



BIO 110 BIOLOGY: ATOMS TO CELLS

DR. NICHOLAS PULLEN
FALL 2022; MCKEE L0152

Lecture Section 010
Fall 2022, MWF 10:10-11
McKee Hall
Room L0152

Professor:
Dr. Nick Pullen
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Graduate Assistant:
Lani Irvin
Lani.Irvin@unco.edu

This course primes you for the study of life. The material intersects with many careers in research, health professions, bioethics, scientific illustration, and science writing. *Biology: Atoms to Cells* explores the physical and chemical underpinnings to show that biology is truly an interdisciplinary science.

We'll address fundamental questions such as: what is life? How did living systems emerge from the primordial biochemical soup? How many kinds of cells are there in a human? What and where is the information and energy for life? How do we measure

biology? How do we analyze data? And, how can this all be connected to the grim parts of life like disease? This might all sound weighty, but trust me, it *is* fun. A question we'll ask every day is: how does this relate to me [you]?

With each major topic we will discuss significant ethical considerations, what is scientific, what is trustworthy, and what is not. Now, perhaps than ever, everyone is a little more focused on these issues. You will also participate in a lab course where you practice some of the topics and do the work of a biological scientist.

ABOUT THIS COURSE

Contact

Dr. Nick Pullen
Nicholas.Pullen@unco.edu
Office: Ross Hall 2536; [research lab](#)
Office Hours: Monday/Wednesday 8:30am-10am

Lecture GTA: Lani Irvin
Lani.Irvin@unco.edu
Office: Ross 1566
Office Hours: Monday/Wednesday 12:30pm-1:30pm

Final Exam

Friday, December 9, 8am-10:30am in McKee L0152

[link](#)

Required Materials

iClicker Student access
McGraw-Hill *Connect* for the textbook *Biology, 5th Ed.*
The UNC bookstore sells both [here](#). However...
You can sign up and join the iClicker class [here](#).
You can get *Connect* for less money by registering [here](#).
Do NOT buy a used hardcopy textbook it will end up costing more money to get Connect.

[link](#)

Attendance/Conduct

Required and in-person MWF 10:10-11:00 at McKee L0152. This is not an online class.

[link](#)

Time Commitment

This is a 4-credit class, so you should expect to work on it at least 8-hours per week in addition to lecture time.

[link](#)

Grade

Just A, B, C, D, or F. No "+" or "-" grades for BIO courses.
Based on (% weight): exams (57%), quizzes (9%), homework (9%), and lab (25%).

[link](#)

BIO 110 Help

- In-class TA, your lab TA, and Dr. Pullen!
- UNC Tutoring Center ([link](#))

[link](#)

Schedule

MWF, 10:10-11 in-person lectures, with set dates for homework, quizzes, and exams.

[link](#)

Welcome to BIO 110! If there ever was a time for more people to be studying more biology, **it is right now**. Think about all those healthcare professionals and researchers spread thin doing the strenuous work of getting us through a pandemic. Also think about all those talking heads who could use a dose of science in their lives – maybe you can help them!

If you're feeling anxious about anything, please feel free to reach out to me, the in-class TA, and other academic support systems like the advising centers, the tutoring center, and even your RA if you live on campus (they are great guides for how to succeed in college).

Course Description (from the UNC Catalog, [link](#))

Introduction to fundamental chemistry of life, cell biology, genetics, and biology as an interdisciplinary science. Study of scientific practice through a course-based undergraduate research experience. Not recommended for non-science majors.

Detailed Course Description and Goals

We have a lecture every MWF 10:10-11am. You will also meet with your lab section once a week, separate from this lecture section – more details on that will come from your lab TA, and you should direct all questions about lab to them. Lecture focuses on fundamental cell and molecular biology, which is broken down into **four topic areas/units**: (1) chemistry and biomolecules; (2) cell structure and work; (3) cellular metabolism; (4) genetics. Lecture is not just me talking. I encourage you to ask questions, and you will need to be actively engaged with your **iClicker**. You will work on **short written activities** daily. Occasionally we work on **case studies in small groups**. You should prepare ahead of class by completing the relevant reading and **homework** (SmartBook in Connect) – some of the homework questions might be totally new to you, but that's okay because it's graded on effort, not correctness. Almost every week there will be a **short online quiz** on what we covered, and these **are** graded for correctness. Units 1-3 are each covered by a **Unit Exam**, Unit 4 is covered on the **Final Exam**. Note that the Final Exam will also include a portion covering the entire course (a.k.a., comprehensive/cumulative). **The lowest** Unit Exam grade is dropped, the Final Exam will **NOT** be dropped.

