Foundations in Biology I (BIOL-105/115) Summer 2018

Welcome to Foundations in Biology! This syllabus provides essential information about the course. You are responsible for knowing this information, so please read it carefully.

Course Information

Contact Information:
Dr. Mun Chun (MC) Chan
mc2198@georgetown.edu
Office: 355 Regents Hall

Lecture:
MTRF 9-11am
Regents 239

Laboratory:
MTRF 12pm -2:30pm
Regents 361

Office Hours:
T: 3-5pm and by appointment.

Course Expectations

I expect you to be engaged in this course; to come to each class prepared, treat all members of the class with respect, and turn assignments in on time. You can expect the same from me in return.

Lectures
Attendance at all lectures is important and expected. You are responsible for all information presented in lectures, including any announcements and course content not found in your textbook. Your active engagement is expected. Engagement entails coming to class prepared, listening actively, and speaking up when required. You may be asked to take a specific stance in a class debate, work in small groups, answer "iClicker" questions, or make a brief presentation to the class.
Of course participation is not possible if you are not here, so you must come to every class on time.

Materials
Textbook – Biology: How Life Works, 2nd edition, by Morris, Hartl, Knoll, Lue
We recommend buying it with the "LaunchPad Portal" (ISBN#: 978-1464126093); this gets you access to an e-text. It is in the bookstore, but cheaper through Amazon.
Several copies are on reserve in Blommer Library (3rd floor Reiss).
IF you have the 1st edition of the textbook, it will be fine for this course (though you'll need to accommodate a few changes if you take the second semester of Foundations).

The lectures and readings for this course are designed to supplement, not repeat, each other. We will talk about topics in class that are not covered explicitly in the readings, and you will read about things that we will not discuss in much detail. I often use different examples than the text in order to give you an additional perspective or to highlight different aspects of a subject. Therefore, to do well in this course you must attend all lectures and keep up with the readings.

Quizzes
In order for you to assess how well you are keeping up with the material, we will have several quizzes. These quizzes are non-cumulative and cover material from previous lectures, readings, and assignments as well as readings assigned for the current day. The point of the quizzes is to review your understanding of the core concepts surrounding these lectures, and to begin to help you think of the topics in the way that will be tested during the exam. Many of the questions are T/F, but make sure you understand WHY the answer is true or false, because that is what will be tested in the exams.

The best way to work on the quiz will be with a partner(s). You are welcome to also use textbook, notes and the internet.

The quizzes will be completed on Canvas, and will (usually) be available immediately after the final lecture, until 10 pm of the due date. The dates and the material covered is explained in the table on p. 5.

Laboratory
If you are enrolled in Biol 115 laboratory, your attendance and active involvement in all labs is required. It is not possible to make up a missed lab. You will receive more detailed information about the expectations for this portion of the class in your lab section. Please note that two or more unexcused absences from lab will result in failing the entire course.

You will be expected to have read through your lab manual by the time you get to class. You will be expected to complete all pre and post-lab assignments. No late pre-lab assignment will be accepted. Late post-lab assignments will result in loss of points (details below).

Getting your Questions Answered
There will be an opportunity to ask questions and get answers in class, or immediately after laboratory class. ALL questions are valuable and are important to ask if you need help. Don't let yourself fall behind in understanding! Jump right on it and get help that day!

Late Policy
This is simple. Assignments are due on their due dates. All due dates for the entire semester will be available on the Course Schedule below. Late Post-Lab and Research Paper assignments will lose 10% per day; nothing will be accepted after 2 days. Note that Postlab_05 CANNOT BE LATE, and is due on Thursday August 10th.

There will be no unexcused make-up exams or quizzes, regardless of circumstances. To be excused from an exam due to a documented family emergency or illness, you must notify me before the exam and provide appropriate documentation. A replacement assignment might be assigned in these circumstance, and will be expected to be completed by the assigned deadline.

If you miss an exam for any other reason or fail to notify me in advance, you will receive a zero.

Things might come up. Talk to me beforehand; talk to me early if there is a possibility you will miss something. Don't wait until it's after-the-fact, or too late. Let's work together to get you through the course.

Grading

Although you are registered for two separate courses, Biol-105 and Biol-115, we highly suggest that you take both courses. We view the lecture and lab as parts of one integrated whole.

The grade for each course is determined by the following algorithm:

Biol-105 (lecture: 3 credits)

150 points - Exam #1 (Tu, July 7th)
150 points - Exam #2 (Th July 26th)
150 points - Exam #3 (Th, Fr Aug 2nd/3rd)
250 points - Final Exam (Fr Aug 10th)
150 points – Research Paper
150 points - Quizzes
1000 points – COURSE TOTAL

Biol-115 (lab: 2 credits)

200 points – Post Lab papers (5 papers)
50 Points –Pre Lab papers (5 plans)
50 points –Participation and active engagement in lab.
300 points – COURSE TOTAL

There are **no** opportunities for extra credit work in the very short intensive course. Please focus on the assignments and exams given here.

