
	9/2 W	Genetics and DNA	3	
	9/4 F	Carbohydrates, Lipids	3	
3	9/7 M	Proteins	3	
	9/9 W	Cell Structure	4	
	9/11 F	Prokaryote and Eukaryotic Structures	4	
4	9/14 M	Cell Membranes	5	
	9/15 T	Transport across Cell Membranes	5	Attendance Verification Essay 1 Due
	9/16 W	Exam 1		
	9/18 F	Energy and Metabolism	6	
9/21 M	Enzymes, Kinetics, and Thermodynamics... oh, my	6		
5	9/23 W	Enzymes, Kinetics, and Thermodynamics... oh, my	6	
	9/25 F	Cellular Respiration, glycolysis	7	
	9/28 M	Aerobic Respiration	7	
6	9/30 W	Aerobic and Anaerobic Respiration	7	
	10/2 F	Photosynthesis	8	
	10/5 M	Photosynthesis	8	
7	10/7 W	Cell Communication - outgoing	9	
	10/9 F	Cell Communication - incoming	9	
	10/12 M	Cell Division and the Cell Cycle	10	Midterm Grades
10/14 W	Control of the Cell Cycle , Cancer	10		
10/16 F	Proakryotic, Eukaryotic Cell Division	10		
9	10/19 M	Exam 2		Essay 2 Due
	10/21 W	Meiosis	11	
	10/22 F	Sexual Reproduction	11	
10	10/26 M	Mendelian Genetics	12	
	10/28 W	Mendelian Inheritance	12	Withdraw Deadline
	10/30 F	Chromosomes and Linkage	13	
11/2 M	Chromosomes and Mutations	13		
11	11/3 T	DNA Structure, Sequencing	14	Election Day
	11/4 W	DNA Replication, Repair, and Mutations	14	
	11/6 F	DNA Replication in Prokaryotes vs Eukaryotes	14	
12	11/9 M	Genetic Code	15	
	11/11 W	Prokaryotic Transcription	15	
	11/13 F	Eukaryotic Transcription	15	
13	11/16 M	Gene Expression	16	
	11/18 W	Prokaryotic Gene Expression	16	
	11/20 F	Eukaryotic Gene Expression	16	
14	11/23 M	Biotechnology	17	Essay 3 Due
	11/24 T	Last Day of On-Campus Instruction		
	11/26 R	Thanksgiving		
15	11/30 M	Genome Mapping, Genomics	17	Online Instruction Resumes
	12/2 W	Proteomics	17	
	12/4 F	Final Review		
16	12/7 M	Reading Day		Last Day of Instruction
	12/11	Final 10:30 – 12:30pm		
	12/16	Grades Due		