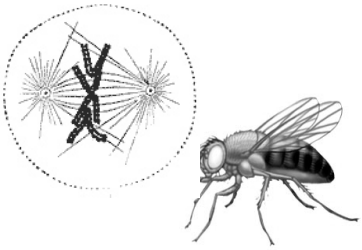
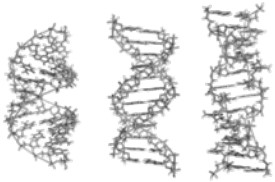


Bi 211 General Biology I: Cells
Syllabus for Summer Session 2015



Instructor: Dr. Peter Wetherwax

GTFs: Dan Thomas and Roberta Torunsky
Undergraduate Teaching Assistants: Varneet Barr, Lauren Goemaat, Jacki Salazar and Julia Metzler
(email addresses are posted on the course *Canvas* site)

Student Learning Outcomes for BI 211 General Biology I: Cells

In this first course of the general biology sequence, we study biological processes from a molecular and cellular prospective. These concepts are central to understanding all other areas of biology. All organisms must accomplish two major functions: 1) extract energy from their environments to build and maintain their bodies, and 2) reproduce themselves. We start by studying the four types of biological macromolecules that build organismal bodies: carbohydrates, lipids (e.g., fats), proteins and nucleic acids (e.g., DNA). We then examine how cells obtain from the environment the building blocks for constructing these macromolecules and the energy for manipulating them to carry out body functions. Next we examine reproductive functions, beginning with the two types of cell division, mitosis and meiosis. From there we study genetics, how traits pass from parent to offspring, starting with the structure and replication of DNA followed by how genes code for proteins. Finally we look at the genetic basis of inheritance, including Mendelian genetics, pedigree analysis and the genetics of complex traits. Many of these topics are taught using a case-study approach, mostly using examples of genetic diseases in humans. BI 211 is a prerequisite for all the other general biology courses in the sequence (BI 212, BI 213, and BI 214).

The goals for BI 211 fall into two general categories: (1) to learn the foundational concepts related to cellular and molecular biology and (2) to develop skills in analytical thinking that will serve students in subsequent biology classes (and courses in other subjects) and scientific research experiences as they progress through their academic program.

Concept-based goals:
1. To describe the chemical structures and major functions of the four major types of large biological molecules that make up all living organisms.
2. To understand energy harvest pathways, including cellular respiration, fermentation and photosynthesis, and their relevance to human disease.
3. To describe and illustrate chromosomal and cellular events during the various stages of both mitosis and meiosis, with a focus on their roles in cancer and Down Syndrome.
4. To understand and describe the major processes involved in gene action, including the mechanisms of protein synthesis, comprising transcription and translation, and how they are controlled to propel embryonic development.
5. To understand the basis of transmission genetics and solve problems using Mendel's first and second laws; to analyze genetic pedigrees.

Skill-based goals:
1. To develop competency in the basic terminology and methodologies used in the biological sciences.
2. To learn the process of scientific inquiry and its applications.
3. To learn how to learn about biology.
4. To learn to communicate knowledge, ideas and reasoning clearly and effectively in oral and written forms appropriate to the biological sciences.
5. To become familiar with the use of science relevant search engines, and learn to identify primary work and understand the merits of the peer review process; to develop the ability to think critically about information, evaluate the validity of arguments, and weigh the merits of disparate scientific conclusions

Course Prerequisites

Students must have taken Ch111 or higher, but note that a year of general chemistry (Ch221-223), with lab, is required for biology majors and several other science majors. **The prerequisites for Bi211-214 will be strictly enforced.**

Students beginning the General Biology sequence with Bi 211 need a basic competency in math and chemistry, but should continue their studies in these areas if they want to be able to take Bi 214 and leave open the option of becoming biology majors. Students may also stop the sequence after completing Bi 213 and be eligible to take some, but not all upper division biology courses. Bi211 is the only prerequisite for Bi212 and Bi213. Bi214 requires completion of both Bi212 and a year of general chemistry. Completion of Bi 211-214 will allow students to take any 300-level biology course and major in biology.

