

# Biology 111: Introduction to Cell and Molecular Biology

Section 16. MWF 9:30-10:20 AM Harbor Walk West Room 217

## Course Syllabus

Instructor Deb Bidwell

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## Course Description:

- Introduction to Cell and Molecular Biology is a foundation course for science majors emphasizing critical thinking skills, and the concepts of structure, and function in biological systems at the molecular, and cellular levels. Topics include the scientific process, biochemistry, molecular biology, cell structure and function, respiration, photosynthesis, and genetics. Completion of this class and the associated laboratory meets a General Education requirement. Please see (<https://lms.cofc.edu/d2l/le/content/98669/viewContent/1105726/View>) or the addendum at the end of this syllabus for details.

### *Pre-requisites*

- None. Biology 111 Laboratory is a co-requisite, unless students already have credit for the laboratory portion of the course.

## Course Learning 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.

## Contact/Communication

### *Private Student-To-Instructor Contact*

- Students should contact me about issues that are specific to the student **by email at [bidwelld@cofc.edu](mailto:bidwelld@cofc.edu)**
- My response turn around time with emails will normally be **within 24 hours on weekdays and within 48 hours on weekends.**

### *General Student-To-Instructor and Student-To-Student Contact*

- Students should contact the Instructor and other students on issues that are not student-specific and may benefit or apply to the entire class using the **OAKS Discussion Board Lounge open 24 hours a day, 7 days a week.**
- My response turnaround time on the discussion board lounge will normally be **within 24 hours weekdays and within 48 hours on weekends.**

### *Office Hours*

- Online group office hours with instant feedback in the OAKS **Chatroom On Wednesdays from 9-10 PM Eastern Standard Time.**
- In person office hours (group drop-in) in **Harbor Walk West 309/311: Mondays and Wednesdays 10:30 – 11:15 AM**
- **Individual office hours may be arranged by appointment**

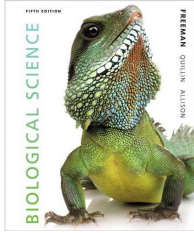
### *Course Communication and Community Building*

- **OAKS** will be utilized for **content, quizzes, news, updates, and online office hours.** *New to Oaks?* tutorials here: <http://blogs.cofc.edu/oaks/students/getting-started/>
- **Email** will be used to communicate important or sudden changes in course information.
- We will **all work together to build our classroom and online learning community.** I will play a facilitating role in helping you get to know, work with, trust and collaborate with the other members of our class. Each member of the class must be willing to participate in a dynamic and engaging learning group that is inclusive. Your participation, willingness to contribute, and your initiative are paramount to having a successful and enjoyable learning experience. We **aim to develop a spirit of camaraderie and team learning that will unite us** as a community of learners.
- This semester we will be doing some group discussion work online using discussion boards through OAKS. **As your instructor and facilitator I'll require you to make OAKS discussion posts about our course readings, as well as expecting you to thoughtfully reply to several of your peers' comments.** You can find a **rubric** about the expectations for quantity and quality of online discussion comments on OAKS.
- **Netiquette:** In our course discussions, we will be using complete sentences and proper grammar and will **not be using abbreviations or slang the way we might while texting.** Because it is difficult to interpret tone from only written text, and our online communication in the OAKS discussion boards will lack facial expression, body language, hand gestures, and other social clues, it is especially important that we all take special care to be sensitive to possible tone misinterpretation which can lead to inadvertently hurt feelings that result in exclusion rather than inclusion. **We will all need to make sure that we are respectful, and professional in our posts.** For example, when we are challenging each other's ideas, it is vital that we do not allow arguments to become personal. We can disagree about the subject matter in a respectful, intellectual way that still allows for us to work well, and collaborate together.

