



Biology 113
Winter, 2007
OSU-Mansfield Campus
Stephen T. Abedon
abedon.1@osu.edu

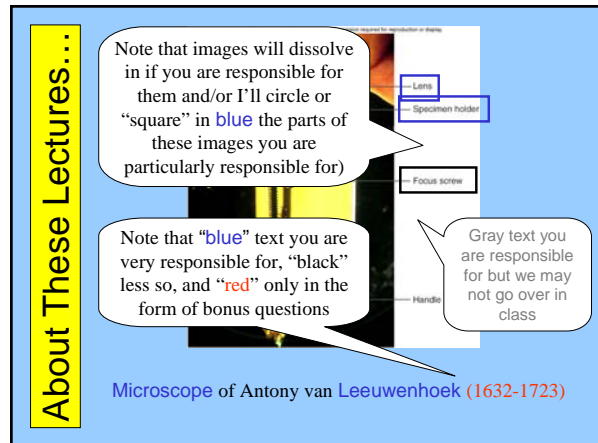
Can you read this?

If you can't read this then you really ought to move to a new seat!

How about now?

If you can't read this then you really ought to move to a new seat!

About These Lectures...



Note that images will dissolve in if you are responsible for them and/or I'll circle or "square" in blue the parts of these images you are particularly responsible for)

Note that "blue" text you are very responsible for, "black" less so, and "red" only in the form of bonus questions

Gray text you are responsible for but we may not go over in class

Microscope of Antony van Leeuwenhoek (1632-1723)

Bio 113 Basics

How to do well:

- Conscientiously read your text before lectures
- Learn from your text, use PowerPoint presentations (i.e., lectures) to help limit what you need to learn; There's a lot we won't cover
- Don't make lectures the first time that you see new material—see it first in your text
- If at test time you are thinking "nobody could possibly learn that many terms", then you probably also don't understand the material
- Tests will measure both your understanding and your success in memorizing the material

❑ Lecture PPTs (and schedule) may be found at... www.phage.org/lectures

More on Doing Well

- ❑ Here I provide a general overview on what it takes to do well in this course
- ❑ Note that these concepts are applicable to more than just Bio 113
- ❑ They also have a "Duh" quality to them, but they do need to be stated explicitly lest you approach the first exam thinking otherwise
- ❑ To do well, you need to have at least one of the following qualities:
 - ❑ You need to have a really great memory, or
 - ❑ You need to put in a great deal of time, or
 - ❑ You need to have taken the time to learn from your previous biology classes (especially as presented by the text versus as required by the instructor), or
 - ❑ You need to enjoy the material, i.e., to the point where you are willing to study enthusiastically
- ❑ Prepared or otherwise, it also wouldn't be such a bad thing for you to not freak out come exam time

Important Point:

Questions are Great!

But notes are on line and most of the material comes from your text, so please...

Don't Ask the Class to Slow Down for the Sake of Your Note Taking!!!

Another Important Point:

If you have trouble understanding lecture material...

Then try reading your text before attending lectures!!!

(And please take the time to read it well!)

When e-mailing, please use a meaningful subject heading!!!!

If you still have trouble then you need to make an appointment to see me

Bio 113/114

- ❑ **Bio 113 considers**
 - Biology at or below the level of the Cell (units 1 & 2)
 - Genetics (probability theory/problem sets) (unit 3)
 - Developmental Biology (only a bit during one lab but see chapters 21, 38, & 46 if you have a strong interest in this material)
- ❑ **Bio114 considers**
 - Biology at or above the level of the Individual Organism (units 4, 5, & 8)
 - Evolutionary Biology (unit 4)
 - The Diversity of Life (unit 5)
 - Ecology (unit 8)
- ❑ We won't be covering details of plant or animal form and function (units 6 & 7)

Bio 114



Bio 113



Surviving Bio 113

- ❑ You can study anything you like, but let the PowerPoints guide you toward what you need to know for exams (i.e., see www.phage.org/lectures)
- ❑ Study your biology daily; Memorize material; Seek to understand what is going on; If you don't have a strong understanding then you will not do well in this class
- ❑ The above is **the** most important thing for you to understand if you intend to do well in this course!
- ❑ Don't forget to read your text (and read it well), and attend lectures; Memorization is one thing, but if you don't understand the material, then you are doomed!