Course Format

Lectures (Monday-Friday, 9:00-10:50 in 240C Mackenzie Hall)

Do the assigned readings before coming to class. Some lectures will include activities that help you to actively engage with the material. These activities will often be done collaboratively with a small group of students discussing the problem together for a few minutes before discussing it as a whole class. Your active participation will help you to understand the material and better prepare you for exams.

Your application of two principles will help you learn biology. First**, learning is done by the learner**. In other words, the structure of the class helps identify the important concepts and skills, organize the material, provide practice, and encourage learning, but only students themselves, by putting in effort on a continuing (and not binge) fashion, can actually do the learning. Second, **the speaker is doing the learning.** In a lecture, it is the lecturer who, during preparation, is learning the material, not necessarily the people listening. On the other hand, when arguing one's answer on an iClicker question, the person who is doing the talking is doing the learning about the material.

Labs (Tuesdays, Wednesdays and Thursdays in 112 & 129 Huestis)

The lab session is a small group of about 20 students that meets three times a week. In lab, you will explore the diversity and complexities of cells, model major concepts in cellular biology, discuss issues related to cellular biology, and perform scientific investigations to understand the mechanisms of inheritance. You can attend only the section for which you are registered. Attending other sections will only be allowed in extraordinary situations and with *prior* approval from your GTF. **Attendance is mandatory; it is not possible to make up labs.**

Help Sessions and Office hours: There are several help sessions every day. The exact times are posted in a table towards the end of the syllabus and will be posted on *Canvas*. These sessions are there to help you succeed in all parts of the course: problem sets, labs and exams. Please plan on attending these regularly (ideally every day). This class takes place over 10 weeks during the regular year. Since this is condensed into a 3-week class, it is especially important that you keep up on the material. Most students cannot succeed in this course without coming to help sessions.

Course Evaluation

Laboratory activities (9 total; 1% each)	**9%**
Problem sets (homeworks) (5 total; 2% each)	**10%**
Clicker questions	**6%**
Exams	**75%**
midterm exam (30%)	
final exam (45%)	

Problem sets (homeworks): There will be five problem sets posted on *Canvas* during the term. The problems are similar to the types of problems used in exams. They will be collected at the **beginning of lecture** (see schedule for dates). No late homework will be accepted. The solutions to each week's problems will be posted on *Canvas* on the day they are due. We will be happy to discuss the problems during our office hours.

Laboratory activities: Lab handouts will be turned in at the end of each lab period. Each lab will be graded on a 5-point scale. For some labs, part of this grade will be based on your active engagement in the lab. All labs cannot be made up because they involve additional materials. Late labs will not be accepted.

Clickers (personal response systems): iClickers will be used in every class to encourage active participation and to provide feedback to instructors and students. In fact, many days will begin with a couple of clicker questions. Each student should purchase a clicker for use in this class before the first day of classes. You must register your clicker on the course *Canvas* site. Questions during lecture that require clickers will be multiple choice. Points will be earned two different ways: (1) 2-point questions: 2 points will be awarded based on participation alone, not on whether the question is answered correctly; (2) 4-point questions: 4 points for the correct answer, 2 points for an incorrect answer. Total percent for the clicker portion of your grade will be based on 85% of the total possible iClicker points: your clicker grade = (total points earned)/(85% of total points possible). iClicker problems are not a means of taking attendance. They ask students to grapple in real time with the material under discussion. Furthermore, they provide an opportunity to exercise the principle that the speaker is the one doing the learning because first, when you answer the iClicker problem you are 'speaking', and second, you will have to verbally argue your answer to either the class or to a student who selected a different solution than yours.

Exams: There will be two exams: a midterm and a final. All exams will be the same format: short-answer. The final is cumulative. The exams will cover material from all aspects of the course including lectures, labs, readings and problem sets. Exams will be designed to probe a deep understanding of the concepts and principles discussed, and an ability to apply the concepts to novel situations rather than a memorization of detail. **Exams cannot be made up or taken early.**

Posting of grades: Scores for assignments and exams will be posted on the course *Canvas* site. Check your scores when we post them because you will have only two days after the posting to notify us about a mistake or omission.