Biology: Atoms to Cells is an entry-level course that sets the scientific stage for how life evolves and works. We cover the fundamental developments in biochemistry, cell & molecular biology, and genetics. In lab you will have the opportunity to design your own research project and practice the process of doing science. By the end of BIO 110 you will be able to:

- Describe and apply the basic principles of biology such as evolution, biochemical building blocks, and the storage and transmission of biological information and energy.
- Discuss and demonstrate how scientists solve problems in biology.
- Evaluate the scientific validity of arguments.
- Collect, organize, and interpret data.
- Demonstrate skills in scientific observation.

These are all skills that will help you in future coursework and in your future careers. Because of the broad content practiced here, BIO 110 serves as a requirement for several majors and as a Liberal Arts Core (LAC) course. If your major does not specifically require BIO 110, I encourage you to consider instead taking BIO 100 for LAC 6 credit.

REQUIRED COURSE MATERIALS

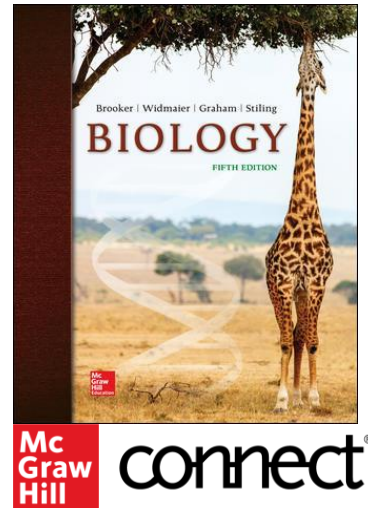
Textbook

McGraw-Hill *Connect* for *Biology*, 5th ed. by Brooker, Widmaier, Graham, and Stiling. There are two ways to do this:

1. Purchase directly through the registration process at this [link](#). This is also found in the BIO 110 Canvas page.

A hardcopy textbook is not required for this course.

Do **NOT** buy a used hardcopy textbook. It won't include *Connect* and you will end up paying more in the end. Used textbook dealers who claim to sell *Connect* codes are usually just trying to swindle you out of some more cash!



iClicker

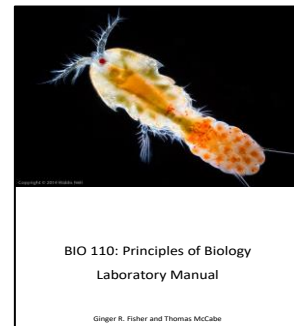
You can purchase iClicker access by signing up through this [link](#). You can use a smartphone, tablet, or laptop to run the iClicker app during class, but you must be connected to WiFi (most important for phones). If you do not use the app, then you need to get a physical clicker (pictured right).

Buyer beware: used iClickers may not include app access, which will end up costing you more. Also, sometimes the barcode/serial number is scratched off – these are people trying to steal your money, and the app won't record your responses.



Lab Manual

You will be provided a lab manual through your lab Canvas page. You must print the manual. You can do this for a fee somewhere like FedEx/Kinko's, or **for free** at a [High Plains Library District](#) location (you get 200 free pages per month if you get a library card)



Notebook

You need a blank composition notebook to record your experimental work in lab. You can get these at the UNC Bookstore, or any place that sells office supplies.



Supplemental Material

In the Canvas Units (Modules) I post videos, essays, news, and other resources of interest that are related to the topics we cover but are **NOT** required reading for BIO 110. These are just for your consideration if you are interested and have the spare time, and so they are always marked “FYI:” in their page names. Additionally, on Saturday mornings I send a Canvas Announcement with a list of what I considered “Interesting Side Reading, Watching, and Listening” for the previous week. I send these to you to demonstrate how the topics we talk about in class relate to everyday life. Again, you are not required to open any of these resources (I will never ask you a question about them on an exam), but I have gotten a lot of feedback from students who say looking over these interesting things helps bring together and apply all the class material. Plus, a lot of it is entertaining!