In this class you will work hard, you will begin to learn biology/how to be a biologist, and you will learn how to succeed in subsequent majors science courses.

Caveats

- ❑ Some will take this course without a reasonable background in biology and may be better off taking Bio 101 first
- ❑ Some will have already have taken Bio 101 but will underestimate how much more difficult Bio 113 is compared with Bio 101
- ❑ Some will be coming from Chem 121 but will not understand how learning Chemistry is different from learning Biology
- ❑ Some will have a poor background in chemistry and this will make it very difficult to understand what is going on in Unit 1 of your text
- ❑ Some are capable of doing well in Bio 113 but nevertheless are unprepared to devote the time (and energy) necessary to do well
- ❑ Some may be capable of doing well in Bio 113, but this may be their first exposure to a major's science course (in college)

So Much Bio, So Little Time

- ❑ To do well, most of you should be studying biology five or six days/week, with a minimum of about 20 hours per week devoted to Bio 113 (10 hours for every time we meet!)
- ❑ You need to have learned the material well in advance of studying for the first exam (week 3)
- ❑ You must take the time to learn and understand the presented material before we (rapidly) move on to the next topic
- ❑ This course covers ~20 chapters in 10 weeks; That's 2 chapters/week (duh ☺), more than one per day; You must become very familiar with a chapter before we move on to the next one
- ❑ (note: this is kind of like teaching the Chem 121-123 series in two quarters rather than three)
- ❑ If you don't learn today the material covered today, then when will you learn that material?

Course Structure

- ❑ Grading:
 - 3 midterms (200 points each x 3 = 600 points)
 - 2 lab exams (100 points each x 2 = 200 points)
 - 1 final exam (150 points comp + 150 points non-comp = 300 points)
 - 600 + 200 + 300 = 1100 points
- ❑ Extra stuff:
 - Reading and/or lecture quizzes
 - "30% rule" on all exam questions
- ❑ See syllabus for details:
 - www.phage.org/school_syllabus.htm

I'm Imploring You!

- ❑ Get on top of this course early in the quarter, e.g., by the end of the first weekend
- ❑ Ten (three!) weeks go by very (very) quickly
- ❑ If you wait three, two, or even one week before realizing that this course is going to be very time consuming, then it may already be too late for you to catch up!
- ❑ This goes particularly for those of you who did not earn A's in Chem 121 and do not have strong backgrounds in biology
- ❑ But watch out even those of you who did/do

In this class you will work hard, you will begin to learn biology/how to be a biologist, and you will learn how to succeed in subsequent majors science courses.

I Really, Really Mean It!

- ❑ Study for the first exam in Biology 113 as hard and as well as you have studied for any exam, ever
- ❑ The best time to begin studying for that exam is today!
- ❑ Don't delay! Buy now! This deal won't last. And if you order right now...
- ❑ I once had a student who said that she never studied for the first exam in any course. "I mean, what if I studied and I didn't have to? Wouldn't that be a waste of time?"
- ❑ Don't be that student!!!!!!!

In this class you will work hard, you will begin to learn biology/how to be a biologist, and you will learn how to succeed in subsequent majors science courses.

