

BIO 201 A – Cell Biology
Syllabus
Spring 2018

Lectures:	MWF 9:00 - 9:50 AM Norton 112
Professor:	Dr. Lara Hutson
Office:	Cooke 317
Email:	larahuts@buffalo.edu
Office Hours:	Mondays and Tuesdays 1:00-2:00 PM Cooke 651
TA Help sessions/Office hours:	To be posted in UB learns

About BIO 201

What is life? In BIO 201 we will explore this question and learn how cells – the basic structural unit of life – capture, transform, and use energy to maintain homeostasis, grow, and reproduce. In lab you will learn many of the techniques used in cell biology, and by the end of the semester you should understand what types of questions can best be answered with each of the different techniques.

Important information regarding section enrollments

You should be registered for either a hybrid or a traditional lab for this course, depending on your major or intended major. Hybrid labs have 'H' at the end of the section number (e.g. A13H); traditional labs have 'T' (e.g. A04T). For more information, refer to the [BIO 201 labs website](http://wwwbiology.nsm.buffalo.edu/Bio_201_Hutson/Bio201_Main.html): http://wwwbiology.nsm.buffalo.edu/Bio_201_Hutson/Bio201_Main.html.

Required Materials

1. **Textbook:** “Life: The Science of Biology,” 11th Edition by Sadava, Hillis, Heller, & Hacker (2017) is *strongly recommended*. The text is available as hard-cover, looseleaf, or e-text, for either purchase or rent. It is also available as a three-volume set, of which only Volume 1 is used in BIO 201. BioPortal Access is not required. (Note that this textbook is used for BIO 200, BIO 201, and BIO 203. For BIO 201 only you can get away the 10th Edition of the textbook. Reading assignments for the 10th edition will be posted to UB learns. However, some of the page numbers may not be exact.)
2. **Reef/iClicker registration** by the 2nd week of classes. Do NOT purchase this! Instructions to register will be provided in UB learns. Make sure you register for BIO 201 A (9:00 AM) Spring 2018. IMPORTANT: If you want credit for participation, you must register using your first and last name as they are listed in HUB and using your **UB email address**. Do NOT try to download the App in class!
3. **All lab sections:** A composition book to be used as a lab notebook.
 - **Students in traditional ‘T’ labs:** *BIO 201 Lab Manual* 5th Edition, Hutson. Hayden McNeil. 2018 (available for purchase at UB Bookstore: ~\$60). You must use the 5th Edition or you will not be allowed to participate in lab. Personal protective equipment (PPE) will be provided in lab.
 - **Students in hybrid ‘H’ labs:** Access to Late Nite Labs ~\$60 You will learn how to access this *in your first lab meeting* (2nd week of the semester). (*Optional:* BIO 201 Lab Manual, above) Other information and computer requirements are provided in the lab UB learns site.

Lectures

- Lectures are your primary source of information for this class. **Lecture attendance is the strongest predictor of performance in BIO 201.** Most of the lectures will follow a traditional lecture format. However, six (6) of the lectures will be “flipped,” which means that you will have to do some outside

work in preparation for class. These assignments are shown in Bold Red in the Lecture schedule at the end of the syllabus.

- **Lecture slides** will generally be posted in the “Lectures” folder of the “Course Documents” section of UB Learns by 5 PM on the day before class. It is strongly recommended that you print these out and bring them to take notes on during lecture.
- **Lecture recordings** will (usually) be available under Classroom Recordings in UB Learns. **WARNING: DO NOT** rely on lecture recordings or the textbook as your primary source of information. Lecture recordings sometimes fail, and the textbook is primarily designed to enhance and clarify lectures.
- **Class participation:** In addition to the flipped classroom assignments described above, I will routinely ask questions in class that you can answer using the Reef/iClicker App. Each question is worth a total 0.3 points, and I will ask approximately 100 questions in class over the course of the semester. On flipped classroom days each question will be worth 0.2 pts due to the larger number of questions that will be asked. Questions during the first week of the semester will not count towards the final score. ★ **DO NOT contact me if you forget your device, experience technical problems, or miss lecture: It is not feasible for me to provide make-ups or award credit for missed questions/lectures. If you have problems with the App, you must contact Reef customer support.** ★