Course Materials

Textbook: The text, *Biological Science* by S. Freeman, 4rd or 5th edition, will be used as a general reference throughout the first three quarters of General Biology. Readings include background material useful to prepare you for lecture and to study for exams. We don't expect you to memorize all details in this material. A good strategy is to skim over the entire chapter first, concentrating on the major concepts, then to read more carefully the assigned pages, focusing on the ideas discussed in lecture and lab. Copies of both editions of the textbook are on reserve in the Science Library.

Course Packet: This packet contains the lecture and lab handouts you will need during the course. Available at the Duck Store.

iClickers: Each student will need to purchase a clicker (available at the Duck Store). iClicker-1 or iClicker-2 will be used in this course. You must register your clicker (see link available on blackboard for clicker registration).

Calculator: You will need a calculator capable of simple arithmatic for the lecture and exams. No graphing calculators or other calculators capable of storing anything except single numbers. Cell phones cannot be used during exams.

Lecture and Lab Schedule

*please bring your textbook to lab on these days

Note that every lecture session will have some points associated with it (iClicker or exam) and every week has graded material to be handed in (lab reports and graded homework or exams). It is important to not let yourself get behind; make-up points do not exist.

Day	Date	Lecture	Lab	Problem Sets
M	6/22	L1: Macromolecules		
Tu	6/23	L2: Cell structure and function	Lab 1: Discovering molecules	
W	6/24	L3: Energy, enzymes and ATP; Harvesting chemical energy	Lab 2: Discovering cells	Problem set 1 due at start of lecture
Th	6/25	L4: Harvesting chemical energy	Lab 3: Modeling cellular respiration*	
Fr	6/26	L5: Photosynthesis		
M	6/29	L6: DNA structure and the cell cycle		Problem set 2 due at start of lecture
Tu	6/30	L7: Cell cycle continued. . .	Lab 4: Modeling photosynthesis*	
W	7/1	L8: Protein synthesis	Lab 5: Cell cycle*	Problem set 3 due at start of lecture
Th	7/2	Midterm exam (lectures 1-7 and labs 1-5)	Lab 6: Protein synthesis	
Fr	7/3	4th of July holiday, no class		
M	7/6	L9: Meiosis and the sexual life cycle		
Tu	7/7	L10: Genetics: Mendel's laws	Lab 7: Meiosis & Mendel*	Problem set 4 due at start of lecture
W	7/8	L11: Recombination; Sex-linked traits and pedigrees	Lab 8: Modeling simple genetic traits (VGL)	
Th	7/9	L12: Beyond Mendelian genetics	Lab 9: Modeling complex genetic traits (VGL)	Problem set 5 due at start of lecture
Fr	7/10	Final exam (entire course; exam given at normal lecture time)		

Learning Environment

The University of Oregon is working to create inclusive learning environments. Please notify us if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact the Accessible Education Center in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu. If you have a documented disability and anticipate needing accommodations in this course, please talk to your instructors during the first week of class. Please request that the Counselor for Students with Disabilities send a letter verifying your situation.
Professional conduct Please arrive to lab and lecture on time and stay until class is over because late arrivals and early departures make unnecessary noise and disruption that distracts your classmates. Please do not chat during lectures except when asked to discuss problems with other students. This is disruptive to those around you and inhibits their chance to learn; it's not fair to your classmates. Likewise, using your cell phone, tablet, or computer to check email, facebook, surf the web etc. is disruptive to those around you. While taking notes and following along the lecture notes on your tablet or computer is often helpful for learning, extraneous images on computer screens can be a great distraction for those behind you and simply is not fair to them.