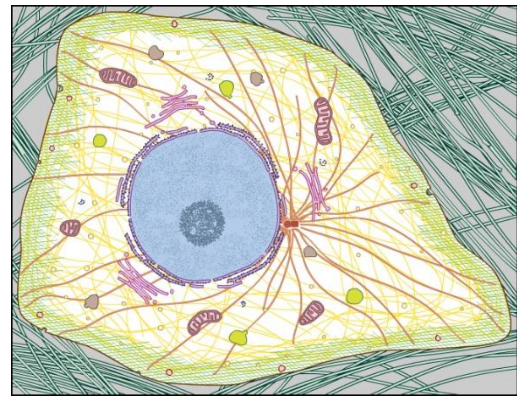
COURSE CONDUCT

THIS CLASS IS IN-PERSON

If you think you will have difficulty with this, then I encourage you to drop this class.

Communication and Technology Expectations

Messages sent to your Bears email account or posted through Canvas are considered official communication. **I strive to respond to questions within 24-hours, and I expect the same of you.** Please try to avoid using other email addresses (like gmail or yahoo), because they are sometimes marked as spam, so I might not see them. Check Canvas and email at least once per day. Additionally, everyone needs to use the iClicker app for participation and have access to McGraw-Hill Connect for homework.



This is from a neat interactive tool at [the Cell Image Library](#) that allows you to visualize different parts of the cell. Another (and I think cooler) tool to try is the [Allen Cell Explorer](#).

Canvas

Access your course materials through Canvas by going to canvas.unco.edu. Lecture notes, links of interest, quizzes, homework, grades, and official class-wide announcements are posted there. Course material is organized into modules that follow the schedule in this syllabus. Course announcements are sent through Canvas.

Lecture Conduct

UNC policies and recommendations for academic misconduct will be followed. You are responsible to the Bear Code ([link](#)). You are expected to complete online quizzes independently. Any public posting of exam or quiz questions and lecture materials is considered misconduct and will be investigated. We expect everyone to work hard, ask questions, and discuss relevant information. Everyone should be respectful of others' civil and sincere participation. Disruptive individuals will be directed to leave the classroom – disruption includes off-task behavior such as melting your brain with social media.

Lecture slides are posted to Canvas ahead of time. I expect you to come to class with these so you can take notes on top of mine (hardcopy, on a computer, whatever works for you).

To encourage attendance and live interaction, classes will not be recorded except to meet necessary accommodations such as endorsed by the Disability Resource Center or other official university functions.

Attendance

We expect you to attend all assigned class periods. **There are no make-up clicker points.**

If you come to realize that you will need to be absent from classes for a lengthy period of time, then you should communicate with the offices of the Dean of Students (dos@unco.edu) and Registrar (registrar@unco.edu) regarding options. I generally do not offer incompletes ("I") for BIO 110.

Out-of-Class Time Commitment

Per the federal credit hour definition, each week you are expected to do two hours of out-of-class work per credit-hour. Since this course is worth four-credit hours, that means you should expect to spend at least eight-hours per week working on BIO 110 in addition to lecture time.

Translation: you should expect that studying for BIO 110 will occupy a significant amount of your time, it's more than just showing up to class, it's also: reading, homework, quizzes, labwork, independent studying.

Academic Integrity

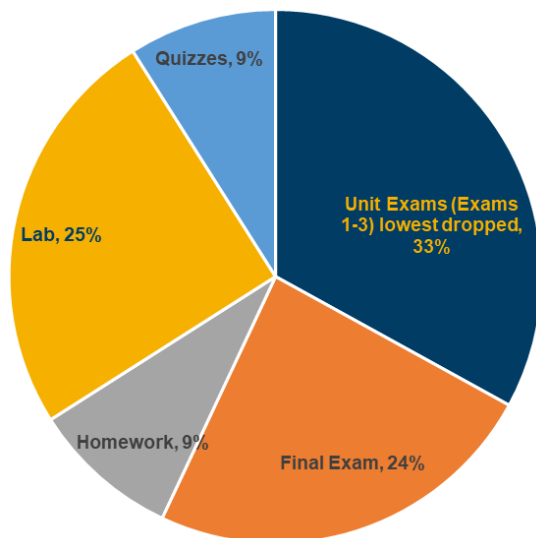
You are expected to practice academic honesty in every aspect of this course ([Bear Code!](#)). Students who engage in academic misconduct are subject to grading consequences in this course and/or university disciplinary procedures through the Office of Community Standards and Conflict Resolution. This includes, but is not limited to, copying someone else's work and using banned material while taking exams. The penalty for cheating or plagiarism ([link](#)) is a zero for the course.

GRADING

Grades in the course are based on a weighted system. The weights can be seen in the pie graph below.