Homework

- A pre-test posted in UB learns Assignments is due at **11:45 PM Monday, Feb. 5**. This is worth 3 pts regardless of your score. In order to receive credit you must take the test seriously *and* complete it.
- Online homework assignments will be posted almost every week in UB learns Assignments. Homework is due at 11:45 PM Sunday nights with the exception of Feb. 4, Feb. 25, Mar. 18, and Apr. 8. Each assignment is worth 5 points and the lowest score will be dropped in calculating your final grade (11 Homeworks @ 5 pts, lowest dropped = 55 pts).
- Each homework assignment is assembled of ten random questions from the previous week’s lectures. You have three tries to do each homework assignment before the due date, and the highest score of the three will be recorded. After the due date, the homework assignment will be posted again just for practice. A week before each Exam I will post a 50-question practice exam from the collected homework questions that you can complete as many times as you wish for practice.

Exams

- Three lecture exams will cover lecture material only; the Lab final will test lab comprehension. Exam 1 (Lectures 1-10) is **in class WEDNESDAY, FEB. 21**. Exam 2 (Lectures 11-24) is **in class WEDNESDAY, APRIL 4**. Exam 3 (Lectures 25-40) is during finals week, **7:15-8:45 PM WEDNESDAY, MAY 16**. The **Lab final will be administered IN LAB during the last lab meeting (2nd to last week of classes)**. For information about coverage and point values, see “Grades” below.
- **Format:** All exams are multiple choice. You **MUST** bring, a dark pen and/or pencil, and photo ID to every exam. **NO** cell phones, calculators, or cheat sheets are allowed. When you arrive at an exam, **you must place all notes, cell phones (silenced or off), and books in your bag, and your bag must be placed in the front or back of the room, and you must sit in your assigned seat. Anyone found with any of these items during the exam, or who is sitting in any seat other than their assigned seat, will receive an automatic zero on the exam.**
- **Make-up policies:** If you know that you must miss an exam, you must contact me at least **2 weeks before the exam**. All make-up exams will be administered *before* the scheduled exam. In the event of

a medical emergency, you must contact me **within 24 hours of the missed exam**. You may receive a make-up exam only if you provide me with official documentation of the emergency.

- **Scores:** Exam scores will be posted to UB Learns as soon as they are available. It is your responsibility to check your scores when they are posted. If you believe there is an error in your score, you must pick up your exam, check your Answer Sheet against the posted Key to confirm the error, and contact me as soon as possible with your section (BIO201A), your first and last name, and the specific nature of the error.

Labs

Labs meet **beginning in the second week of the semester** (see schedule at end of Syllabus). All labs are mandatory and meet at the time, day, and room specified in HUB. More information about lab can be found in the "About BIO201 __ Labs" document in your lab UB learns site.

- **Quizzes:** Quizzes are given at the beginning of each lab beginning with Lab 1 to ensure that you have read the lab carefully and are prepared to complete the week's lab. Prelab questions are provided to help you prepare for quizzes but are not graded.
- **Lab reports:** Most of the lab reports are completed in Microsoft Excel, and all lab reports must be submitted through UB learns. You can download the latest version of Excel from the [UBIT Software Download Site](#).
- **Late work:** You will lose 1 point per day a lab report is late (1 pt if up to 24 hrs. late, etc.).
- **Lab make-up policy:** **All lab make-ups must be arranged through your lead TA.** If you know that you will need to miss a lab, you must contact your TA *at least 2 weeks prior* to the lab. If you miss a lab due to emergency, you must contact your TA *within 24 hours* of the missed lab.