Cheating devalues the reputation of our institution, its faculty, its students, and the significance and value of your academic degree. Academic misconduct is particularly unfair for students who do their work with integrity and honor. The University Student Conduct Code (https://uodos.uoregon.edu/StudentConductandCommunityStandards/AcademicMisconduct.aspx) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. For example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only sources and resources authorized by the instructor. If you have any question about whether an act constitutes academic misconduct, it is your obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at http://library.uoregon.edu/guides/plagiarism/students/index.html

We want you to learn and to do well in the course, but we will not tolerate academic dishonesty. Sanctions for academic dishonesty will be a lowering of the final grade or failure. If you find yourself in trouble, or if you are aware of academic dishonesty occurring, please talk to one of the instructors. Personal crises do happen. If you are having difficulties that are interfering with your ability to do well in the class, please tell an instructor as soon as possible. We may be able to refer you to someone for help or to make special arrangements if the need is real and if you have done your best to deal with the situation in a timely manner. Don't hesitate to call the campus crisis center (541 346-3227) if you or a friend need assistance. Finally, we promise to respect you as students and as individuals, and ask that you return that respect to us and to your fellow classmates.

We support Title IX and have a duty to report relevant information. The UO is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. Any UO employee who becomes aware that such behavior is occurring has a duty to report that information to their supervisor or the Office of Affirmative Action and Equal Opportunity. The University Health Center and University Counseling and Testing Center can provide assistance and have a greater ability to work confidentially with students.

Lecture	Readings from 5th Edition
1	• Ch 1: read quickly to get an overview of the book and the overall structure of the field of biology. Pay particular attention to the sections on cells (p. 2-5), classification (p. 6-8), and science as a process (p. 9-13). It is highly recommended that you review basic chemistry principles in Ch 2. • Ch 5: read the entire chapter on carbohydrates • Ch 6: focus on pgs. 84-88 (types, structure of lipids); skim pgs. 89-94 to review diffusion and osmosis • Ch 3: read pgs. 41-52 to focus on protein structure and function • Ch 4: read pgs. 57-59 for an introduction to nucleic acid structure and function
2	• Ch 29-33: skim over the chapters to answer questions about domains, kingdoms and Lab #2 • Ch 7: read the entire chapter on cells; focus on characteristics of prokaryote and eukaryote cells and organelles (p. 106-117); read pgs. 118- 127 to gain a deeper understanding of cell dynamics. • Ch 6: read about cell membranes and membrane proteins on pgs. 94-96 • For more info: study area at www.masteringbio.com: Ch 7 BioFlix Animations: Tour of an Animal Cell, Tour of a Plant Cell
3	• Ch 2: read pgs. 30-32 to focus on chemical reactions and energy • Ch 8: read pgs. 136-150 for basic understanding of ATP and redox reactions ,and to focus on enzymes, effects of temperature and pH on enzymes
3 & 4	• Most students will have to carefully read Ch 9 on cellular respiration several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. You must gain a basic understanding of the following material but don't need to memorize all of the chemicals. Pgs. 154-158 provide a nice overview of cellular respiration, pgs. 159-172 provide more detail of the processes of cellular respiration, and pgs. 172-173 discuss fermentation. • For more info: study area at www.masteringbio.com: Ch 9 BioFlix Animations: Cellular Respiration
5	• Most students will have to carefully read Ch10 on photosynthesis several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. Pgs. 176-178 provide a brief overview of photosynthesis, pgs. 178-189 (light reactions) and pgs. 190-192 (Calvin Cycle) cover the details of photosynthesis. • For more info: study area at www.masteringbio.com: Ch 10 BioFlix Animations: Photosynthesis
6	• Ch 4: read pgs. 57-65 on DNA structure and function • For more info: study area at www.masteringbio.com: Ch 4 Web Animation: Nucleic Acid Structure
6 & 7	• Ch 12: read pgs. 219-223 for an introduction to the cell cycle; pgs. 223-229 for details of mitosis; pgs 229-232 for control of the cell cycle; pgs. 232-234 for cancer and the cell cycle • Ch 15: read pgs. 284-295; read pgs. 297-300 (correcting mistakes in DNA synthesis) • For more info: study area at www.masteringbio.com: Ch 11 BioFlix Animations: Mitosis; Web Animation: The Phases of Mitosis; Ch 15 BioFlix Animations: DNA Replication; Web Animation: DNA Synthesis
8	• Ch 16: read pgs. 304-312 for an introduction to genes, the central dogma, and the genetic code; pgs. 313-315 discusses mutations • Ch 17: read the entire chapter for the details of protein synthesis • Ch 4: read pgs. 65-68 for RNA structure and function • For more info: study area at www.masteringbio.com: Ch 17 BioFlix Animations: Protein Synthesis; Web Animation: Synthesizing Proteins
9	• Ch 13: read pgs. 237-249 for details of meiosis; pgs. 249-251 discuss mistakes in meiosis • For more info: study area at www.masteringbio.com: Ch 13 BioFlix Animation: Meiosis
10 & 11 & 12	• Ch 14: read pgs. 256-259; pgs. 259-263 discuss Mendel's 1st Law; pgs. 263-266 discuss Mendel's 2nd Law; pg. B8 (Bioskills 5) discusses some simple rules of probability that are useful for understanding Mendelian genetics • Ch 14: read pgs. 266-275 and Box 14.1 on pg. 274 • For more info: study area at www.masteringbio.com: Ch 14 Web Animation: Mendel's Experiments, The Principle of Independent Assortment

