

Syllabus: Introduction to Biological Sciences 111a (BSCI 111a)

Schedule of Experiments

Week of:	Experiment
Aug 25-29	1 Introduction to Laboratory Techniques and Spectrophotometry Experimental Design Project Description.
Sep 1-5	2 Amino Acids and Protein Structure
Sep 8-12	3 Introduction to Scientific Writing and Statistical Concepts
Sep 15-19	4 Experimental Design
Sep 22-26	5 Enzyme Kinetics: Measurement of Succinate Dehydrogenase Activity
Sep 29-Oct 3	6 Infrared Gas Analysis of Photosynthesis and Respiration in Plants Introduction to the Molecular Biology experiments
Oct 6-10,13-17	7-8 DNA Structure, the Central Dogma of Molecular Biology, and the Polymerase Chain Reaction
Oct 27-31	9 Bioinformatics
Nov 3-7	10 Recombinant DNA I - Restriction Endonucleases, Plasmid Vectors, and Agarose Electrophoresis
Nov 10-14	11 Recombinant DNA II - Ligation, Transformation and Restriction Mapping
Nov 17-21	12 Recombinant DNA III - Plasmid DNA Miniprep and Restriction Analysis
Dec 1-5	13 Biological Sciences Research Lab Tour

Note: goggles are required for experiments 5 and 11 only.

There is no class during the weeks of October break (Oct 20-24) and Thanksgiving break (Nov 24-28).

Syllabus: Introduction to Biological Sciences 111a (BSCI 111a)

Overview

I. General information

- A. Course goals
- B. Who's who
 - 1. Instructor
 - 2. Teaching assistants (TAs)

II. Assignments and grades

- A. Types of assignments
 - 1. Prelab assignments
 - 2. Problem sets
 - 3. Tests
 - a. Format of tests
 - b. Schedule of tests
 - c. Suggestions for preparing for tests
 - 4. Participation
- B. Grades
 - 1. Grading rotation schedule.
 - 2. Dropping the lowest grade.
 - 2. Calculation and weights

III. Course Policies

- A. Absences
 - 1. Policy on excused absences.
 - 2. Late work
 - 3. Procedures associated with rescheduled or missed labs
- B. Regrade requests.
 - 1. Who graded my paper?
 - 2. Can I appeal this regrade?
- C. Safety rules.
- D. Other requirements

IV. Application of the Honor Code in BSCI 111 lab

V. Frequently asked questions

- A. Where are the class data?
- B. Where are the answer keys?
- C. Why do I only get one hour of credit for three hours of lab time per week?
- D. This lab is supposed to go along with lecture. Why doesn't it correspond more?
- E. Why is the majority of my grade from tests?
- F. Why are the tests so hard?
- G. I have an accommodation from the ODC. What should I do?
- H. Can I use the computers and printers in the lab?

I. General information

A. Course goals

1. *To provide students practical experience with important methods and techniques of modern biology.* We try to coordinate our experiments with the topics in BSCI 110 to allow you to actually do things that you learn about in lecture.

2. *To introduce students to the fundamental principles of experimental design and statistical analysis.* It is our goal to give you the opportunity to function as a scientist. This means participation in the actual scientific process of literature review, experimental design, data collection, statistical analysis, and scientific writing.

3. *To increase students' ability to use the higher-order thinking skills of application, analysis, evaluation, and synthesis.* Most students enter BSCI 111 with excellent knowledge and comprehension learning skills. However, as a scientist, physician, engineer, or other professional, you will routinely have to use higher order thinking skills. Through experiences in this course, you will be given the opportunity to apply the skills of **application** (e.g. performing calculations and statistics), **analysis** (e.g. experimental design), **evaluation** (e.g. hypothesis testing), and **synthesis** (e.g. through writing up the results of your research). You will also be required to use these skills on tests because many questions will go beyond knowledge and comprehension.

B. Who's Who

1. Instructor Dr. Steve Baskauf

How to contact him:

office: 2128 Stevenson Center

office hours: Monday and Friday 10:30-11:45 AM

email: steve.baskauf@vanderbilt.edu

phone: 3-4582 (email preferred and more reliable)

Where to find him:

I am generally in the laboratory area during all of the scheduled laboratory times (every afternoon and Tue & Thu mornings). During much of this time you can look me up in the lab if you need to see me. I am usually on campus most of the day each weekday, so if you cannot find me **please ask one of the staff members where I am**. To ensure that you can find me when you need to see me, email me in advance to arrange a specific time. **Please do not ask me to meet with you during the half hour before the start of a lab, or during the first half hour after the start of a lab.**

What should I contact him about?