Learning Goals

The Department of Biology has set scientific content, process, and communication learning goals for the 4-year curriculum (biology.georgetown.edu). The two semesters of Foundations of Biology share responsibility for introducing each of the ten learning goals as a means to build your biological 'foundation'. Thus, this course is not just about building your scientific knowledge. Much more importantly, it is about deepening your understanding of the epistemology of science and your ability to effectively communicate your scientific ideas. Ultimately we'd like you to think about yourself as a scientist, not just a student of science.

Georgetown Biology Department Learning Goals and how material from this course relates into these goals

Insight into the Process and Product of Science

We begin our learning goals with a focus on process to emphasize our belief that the goal of a biology education is to enable students to make creative and careful use of their knowledge. Only then will they be scientists.

1. Integrate New Knowledge into Existing Intellectual Frameworks
   Material for this course is foundational through the semester, and to a degree in the Biological Sciences. In addition, you will be expected to write a literature review.
2. Engage with Scientific Inquiry
   The labs and literature review will help you engage in and understand research science. Most labs will be inquiry-based learning labs.
3. Represent and Interpret Data in Quantitative and Statistically Meaningful Forms
   Lab 5 will engage specifically in using and understanding quantitative data.
4. Communicate Scientific Understanding in Oral and Written Forms
   Through lab reports, you will have a chance to engage in scientific writing
5. Appreciate the Epistemology of Science
   Throughout the course, we will focus on the systems of knowledge that makes up Science, and understand how this system differs from other knowledge systems.

Fundamental Biological Concepts

Two themes relate to the five categories of fundamental biological concepts that we describe below and we list them here:

- Our understanding of chemistry, mathematics, and physics enables us to understand biological phenomena. It is therefore essential that Biology students have a strong foundational understanding of these fields – of both their concepts and their "ways of knowing".
- Evolutionary mechanisms create and profoundly affect organisms and their characteristics. It is therefore essential that Biology students have a strong foundational understanding of the theories, evidence, and mechanism of evolution.

6. Organization of Molecular, Cellular, Organismal and Ecological Systems
   The first quarter of the course focuses on molecules and a biochemical approach to understanding biology, while the second quarter focuses on cells.
7. Evolution as a framework for understanding biological systems
   This core theory is implicit in all discussions and labs. Lab 3 will focus on unicellular eukaryotes, lab 4 on development.

8. The Flow of Biological Information
   The third quarter of the course will focus on the central dogma and understanding material related to molecular biology
9. Flow of Energy and Matter in Biological Systems
   Metabolic pathways are a key portion of the second quarter.
10. Interdependence and Interactions within Biological Systems and Their Emergent Properties
   For the last quarter of the course, we will focus on integrated physiology.

Schedule and Curriculum

Date	Lecture Topic	Lecture Reading	Quizzes and Exams	Paper	Lab Exercise	Lab Assignments Due
Mo July 9th	Biochem 1- Atoms, Bonds, Molecules Reactions and Energy	Chp 2.1-2.4, 6.1-6.4			Intro to Inquiry based labs and Lab writing	Prelab 1_01 in class
Tu July 10th	Biochem 2. Proteins and Enzymes	Chp 2.5, 4.1, 6.5	Quiz 0: On Framingham Study		Lab 01: Enzyme Labs	
Th July 12th	Biochem 3. Carbohydrates and Nucleic Acids	Chp 2.5, 3.1, 3.2	Quiz 1: Biochem 1 and 2		Lab 01: Enzyme Labs	Prelab 1_02
Fr July 13th	Biochem 4- Lipids and Membranes	Chp 2.5, 5.1, 5.2		Assigned	Lab 01: Enzyme Labs	Prelab 1_03
Mo July 16th	Cell Biology 1. Observation and Compartmentalization	Chp 5.3, 5.4	Quiz 2: Biochem 3 and 4		Lab 02: Cell Lab	Prelab 2_01 Postlab 1
Tu July 17th	Cell Biology 2. Energetics and Signaling	Chp 7 and 9	**Exam 1: Biochem**		**Exam 1**	
Th July 19th	Cell Biology 3. Structure and Connections	Chp 10.1 , 10.4, 10.5	Quiz 3: Cell Bio 1		Lab 02: Cell Lab	Prelab 2_02
Fr July 20th	Cell Biology 4. Dynamics and Cytoskeleton	Chp 10.2, 10.3		Topics Due	Lab 02: Cell Lab	
Mo July 23rd	Mol Bio 1: DNA, Genome and Replication	Chp 13.1-13.4, Chp 12	Quiz 4: Cell Bio 2, 3 and 4		Lab 03: Molecular Microbiology	Prelab 3_01 Postlab 2
Tu July 24th	Mol Bio 2: Transcription and regulation	Chp 3.3, 3.4, 19			Lab 03: Molecular microbiology	Prelab 3_02
Th July 26th	Mol Bio 3: Protein Synthesis and Degradation	Chp 4.2	**Exam 2: Cell Biology**		**Exam 2**	
Fr July 27th	Dev Bio 1: Cellular and Mol. Processes	Chp 11, Chp 20	Quiz 5: Mol Bio (due Sat) Q6		Lecture on Development of Xenopus	

