BIOL200 Integrated Biological Principles I
Spring 2019

Class Instructor:
Laura Runyen-Janecky
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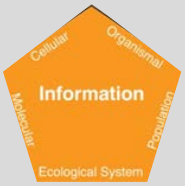
Gottwald Science Center B-213
Office hours – generally M 9-11:30

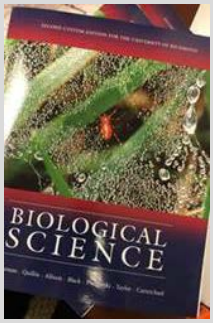


Course details:
Class in Gottwald A306: WF 9:00-10:15 AM (red class) or 10:30-11:45 (blue class)

Lab in Gottwald A306: W (blue class) or TH (red class) 1:30-4:20

Prerequisites for the course: C- or above in BIOL19X; CHEM141/191/192 pre or co-requisite).

Required materials:
Blackboard and BOX access for class
Blackboard access for lab

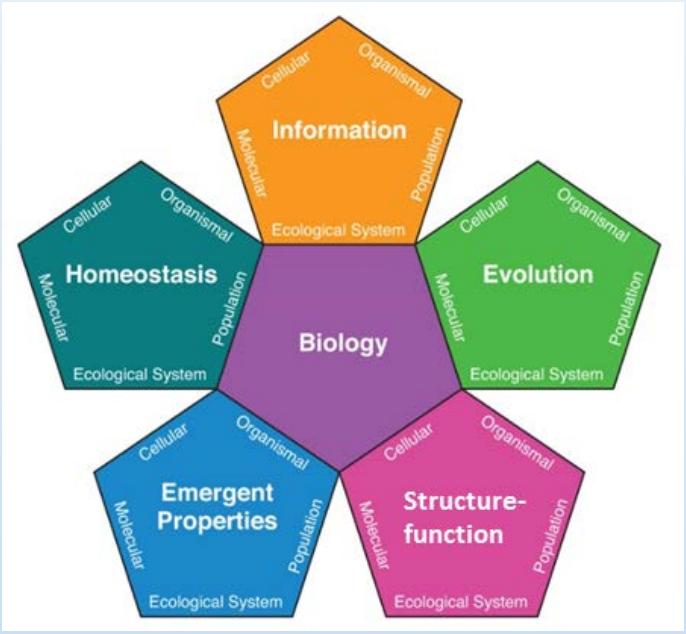


Custom textbook called Biological Science, 6th edition by Freeman

Access to Excel (not Google sheets)

A Short Guide to Writing About Biology, 9th edition by Pechenik (pdfs of relevant pages will provided too)

Safety glasses, closed-toed shoes, calculator and a lab notebook



Course overview:

There are several fundamental principles that span all biology disciplines, whether you are studying the function of a single enzyme or the dynamics of an ecosystem. These principles include: Evolution, Structure-Function Relationships, Information Flow, Homeostasis, and Emergent Properties of Biological Systems.

This course is the first of a two-part sequence (Integrated Biological Principles I & II: BIOL 200 and BIOL 202) that will help you build a solid understanding of these major principles. The goal of BIOL 200 is to give you a strong foundation in these interconnected themes of biology, with a focus that spans from the molecular-level to the organism-level. This foundation will give you a context in which to place new information about biology, whether that new information comes from an upper level course, a research experience, the news, or in your future career.

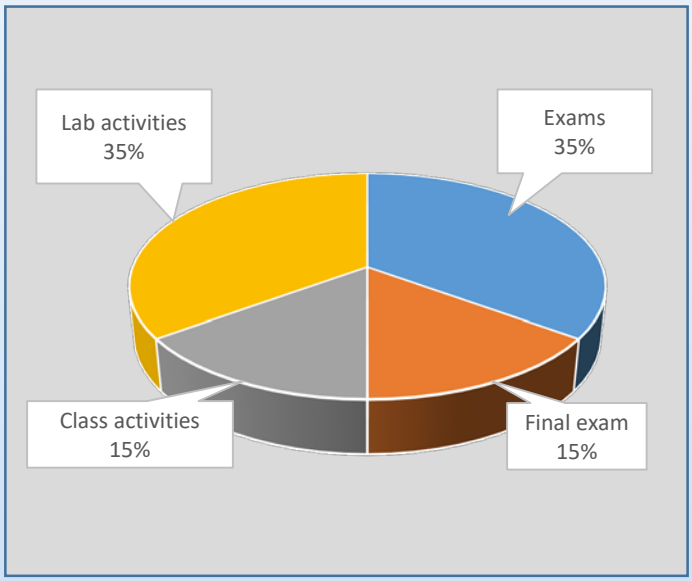
Learning Objectives and Assessment

By the end of this course, students should understand and be able to explain how:

- The diversity of life evolved over time by the processes of genetic change and natural selection.
- Basic units of structure define the function of all living things.
- The growth and behavior of organisms are controlled through gene expression in response to internal and external information.
- Biological systems require energy and are governed by the laws of thermodynamics.
- Living systems exhibit emergent properties that are a consequence of interacting parts, and that those properties could not be predicted from studying the parts alone.
- Scientific thinking enables us to solve biological problems.

You will become competent in applying the process of science and quantitative reasoning to solve problems, building on the skills from BIOL19X including:

- Interpreting data and understanding its strengths and weaknesses
- Implementing the scientific method
- Formulating testable hypotheses
- Choosing the proper experimental and statistical method to address a question
- Communicating scientific information to a variety of audiences, both orally and through writing
- Reading and interpreting the scientific writings of others, particularly primary research articles
- Understanding how biology intersects with other disciplines and why these intersections are important to addressing societal problems
- Understanding the role that science plays in our society and the ethical implications of scientific research



Assignment of Grades: Remember that college is about learning, and the grade you earn is a representation of that learning. It is intended to be a short-hand for other audiences to know how you met the objectives and challenges of this particular course during this particular time. Historically and on average, the grade distributions across BIOL200 sections are similar. For this section of the course:

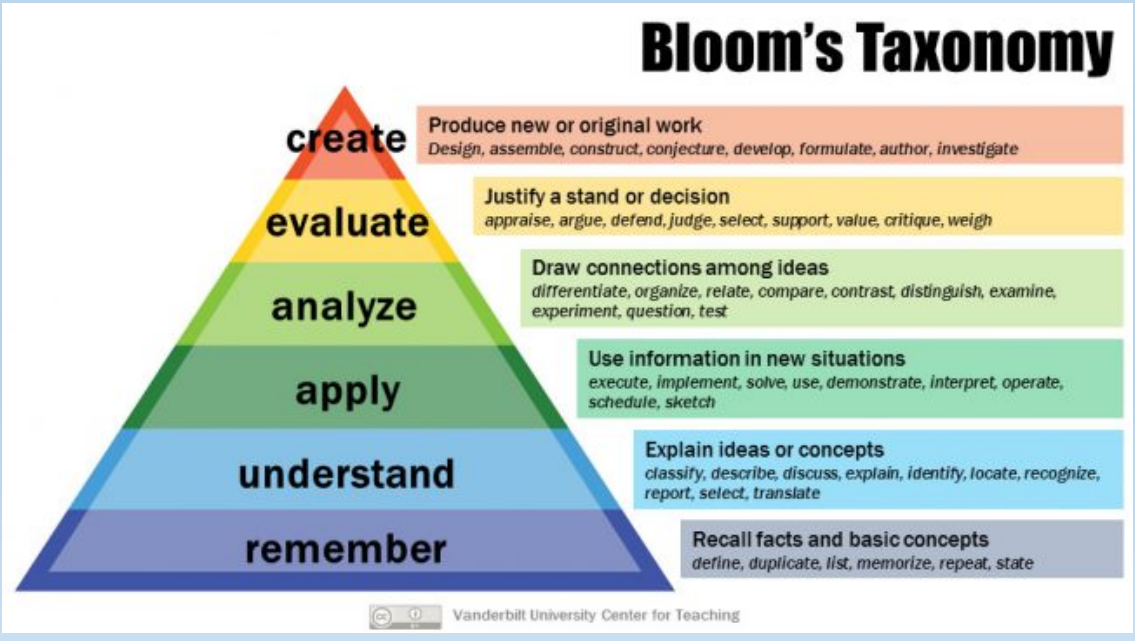
900-1000 points (90%) = A range (A+, A, A-)
800-899 points (80%) = B range (B+, B, B-)
700-799 points (70%) = C range (C+, C, C-)
600-699 points (60%) = D range (D+, D, D-)
< 599 points (< 59%) = F

Pluses and minuses will be assigned at the instructor's discretion, based on elements including, but not limited to, class participation and trajectory of learning.