1. All questions related to absences (use email).
2. All questions about the tests.
3. Regrade appeals (**after** a rejection by the grading TA).
4. Questions about assignments.

2. Teaching Assistants (TAs)

How to contact them:

You can find out the names of the TAs and their email addresses on the TA page of the class website:

<http://www.cas.vanderbilt.edu/bsci111a>

Where to find them:

The office hours and locations for the TAs are also on the TA page of the website.

What should I contact them about?

1. Questions about assignments.
2. Clarification or regrade requests for assignments that they graded.

II. Assignments and grades

A. Types of assignments

1. Prelab assignments:

Prelab assignments are designed to help you prepare for each upcoming lab. The particular requirements for each prelab will be specified in the lab manual. You may be asked to summarize the experimental design, describe concepts outlined in the introduction, or other tasks that may help you prepare for the lab. Prelabs are due **at the beginning of the period of the relevant lab** and should be turned in to your teaching assistant. The prelabs will be graded by different TAs on different weeks - refer to the initials at the top of the page and the grading schedule on the TA web page to determine who graded it. Each prelab is assigned a score from 0 to 10. The lowest score will be dropped before determining your average in the prelab category.

2. Problem Sets:

After each experiment, an assignment consisting of several short answer questions or problems will be given. These questions or problems will be based on the experiment performed in class that week. You will be expected in many instances to incorporate the results of your experiment into the answers to these problems. The purpose of the problem sets is to help you to reflect upon and synthesize what you have learned in the lab. You may not get the results that you expect for the experiment. The important thing in the problem sets is to draw the appropriate conclusions from the results that you got, NOT to get particular results.

Problem sets are printed at the end of the protocol for each lab. The problem sets are due **at the beginning of the following lab period** and should be turned in to your teaching assistant. They will not be accepted past 20 minutes after the hour when lab starts. The problem sets will be rotated and graded by the same TA who graded the prelab you turned in that week - refer to the initials at the top of your paper and to the grading schedule on the TA web page to determine who graded the problem set. Each problem set is assigned a score from 0 to 10. The lowest score will be dropped before determining your average in the problem set category.

There will not be a separate grade category for the components of the research project. They will be included in your scores for problem sets.

3. Tests:

a. Format of tests

Tests are designed to test your understanding of the concepts used in the experiments. Questions will address thinking skills on all levels, including application, analysis, synthesis, and evaluation as well as recall of information. All tests will be scheduled in advance and will cover topics from specified labs as listed below. All material on the tests will come from lab -- information from lecture will **not** be required. The format will be multiple choice and the tests will be taken on computers in the BSCI lab during the days listed in the schedule below. **It is not acceptable to take the tests on computers outside the BSCI lab without permission. Doing so constitutes an honor code violation.** The computers in the lab will be available on the testing days (Tuesdays through Thursdays) from 7:30 AM until 7 PM, except during scheduled laboratory periods (9:00 AM to 12:00 noon and 1:00 PM to 4:00 PM on Tuesdays, 1:00 PM to 4:00 PM and 5:00 PM to 8:00 PM on Wednesdays, and 9:00 AM to 12:00 noon and 1:00 PM to 4:00 PM on Thursdays). During the scheduled laboratory periods, two computers at the side and back of the lab will be available for use on a first-come, first-served basis (although users at that time should expect the normal laboratory noise levels). **Except in the most extreme emergencies, you will not be allowed to make up or be excused from a test. Except in unusual circumstances, tests will not be given after the end of the last day on which they are scheduled.**

Each test will contain 10 multiple-choice questions worth one point each. The lowest test score will be dropped before determining your average in the test category. Answer keys for each test will be posted in the display case in the hall outside the BSCI lab.

b. Schedule of tests:

Test Number	Experiments covered	Tue to Thu*
1	1 - 2 and Honor Code	Sep 16-18
2	3 - 4	Sep 30-Oct 2
3	5 - 6	Oct 14-16
4	7 - 8	Nov 4-6
5	9 - 10	Nov 18-20
6	11 - 12	Dec 8-10**

* Except for the last test which is Mon-Wed.