## **Expectations**

- Students must earn **100% on OAKS syllabus quiz** to access course materials.
- Students should plan to **log into Oaks at least 3 times per week.**
- Students should expect to dedicate **6+ hours per week** to this course to be successful.
- This class is **student-driven.** Motivation must come from the student.
- Our class should be **interactive and engaging.**
- Students are expected to **contribute** to our **learning community.**
- **There are weekly obligations:** quizzes, discussion board posts, or exams.
- **Procrastination will doom you. The course builds, and snowballs.**

## Required Course Materials



- **Computer/technology** with access to **internet**
- **Software/Apps:** (OAKS, PowerPoint)
- **Textbook:** Freeman, Biological Science 5th edition
- Basic **scientific calculator** (logs, exponents, & square roots)

## Participation

- Student participation includes group work in class and posts to the **online group discussion board for each module's reading. Please see netiquette rules above and rubric regarding posting guidelines and expectations.**
- There is no attendance requirement, but you will not do well if you do not attend.

## Accommodation

- SNAP students, Athletes, International, ESL, and all students with life circumstances that may warrant accommodations are encouraged to **discuss any concerns with the Instructor** in a timely manner. I am fluent in Spanish. I understand that we all have way more important things going on in our lives than this biology class. I aim to be friendly, approachable, and understanding. I will hold you to high standards.

## Honor Code and Academic Integrity:

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 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 F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College.

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>

## Assessment

- Unit quizzes will be multiple-choice, **individual**, timed, randomized, approximately 10 questions, and conducted through OAKS. They are open-book and open-notes but students must prepare ahead of time, as quizzes are challenging and there will not be time to look up individual answers. One is optional (at fall break) and lowest is dropped.
- Exams (3) will be in-class, short answer, and multiple-choice exams. Extra credit will be based on weekly readings. If you are truly too sick to take an exam, you should be in the hospital or seeking immediate medical attention. If you need to miss an exam due to official CofC activity, please make arrangements well ahead of time. Documentation must be provided through the Dean of Students office at 67 George Street.
- Discussion posts (3) will be made through the OAKS discussion board in small groups, and evaluated according to the rubric found on OAKS in course content.

## Grades calculated as follows:

<b>Component</b>	<b>Value (% of final course grade)</b>
<b>Quizzes - one optional, lowest dropped (7)</b>	<b>25</b>
<b>Exams (3)</b>	<b>40</b>
<b>Cumulative Final Exam</b>	<b>20</b>
<b>Discussions (3)</b>	<b>15</b>
<b>Total:</b>	<b>100%</b>

Tentative Schedule for section 16 MWF class:

Week	Lecture topic	Chapter readings	Discussion Readings/Videos	Due for grading	Suggested home work (not collected or graded)
1 <b>no labs yet</b>	Introduction. What is life? What is science?	1 Bioskill 14 (text appendix)	<u>Article on OAKS:</u> Tardigrades – for class	<b>Must score 100% on syllabus quiz for access to course materials on OAKS.</b>	Look for tardigrades, play outside, meet people in class.  Answer blue questions in text
2 <b>labs start</b>	Scientific literacy Biology's tenets The cell Diffusion Osmosis	1, 7, 6.3 The Big Picture pp16-17 Bioskill 3, 4, & 7	<u>Article on OAKS:</u> The trouble with "theory" – for class	<b>Quiz 1</b> (OAKS online) opens Thursday 9/3 closes Sunday 9/6 average of up to three tries.	Complete Sponge Bob Science activity  Answer blue questions in text
3 <b>yes, we have class on Labor Day</b>	Atoms Bonds Chemical reactions	2 Bioskill 8	<u>Article on OAKS:</u> Why I study duck genitalia -for Discussion Board post	<b>Discussion Board Post #1</b> Post your thread to OAKS discussion board by 9/9 and comment on two peer posts by 9/11 (midnight deadlines)	Answer blue questions in text
4	Water pH carbon skeletons functional groups proteins	2 3 The Big Picture p 104-105	<u>Article on OAKS:</u> The mystery of earth's oxygen – for class	<b>Quiz 2</b> (OAKS online) opens Thursday 9/17closes Sunday 9/20 average of up to three tries.	-pH practice problems -chemical doodling -answer blue questions in text
5	Nucleic acids Carbohydrates Lipids	4 5 6 The Big Picture p 104-105	<u>Article on OAKS:</u> Paleo carb diet – for class	<b>Quiz 3</b> (OAKS online) opens Thursday 9/24 closes Sunday 9/27 average of up to three tries.	-Prep for exam 1  -Answer blue questions in text
6 <b>Exam 1 on 9/30</b>	Membranes &cell connections (Mon.) Cell signals & energy (new material Fri.)	6 11.1-11.2 The Big Picture pp 104-105 11.3, & 8 (new material)	No article this week	<b>Exam 1 on 9/30</b>	Answer blue questions in text
7	Photosynthesis	10 Bioskill 15 The Big Picture pp 198-199	<u>Article on OAKS:</u> Biomimicry, using nature's solar technology – for class	<b>Quiz 4</b> (OAKS online) opens Thursday 10/8 closes Sunday 10/11 average of up to three tries.	Answer blue questions in text  Finalize and correct concept map.