Grades

Point breakdown for BIO 201 sections A and C:

Assessment instrument	Info	Points
LECTURE		
Exam 1	Lectures 1-10	100
Exam 2	Lectures 11-24	140
Exam 3	Lectures 25-40	150
Flipped classroom assignments	6 @ 2 pts each	12
In-class questions (Reef/iClicker)	100 x 0.3 pts per question	30
Weekly homework (UB learns)	11 @ 5 pts each, drop lowest = 50 pts	50
Pre-test	3 pts for completion	3
<i>Lecture subtotal</i>		485
LAB		
Quizzes	5 pts each, Labs 2-10, drop lowest	40
Lab 1 Worksheet	6 pts	6
Lab Reports	8 pts each, Labs 2-7, 9-10	64
Lab Notebooks	3 pts each, Labs 2-9	24
Clean-up ('T' labs) or Pipetting practical ('H' labs)	8 pts	8
Lab Final	30 pts	30
<i>Lab subtotal</i>		172
GRAND TOTAL		657

Final letter grades will be determined from the scale below:

A: 93.3-100.0%	B: 83.3-86.5%	C: 73.3-76.5%	D: 60.0-66.5%
A-: 90.0-93.2%	B-: 80.0-83.2%	C-: 70.0-73.2%	F: <60.0%
B+: 86.6-89.9%	C+: 76.6-79.9%	D+: 66.6-69.9%	

Individual exam scores may be adjusted, but NO CURVE will be applied at the end of the semester, and there is NO EXTRA CREDIT in this class. If your final % score is between two of the above cut-offs, you will receive the *higher* of the two grades (e.g. if you have a 79.91, you will receive a B-).

How to succeed in BIO 201 and where to get help

- **READ THE SYLLABUS!** This can be found in the Course information content area of UB learns and is the #1 source of all information about the course.
- **Attend lectures and be prepared.** Skim the reading assignment before coming to class. Write notes by hand during class and make a note of topics that seemed confusing. Try to answer the in-class questions correctly – it will not only earn you points, but it will help you learn the material better.
- **Do all homework** and repeat as necessary for practice.
- **Complete all practice exams** and repeat for practice.
- **Read all emails from me and content in UB learns.** I post important Announcements about the course regularly. Useful study tips and resources will also be posted in UB learns.
- **Attend office hours and help sessions:** If you cannot attend my office hours, there are many TA help sessions and office hours throughout the week. These will be posted in UB learns Office Hours content area.
- **Discussion Board.** If you cannot make it to office hours, post your questions to the Discussion Board in UB learns, and they will be answered by a TA. You may also answer other students' questions. Please let me know if your posted questions are not answered in a timely manner.
- **All questions about lab** should be directed to your lab TA.

Academic Integrity

Academic dishonesty, as defined in the [UB document on Academic Integrity](#), is grounds for course failure. **Cheating or plagiarism on exams, homework, quizzes, or lab reports will result in a zero on that assignment/exam and will be reported to the Senior Vice Provost for Academic Affairs.** Any subsequent case of academic dishonesty will result in course failure.

Disability accommodations

If you require accommodations to enable you to participate in this course, please contact the [Office of Accessibility Resources](#) (25 Capen Hall: 645-2608) during the first week of class. They will provide you with information, review appropriate arrangements, and provide you with a letter explaining any necessary accommodations. If you need accommodations for lectures or exams, provide me with a copy of your letter as soon as possible. If you require accommodations for lab, provide a copy of the letter to your lab TA by the end of the 2nd week of classes. You will schedule your exams at the Office of Accessibility Resources at the scheduled in-class exam. If this is not possible you must contact email me as soon as possible.