Date	Lecture Topic	Lecture Reading	Quizzes and Exams	Paper	Lab Exercise	Lab Assignments Due
Mo July 30th	Genetics 1: Variation and Mendelian Inheritance	Chp 14.1-14.3, 15.1-15.3 and Chp 16	Quiz 6: Dev Bio		Lab 04: Development of Xenopus	Prelab 4_01 Postlab 3
Tu July 31st	Genetics 2: Complexity of Inheritance	Chp 17 and 18	Quiz 7: Genetics	Rough Draft	Lab 04: Development of Xenopus/ Peer Review.	
Th August 2nd	Physiology 1: Overview and Nervous Sys	Chp 28 and 35 (skim)	**Exam 3.1: Mol Bio, Dev Bio**		Lab 04: Development of Xenopus	
Fr August 3rd	Physiology 2: Endocrine, Musculoskeletal	Chp 37 and 38 (skim)	**Exam 3.2: Genetics**		Lab 04: Development of Xenopus/ Paper consult	
Mo August 6th	Physiology 3: Respiratory and cardiovascular system	Chp 39.1-39.5	Quiz 8: Physiology 1 and 2	Final Paper Due	Lab 05: Intro to Statistics	Prelab 5_01 Postlab 4
Tu August 7th	Physiology 4: The Immune System	Chp 43			Lab 05: Completing the final lab report	
Th August 9th	Physiology 5: Nutrition and Digestion	Chp 40	Quiz 9: Physiology 3 and 4		Lab 05: Rat Dissection	Postlab 5
Fr August 10th	**Final Exam**		**Final Exam**		**Final Exam**	

The Ethos of Foundations in Biology: Basics + Inquiry + Ownership = BIO

"Basics" – Biology courses tend to be about what we already know – and at their best, how we came to know it. This is what I call the "basics" – and it is an important part of the whole. But it is only one part, yet Biology courses and textbooks tend to make it the "end all and be all". So, let's say that a mastery of the "Basics" is (only) one goal of this course.

But biology itself is largely about what we don't yet know! Biology courses should therefore embrace this and teach to this as a goal as well. But how? We'll foreground two additional elements in this course. Two points that can in part be summarized by the phrase "The Value of Not Knowing":

"Inquiry" – meaning asking questions and searching for answers, investigating, and working at the edge. Authentic inquiry is really quite fraught and of necessity means a high failure rate. The NY Times, writing about Dr. Eric Wieschaus, 1995 Nobel prize winner in developmental biology, said "Dr. Wieschaus said he was amazed at having conducted experiments that actually worked. 'Ninety percent of the time they didn't work,' Dr. Wieschaus said, a situation that he said was much the same in his current work."

"Ownership" – engagement and self-awareness, making it yours and being responsible for making it yours, knowing what you know and what you don't know. To truly learn something, you must have the ability to know what you know – and to know what you don't know. (Re-read that a few times until it makes sense!) Indeed, it is the latter ability that makes you an expert learner because only by defining the gaps and misconceptions in your knowledge can you work effectively to repair them.

Unfortunately, students expend a lot of energy trying desperately to hide what they don't know: in class, on tests, and even in conversations with peers. How often have you refrained from asking or answering a question in class because you thought you would look dumb? How often have you simply written aimlessly on an exam, hoping that somewhere in the torrent of words, there might be a word or two that would gain you some partial credit? Sigh… These actions are of course just the opposite of what would really help you learn, but they are very ingrained into our nature, and they are often rewarded by teachers who look happy that the class has no questions – or by the stray point or two you pick up on short answer questions when you really didn't know the answer.

We want to change that in this class. We want this class to be a place where you feel supported – and rewarded (note this emphasis) – for exploring the realm of what you don't know and for having the courage to make mistakes. We will truthfully acknowledge that this is probably an easier sentiment to express than it is for me to enable and you to perform. It is easy to support students in learning information, relatively easy for students to learn information, and easy to check to see if students know it. It is harder to support students in learning habits of the mind, equally hard for students to learn how to learn and how to become scientific thinkers, and very hard to assess this process… and in particular to reward failure.