Succeeding in Bio 113

1. Exam questions are guided by PowerPoints; *study* material that has nothing to do with PowerPoints and and you are not being efficient
2. Reading is not necessarily the equivalent of studying
3. Putting in more time is not necessarily as important as studying well, efficiently, or effectively
4. You are not putting in a lot of time in until you are putting in excess of ~20 hours/week to studying biology/attending class and lab
5. If you don't learn/understand the material before going on to the next topic/material, then when will you learn the old material?
6. Organizing the material is not equivalent to studying for the exams (though certainly it helps you prepare for studying)

Succeeding in Bio 113

7. If you want to do well, you must learn the majority of the material really, really well
8. Try triaging, i.e., concentrate on learning and memorizing that material that (a) you don't know/have memorized and (b) have some reasonable probability of learning
9. Part of studying for the exam should involve IDing that material to concentrate your studying on
10. If you can't at least make a reasonable attempt at knowing the material to the point where you can recite it from memory, then you are not doing an adequate job of studying for an exam
11. Don't put off learning the material until the night before the exam
12. Studying is not easy, no way, no how (and that's why you get summers off)

What is Biology? (a)

Consistent with how majors' biology is taught in Columbus and at other universities, a lot will be demanded of you in this course. I will cover what may appear to be an overwhelming amount of material, and I will not simply give away A's and B's. This is not a consequence of my being particularly mean or nasty. Instead it has to do with what it takes to learn biology.

What is Biology? (b)

The majority of students who take this course do not intend to become professional biologists. Instead, this course serves as a required introduction to biology for a variety of majors and pre-professional programs. Even though non-biology majors may be in a majority in this class, I nevertheless will be teaching this course as though all students present intend to continue on in biology, in one form or another, whether that will be as health professionals or whatever. That is, this course will *not* be tailored specifically to the needs of your major, but should be useful to you regardless.

What is Biology? (c)

In this course, you will be exposed, perhaps for the last time, to the breadth of biology, before your specializing in one or more of its aspects. Thus, we will cover topics you will return to in subsequent courses; you will be exposed here to some aspects of your major, perhaps before your committing completely to that degree program. We will also cover topics you ultimately will have less use for. As I present these topics, whether you find them "relevant" or not, I will assume that all topics covered are equally important to your understanding of biology.

What is Biology? (d)

I will also assume that your departments require that you take a majors' biology course, rather than a non-majors course, because of an expectation that you will be exposed to introductory biology with a majors' rather than a non-majors' level of rigor. Thus, I will be teaching this course as though I were teaching an introductory majors' biology course to a room full of biology majors.

What is Biology? (e)

That means that for you to succeed in this course you must act like an individual who is majoring in biology, rather than as an individual for whom introductory biology is an otherwise irrelevant side issue to your ultimate career (or life) goals. At the very least, you should expect that showing significant enthusiasm (and respect) toward the discipline of biology will be a great aid toward your eventual success in this class.

What is Biology? (f)

So what is biology? For many of you, biology represents something that you watch on the Discovery channel. A bunch of animals (and plants) interacting, with great graphics and lots of excitement. For some of you, biology may have something to do with your staying healthy or excelling in sports. For others, biology represents one step down a road toward a career in the health sciences. Perhaps you care very much about the natural world and want to use an understanding of biology as a tool to clean up the biological disaster we humans, in all of our biological glory, have brought forth upon this planet. All those things are biology, and much more.

What is Biology? (g)

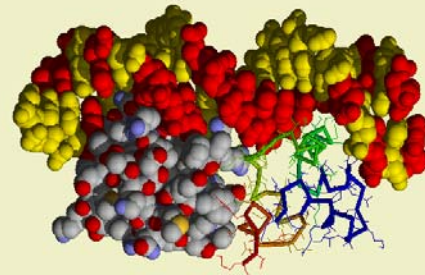
Much more? Yes, much, much more! Biology is huge. It exists as an enormous collection of applied sciences (medicine, pharmacology, bioengineering, agriculture, resource conservation, etc.) and less-applied sciences (evolutionary biology, ecology, non-medical genetics, etc.). It even includes, or at least underlies, things you might not think of as biology such as psychology, economics, marketing, and ergonomics. Biology also encompasses a great deal of chemistry. Many aspects of biology you might even consider applied chemistry. Just as the basic principles of chemistry are derived from physics, many of the basic principles of biology are derived from chemistry (and from physics as well).