Lecture	Readings from 4th Edition
1	• Ch 1: read quickly to get an overview of the book and the overall structure of the field of biology. Pay particular attention to the sections on cells (p. 2-4), classification (p. 5-8), and science as a process (p. 8-12). It is highly recommended that you review basic chemistry principles in Ch 2. • Ch 5: read the entire chapter on carbohydrates • Ch 6: focus on pgs. 82-88 (types, structure of lipids); skim pgs. 89-91 to review diffusion and osmosis • Ch 3: read pgs. 38-51 to focus on protein structure and function • Ch 4: read pgs. 59-62 for an introduction to nucleic acid structure and function
2	• Ch 28-32: skim over the chapters to answer questions about domains, kingdoms and Lab #2 • Ch 7: read the entire chapter on cells; focus on characteristics of prokaryote and eukaryote cells and organelles (p. 103-114); read pgs. 115- 122 to gain a deeper understanding of cell dynamics. • Ch 6: read about cell membranes and membrane proteins on pgs. 92-94 • For more info: study area at www.masteringbio.com: Ch 7 BioFlix Animations: Tour of an Animal Cell, Tour of a Plant Cell
3	• Ch 2: read pgs. 27-33 to focus on chemical reactions and energy • Ch 3: read pgs. 51-56 to focus on enzymes, effects of temperature and pH on enzymes • Ch 9: read pgs. 149-152 for basic understanding of ATP and redox reactions
3 & 4	• Most students will have to carefully read Ch 9 on cellular respiration several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. You must gain a basic understanding of the following material but don't need to memorize all of the chemicals. Pgs. 153-154 provide a nice overview of cellular respiration, pgs. 155-166 provide more detail of the processes of cellular respiration, and pgs. 166-168 discuss fermentation. • For more info: study area at www.masteringbio.com: Ch 9 BioFlix Animations: Cellular Respiration
5	• Most students will have to carefully read Ch10 on photosynthesis several times. Read the entire chapter fairly quickly the first time to get the general ideas and vocabulary. Then read again more carefully the specific pages that are listed. Pgs. 173-174 provide a brief overview of photosynthesis, pgs. 179-184 (light reactions) and pgs. 184-186 (Calvin Cycle) cover the details of photosynthesis. • For more info: study area at www.masteringbio.com: Ch 10 BioFlix Animations: Photosynthesis • The Big Picture: pgs. 192-193 provides nice overview of energy concepts
6	• Ch 4: read pgs. 62-66 on DNA structure and function • For more info: study area at www.masteringbio.com: Ch 4 Web Animation: Nucleic Acid Structure
6 & 7	• Ch 11: read pgs. 194-196 for an introduction to the cell cycle; pgs. 197-200 for details of mitosis; pgs 202-205 for control of the cell cycle; pgs. 206-209 for cancer and the cell cycle • Ch 14: read pgs. 258-263; focus carefully on pgs. 263-268 (DNA synthesis); read pgs. 271-274 (correcting mistakes in DNA synthesis) • For more info: study area at www.masteringbio.com: Ch 11 BioFlix Animations: Mitosis; Web Animation: The Phases of Mitosis; Ch 14 BioFlix Animations: DNA Replication; Web Animation: DNA Synthesis
8	• Ch 15: read pgs. 277-285 for an introduction to genes, the central dogma, and the genetic code; pgs. 285-286 discusses mutations • Ch 16: read the entire chapter for the details of protein synthesis • Ch 4: read pgs. 66-68 for RNA structure and function • For more info: study area at www.masteringbio.com: Ch 16 BioFlix Animations: Protein Synthesis; Web Animation: Synthesizing Proteins
9	• Ch 12: read pgs. 211-223 for details of meiosis; pgs. 225-227 discuss mistakes in meiosis • For more info: study area at www.masteringbio.com: Ch 12 BioFlix Animation: Meiosis
10 & 11	• Ch 13: read pgs. 230-239; pgs. 232-236 discuss Mendel's 1st Law; pgs. 236-238 discuss Mendel's 2nd Law; pg. B19 (Bioskills 13) discusses some simple rules of probability that are useful for understanding Mendelian genetics • Ch 13: read pgs. 239-241; 243-245 and Box 13.1 on pg. 246 • For more info: study area at www.masteringbio.com: Ch 13 Web Animation: Mendel's Experiments, The Principle of Independent Assortment
12	• Ch 13: read pgs. 241-242 to focus on sex chromosomes and sex-linked inheritance; pgs. 250-252 discuss human genetics and pedigrees • Ch 13: read pgs. 245-247 to focus on incomplete dominance, codominance and multiple alleles