Other resources available to students

Office	Services	Eligibility	Contact Information
Undergraduate Academic Advisement	<ul style="list-style-type: none"> • Unlimited free tutoring at Academic Success Centers • Unlimited free online tutoring • Center for Excellence in Writing • Mathematics Help Center • Other tutoring resources by program 	Available to all students	Various locations. http://advising.buffalo.edu/help/tutoring.php
Wellness Education Services	<ul style="list-style-type: none"> • Healthy Eating • Life & Learning Workshops • Stress reduction • Substance use support • LGBTQ wellness • Rape & sexual assault prevention and awareness 	Available to all students.	114 Student Union 716-645-2837 http://www.buffalo.edu/studentlife/who-we-are/departments/wellness.html
Student Support Services (SSS)	<ul style="list-style-type: none"> • Tutoring and academic coaching • Grant funding • Workshops and events • Peer mentoring • Borrow laptops 	Students who are low-income, first generation, or have a disability. US Citizen or Permanent Resident. Working on their first bachelor's degree (or equivalent). Students must apply online.	215 Norton Hall 716-645-2732 sssinfo@buffalo.edu http://www.cpmc.buffalo.edu/sss/
Collegiate Science & Technology Entry Program (CSTEP)	<ul style="list-style-type: none"> • Academic and career counseling • Individualized and group tutoring • Workshops/seminars • Scholarships and research funding 	NY State and US citizen or Permanent Resident from Underrepresented groups or economically disadvantaged pursuing a licensed, health-related profession, or a career in STEM. Minimum GPA 2.5.	222 Norton Hall 716-645-2234 CSTEP@buffalo.edu http://www.cpmc.buffalo.edu/cstep/index.php
Office of Equity, Diversity, and Inclusion	<ul style="list-style-type: none"> • Ensures compliance with UB's policies covering discrimination, harassment, accommodations, equal opportunity, and child protection 	All students. Students may file complaints or seek assistance and accommodations.	406 Capen Hall 716-645-2266 http://www.buffalo.edu/equity.html
Counseling Services	<ul style="list-style-type: none"> • Free individual and group counseling • Workshops • Crisis intervention • Information for international students 	All students	120 Richmond Quad, Ellicott Complex 716-645-2720 http://www.buffalo.edu/studentlife/who-we-are/departments/counseling.html Crisis Services 716-834-3131
Judicial Affairs and Student Advocacy	<ul style="list-style-type: none"> • Refer students who are exhibiting concerning or disruptive behavior, or a student in distress • Enforce UB rules, regulations, and policies • Mediation services • Student advocacy 	All students	9 Norton Hall 716-645-6154 http://www.buffalo.edu/studentlife/life-on-campus/community/rules/violations/student-wide-judiciary.html
Orientation, Transition & Parent Programs	<ul style="list-style-type: none"> • UB Transition Specialists – answers questions, connects students to campus resources and assistance • Transfer ambassador program 	All students. Programs specific to new or transfer students.	Suite 112 Student Union 716-645-3351 http://www.buffalo.edu/studentlife/who-we-are/departments/orientation.html

Veterans Services	<ul style="list-style-type: none"> • Veterans lounge • Navigate benefits and services • UB Student Veterans Association 	Veterans	101 Allen Hall 716-829-5586 http://www.buffalo.edu/studentlife/who-we-are/departments/veteran.html
International Student and Scholar Services	<ul style="list-style-type: none"> • Information for getting started at UB as newly admitted students • Immigration and visa • Social security and income tax • Cultural information and life in Buffalo and at UB • Workshops and events 	International students	210 Talbert Hall 716-645-2258 iss@buffalo.edu https://www.buffalo.edu/international-student-and-scholar-services.html
Health Services	<ul style="list-style-type: none"> • Medical care and student health • Workshops and informational videos 	All students	Michael Hall 3435 Main Street 717-829-2564 http://www.buffalo.edu/studentlife/who-we-are/departments/health.html

Incompletes

Incompletes will only be received by students in good standing (not failing) who have an unavoidable and documented reason that they cannot complete the course in this semester. Upon receiving an incomplete, a student must complete the course when it is next offered (usually in the summer). Arrangements to receive an incomplete must be made before the end of the semester. Please refer to the [University Policy on Incompletes](#) for more information.