How to succeed in this course

We are building on the intellectual framework and maturity that you developed in BIOL 19X. We want everyone to be successful. Success in science courses is based on:

- Spending time and engaging with the material. *For a 1-unit course the University expects you to devote 10-14 hours each week to that course*. For this class that will be 5 ½ hours/week attending class and lab and 4 ½ hours to 8 ½ hours/week reading, preparing assignments and studying the material.
- Keeping up with the material; do not wait until the last minute to study
- Learning new vocabulary
- Understanding the difference between memorization and comprehension and using that knowledge in such a way that you build lasting, useful understanding.
- Preparing for class and lab by reading the assigned material beforehand
- Doing the assigned activities
- Actively participate in lab and lecture...ask questions, answer questions, be engaged, participate in discussions. Participation can also take the form of visiting your professor's office hours, or just having conversations about the course material with your professor before or after class, etc. Also, good participation entails allowing other students the opportunity to answer questions and become involved.
- Making connections among the concepts as we proceed through the course
- Self testing: Draw figures from memory. Explain concepts to a study partner. Answer practice questions.
- Understanding how **you** learn and retain new information. Does rewriting concepts and information work best for you? Do you learn best by examining pictures (visual) or by using auditory techniques? Or do you use a combination of these techniques? The UR academic skills center can help you assess which study skills are suited to you. Apply the approaches that work best for you on a consistent basis.



Things you should know about this course

Exam policy: Exams should be taken as scheduled in the course schedule**. An *unexcused* absence will results in a zero for that exam.** Excused absences include (1) a conflict that is excused by the Dean (example, university sponsored activities such as varsity sporting event), (2) significant illness, (3) conflict with religious observance, and (4) significant family emergencies. *Because of scheduling issues, make up exams for excused absences will generally be administered from 7:30-9:00 AM.*

Late work policy: Late work will be accepted for up to 3 days after the due date, but at a penalty of 10% off per day. After 3 days or when the graded work is returned to other students or the answer key is released (whichever comes first), the late work will not be accepted. *Note that technology failures are not acceptable excuses for late work.* You've grown up in a "wired" world and should know already how unreliable technology can be. Back up your files regularly. Print your files with sufficient time to find another printer if the one you are using decides to stop cooperating.

Lab and lecture are linked:

- Attend every lab and lecture (you must attend the section that you registered for in Bannerweb). If you have an excused conflict with your lab, you need to make arrangements with your instructor to attend another section that week. You may not simply show up to another lab section. Labs are prepped for the precise number of students and can't easily be adjusted.
- If you do not have an excused absence from lab and you miss lab, 30 points will be deducted from your final grade.
- Come to lab and lecture on time. Missed classes will impact your understanding of the material and your instructor may lower your grade on group-based assignments and any participation grades.
- All lab modules are collaborative, so missing will impact your inclusion in the lab. This renders your contributions less significant, and will reflect in your points for that module.
- You are responsible for consulting Blackboard for up-to-date course information. Download required laboratory protocols and bring hard copies with you to lab. We provide copies of post labs, supertech assignments, and other non-protocol materials.

Laboratory safety is important. There is no eating or drinking in the laboratory at any time. Closed-toed shoes must be worn for all laboratory meetings (you will be asked to leave and change your shoes if you do not adhere to this rule). You may be asked to wear safety goggles when performing specific activities during the laboratory period.

More things you should know about this course

There is no major extra credit assigned. Our philosophy is to give you the tools so that you have the opportunity to do well on the assignments we have designed for this course, rather than to have you do more work to make up for poor performance.

Laptop/phone policy (during lecture and lab): Please keep cell phones silenced and put away (unless otherwise noted); in the rare event that you need to be available for phone calls (in the case of an emergency), please talk to me about it before class. If you take notes on your computer, I respectfully request that you stick to course related work, so as not to distract your classmates. Studies provide evidence you can't, and multitasking on your computer is distracting to others behind you (Sana et al. 2013. Computers & Education: 62: 24-31).