Bi211 Office Hours and Tutor Help Session Hours in 111 Huestis

Day	Date	Lecture	Problem Sets and Exams	Time (Staff member)
M	6/22	L1: Macromolecules		11-12 (Peter) 12-2 (Julia) 3-4 (Roberta)
Tu	6/23	L2: Cell structure and function		11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia) 4-5 (Dan)
W	6/24	L3: Energy, enzymes and ATP; Harvesting chemical energy	Problem set 1 due at start of lecture	11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia)
Th	6/25	L4: Harvesting chemical energy		11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia)
Fr	6/26	L5: Photosynthesis		11-1 (Lauren)
M	6/29	L6: DNA structure and the cell cycle	Problem set 2 due at start of lecture	11-12 (Peter) 12-2 (Julia) 3-4 (Roberta)
Tu	6/30	L7: Cell cycle continued. . .		11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia) 4-5 (Dan)
W	7/1	L8: Protein synthesis	Problem set 3 due at start of lecture	11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia) 4-6 (Lauren)
Th	7/2	Midterm exam (lectures 1-7 and labs 1-5)	Midterm exam (lectures 1-7 and labs 1-5)	11-12 (Varneet) 12-1 (Jakki)
Fr	7/3	4th of July holiday, no class		
M	7/6	L9: Meiosis and the sexual life cycle		11-12 (Peter) 12-2 (Julia) 3-4 (Roberta)
Tu	7/7	L10: Genetics: Mendel's laws	Problem set 4 due at start of lecture	11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia) 4-5 (Dan)
W	7/8	L11: Recombination; Sex-linked traits and pedigrees		11-12 (Varneet) 12-1 (Jakki) 2-3 (Julia)
Th	7/9	L12: Beyond Mendelian genetics	Problem set 5 due at start of lecture	11-12 (Varneet) 12-1 (Jakki) 2-3 (Varneet) 4-6 (Lauren)
Fr	7/10	Final exam (entire course; exam given at normal lecture time)	Final exam (entire course; exam given at normal lecture time)	

How to Succeed in General Biology without Really Trying
(just kidding: you probably can only succeed by working hard)

Students often ask us how to do better in the class, especially on the exams. Usually we get these questions right before the final, when it really is too late to learn all of the material that we have covered. Below is a checklist of things you should be doing if you want to learn the material in general biology. There is no easy, magic way to learn this material. It requires constant attention throughout the quarter.