** Note: this test falls on Mon-Wed. Authorization has been obtained from the Administrative Committee to administer a laboratory test during "dead week" (which begins on Dec 3). See the Academic Regulations in the A&S Undergraduate catalog for additional details about "dead week".

c. Suggestions for preparing for tests

During the lab itself. The lab tests will contain some questions requiring knowledge and comprehension. However, many of the questions will require thinking on higher levels. Simply memorizing background information from the lab manual will help you with knowledge questions, but will do little to prepare you for questions requiring thinking on a higher level. To prepare yourself for such questions, as you are in lab you should be constantly asking yourself how the tasks you are doing or data you are collecting fit into the larger scheme of things. For example:

- What assumptions am I making in order to apply a particular equation or statistical test? What would be the consequences if I violated these assumptions?
- Why does the particular experimental design we have chosen allow us to evaluate the hypothesis we are testing?
- Why do my results vary from those of other groups? Is this variation important, or is it just experimental "noise"?
- Why didn't I get the results that I expected? Could this be a result of mistakes I made in the protocol and if so, what could they have been? Or is this an unavoidable result of uncontrollable biological variation or experimental conditions?

Studying for the tests. Each experiment lists several learning objectives which state the skills that you should have achieved by the time you have finished the lab and problem set. These objectives are intended to guide your thinking in a general way - they are not a list of questions I will ask you on the test. However, each test question is designed to test a particular objective, so using the learning objectives to guide your studying for the tests will help you to focus on the ideas that are the most important and will help you to determine which of the important ideas you need to review the most.

4. Participation

At their discretion, TAs will award points for participation in discussions and for work associated with the research project. Students who are prepared and fully participate can expect to get all of the points associated with these activities. This category is not normally intended to judge students' participation in the normal lab exercises.

B. Grades

1. Grading rotation schedule

Grading of the prelabs and problem sets is rotated by the TAs in your section. Please see the schedule on the TA web page to determine who graded a particular assignment. The final draft of the paper for the project will be graded by a research mentor who is not associated with your group.

2. Dropping the lowest grade.

The lowest grade in the problem set, test, and prelab categories will be dropped before the calculation of the average for that category. The participation grade will be incorporated without modification.

3. Calculation and weights

The weights of the four categories will be:

problem sets	50%
tests	35%
prelabs	10%
participation	5%

The final average will be a weighted average of the category averages. There is no specified scale for the letter grade, although the scale is typical of those used in other courses at Vanderbilt.

III. Course Policies

A. Absences

1. Policy on excused absences.

Attendance in lab is mandatory. Teaching assistants will monitor attendance and record absences. There is no special attendance policy for this course; the policies established in the Academic Regulations section of the A&S Undergraduate Catalog are enforced. If you are not already familiar with them, you should read them at:

<http://www.vanderbilt.edu/catalogs/undergrad/acadreg.html>

Excused absences with the possibility of make-up work will be granted by Dr. Baskauf according to the established college guidelines.

Except in the case of true emergencies, a possible excused absence should be discussed with Dr. Baskauf as far in advance as possible - you should not assume that an excused absence will automatically be granted. This discussion should occur via email. If you also discuss your situation verbally, please send a summary of the discussion via email to Dr. Baskauf. An unexcused absence will result in a zero for any graded work that should have been performed for or during the missed lab.

2. Late work

All assignments must be turned in to your TA at the beginning of the lab period on the day in which they are due. Any assignment that is not turned in by 20 past the hour is considered late. **Late assignments will not be accepted and you will receive a zero for the missing work.** Work that is late due to emergencies must meet the same college guidelines as excused absences and should be discussed with Dr. Baskauf.