Honor Code: *The School of Arts and Sciences, the Jepson School of Leadership Studies, The E. Claiborne Robins School of Business each operates under the University Honor Code Statute. Breaches of the code are cheating, plagiarism, lying, academic theft, disclosing honor council information, registration irregularity, and failure to report an Honor Code Statute violation. Any person who violates these standards shall be subject to disciplinary action ranging from reprimand up to and including expulsion from the University. Determination of guilt or innocence and imposition of sanctions, when necessary, will be effected according to established procedures, with procedural fairness observed, and with appeal procedures available*. (University of Richmond Undergraduate Catalog)

How does the Honor Code apply to this course? While you are encouraged to discuss class and lab material with others, all graded assignments must be your own work unless otherwise indicated. Any work suspected to have violated the Honor Code is subject to being submitted to the Honor Council. You may not share electronic documents for this course unless indicated on the assignment.

Extracurricular activities: As faculty who were once students ourselves, we know students may have university sponsored activities that conflict with normal class schedules at times. Participating in some extracurricular activities at the collegiate level requires an outstanding level of commitment and dedication. As instructors, we understand that such commitments can be extremely time consuming. However, you are still responsible for completing all assignments (in and out of class) in a timely fashion. If you know in advance that you are unable to complete an assignment, exam, or laboratory exercise, due to your involvement in an extracurricular activity, it is your responsibility to notify your instructor as soon as possible. You will be held accountable for any incomplete assignments.

ADA: Please contact the instructor if you require special accommodations because of an identified condition that meets the requirements of the Americans with Disabilities Act (ADA). Special accommodations are available if there is a documented need. The University has diagnostic services, which may be helpful to you if you suspect that you have a condition (physical, sensory, cognitive, systemic, learning, or psychiatric) that is hindering your academic performance. Your academic advisor may be able to offer you more information about these services. For more information, please contact the Office of Student Development in Room 338, Tyler Haynes Commons or phone 289-8032.

Other Resources

If you experience difficulties in this course, do not hesitate to consult with your instructor. There are also other resources that can support you in your efforts to meet the BIOL200 course requirements, specifically, and your academic and personal well-being needs, in general.

Academic Skills Center

(asc.richmond.edu, 289-8626 or 289-8956): Supports students in assessing their academic strengths and weaknesses; honing their academic skills through teaching effective test preparation, critical reading and thinking, information processing, concentration, and related techniques; working on specific subject areas (e.g. calculus, chemistry, accounting, etc.); and encouraging campus and community involvement.

Boatwright Library Research Librarians

(library.richmond.edu/help/ask.html or 289-8669): Assist students with identifying and locating the best resources for class assignments, research papers and other course projects. Librarians also assist students with questions about citing sources correctly. Students can schedule a personal research appointment, meet with librarians at the library's main service desk, email, text or IM.

Writing Center

(writing.richmond.edu or 289-8263): Assists writers at all levels of experience, across all majors. Students can schedule appointments with trained peer writing consultants who offer friendly critiques of written work.

Counseling and Psychological Services

(caps.richmond.edu or 289-8119): Assists students in meeting academic, personal, or emotional challenges. Services include assessment, short-term counseling and psychotherapy, crisis intervention, psychiatric consultation, and related services.

Speech Center

(speech.richmond.edu or 289-6409): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions offered by teams of student consultants trained to assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations.

Career Services

(careerservices.richmond.edu or 289-8547): Assists students in exploring their interests and abilities, choosing a major, connecting with internships and learning experiences, investigating graduate and professional school options, and landing a first job. We encourage students to schedule an appointment with a career advisor during their first year.

BIOL200 class schedule and readings – RJ section (Version 1- 7 January 2019)