Important Dates

- Feb. 5: Last day of Add/Drop: **NOTE: No one will be permitted to Add any section of BIO 201 after 8:30 AM Feb. 5.**
- Mar. 17-25: Spring break
- Friday, Apr. 20: Last day to resign a course (R will appear on transcript)
- Friday May 11: Last day of classes
- Wednesday, May 16: Final exam

See also the [Registrar's Office Calendar](http://calendar.registrar.buffalo.edu/calendar/): <http://calendar.registrar.buffalo.edu/calendar/>.

Repeating the course

BIO 201 is a "limited enrollment" course, which means that the enrollment in these courses is limited by the number of student positions available. Consequently, self-registration in these courses in the Fall and Spring semesters may be limited to those students who are taking the course for the first time. Students who plan to repeat the course for any reason should plan to register for the course in the Summer. Repeat enrollment is defined as previously enrollment in the course at UB, or who transferred an equivalent course to UB, receiving a letter grade of 'A', 'B', 'C', 'D' or 'F' and qualified values thereof (e.g. 'A-', 'D+'); or a grade of 'P', 'S', 'U', 'I', 'J', 'N', or 'R', unless the student has taken an Administrative Withdrawal for an entire semester (grades registered as 'W').

BIO 201 A – Spring 2018
Schedule and Reading Assignments

Schedule and reading assignments are *approximate* and may be subject to change. Any changes will be announced in class. It is expected that all students have at least skimmed the reading assignments and therefore have a basic knowledge of the material prior to coming to class. **Flipped classrooms are listed in bold red and require outside work before coming to class.**

<i>Week</i>	<i>Date</i>	<i>Lecture Topic</i>	<i>Reading (Sadava, 11th Ed.)</i>	<i>Lab</i>
1	<i>The Chemical Basis of Life</i>			NO LAB
	1/29	1: Introduction	Ch. 1 pp. 1-19	
	1/31	2: The chemistry of life	Ch 2. pp. 22-38; Video: Crash Course Biology #1 and #2	
	2/2	3: Biological Macromolecules; Amino acids	Ch. 3, pp. 41-47	
2	2/5	4: Proteins	Ch. 3, pp. 48-52	Lab 1: Designing controlled experiments
	2/7	5: Carbohydrates; Lipids	Ch. 3 pp. 54-62; Video: Crash Course Biology #3	
	<i>Cells</i>			Lab 2: Biological Buffers
	2/9	6: Nucleic Acids, Origins of life	Ch. 4 pp. 65-79; Video: Crash Course Biology #10 (through 8:49 only)	
3	2/12	7: Origins of Life (cont.); Cells	Ch. 5 pp. 81-92; Crash Course Biology #4 (#5 optional)	Lab 2: Biological Buffers
	2/14	8: Evolution of Eukaryotes; The Endomembrane System	Ch. 5 pp. 105-107, 92-95; Ch. 6 pp. 126-127	
	2/16	9: The Endomembrane System	Ch. 5 pp. 95-98,; Video: Cell Organelles 2 Cytoskeleton	
4	2/19	10: Cytoskeleton and Molecular Motors	Ch. 5 pp. 98-103, including Expts 5.20A and 5.20B; Video: A Day in the Life of a Motor Protein	Lab 3: Microscopy A: Brightfield microscopy, survey of cells, osmosis
	Wed. 2/21 - EXAM 1 (Lectures 1-10)			
	2/23	11: Multicellularity: Extracellular matrix, membranes, and cell adhesion	Ch. 5 pp. 104-105; Ch. 6 pp. 110-118	
5	2/26	12: Membranes & Osmosis	Ch. 6 pp. 118-123; Video: Transport in Cells: Diffusion and Osmosis	Lab 4a: Microscopy B: Survey of microscopic methods
	2/28	13: Membrane transport	Ch. 6 pp. 123-126; Video: Transport in Cells: Active Transport	
	3/2	14: Cell signaling	Ch. 7 pp. 131-141	
6	3/5	15: Cell signaling (cont.)	Ch. 7 pp. 132-141 (cont.)	Lab 4b: Microscopy B: Hybrid labs meet in
	<i>Energy, Enzymes and Metabolism</i>			
	3/7	16: Energetics and ATP	Ch. 8 pp. 150-163	