But if we want to have this course mirror authentic scientific practice than we must do that very thing. How can we together transcend the usual practice of staying only in charted waters? We'll need to change a few significant aspects of the course that will likely make it quite different from previous science courses you have taken. Be forewarned… and read on!

Changing Class Habits: The classes will be interactive. It will be a time of active learning, so come prepared to work together in groups to discuss ideas, problem solve, brainstorm, etc. This will be true in lecture and especially in the smaller recitations.

Changing Lab Habits: The labs are very open-ended and inquiry-driven. There will be lots of cutting edge science, lots of opportunity to talk about the science that you are doing, lots of opportunities to design your own experiments, and lots of opportunities to have experiments fail! This will be cool – we promise – but likely very different and a bit unnerving if you have never had this level of freedom and responsibility in a lab before.

Changing Reading Habits: We will work to make the readings an interactive experience by providing Blackboard Discussion Boards as a means to allow you to talk with your colleagues about the information and ideas as you are reading about it. Recitations will also be a good time for talking about your own ideas and questions.

Changing Writing Habits: Writings this semester – for lab and for the research paper – will focus on developing the skills of thoughtful scientific analytical thinking. Get used to thinking hard before you put fingers to keyboard. You will be judged on the strength of your arguments rather than on the conclusions you draw.

Changing Exam Habits: The exams will provide an opportunity – and reward points accordingly – for insightful answers that cogently address both what you are certain about and what you are uncertain about.

We love a quote from Dudley Herschbach, a chemist at Harvard: "In the real science you aren't too worried about the right answer… Real science recognizes that you have an advantage over practically any other human enterprise because what you are after – call it truth or understanding – waits patiently for you while you screw up. … Nature speaks in many tongues and we are all alien. What a scientist is trying to do is decipher one of those dialects. [If a scientist makes progress, we do so] because nature doesn't change and we just keep trying. It's not because we are particularly smart but because we are stubborn."

How to Succeed in Foundations of Biology

Based on previous experience, we know that this course will be very different than many of your previous biology classes. Hence, you may need to take a different approach to your studying. Here is a good list of successful strategies for approaching this course. Not all of them will be right for all students – but some might help you!

Time

How much time should this course take each week? We get asked this a lot, and while it is hard to give a good answer, here are some general guidelines: 2 hours in class + 2.75 hours in lab + 2 hours reading/discussion board + 2.25 hour other work (lab report/research paper/studying) = 4.75 hours in class and 4 hours outside of class = 10 hours total per day. This short intensive class is a full-time job and you should treat it as such. Plan to spend an additional 10 hours on the three days you are not in the class to revise, review and prepare for exams. Sit down with your planner now and set aside blocks of time. Remember that this is a 5-credit course.

Individual v. Group Effort

You'll need to find a balance that works for you between working solo and working with a partner or two. It can often be helpful to have someone with whom you can sort through difficult concepts; this is why you work in pairs in the lab, and converse on our discussion board. But you also want to make sure that you take ample time to think through topics on your own so that you are clear about what you can understand and solve and create with just your own mind at your disposal. Most students find that it is best to think on their own first, figure out what they do and do not know; then use the group to fill in missing knowledge, and finally go back to working on their own to embed the new knowledge deeply.

Course Readings

There is a significant amount of reading in this course. You will be reading ~1-2 chapters a day, or ~40-80 pages. We remember being students in introductory biology course (many) years ago and being frustrated by our textbooks. We found them *fascinating*, but we also know that we often found it *impenetrable and time-consuming*. We compensated by either highlighting all of the information that was new to me (with the result of many soggy yellow pages!) or simply ignoring the book and hoping we wouldn't really need it. Neither was an effective strategy. Let's try to avoid that scenario for you by the following tips:

1. Be clear about why you are reading the textbook. You're likely thinking this is a trick point: that the purpose is obviously to read the material in order to compress it into a set of more compact notes – i.e. that the purpose is to extract the facts. Nope! As lovely as it would be for you to be able to do this, it is pretty much an impossible task. Why? Have you *seen* the size of our textbook?? Do you have any idea how much information is *in* that book? If you read it for the purpose of finding facts, get a shovel… there are thousands of them.

   So, then… why read the textbook? Glad you asked! The primary purpose of reading the book is to give you a first round of exposure to the topics before class – and a place to serve

as a reference after class. We have a lot of ground to talk about in class and move quickly. We also use class as to problem-solve – trying out how well you understand the ideas. If you are encountering ideas for the first time in class, you simply won't be able to keep up.

So how do you know which ideas are the right ones to read and think about before class? Look at the powerpoint slides and see what parts of the chapter will be emphasized in lecture.