Note that +/- grades are not assigned for BIO courses.

Assignment Weights that Determine Overall Course %



Letter grades are based on your Overall %:

≥90%	A
≥80% to <90%	B
≥70% to <80%	C
≥60% to <70%	D
< 60%	F

GRADED ASSIGNMENTS (% WEIGHT)

Unit Exams (33%)

Each of the first three exams are Unit Exams that will cover approximately $\frac{1}{4}$ of the course material presented in lecture and in the textbook, each corresponds to a topic area/unit (chemistry and biomolecules; cell structure and work; cellular metabolism). All exams will be taken in person in the classroom. There will be a mixture of question types. Unit exam dates are listed in the schedule and will not change. This allows you to plan your study time accordingly. I will **drop the lowest unit exam grade**. For this reason, there are no make-up exams for this course*. I simply drop the grade you missed. This is a policy across all BIO 110 sections. You may not take exams with another section (Dr. Fisher's).

*There are three very specific reasons for a make-up exam; proof and arrangement of make-up ahead of time are required:

- Military duty (official orders as proof)
- NCAA athletic participation (official communication from athletics as proof) NOTE: club sports are **not** excused
- Jury duty (notice of call with specified dates of attendance)

Final Exam (24%)

The final exam will include both the last $\frac{1}{4}$ of the material presented (genetics) as well a comprehensive review of all material covered throughout the semester. The final exam is longer than the unit exams. The final exam date is set by the university. If you do not take the final, I must give you an "F" grade for BIO 110 regardless of your assignment score average. You may not take the final exam with another BIO 110 section. **The date for the final exam is Friday, December 9, 8AM-10:30AM in McKee L0152.** This date and time cannot change, so plan accordingly.

Quizzes (9%)

There will be quizzes given through Canvas about once per week. These are intended as practice for the types of questions you will see on exams. Quizzes are 10 multiple choice questions. You will have one attempt per quiz and 30-minutes to answer and submit all 10 questions. When you are finished it is very important that **you click the submit button to record your grade** – if you do not do this you receive a 0. You are expected to do these independently. There are no make-up quizzes. Your ONE lowest quiz score is dropped. Posting quiz questions to the internet is considered academic misconduct.

Homework (9%)

At the beginning of each new chapter, a homework assignment will be due through McGraw-Hill Connect; you can get to it through Canvas or through the Connect website. Homework is designed to help you test your understanding, identify knowledge gaps, and prepare you for learning the material in class. You will need to complete and submit this homework **BEFORE** you come to class on the day scheduled to begin the new chapter. The due dates for all of these are listed in the schedule and the links to the homework are in Canvas. If you miss an assignment, you can still review the material to help you learn, but the grade will remain a 0. To access the homework, click on the link for the homework assignment in Canvas. Answer the practice questions provided until you reach 100% completion. If you have technical issues with the homework assignment, please call McGraw-Hill technical support at 1-800-331-5094.



Engagement (Bonus)

Course response (“clicker”) software is used to determine how we are doing as a class on the day’s topic. You need to use the iClicker app to receive credit or bring a physical iClicker. If you use a smartphone for this, you should connect to UNC WiFi. Engagement is based on the percentage of these questions that you answer over the entire semester. **You are not penalized for incorrect answers.** We will also check iClicker activity by having you write unannounced responses on paper for turn-in, for example “Write down one way something from today connects to your everyday life.”

You must use your UNC email for iClicker registration, which can also be done at this [link](#). After you finish the registration process you can add the course: first search for University of Northern Colorado, then search for “Pullen” to select the correct section.

Laboratory (25%)

This course has a lab component, which you should be registered for with a graduate teaching assistant (GTA) as your lab instructor. No more “cookbook” labs! (that is NOT real science) Instead, you will be asking questions that no one knows the answers to, designing experiments to tackle those questions, collecting the data from those experiments, and analyzing the results to form conclusions. This is what it’s like to do *REAL* science! You will study the biology of a model organism, the planktonic copepod *Tigriopus californicus*. Rest assured that you will have a lot of guidance from your GTA as you begin. Your lab session meets once a week except for the weeks of September 5th and November 21st. You will be given a separate syllabus for the lab and will be expected to follow all guidelines listed therein. Please note that any questions about your specific lab section should go to your lab GTA first.