	3/9	17: Enzymes	Ch. 8 pp. 157-163	Cooke 210
7	3/12	18: Regulation of enzyme activity	Ch. 8 pp. 163-169	Lab 5: pH and Enzyme Activity
	3/14	19: Overview of metabolism; glycolysis	Ch. 9 pp. 172-176; Video: Crash Course Biology #7	
	3/16	20: Aerobic metabolism: Pyruvate oxidation and the TCA Cycle	Ch. 9 pp. 176-179	
<i>March 17-25 - Spring Break</i>				
8	3/26	21: Electron transport system, ATP Synthase	Ch. 9 pp. 179-182	Lab 6: Chloroplast isolation and Hill Reaction
	3/28	22: Anaerobic metabolism and regulation	Ch. 9 pp. 184-189	
	3/30	23: Photosynthesis: light-dependent reactions	Ch. 10 pp. 193-202; Video: Crash Course Biology #8	
9	4/2	24: The Calvin Cycle; Review	Ch. 10 pp. 202-205	Lab 7: SDS-PAGE of Chloroplast proteins
	Wed. 4/5 - EXAM 2 (Lectures 11-24)			
	<i>Genes and Heredity</i>			
	4/6	25: Cell Division, The Cell Cycle, and MPF	Ch. 11 pp. 213-219	
10	4/9	26: Mitosis	Ch. 11 pp. 219-224	Lab 8: Genomic DNA Extraction
	4/11	28: Spindle assembly checkpoint; aneuploidy	Video: Chromosome and Kinetochore	
	4/13	27: Other cell cycle checkpoints and cancer	Ch. 11 pp. 234-237	
11	4/16	29: Cytokinesis; Apoptosis	Ch. 11 pp. 224, 233-234	Lab 8: The Transforming Principle
	4/18	30: Meiosis	Ch. 11 pp. 226-233; Video: Crash Course Biology #13	
	4/20	31: Heredity: The Transforming Principle and the Hershey-Chase Experiment	Ch. 13 pp. 266-270	
12	4/23	32: DNA Replication	Ch. 13 pp. 270-275 (up to but not including "There are two steps...") plus Experiment pp. 276-277; Videos: Matthew Meselson and Meselson and Stahl Experiment Animation	Lab 10: Bioinformatics
	4/25	33: Mechanisms of DNA replication	Ch. 13 pp. 275-281; Video: Crash Course Biology #10 (8:49 to end)	
	4/27	34: Mutations, DNA damage, and repair	Ch. 13 pp. 282-283	
13	4/30	35: Genes and transcription	Ch. 14 pp. 288-295; Video: Crash Course Biology #11 (through 7:47 only)	<i>NO LAB: Weather Makeups</i>
	5/2	36: RNA processing; Transcriptional Regulation	Ch. 14 pp. 298-301; Ch. 16 pp. 336-340;	
	5/4	37: Transcriptional Regulation (cont.); The Genetic code	Ch. 16 pp. 342-345; Ch. 14 pp. 296-298	

14	5/7	38: The Genetic Code (cont.); Translation	Ch. 14 pp. 301-304	Lab final
	5/9	39: Translation (cont.)	Ch. 14 pp. 304-306; Video: Life Science - Protein Synthesis	
	5/11	40: Protein Trafficking	Ch. 14 pp. 307-309	