3. Skim the chapter before class. You can make more effective use of our time together if you come a bit prepared. This first reading should take you ~30 minutes per chapter. Aim for three goals when you read:
   - Familiarize yourself with the big concepts (what are the main 3 or 4 ideas?)
     - Each chapter starts with a set of Core Concepts. Read them first (or at least the ones that apply to the sections of the chapter you are assigned to read) and think about them until they make at least a bit of sense – i.e. slow down here and take time to think about what those brief sentences really mean.
     - Each chapter ends with a Core Concepts Summary. Read the relevant parts. These first two tasks are your key to identifying the big ideas in the chapter. They provide your roadmap to help you read with a purpose.
     - Make connections to your prior knowledge. Where do these new ideas fit what you already know? How do they surprise you because they don't seem to fit?
   - Take *very* sparse notes. Just enough to put the roadmap down on paper (~1 side of a page). You'll mostly use your class notes for studying, so the primary purpose of the book notes is really just to help you in your reading: many of us have brains that are wired to better understand something if we both read it and write it. Jot down a few big ideas, but mostly write out your questions: what don't you understand?
   - Join the discussion board if you want to do so. Talking about an idea you are working to understand, asking a question about it, attempting to answer someone else's question (even imperfectly or incompletely) is a great way to make your understanding stronger.

4. Come to class. Take great notes! We strongly advise that you print out the powerpoint slides and annotate these for your class notes. This way you won't need to write down what we've already put on the slides for you.

5. That same evening (!) go back to re-read the textbook. Focus in on the parts that we talked about in class. Spend another hour with your textbook now.
   - Flesh out your class notes if you were incomplete in class.
   - Be sure that you are gaining a true understanding of the ideas (not just acquiring factoids) by trying to answer the orange questions and the end of the chapter questions.
   - Make sure you understand the hierarchy of ideas! Use trees to shape your notes.

6. What about LaunchPad? The online support that comes with the text has pros and cons. It's a decent source of fact-based questions to test your knowledge. *But* it doesn't really test your understanding, and that's what is ultimately important in this course. *And* it tests all of the facts from the chapters, whereas we'll be more selective. So, use it carefully.

Conversations
As you read, you'll find that you have lots of questions and some new ideas. Talking about these is the best way to help you reinforce your understanding and clear up points of confusion. We'll provide ample time in lecture, lab and recitation for questions and conversation, but we also want to provide a forum where you can have real-time conversations as you are reading the material.

We've set up discussion forums on Canvas for the various topics about which we'll be learning this semester. If you've got a question or an answer to a question or a new idea or a link to a great website that helped you understand a concept, go to the forum and either join an existing thread about the specific topic or create a new thread if you have a new specific topic. Your professors will read, but not participate in Canvas conversations. Participation in these is not required, but we do strongly encourage you to make use of the forums! Help yourself and help your classmates by being an active forum participant.

Lectures
Class attendance is key to doing well in this course because it is the time we winnow down and work through the volumes of material in the textbook. Be sure to be an active participant in class. It is all too easy in a large lecture to sit there passively and let the ideas wash over you. But then class is largely wasted time from a learning perspective when it should really be among the most valuable time because we have so many minds in one room thinking about the ideas.

- Print out the Powerpoints before class and look them over. They are always up on Bb the day before class.
- Take quality notes on the Powerpoints and/or in a notebook – annotate the figures, use multiple colors, jot down questions/confusions, etc. We strongly recommend that you write – not type – your notes; studies have shown the former to be much more effective as a tool for learning the material!
- Work hard to solve the problems that are sprinkled throughout the class. These problems will be a good way to test your understanding (and they often appear on exams!). If you don't get a problem – or understand the answer – ask a question!

Quizzes
The volume of information introduced in this course is truly daunting. And importantly you will be expected to not only know the material but also be able to use the knowledge. This will require that you spend time reading, thinking, and doing with the ideas of the course on a continual basis and not just in a mad studying frenzy before each exam. So… to give you incentive and to reward your efforts, you'll have 9 quizzes on which you can practice developing your scientific skills. (Hopefully you are by now getting the message that biology is NOT about memorizing facts – it is about thoughtfully tackling new ideas!)

Take the time to do these thoughtfully! Be sure that you can write a solid explanation for each of your answers, even though many of the questions in this format only allows you to submit a T or F; this is great practice for the exam. Seek help if you are truly stuck.

- There will be 9 quizzes, each worth from 15-20 points
- They will be administered via Canvas and are available at 1pm the day of the last lecture covered in the quiz.

- Answer keys will be posted when the quiz is closed, at 10pm.
- Total quiz score is 150 (the equivalent of one exam).
- The last question of each quiz is an open-ended ungraded communication tool, where you can tell me if there is any aspect of the class that still confuses you. Note that this section should not be in lieu of you speaking with me or the TAs to get help.