What is Biology? (h)

But while physicists like to study very simple systems and chemists like to complicate things just a little, biology is the study of systems possessing literally incomprehensible complexity. Consequently, physics is sufficiently easy that much of what goes on may be described mathematically. You may balk at the math, but imagine how difficult physics would be if you could not describe physical processes mathematically. Chemistry, too, can be handled at even the introductory level using various mathematical tools (and the periodic table of elements if one of the most awesome syntheses of ideas yet achieved by man). With biology you have few such luxuries.

What is Biology? (i)

Phage CRO Repressor on DNA. Andrew Coulson & Roger Sayle with RasMol, University of Edinburgh, 1993



What is Biology? (j)

Typically in biology, things are imperfectly understood and far too complex to allow mathematical manipulation (though certainly there are exceptions, which we shall consider). An inability to use math means that in biology there is far-less potential to derive answers from simple components. Consequently, there is a huge requirement that you simply memorize concepts along with the terms associated with their descriptions.

What is Biology? (k)

Then, and here is the worst part of all, these concepts or even terms are typically imperfectly understood. Thus, even memorizing pat definitions usually will not equate with actually understanding what is going on. You have to immerse yourself in the science before understanding happens. To actually do biology, you will also be expected to apply these memorized concepts to novel situations, over and over and over again.

What is Biology? (l)

If you start with a very broad, incompletely understood, term- and concept-laden field, and then design a rigorous survey course to introduce it, you have all the ingredients for a recipe of information overload. Moreover, I am not going to attempt to completely protect you from either information overload or ambiguity in this course. Both are basic characteristics of the science of biology. If you have any desire to continue in biology, whether as a major or in a related field, you will have to come to terms with both information overload and ambiguity.

What is Biology? (m)

I've had to come to terms with this, and will continue to have to since, minimally, preparing for lectures I must confront information overload, ambiguities, and an incomplete understanding of concepts each and every day. (And that does not even begin to address the difficulties involved in doing research.) Nevertheless, the breadth and complexity of biology actually is the fun part, something certainly to always respect, but also something which means you will never run out of interesting questions or problems. Indeed, if I wanted easy problems, I wouldn't be a biologist (and, chances are, you wouldn't be studying biology).

What is Biology? (n)

Operationally, information overload means that we will cover more material, you will be responsible for more details, and I will expect you to understand concepts better than many of you will prefer, or, indeed, are prepared to do. *It means that when you sit down in front of the first exam you may be completely blown away by the dissonance between your usual studying strategies and that necessary to excel at majors' biology.*

What is Biology? (o)

Especially excel to the point where you are able to answer all questions on all exams. It means that those of you who are perfectionists, but who do not have a superlative ability to memorize, as well as derive and understand, are not going to achieve 100s on exams, no matter how much studying you do. If you must be perfect to satisfy some inner demon, and you are not exceptionally bright, you are going to be frustrated by biology because there are always going to be 2000 nuances, concepts, or details that you won't even be aware of. In short, your expectations of what biology is all about and what biology really is all about probably do not fully correspond.

What is Biology? (p)

For those of you who are planning on going on to medical school, think of introductory majors' biology as medical-school lite. There is only a quantitative difference in intensity, not a qualitative difference. In particular, if at this level you cannot figure out how to deal with information overload, ambiguity, and not being able to know or understand everything, then you are not going to be able to deal with these problems at higher levels (e.g., organic chemistry, biochemistry, etc.).

What is Biology? (q)

Furthermore, if you really are serious about going to medical school, you should be able to excel in this course or at least learn how to excel at it. I certainly will not be setting things up so that nobody can earn an A. Therefore, if you think you have what it takes to go on to medical school, you should also have what it takes to earn an A in introductory biology. No excuses, just do it.