Final Exam: 7:15-8:45 PM Wednesday, May 16, Location TBA

BIO 201 Learning Outcomes

Number	Program learning outcome	"Enduring understandings"	Depth	Specific outcome objectives for BIO 201	Assessment instrument
1	Provide Breadth of knowledge of basic principles and concepts	Know the answer to the question "What is Life?" and how cells carry out the functions of life.	2	A. The Chemical Basis of Life: i. Be able to identify the characteristics of living organisms; ii. Recognize how basic chemistry and thermodynamics apply to living organisms iii. Identify hierarchy of biological macromolecular structure (monomers -> polymers -> higher-order structure) and how structure relates to function	Exam 1; Homework; In-class questions
				B. Cells: i. Be able to identify organelles and match organelles to function. ii. Know cell membrane properties and be able to predict what kinds of molecules can diffuse through cell membranes; iii. predict whether cells will shrink or swell in solutions containing various solutes based on membrane properties; iv. Be able to distinguish between different membrane transport mechanisms; iv. Know how cells communicate with each other using signal transduction	Exams 1-2; Homework; in-class questions; Labs 2-3 Quizzes and Lab Reports; lab final
				C. Energy, Enzymes, and Metabolism: i. Recognize basic differences in metabolism between different types of organisms, ii. recognize advantages of aerobic metabolism and photosynthesis; iii. Identify reactants and products of major metabolic pathways; iii. Recognize what enzymes do and do not do.	Exams 2; Homework; in-class questions; Labs 4-5 Quizzes and Lab Reports; lab final
				D. Genes and Heredity: i. Differentiate between sexual and asexual reproduction; ii. Differentiate between mitosis and meiosis; iii. Recognize mechanisms by which cells translate genotype to phenotype; iv. Differentiate between DNA Replication, RNA Transcription, Protein Translation	Exam 3; in-class questions; Labs 7-8 Quizzes and Lab Reports; lab final
2	Depth within specialized areas		0		
3	Provide an understanding of experimental design and methodology	Recognize and be able to apply scientific method correctly.	2	A.i Recognize and use scientific method correctly; ii. Be able to formulate testable hypotheses	Quizzes and Lab reports Labs 1-8; Lab final
				B. i. Recognize and be able to explain what is accomplished by using positive and negative controls; ii. be able to interpret different control sample results for a variety of experiments	
				C. i. Be able to convert between mass and moles, calculate concentration in molarity, convert between units of measure, manipulate logarithms, and perform other basic calculations relevant to biology; ii. use Excel to record, analyze, and graph data; iii. recognize importance of sample size and the relationship between sample size and standard deviation	

				D. i. Read and use micropipettes and serological pipettes correctly; ii. Use a microscope correctly and calibrate an ocular micrometer, iii. Identify which technique(s) is/are appropriate to answer different biological questions	
4	Develop approaches for integration of information	Integrate information from different disciplines	2	A. i. Recognize relationships between cell biology, thermodynamics, and chemistry; ii. Recognize how hormones regulate metabolism using cell signal transduction	Exam 3; in-class questions; Labs 1, 4, 5, 8
5	Encourage critical thinking and hypothesis building	Apply critical thinking in biology and build correctly-formulated and testable hypotheses.	2	A. i. Recognize the difference between opinions and data	Exams 2 & 3; in-class questions;
				B. i. Analyze and interpret quantitative and qualitative data from real and hypothetical experiments	Labs 1-8 Quizzes, Lab Reports, Lab final
				C. i. Be able to formulate original, testable hypothesis; be able to design and interpret results of controls	Labs 1-8 Quizzes, Lab Reports, Lab final
6	Provide skills in scientific communication	Clearly communicate data and conclusions.	1	A. i. Be able to clearly explain results of and conclusions from experiments (written); ii. Be able to explain biological concepts and definitions correctly in a few words	Labs 1-9 Quizzes, Lab reports, Lab final
7	Provide contemporary information	Apply scientific reasoning to biology in the news.	1	A. i. Correctly identify trans-fats and difference between trans-fats and naturally-occurring lipids; ii. Use scientific data to answer questions: Are trans-fats bad for you? Should all food containing DNA be given a warning label? Why are vitamins important?	Exams 1 & 3; in-class questions
8	Encourage appreciation of scientific values	Appreciate and demonstrate scientific values and ethical behavior.	1	A. ii. Demonstrate ethical behavior by submitting original lab reports; iii. Demonstrate professionalism by using appropriate lab safety and clean-up	Lab reports, Lab behavior (participation points)