Research Paper
You will be expected to write a research paper in this class. On Friday, July 14th, you will learn about The Framingham study, and look for news articles based on research done in The Framingham Study. You will then be expected to find the primary paper(s) that the news article references.

More information will be given on Friday July 14th. .

Lab
There is a daily required lab. It follows the subject matter of the classes and will allow you to encounter science much more vividly than you can do via a textbook, to do and think about the process of science rigorously and creatively, to work collaboratively with your peers, and to write effectively about your research. Lab here is not about getting the right answer or 'finishing'. A well-done experiment may provide insight (never answers) but usually just raises more questions. The entire concept of completion is really anathema to research.

Our goal is for you to slow down/observe, be rigorous/creative, think/do, write/reflect. Don't stress about how far or fast you are going. But be sure to think carefully about everything you are doing as you move along. Your lab papers need to demonstrate the quality of your thinking and how well you understand what you did, why you did it, and what you learned from it (about the science and your scientific process). Write your lab papers to be understood by a peer.

One really important trick is to think of the lab as a 3-hour review session. We have carefully designed the labs to illuminate many, many of the big ideas in lecture. So, as you work in lab, slow down and keep trying to relate what is happening in the test tube (or under the microscope or on the gel) to the underlying concepts. It is a great way to practice applying your knowledge.

You will be ably assisted by our specially-trained cohort of TAs. Your TA will have primary responsibility for mentoring you and evaluating your work, but I provide strong oversight. Any questions/concerns about the lab should be brought to their attention.

Writing
Both your Lab Papers and your Research Paper are opportunities for you to work on your (scientific) writing skills. Your grade will be largely dependent on how well you communicate your ideas – and that is in turn largely dependent on the quality of your writing. Quality of writing refers to the mechanics, the rhetoric, and the process. Details about writing goals are in the "Writing Goals" pages at the back of this document. If you struggle writing, we recommend you visit the *Writing Center* (http://writingcenter.georgetown.edu/).

General points to keep in mind when writing:

- Have something to say. Be selective in what you choose to say. Put your main message(s) up front in your writing – in the form of thesis statements and topic sentences.
- Remember your audience. Your writings should be aimed at a peer who is unfamiliar with the specifics of your topic. Write to teach them.
- Organize your arguments. The goal of your writing is to support your message. You can discern your organization best post-writing by creating a quick and dirty outline from your writing: does that outline seem logical?
- Revise your writing. None of us has ever written something well the first pass through. Proofread with the goal of eliminating 20% of what you wrote the first time and restructuring the rest! Tighter writing is always better writing. And please double-check grammar, punctuation and spelling. If you are sloppy with these, you are likely sloppy with your science, too.

All work done in connection with this class must adhere to the rules of the Georgetown honor system. As *responsible scholars*, you are expected to properly reference at all times. Proper citations include a notation within the text and a reference list at the end of the text.

Your job as a *responsible scholar* is to critically evaluate your sources to be sure you are using only the highest quality information in your writing. This is particularly challenging with the vast proliferation of on-line material (see below for specific help with this topic) but is true of all sources. Just because it is published, doesn't make it true. Some tips:

- Read with a critical eye – Can you find the same information elsewhere by a different author? Do you see gaps in the logic? Is the information fully cited or are the data presented in the source? Does the author have a bias?
- Read with a creative eye – What can you do with the new ideas that you have just read? Does it lead you to new research? Does it lead you to re-evaluate your research question?
- Be certain that you have dug down to the origin of the information and are citing it properly – You should not be citing from a source if it is in turn only citing that information from another source. Be sure to find the original source for the information, read that and then cite it. Information can get blurred when it is handed down too often (like playing telephone as a kid). This is especially true with information on the web.
- Be cautious with on-line sources – It is a remarkable how much information is now readily available at a click of the computer button. It is also dangerous how much false information is readily available at a click of the computer button. Check out this link for a really good resource on evaluating on-line sources: http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html
- A note on Wikipedia. Everyone loves Wikipedia. I love Wikipedia. I use Wikipedia. BUT Wikipedia is not a peer-reviewed or professionally or impartially edited source. It has errors (like everything) but it also has bias from its authors. Use it with care and only as a starting point for further research! It cannot be your final citation for information!

Within the text citations:
Scientists do not typically use quotations within papers. They rethink and rewrite the information *in their own words*. You should do the same. Regardless of whether you use another person's words or just their thoughts, you need to cite them. Please do not use footnotes!

Within the text citations should be as follows:

Journal article:

Single author (author last name, year)
Two authors (author last name and author last name, year)
Three or more authors (author last name, et al., year)

Book:

As above, but be sure to include page numbers.