8	Cellular Respiration	9 The Big Picture pp 198-199	<u>Article on OAKS:</u> Missing link in the evolution of complex cells – for class	<b>Optional Quiz 5</b> (OAKS online) opens Thursday 10/15 closes Sunday 10/18 average of up to three tries.	If you don't choose to take quiz 5 by the deadline for a grade, be sure to study from it when it is released for practice.  Answer blue questions in text
9 <b>no class Mon.</b>	Cell cycle Mitosis DNA synthesis	12 15 The Big Picture 366-367	<u>Article on OAKS:</u> Henrietta Laks – for discussion board post	<b>Discussion Board Post #2</b> Post your thread to OAKS discussion board by 10/21 and comment on two peer posts by 10/23 (midnight deadlines)	Prep for exam 2 Answer blue questions in text
10 <b>Exam 2 on 10/28</b> (withdraw deadline is 10/29)	DNA synthesis continued Meiosis (new material on Friday)	15 13 (new material) The Big Picture 366-367	No article this week	<b>Exam 2 on 10/28</b>	
11	Meiosis continued Genetics	13 14 Bioskill 5 The Big Picture 366-367	<u>Article on OAKS:</u> Race, the power of an illusion – for class	<b>Quiz 6</b> (OAKS online) opens Thursday 11/5 closes Sunday 11/8 average of up to three tries.	Draw out meiosis Genetics problems #1 Answer blue questions in text
12	Genetics continued	14 The Big Picture 366-367	<u>Article on OAKS:</u> How simple can life get? – for class	<b>Quiz 7</b> (OAKS online) opens Thursday 11/12 closes Sunday 11/15 average of up to three tries.	Genetics problems #2 Prep for exam 3 Answer blue questions in text
13 <b>Exam 3 11/20</b>	The genetic code Transcription Translation	16 17 The Big Picture 366-367	No article this week	<b>Exam 3 on 11/20</b>	Prep for exam 3 Answer blue questions in text
14 <b>no class Wed. and Fri.</b>	Control of gene expression	18 19	No article this week	No quiz or discussion board (Thanksgiving)	Give thanks and get full  Answer blue questions in text  Develop study plan for all final exams
15	Epigenetics Biotechnology Biomimicry	20 21	<u>Article on OAKS:</u> Epigenetics, why fathers matter – for discussion board	<b>Discussion Board Post #3</b> Post your thread to OAKS discussion board by 12/2 and comment on two peer posts by 12/4 (midnight	

				deadlines)	
16	Wrap it up, course evaluations, final exam review		<b>(LAST DAY</b>	<b>OF CLASS IS ON</b>	<b>MONDAY 12/7)</b>
	<b>CUMULATIVE</b>	<b>FINAL EXAM</b>	<b>MONDAY</b>	<b>DEC 14th</b>	<b>8-11 AM</b>

Addendum: General Education information:

**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
  - 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**
  - <sup>1</sup>Understand 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).

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<sup>1</sup> 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.*



- 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.
  - 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 <sup>2</sup>impact 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 an 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

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- the development of antibiotic resistance in disease organisms