

**BIOLOGY 111 (section 12):  
INTRO TO CELL & MOLECULAR BIOLOGY  
Fall 2018**

**Instructor:** Dr. Christopher (Chris) Freeman

**Time/Location:** MWF 12:00 to 12:50 in RITA 154

**E-Mail:** freemancj@cofc.edu

**Office Location:** RITA 204

**Office Hours:** M/W 9:30 am to 11:00 am or email to make an appointment

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**COURSE DESCRIPTION:**

Introduction to Cell and Molecular Biology is a foundational Biology course that emphasizes:

- Critical thinking skills
- Structure and function in biological systems at both the molecular and cellular level
- The link between interesting recent or important scientific research and the everyday lives of students and/or the functioning of ecosystems

**Key topics include:**

- The scientific process
- Biochemistry
- Molecular biology
- Cell structure, function, and replication
- Respiration
- Photosynthesis
- Genetics

Completion of this course satisfies a General Education requirement and the lab BIOL111L is a co-requisite.

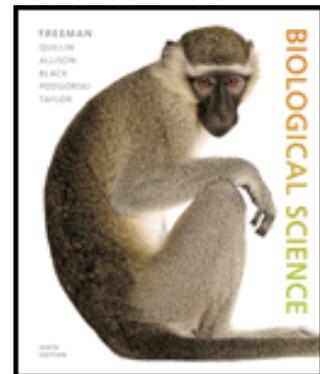
**REQUIRED TEXTBOOK and SUPPLIES:**

*Biological Science* 6<sup>th</sup> Edition by Freeman et al. (not me)

Notebook or scrap paper for notes and activities.

Download “clicker” software (**using CofC email-I will send a link**). **It should be \$14.00 for the year.**

<https://www.polleverywhere.com>



**COMMUNICATION and OFFICE HOURS:**

I will answer emails quickly (generally within 24 hours during the week) and on or potentially before Monday if you send me an email after 5 pm on Friday. Email is the best way to contact me. I am available to help you however I can with this course (or with general questions/concerns) and my office hours are in place to help students. I encourage any students that have questions to come to office hours or schedule a time to meet with me outside of class. **Students that stop by to go over material on a regular basis and ask questions**

**generally do very well in this class. I am also available outside of office hours (by appointment).**

### **OAKS and EMAIL:**

(Log into <http://my.cofc.edu> and click on the link to OAKS)

I will upload useful materials (study guides, worksheets, papers, lecture slides, useful links, videos, and the syllabus) to OAKS. In addition, important class information and updates will be uploaded in the announcements section on OAKS. Grades will also be uploaded to OAKS so students can track their progress!!!

\*All communication pertaining to the class will go through OAKS, the OAKS announcement section, or your CofC email so please check all daily.

\*Students are responsible for remaining up to date with OAKS and any email correspondence.

### **COURSE STRUCTURE, ASSESSMENTS, and GRADING:**

**EXAMS\*:** The course will be divided into three sections that each has an exam (**3 exams!**). Each exam will take an entire class period. These exams allow students to test their understanding of the material more frequently than just a mid term and final.

Exams will each be 30 multiple-choice questions and use a Scantron form. Students are responsible to bringing a #2 pencil to exams to use on the Scantrons.

Exam questions will be pulled from lecture slides, lecture notes, and the corresponding textbook material. There is a lot of information in this class (~20 chapters!!!), so I urge students to take detailed notes and ask questions in class or office hours.

There will also be a comprehensive final exam at the end of the course that will be 100 multiple-choice questions.

**\*Make up exams will not be administered except under situations like a documented medical or family emergency. If a situation like this arises, please provide me with a notice from the Absence Memo Office.**

**QUIZZES:** A brief “Clicker” quiz (using cell phones, computers, or tablets) will be given at the start of each new chapter (starting on the second week). These quizzes will broadly cover material on that chapter in the book. These are to encourage students to stay current with reading and material, so **the quiz will consist of questions given before (or even during) the lecture on the chapter.** These are a great opportunity to test your understanding, identify areas where you need to focus (or ask me questions), and improve your grade

(25% of your final grade!).

**\*Quizzes cannot be made up if you are late to class or absent (unless by an excused absence-see above information for make up exams).**

### **ASSIGNMENTS:**

We will have assignments during (and outside of) class over the course of the semester to encourage active participation and collaboration and discussion among students. These activities (Think, Pair, Share; short writing assignments; reading articles; reviewing news stories, a debate; and others) will be handed in at the end of class and graded based on both individual participation and content and will make up 100 of the total 800 points available in the class. This is a very easy source of points that will be missed if students are not present in lecture or don't turn in their assignment on time. These assignments cannot be made up if students are late or absent (unless by an excused and documented absence as outlined above).