For example: *Others have recently shown that numerous enzymes are active at low temperatures; importantly, but not surprisingly, this is particularly true of enzymes found in psycrophiles (Smith, et al., 2010).*

End of text references:

These should be listed by author, in alphabetical order, exactly as shown below. If you cite from our textbook you must reference, too. Examples of proper references are given below. Follow the capitalization and punctuation precisely! Italicize all Latin names!

- Article in a journal: Sondheimer, N., and Lindquist, S. (2000). Rnq1: an epigenetic modifier of protein function in yeast. Mol. Cell 5, 163–172.
- Article in a book: King, S.M. (2003). Dynein motors: Structure, mechanochemistry and regulation. In Molecular Motors, M. Schliwa, ed. (Weinheim, Germany: Wiley-VCH Verlag GmbH), pp. 45–78.
- An entire book: Cowan, W.M., Jessell, T.M., and Zipursky, S.L. (1997). Molecular and Cellular Approaches to Neural Development (New York: Oxford University Press).
- For on-line sources, give the title of web site, author or editor, organization responsible for the site, date of site's publication or date of last update, date of access, and the url. A regular scientific journal article accessed on-line is an article, not an on-line source!

Exams

All exams will be cumulative. This means that while the questions on each exam will focus on the most recent material, you will be expected to be able to integrate ideas throughout the semester. Each exam question will be written so that you can describe what you know and what you don't know about the answer. You will gain credit for accurate accounts of both, though you can only achieve full credit by actually knowing the answer.

The exams are designed to take 60 minutes. If you require extra time on exams or special testing conditions, please be sure to see the *Academic Resource Center* (3rd floor Leavey Center) to complete the required paperwork.

If you cannot take an exam on the designated day, you must get permission in advance from Prof. Chan to take a make-up exam.

Exams will be returned soon after you have taken it. If you disagree with the grading of a question, you must submit a written request for a re-grade.

- Your request must clearly explain why your answer merits more credit than it received.

- Re-grade requests must be submitted in lecture by the day after your exam was returned.
- You should know that a re-grade request opens the question to a fresh assessment. The result may be an increase or a decrease in the grade.

The FINAL EXAM is scheduled from 8:15-10.15 am on Fr Aug 11th. <u>You must be in attendance to take the exam</u>.

<u>Studying for Exams</u>

1. *Look ahead.* Exams from previous years are available on Canvas. At the very beginning of a new unit, look at these exams. This will help make the finish line clear.
2. *Repeated exposure* to the material – even if brief – is better than trying to study all at once before the exam. This is especially important on exams that ask you to apply your knowledge. So, try this as a weekly pattern:
   a. *Briefly read the text* the night before class and jump into the Bb conversation.
   b. *Attend class* and be an active participant.
   c. *Look over the notes/slides/textbook* that evening. Fill in gaps in your notes. Be sure you are clear on the BIG ideas. Write down questions you need to get answered.
   d. *Complete the problem set* that week. This will give you an opportunity to really try to use the ideas when solving new problems.
   e. *Review the day's material the previous night*. One very useful technique is to organize the information from the week into a tree or flowchart of ideas; this will help you organize the information and to be clear on what are big, medium, and small ideas in each topic.
   f. *Apply your knowledge in lab*. We've worked hard to align class and lab. Use this to your advantage and think in lab! Try to apply new ideas, vocabulary, etc.
3. *Practice problem solving*. The exams are all about applying your knowledge. So… when you study, be sure to continually test the depth of your understanding. How? Rework the questions in the text, the questions at the end of the chapter, the questions we did in class, the questions from the quizzes and recitation. And you can make up new questions by just extrapolating a bit beyond the questions you already have in hand; tweak the scenario and see if you can figure out the consequence: what would happen to a cell without telomerase? without a peroxisome? Why would a cell need twice as many mitochondria? What if DNA polymerase was less accurate? What if…?
4. *Practice writing out your explanations*. Thinking about ideas to yourself and expressing them concisely in written form are different skills, and you need to practice the latter to do well. Note that we do NOT use the term "answer" here. Ironically, one of the worst things you can do when you see a new question is to immediately say "Aha! I've got *an* answer!" This is because a good "answer" is really all about the explanation. We often don't give much or any credit for just the answer alone! What earns you credit is the explanation.
5. *Use bullet points to build these explanations*. Use bullet points as a quick way to organize your explanation into a set of coherent and connected ideas. Think of each bullet point as one part of the full explanation. If you add the bullet points up, they should equal the answer!
6. *Emphasize class notes when studying*. It is simply impossible for you to learn all of the information in the textbook. Reading through it is important to give you a brief exposure to the full breadth of information, and reviewing it can help clarify concepts form class. But

what you will be held responsible for on exams is what we talk about in class. So when you study, don't go back to re-read the chapters. Focus on understanding the material we talked about in class (the book can help you do this) and applying that material.