What is Biology? (r)

No doubt I've now managed to scare many of you to death. And many of the rest of you may be saying, "What a jerk" (*expletive deleted*). Of course, if biology is that bad, then nobody would study biology, right? Well, right. The truth is that biology is not impossibly hard, just harder than many of you realize. To succeed, all you are going to have to do is to get on top of the material as early as possible in the quarter, and then stay there.

What is Biology? (s)

The only sure cures for information overload are organization and conscientious determination to learn the material. The best piece of advice I can give, as well as the one most likely to not be taken sufficiently seriously, is that if you wait until after the first exam to get serious about this course, you are going to have a much (much, much, much) harder time than if you start getting serious today.

What is Biology? (t)

To succeed at biology, just as in chemistry or physics, you are going to have devote time to learning a core of language and understanding, well before sitting down for your first biology exam. It is upon this core that you will be building when you actually start studying for an exam. One does not study for biology in the same manner as for chemistry or physics, however. This is because problem solving is not quite as central to biology as it is to chemistry or physics. For many individuals, especially those who are better memorizers than problem solvers, this means that biology can be an easier science to learn than either chemistry or physics.

What is Biology? (u)

However, in biology you will lack the crutch of routinely assigned problem sets. In chemistry and physics, these problem sets force you to think about and do these sciences on a regular basis. In biology there typically exists no mechanism forcing you to study regularly. Consequently, many are shocked, when they finally sit down to study for exams, at just how much material there is to learn.

What is Biology? (v)

This, however, does not mean that biology is impossible. It simply means that, just as with chemistry and physics, the key to success in biology is to spread out your studying rather than saving it all for just prior to the exam. (Hint: If you are putting off doing your physics and chemistry problem sets until just before the exam, then you are attempting the scholastic equivalent of running a marathon without first getting into shape, with, in most cases, predictable results.)

What is Biology? (w)

In biology, your core of knowledge will mostly consist of memorized concepts (*genetics, however, will also involve assigned problem sets*). What you build onto this core while studying for exams will also consist of memorized concepts. Consequently, unlike in chemistry or physics, you are going to have to invent, by yourself and for yourself, ways to learn this core of knowledge. The easiest way to do this is to carefully copy your notes after each lecture, making sure as you do so that you fill in any missing information by consulting your text, your classmates, or me.

What is Biology? (x)

That way you will develop a working knowledge of the material, your core. Then the material that you need to completely memorize for the exam will be much-less overwhelming. Again, everybody who has a desire to excel in biology must come up with a means by which they deal with information overload. It is up to you to implement a strategy that works for you. Furthermore, there is nothing more pitiful than watching someone attempt to cram, at the last possible moment, an entire quarter's worth of biology into his or her mind for a comprehensive final exam. I know it cannot be done. If you don't know this already, I can guarantee that you will learn, the hard way, when you take that final exam.

What is Biology? (y)

In short, biology is a difficult subject and may be unlike any you have encountered before. I can play some role in limiting the amount of material you are responsible for learning and I can explain and then re-explain again the nuances of difficult concepts. What I cannot do is to force the information, day after day, into your brain, or change ineffective study habits into effective ones. Only you can do that.

Your text puts much of the above this way:

What is Biology? (z)

"In some ways, biology is the most demanding of all sciences, partly because biology is a multidisciplinary science that requires a knowledge of chemistry, physics, and mathematics. Modern biology is the decathlon of natural sciences. If you are a biology major or a pre-professional student, you have an opportunity to become a versatile scientist. If you are a physical science major or an engineering student, you will discover in the study of life many applications for what you have learned in your other science courses. If you are a nonscience student enrolled in biology as part of a liberal arts education, you have selected a course in which you can sample many scientific disciplines. And of all the sciences, biology is the most connected to the humanities and social sciences."