### **GRADING BREAKDOWN:**

- Exams: 300 Points (100 points each)
- Final Exam: 200 Points
- In Class Quizzes: 200 Points
- Assignments: 100 Points

**Total: 800 Points**

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

- 0 due to academic dishonesty = XXF

I do not curve grades on exams or final scores in the class, but there are opportunities (other tests, quizzes, and assignments) to make up points if you do poorly on a single test. If, at the very end of the semester, your final grade is near (<0.5 points) a letter grade threshold, I will round up. As an example, if you have a 79.6, I will round up to an 80 and you will have a B- in the class. In comparison, if you have a 79.5 or below, your grade will remain a C+. This cutoff system is the only way that I can maintain a consistent treatment of grades across students, so there will be no exceptions.

### **RELEVANT ARTICLES and NEWS STORIES:**

Scientific inquiry and a growing understanding of global biological systems impact the everyday lives of humans and the functioning of ecosystems on this planet. In order to help link biological science and the process of the scientific method with the lives of students, we will go over recent interesting or historically important scientific literature and news articles during class. On average, there will be one new article per chapter. These papers/articles will also be provided on OAKS and, in some cases, students may need to read these prior to coming to class. **Materials from these papers/articles will not be on in-class exams, but basic questions from papers might be on later “clicker” quizzes and will also make up ~10 % of the questions on the final exam.**

**EXTRA CREDIT:**

Extra credit options are of minor point value. They are available for a **maximum of 20 points** (remember out of your 800 total). Some extra credit questions may also occasionally appear on the exams for a couple of extra points. Note that your time is better spent studying the material than doing extra credit.

**Option #1 (10 points):** Read a peer-reviewed, published (ask the professor if you have a question about this-start looking on <https://scholar.google.com>) scientific article on a subject that interests you. Write a one page (double spaced) summary of the article. For full credit, make sure to outline why the authors did the research, what their hypotheses or predictions were, the methods they used to test their hypotheses, and their results and conclusions. Also make sure to mention why you were interested in the article and attach a copy of the article to your summary to receive full credit. **The article and summaries must be handed in to me (hard copy only) by 5 pm on December 3<sup>rd</sup>.**

**Option #2 (10 points):** Go to: <http://www.iucnredlist.org> and find an organism that is of interest to you. Write a one page (double spaced) summary of the organism and why it is of interest to you. For full credit, only include an organism that has been evaluated by the IUCN and discuss what its status is, how that status was determined, what the major threats to its survival are, where it is found and its current/historical range, how many of the species are left in the world, its common and scientific name, and what, if anything is being done to protect it. **This information must be handed in to me (hard copy only) by 5 pm on December 3<sup>rd</sup>.**

**Option #3 (10 points):** Watch a TED Talk: <https://www.ted.com/talks> on some sort of Biological Science/Conservation Biology/Ecology/Biodiversity/Chemistry subject and write a one page (double spaced) summary of it. For full credit, include a link to the talk, discuss who gave it, why they decided to give it and/or why they were the best person to talk about the subject, give a summary of the main take home messages, how it relates to a subject we talked about in class, and why it is important to be discussing right now. **This must be handed in to me (hard copy only) by 5 pm on December 3<sup>rd</sup>**

**ATTENDANCE and CLASS ETIQUETTE:**

Please attend all meetings of the class. We go over a lot of information in this class and if you are chronically absent or late to class, you will do poorly. If you miss classes, you will also lose available quiz and activity points and miss important information. Students are responsible for getting notes or any missed information from classmates and/or visiting the professor during office hours if they have questions due to a missed class. I'm happy to go over material with you.

**Please do not spend class texting or using the Internet for activities not related to class. This is distracting to students that are learning the material.**

**All small (cell phones, tablets) electronics must be turned off during class (unless during a quiz). Computers are allowed for note taking, but this will be restricted if students are using their computers for activities not related to class.**

**Please be understanding of other students need for a quiet classroom and do not talk during class, tests, or in-class quizzes. Please also refrain from distracting activities (chewing and popping gum, etc...).**

#### **SUPPLEMENTAL INSTRUCTION:**

**I strongly suggest that students attend at least one SI session per week.** A supplemental Instruction (SI) leader will be assigned for this course (more details TBD). This leader is a student that will run active SI gatherings and study sessions to answer questions, review content, and help with problems. This is helpful and I encourage all students to participate. **Students that attend these on a regular basis do better in the class by nearly a full letter grade.**

#### **SCIENCE TUTORING LABS:**

<http://csl.cofc.edu/labs/>

<http://csl.cofc.edu/labs/science-lab/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, speaking & writing skills, and course content. They offer tutoring, 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.

#### **ACCOMODATING DISABILITIES:**

The college and professor will make any reasonable accommodations for students with documented disabilities. If students need these accommodations (outside class exams/extended time/etc...), they should see the Center for Disability Services/SNAP (located on the first floor of the Lightsey Center, Suite 104) and get a formal notice from SNAP to the professor as soon as possible so that we can make necessary arrangements.