7. *Make sure you know the theory behind your lab work.* Lab exists in part to reinforce the theory behind the scientific principles we discuss in class. Do include it in your studying.
8. *Study in small groups* but be sure to let everyone in the group try to answer a problem independently before you share ideas. This is the way to gauge your own understanding.
9. *Get extra help.* I am available! Ask for extra help, please!

Test-Taking

1. *Get sleep the night before and eat something for breakfast*. Your brain works better when it is well-rested and well-fed. Really.
2. *Pace yourself*! Stick to the time recommendations so that you don't overwrite for the first problems and run out of time at the end! Don't get too hung up on problems that confuse you and don't focus too much on the problems with which you are comfortable.
3. Students struggle to provide the right level of detail in their answers. So pretend that your audience on the exam is an imaginary peer who missed that day of class. They know a bunch of biology, but they need the steps of the answers spelled out for them, and don't clutter their thinking with extraneous ideas!
4. Use the same bullet point idea as you did when studying. Try this idea:
   a. *Read the question* carefully (including the title) and underline important terms.
   b. *Stop and brainstorm* for 30 seconds. What ideas come to mind that you think you want to include in your answer?
   c. *Write these down as bullet points* with some space in between. Then write a sentence or two next to each bullet point. You don't even need complete sentences – just complete thoughts! Quick pictures are good, too.
   d. *THEN – and only then – think of your answer by connecting the dots.*
   e. *Move on* to the next question and the next and the next…
   f. *Go back* with the extra time to reread your answers and flesh them out as needed.
5. If you don't know an answer – or can only get partway to an answer – don't panic. Put down the bullet points of what you do know, and then with your last bullet point try to be as specific as possible about what you don't know that is preventing you from answering fully.

Honor Code
Georgetown's honor code prohibits academic dishonesty – including cheating, plagiarism and false citations – and I must report any suspicion of plagiarism to the Honor Council. To quote the Honor Guide:

(1) "Cheating is the use or attempted use of unauthorized materials, information, study aids, or unauthorized collaboration on in-class examinations, take-home examinations, or other academic exercises." Cheating is an honor code violation for both the giver and receiver of information. I will be quite specific when collaboration is encouraged/required; if it is ever unclear – ask! Do not make assumptions. On all assignments, provide the name of all students who have contributed intellectually to the assignment.

(2) "Plagiarism is the act of passing off as one's own the ideas or writings of another." and "False citation is the attribution of intellectual property to an incorrect or fabricated source with the intention to deceive." Follow the rules described in the citations section.

To be clear about how we are vigilant about academic dishonesty:
(1) All bookbags and backpacks, cell phones and other electronic devices will be left at the front of the exam rooms. You will keep only two pens with you for the exam.
(2) All exams will be photocopied before they are returned to you.
(3) All written work may be submitted to Turnitin.com.

We have come across several instances of plagiarism in my time at Georgetown, and several points worth noting have emerged: (1) Plagiarism typically results from last minute pressures to complete an assignment. Work ahead of schedule! (2) Boundaries between collaborative and individual work can seem blurry. We will try to be clear, and you should be sure to ask when you are uncertain. (3) Plagiarism is remarkably easy to detect. Really. (4) All experiences with the Honor Council have been thoughtful and respectful – yet uncomfortable for all involved.

As Rick Pitino once said "When you have a problem, if you tell the truth, the problem becomes part of your past. If you lie, it becomes part of your future."

IF you find yourself "stuck" (e.g. desperate about a deadline and seeing no option but to take a "short-cut"), just relax. Keep working. Write to Prof. Chan, and your TA to alert us that you will be turning in the assignment late. Then, we can work together to help you finish your assignment promptly and thoroughly. No grade is worth sacrificing your integrity.

To learn more about the Honor System:
http://gervaseprograms.georgetown.edu/hc/honor_system.html
If you are unclear what constitutes plagiarism, please read:
http://gervaseprograms.georgetown.edu/hc/plagiarism.html

On all lab papers, research papers, and exams*, you must sign the University Honor Pledge:
In the pursuit of the high ideals and rigorous standards of academic life,
I commit myself to respect and uphold the Georgetown University Honor System:
To be honest in any academic endeavor, and to conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.

Sexual Misconduct

Please know that as faculty members we are committed to supporting survivors of sexual misconduct, including relationship violence, sexual harassment and sexual assault. However, university policy also requires us to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct. Georgetown has a number of fully confidential professional resources who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. More information about campus resources and reporting sexual misconduct can be found at http://sexualassault.georgetown.edu