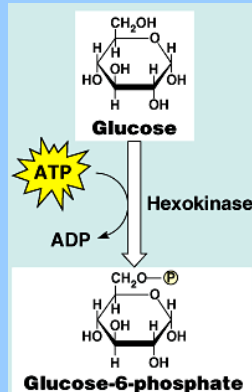
What is Biology? (!)

"No matter what brings you to biology, you will find the study of life to be challenging and uplifting. Do not let the details of biology spoil a good time. The complexity of life is inspiring, but it can be overwhelming."

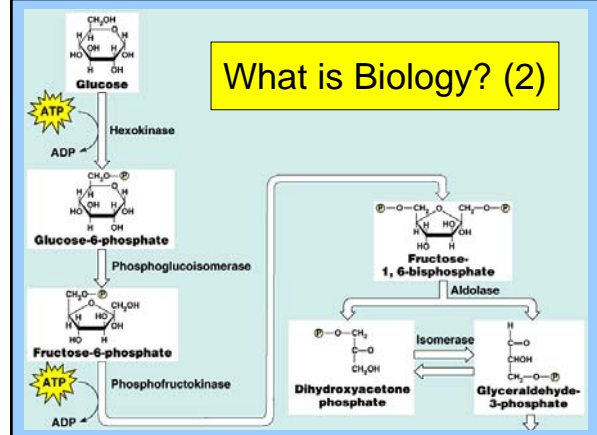


Typically half of my students in bio 113 don't earn a C- or higher—don't be one of those students!

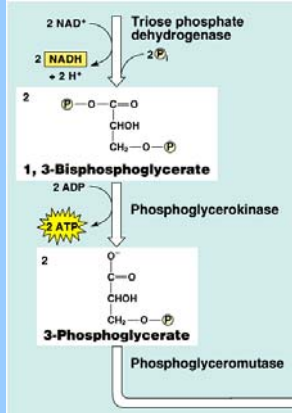
What is Biology? (1)



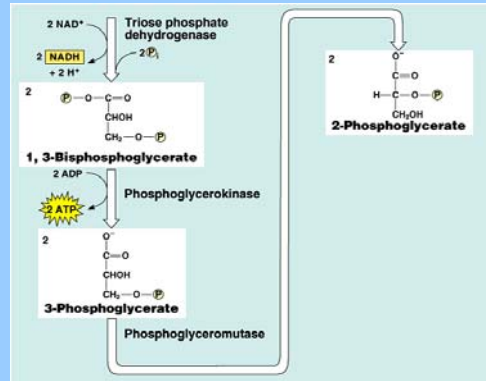
What is Biology? (2)



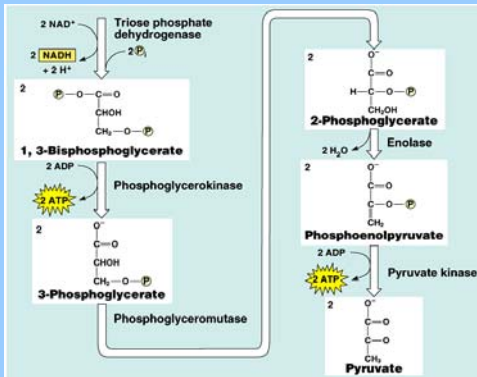
What is Biology? (3)



What is Biology? (4)



What is Biology? (5)



Our First Lab

- ❑ Please read the assigned laboratory exercise before showing up for lab; see laboratory schedule for the assignment
- ❑ Ultimately you will be tested in labs on your knowledge of your lab text; the lab exams (2) will be open book
- ❑ I am looking for a conscientious participation in lab in which you read and following the directions in your lab text; answer all questions except those I indicate not to (in lab schedule)
- ❑ Don't blow off labs; earning the points associated with the lab portion of this course will require that you successfully engage your brain, as well as your body, during laboratory periods
- ❑ Our first lab, however, will be a particularly weird one, consisting mostly of my lecturing

The End