#### **NAME and PRONOUN PREFERENCE**

I will gladly honor your request to address you by the name and gender pronouns of your choice. Please advise me of this early in the semester via your college-issued email account or during office hours so that I may make the appropriate notation on my class list.

#### **FOOD and HOUSING INSECURITY**

If you are housing or food insecure, there are programs through the College that may help. Students can contact Mark Antoine at [antoinep@cofc.edu](mailto:antoinep@cofc.edu) or visit the Dean of Students in the 3<sup>rd</sup> floor of the Stern Center.

**Fall 2018 TENTATIVE COURSE SCHEDULE, AND CORRESPONDING [BOOK CHAPTER]:**

22 <sup>nd</sup> August	Introduction, Syllabus, Biology, and Life [1].
24 <sup>th</sup> August	Chemical bonds, thermodynamics, water [2].
27 <sup>th</sup> August	Chemical bonds, thermodynamics, water [2].
29 <sup>th</sup> August	Proteins [3]
31 <sup>st</sup> August	Proteins [3]
3 <sup>rd</sup> September	Nucleic acids [4]
5 <sup>th</sup> September	Nucleic acids [4]
7 <sup>th</sup> September	Carbohydrates [5]
<b>10<sup>th</sup> September</b>	<b>NO CLASS</b>
12 <sup>th</sup> September	Lipids and membranes [6]
14 <sup>th</sup> September	Passive and active transport [6]
<b>17<sup>th</sup> September</b>	<b>EXAM 1</b>
19 <sup>th</sup> September	Cell structure and function [7 and 8]
21 <sup>st</sup> September	Cell structure and function [7 and 8]
24 <sup>th</sup> September	Cell structure and function [7 and 8]
26 <sup>th</sup> September	Respiration [9]
28 <sup>th</sup> September	Respiration [9]
1 <sup>st</sup> October	Photosynthesis [10]
3 <sup>rd</sup> October	Photosynthesis [10]
5 <sup>th</sup> October	Cell to cell interactions [11]
8 <sup>th</sup> October	Cell to cell interactions [11]
10 <sup>th</sup> October	Mitosis [12]
12 <sup>th</sup> October	Mitosis [12]
15 <sup>th</sup> October	Meiosis [13]
17 <sup>th</sup> October	Meiosis [13]
<b>19<sup>th</sup> October</b>	<b>Buffer/Makeup/Review Day</b>
<b>22<sup>nd</sup> October</b>	<b>EXAM 2</b>
24 <sup>th</sup> October	<b>In-class debate</b>
26 <sup>th</sup> October	<b>In-class debate</b>
29 <sup>th</sup> October	<b>In-class debate</b>
31 <sup>st</sup> October	Mendel and the gene [14]
2 <sup>nd</sup> November	Mendel and the gene [14]
<b>5<sup>th</sup> November</b>	<b>FALL BREAK-NO CLASS</b>
7 <sup>th</sup> November	DNA synthesis and repair [15]
9 <sup>th</sup> November	DNA synthesis and repair [15]

12 <sup>th</sup> November	How genes work [16]
14 <sup>th</sup> November	Transcription [17]
16 <sup>th</sup> November	Transcription [17]
19 <sup>th</sup> November	Gene expression in pro- and eukaryotes [18 to 19]
<b>21<sup>st</sup> November</b>	<b>THANKSGIVING-NO CLASS</b>
<b>23<sup>rd</sup> November</b>	<b>THANKSGIVING-NO CLASS</b>
26 <sup>th</sup> November	Gene expression in pro- and eukaryotes [18 to 19]
28 <sup>th</sup> November	Gene expression in pro- and eukaryotes [18 to 19]
<b>30<sup>th</sup> November</b>	<b>EXAM #3</b>
<b>3<sup>rd</sup> December</b>	<b>Biotechnology [20] LAST DAY of CLASS-REVIEW and course evaluations</b>
<b>5<sup>th</sup> December</b>	<b>READING DAY</b>
<b>7<sup>th</sup> December</b>	<b>FINAL EXAM: 12:00pm to 3:00 pm in lecture room</b>

### **COURSE EVALUATIONS:**

Course evaluations will be completed in class towards the end of the semester.

### **HONOR CODE AND ACADEMIC INTEGRITY:**

<http://studentaffairs.cofc.edu/honor-system/>

<http://studentaffairs.cofc.edu/honor-system/studenthandbook/>

<http://parkj.people.cofc.edu/HonorCode.pdf>

<http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

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 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. 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.

**\*Note that this syllabus is subject to change over the course of the semester.**

## **OFFICIAL BIOL 111/L – 112/L COURSE LEARNING GOALS AND 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).
  - Apply physical/natural principles to analyze and solve problems.

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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.*

- **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.

<sup>2</sup> 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.*

## **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
- the development of antibiotic resistance in disease organisms

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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.*

<sup>2</sup> 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*