Week (starting)	**Topic**	**Readings to help you prepare for class & master the material [a, b] (Supplemental Readings are posted on BB)**
Module 1: The diversity of life is based upon common genetic information instructions constantly undergoing random change and selection		
1 1/14	Introduction of the five core themes of the course What is evolution? What are the mechanisms of evolution?	Freeman Chapter 1: 1.3-1.5; https://www.nature.com/scitable/topicpage/biological-complexity-and-integrative-levels-of-organization-468 Freeman Chapter 22: 22.3, 22.5 – sections 22.1-2 are optional "An Introduction to Evolution" accessed either as a pdf on BB or at http://tinyurl.com/pv9trmn (read up to the co-evolution page after misconceptions page)
2 1/21	How does the structure of nucleic acids relate to their function?	Background chemistry information: Freeman Chapter 2 (sections 2.1, 2.2, 2.4); https://www.youtube.com/watch?v=IIgLgMnl-1I ; https://www.youtube.com/watch?v=RSRiywp9v9w Freeman Chapter 4: 4.1-4.3 Freeman Chapter 15: Intro-15.3*
3 1/28	How does stored genetic information give rise to the machinery of life?	Freeman Chapter 16: Intro, 16.2-16.4* Freeman Chapter 17: all Freeman Chapter 19: 19.4 (just alternative splicing)
4 2/4	How does protein structure relate to protein function? **EXAM 1 (Weeks 1-3)[c]**	Freeman Chapter 3: all*
5 2/11	How are the various chemical functions present in organisms possible, given all the energetic restrictions imposed on them?	Freeman Chapter 2: 2.3 Freeman Chapter 8: 8.1-8.5* Lab Module 2 Materials
6 2/18	How are genes regulated?	Freeman Chapter 18: Intro-18.3, 18.5; Freeman Chapter 19: Intro-19.2, 19.5
7 2/25	How is information passed between generations? How does this influence evolution?	Freeman Chapter 12: Intro-12.2 Freeman Chapter 13: all Freeman Chapter 14: 14.1-14.4
8 3/4	How do small and large changes in DNA influence evolution? **EXAM 2 (Weeks 4-7)[c]**	Freeman: pages 475-477 left column (section 23.6 up to take home messages) and page 345 Supplemental Reading Campbell_CH05 as a pdf on BB
9 3/11	Spring Break	
Module 2: Organisms utilize a variety of energy sources but use common processes to generate common "energy currencies"		
10 3/18	How do cells use compartments to control cellular functions?	Cell membranes pdf on BB; Chapter 7 Introduction; 7.1-7.5; 7.6 7.6 (just page 163 and Fig.7.24a on page 164) Endosymbiosis pdf on BB
11 3/25	How do cells help organisms maintain homeostasis?	Freeman: Chapter 39.4 Freeman: Chapter 9: all
12 4/1	How do plants harness solar energy to maintain levels of chemical energy required for life?	Freeman Chapter 2.3 Freeman Chapter 8.1 Freeman Chapter 10: all, except page 227-228
Module 3: Organisms organize cellular functions and maintain homeostasis in response to variety of signals		
13 4/8	How do cells respond to their environment by transmitting external messages inside the cell? **EXAM 3 (weeks 8, 10-12)[c]**	Freeman Chapter 11: 11.3
14 4/15	Continue How do cells respond to their environment by transmitting external messages inside the cell?	
Module 4: Synthesis of the semester topics & objectives		
15 4/22	Putting it all together: Examining biology through the lens of the five themes	TBA
Final Exam	**Mon 4/29 9-12 (red class)** **Wed 5/1 9-12 (blue class)**	

[a] We may adjust the readings and lecture topics during the semester.
[b] See next page for comments/clarifications of reading
[c] Exams will be taken Wednesday of the indicated week.

* Comments/clarifications on reading

Week 2
Section 15.3 – We will focus on making sure you understand the fundamental of DNA replication in class. Try not to get overwhelmed by the 3-dimmendional complexity (eg Fig 15.11) when you read.

Week 3
Section 16.3 - You can skip the subsection “How did the researchers crack the code” except for four paragraphs about “punctuation”
Section 16.4 – The subsection “chromosome mutations” is info that we will come back to much later in the semester. Just skim through it now.

Week 4
Section 3.1 – You can skip last paragraph in “How do amino acids link to form proteins” on page 81 and entire subsection “Polymerization of proteins in early earth” (pages 81-82)
Section 3.3 – Note that the subsections “Protein folding is often regulated” on page 89 gives example of a “disordered protein” folding upon binding a molecule. There are also examples of small molecules binding to proteins that are not “disordered” to change the protein shape so that the protein is functional. Also, you can skip last subsection “Folding Can be Infectious” on page 89.

Week 5
Section 8.2 – The subsection about Redox Reactions will be built on in Week 6. Try to see the big picture on how electrons are transferred in redox reactions without getting lost in all the names and chemical structures of the molecules that carry the electrons.

Week 6
Figure 18.4 Galactosidase permease = lactose permease

Week 7
Section 12.2 “relaxed” chromatin described here is relative to very very highly condensed chromatin in chromosomes during mitosis and meiosis.
Section “How do chromosomes move” pages 260-262 – For this class, you do not need to know these details, but super interesting to read anyways