STUDENT SUPPORT

Tutorial Services

UNC maintains a [large tutoring center](#) offering a variety of **FREE** support systems including scheduled one-on-one tutoring, group tutoring, drop-in tutoring, Supplemental Instruction (SI), evening hours, Sunday hours, and occasional late-night gatherings where snacks are provided! BIO 110 gets a lot of support from the UNC tutoring center with several trained, qualified tutors who were very recently students in this class. Their main office is Michener Library L149. Phone: (970) 351-1904.

What should I do to be successful in BIO 110?

- Study often. I recommend studying/reading in time increments that don’t cause mental overload, and on average you should be working on BIO 110 at least an hour every day (including weekends!), some days you might need more. You can break up this time if it works for you – reward yourself for a good study period, and then get back to it. If you wait until a few days before the exam to start studying, you will be overwhelmed by the amount of material and less likely to be successful.
- Work individually and in groups. It’s an excellent idea to study in groups, since it helps bring together information from different perspectives. The UNC libraries, tutoring center, and the School of Biological Sciences (Ross Hall) have resources and spaces built to support studying. It’s

just as important to have some solo study time too. I especially recommend checking out some of the study spaces we have in Ross Hall since you can be nearby your GTAs and professors if you have a pressing question.

- Be engaged and ask questions. I want you to ask questions in class if something is not clear or you want to know more. I will often ask questions of the class, and I want you to feel free to answer. Don't worry about being right! And, **if you're uncomfortable asking questions in class, that's okay!** Always feel free to ask me in person away from the crowd and through email. You might be surprised to learn that I consider myself a naturally introverted person. I rarely asked questions in class as a student.

What should I do if I need BIO 110 help?

- I have office hours set aside in my week that are dedicated to tutoring BIO 110.
- Talk with your lab GTA and the in-class GTA. Remember that they are also part of the BIO 110 teaching team!
- Take advantage of the tutoring center and SI, both mentioned above.

University-Wide Support and Policies

[CLICK HERE](#) to read important statements applying to the UNC community including disability resources, professional counseling, Title IX, equity, and inclusion.

https://www.unco.edu/center-enhancement-teaching-learning/teaching-resources/syllabus_statements.aspx

INSTITUTIONAL OUTCOMES

This course satisfies 4 credits of LAC Area 6

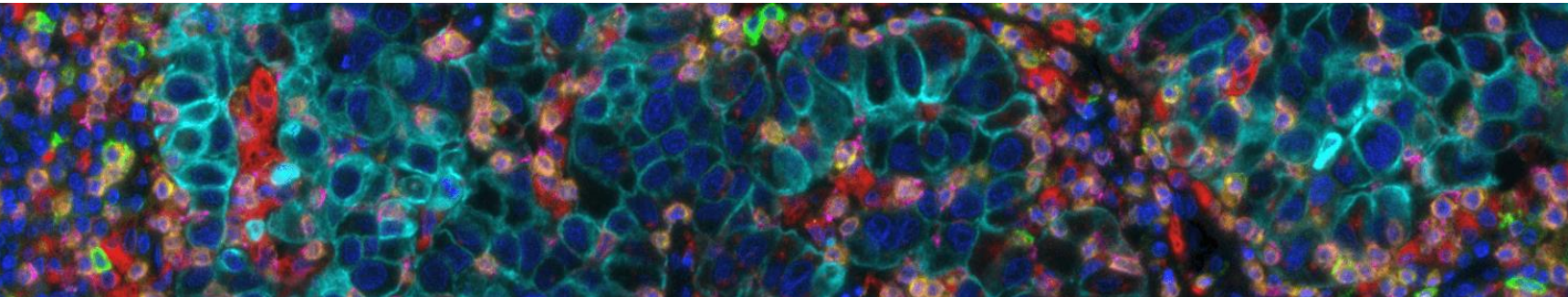
LAC6 Student Learning Outcomes:

1. Explain the fundamental concepts within the scientific field of study at the introductory level.
2. Explain relevance of the science content to real world topics affecting humanity.
3. Evaluate the quality of evidence in a scientific argument
4. Select or Develop a Design Process. a. Select or develop elements of the methodology or theoretical framework to solve problems in a given discipline.
5. Analyze and Interpret Evidence. a. Examine evidence to identify patterns, differences, similarities, limitations, and/or implications related to the focus.
6. Analyze and Interpret Evidence. b. Utilize multiple representations to interpret the data.
7. Draw Conclusions. a. State a conclusion based on findings.
8. Interpret Information. a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
9. Represent Information. a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).