Check List

- ☐ Did I actively participate in every lecture?
  We *think that the lectures are important for learning the material in this course. Just reading the lecture slides does not substitute for attending lectures. If you don't come to lecture, you shouldn't expect to do well in the course. But simply attending the lectures isn't enough. You need to be an active participant. By active, we mean that your mind needs to be actively working with the information as it is presented. If you are confused or have a question, please raise your hand. Most students find it useful to write notes to help to keep their minds on the material, but you shouldn't try to write so much that you aren't even able to think about the material. Remember, all of the slides shown on the screen are posted on Canvas so you don't need to write down everything that is on the slide.*

- ☐ Did I read the lecture slides on the day of **every** lecture and then compare those notes with my own notes and the readings?
  You should understand everything that we put on the slides. If the slide is a figure from your text, then you should look up that figure and read the material about that figure to make sure you understand it completely. If you have a question then you should come to one of the office hours or help sessions. Waiting until right before the exams to look at these lecture notes is no substitute for looking over the notes right after hearing the lecture.

- ☐ Did I do all of the problems as the material was presented in lecture? After doing the problems did I attend help sessions to see if I am doing them correctly?
  The problems that are posted come from previous exams. They give you a good idea of your understanding of the material. They also help you to become more comfortable with solving these kinds of questions so you can perform better on the exams. Solving the problems on your own is probably the singly most important thing you should do (besides coming to class) in order to be successful in this course. The problems are often not simply asking you to repeat facts that you have learned. They often ask you to apply the concepts to novel situations. That is what scientists do and we want you to do science in this course. Just like you can't learn how to play a guitar by simply reading about it, you can't learn to do science (e.g., solve problems) without practicing doing science (i.e. practicing solving problems). If you just get the answers from a classmate or staff person at help sessions without trying to solve them yourself, then you aren't practicing.

- ☐ Did I read all of the assigned readings in an active manner?
  The textbook can be dry at times, but it presents the material in a very clear and concise manner. Much of the material cannot be understood by reading it once. You should be active as you read the material: take notes, underline key points, redraw important figures on your own. It's amazing how many evaluations we get from students that say "I had trouble doing well in this class/" and also say "I hardly read the text at all." It is true that most of the material on the exams has been covered in the lectures. But most people need to study this material in several ways: listening in lectures, working on the concepts in labs AND reading about it.

- ☐ Did I actively participate in all of the labs?
  The labs have been designed to help you learn the concepts in this course. It is very easy to just go through the motions in lab and get full credit for the labs BUT then you are wasting your time and not taking advantage of a very powerful way to learn complex material: modeling. We have carefully designed the labs so that you work with the concepts in a very active way. It is basically the same concepts that you hear in lectures, and read about in the text, but most of us need to work with the material in a number of different forms. For many students, nothing works as well as modeling.

- ☐ Did I visit the GTFs, Undergrad Assistants and faculty during their office hours and help sessions?
  We don't charge for this service. ☺ You really should take advantage of the many hours we offer every week and get individual attention.

- ☐ Did I compare my answers to the exam solutions and work on the material I missed?
  If you didn't get it the first time, make sure you don't miss the problems on the .same concepts in subsequent exams. We've even been known to repeat similar questions that students missed on earlier exams.

- ☐ Did I retake exam questions and resolve problem sets prior to the midterm and final?
  Even though you've already seen the solutions, it still is a good idea to download the unsolved problems and exam questions and work on solving them again when studying for the midterms and final.

- ☐ Did I try to make connections with the material to things I hear about and read about outside of class?
  The best students try to see the connections in other courses and parts of their lives. They are thinking about and processing the information even when they aren't specifically working on readings or problem sets for the course. We love to hear about connections you are discovering outside of the assignments.