GT Pathways Content Criteria:

1. Develop foundational knowledge in specific field(s) of science.
2. Develop an understanding of the nature and process of science.
3. Demonstrate the ability to use scientific methodologies.
4. Examine quantitative approaches to study natural phenomena.
5. Perform hands-on activities with demonstration and simulation components playing a secondary role.
6. Engage in inquiry-based activities.
7. Demonstrate the ability to use the scientific method.
8. Obtain and interpret data, and communicate the results of inquiry.
9. Demonstrate proper technique and safe practices.

The Colorado Commission on Higher Education has approved BIO 110 for inclusion in the Guaranteed Transfer (GT) Pathways program in the GT-SC1 category. For transferring students, successful completion with a minimum C– grade guarantees transfer and application of credit in this GT Pathways category. For more information on the GT Pathways program, go to <http://higher.ed.colorado.gov/academics/transfers/gtpathways/curriculum.html>



SCHEDULE

Exam dates will not change, topics may be adjusted and will be announced if so. Exams are in-person Quizzes are listed by Fridays but are really due Sunday evenings on Canvas. SB = SmartBook (Connect)

Wk	Day	Date	Lecture Topic	Chpt	Assignments
UNIT 1 CHEMISTRY AND BIOMOLECULES					
1	M	22-Aug	Introduction - What is Life?		
	W	24-Aug	Studying Life	1	
	F	26-Aug	Case Study - Science Methods		Quiz
2	M	29-Aug	Chemistry of Life; Water	2	SB 1, SB 2
	W	31-Aug	Water, Carbon, Small Molecules		
	F	2-Sep	Case Study - Too Much Aspirin		Quiz
3	M	5-Sep	LABOR DAY: NO CLASS		
	W	7-Sep	Carbohydrates and Lipids	3	SB 3
	F	9-Sep	Nucleic Acids, Proteins, and the Central Dogma		Quiz
4	M	12-Sep	Case Study - Brains and Broncos		
	W	14-Sep	Chemical Evolution and Life	4a	SB 4a
	F	16-Sep	EXAM 1		
UNIT 2 CELL STRUCTURE AND WORK					
5	M	19-Sep	Cells - types and principles	4b	SB 4b
	W	21-Sep	Organelles		
	F	23-Sep	Cell Structures and Disease		Quiz
6	M	26-Sep	Case Study - Infection Diagnosis		
	W	28-Sep	Membrane Structure and Chemistry	5	SB 5
	F	30-Sep	Membrane Synthesis and Transport		Quiz
7	M	3-Oct	Case Study - MDMA		
	W	5-Oct	Thermodynamics and Enzymes	6	SB 6
	F	7-Oct	Enzyme Control and Pathways		Quiz
8	M	10-Oct	Case Study - Fire and Fish		
	W	12-Oct	EXAM 2		
UNIT 3 CELLULAR METABOLISM					
	F	14-Oct	Cellular Respiration	7	SB 7
9	M	17-Oct	Case Study - Metabolic Murder		
	W	19-Oct	Anaerobic Respiration and Fermentation		
	F	21-Oct	Case Study - Fun in Fermentation		Quiz
10	M	24-Oct	Photosynthesis	8	SB 8
	W	26-Oct	Case Study - Photosynthesis		
	F	28-Oct	Cell Communication (Signal Transduction)	9	SB 9, Quiz
11	M	31-Oct	Case Study - THC and Memory		
	W	2-Nov	Nucleic Acid Structure and DNA Replication	11	SB 11
	F	4-Nov	Case Study - TBD		Quiz
12	M	7-Nov	EXAM 3		
UNIT 4 GENETICS					
	W	9-Nov	Gene Expression 1: Transcription	12	SB 12
	F	11-Nov	Gene Expression 2: Translation		Quiz
13	M	14-Nov	Gene Regulation (Determining Expression)	14	SB 14
	W	16-Nov	Case Study - Schizophrenia		
	F	18-Nov	DNA Mutation and Cancer	15	SB 15, Quiz
14	M	21-Nov	Cell Cycle and Meiosis	16	SB 16
	W	23-Nov	THANKSGIVING: NO CLASS		
	F	25-Nov	THANKSGIVING: NO CLASS		
15	M	28-Nov	Simple Mendelian Inheritance	17	SB 17
	W	30-Nov	Other forms of inheritance and pedigrees		
	F	2-Dec	Case Study - TBD		Quiz
16	F	9-Dec	FINAL EXAM 8AM-10:30AM		