3. Procedures associated with rescheduled or missed labs

If you do not attend your usual lab section because of an excused absence, please follow this procedure:

1. Print out the absence form posted on the course web site and fill it out. If you are making up the missed lab on another day, separate the bottom part of the form. If you are not making up the lab, indicate this on the bottom part of the form and leave it attached.
2. To the top section, attach a copy of the email from Dr. Baskauf excusing your absence from the lab, and the assignments that should have been turned in on the day that you missed lab. Give these papers to your bench's grader for the day when you missed lab. **Do not give these papers to your own bench TA** unless that TA happens to also be the grader. You can find out who the grader is by consulting the schedule on the TA web page. **It is your responsibility to make sure that the grader TA actually gets these papers.** It is best to give the papers to the TA personally. Do not put the papers in a mailbox, under a lab or office door, etc. unless you have made arrangements with the grader to do so.
3. If you make up the lab during another section, give the bottom section of the form to the TA on the bench where you make up the lab so that they know who you are and why you are there.
4. Turn in your problem set for the missed lab when you attend your next regularly scheduled lab.

B. Regrade requests.

Regrade requests for an assignment should be made using the form on the class web page and **addressed to the TA that graded it** (or to Dr. Baskauf in the case of a test). Regrade requests must be made within two weeks of the date on which the work was returned to you. At the end of the semester, regrade requests must be made as soon as possible to allow time for grade changes to be included in calculation of the final grade.

1. Who graded my paper?

Grading of the prelabs and problem sets is rotated by the TAs in your section. Please see the schedule on the TA web page to determine who graded a particular assignment.

2. Can I appeal this regrade?

Regrade appeals to Dr. Baskauf should be made only after a regrade request to the grading TA.

C. Safety rules.

1. Safety goggles.

Most materials used during this course are not hazardous. However, certain reagents in experiments 4 (Enzyme Kinetics) and 10 (Recombinant DNA III) are poisonous and are skin and eye irritants. For this reason, students will be required to bring laboratory safety goggles to those two labs. It is not required that you purchase goggles exclusively for this class. If you already have goggles for another course, you may bring them to BSCI lab on those two days.

2. Eating in the lab.

Do not bring food into the lab. Please do not drink bottled beverages (including water) in the lab.

D. Other requirements

1. Email use

All students are expected to check their email regularly and to ensure that they are able to receive email (i.e. that they are not over quota and that their default email address in the university system is valid). Occasionally important information (protocol changes, announcements, etc.) will be sent to all students in a section. This will be done using the course mailing list. If you have opted to not provide your email address to the campus system, please send it to Dr. Baskauf so that you can be added to the mailing list manually.

2. Lab notebook

Each student should keep a laboratory notebook. The lab notebook should be used to record notes on each experiment; the data from the experiment and any deviations from the protocols in the lab manual, whether they were done on purpose or by mistake. These notebooks will not be used in the determination of your course grade. Your lab notebook is important for you to answer the questions/problems posed in problem sets. Many students prefer to use a looseleaf notebook so that they can keep their assignments there as well.

IV. Application of the Honor Code

The Honor Code is in effect for all assignments in BSCI 111. The first test will include questions regarding the application of the Honor Code in the course, so please study the following information carefully. On the course website there are also excerpts from the student handbook relating to the Honor Code.

Assignments (Prelabs and Problem Sets)

***The Big Picture:* Write your own answers. Don't copy or modify someone else's words.**

Details:

1. Discussion of questions and strategies with other students, TAs, and faculty **is allowed**.

Although group "study sessions" for discussing assignments are not prohibited, they are inadvisable because they tend to lead to "group answers" that are inappropriate collaboration.

2. No part of answers to any assignment **may be duplicated** and shared with other students, with the exception of joint work necessitated by the sharing of lab computers.

Specifically, the exceptions include:

- Excel graphs created in class (including trendlines and equations)
- results of statistical analyses conducted using software on the lab computers
- sequence data collected or manipulated on the computers
- graphs of data collected through computer interfacing
- gel images posted on the course website
- results of Genetics Construction Kit (GCK) problems done together on the computer.

Analysis and interpretation of computer generated data must be done independently.

3. Answers to questions must be your own.

As a practical matter, there is no difference between plagiarizing material from a book (or the Internet) and copying from another student. Therefore, the same features of plagiarism illustrated in the Honor Code section of the Student Handbook (i.e. change in wording, use of a catchy word or phrase, undocumented paraphrasing, and word-for-word copying) are also indications of inappropriate collaboration with other students.

4. If your answers include **quotes or close paraphrasing** of material from another source (e.g. books or the Internet, including the lab manual and course website), they **must be attributed**.

In regular assignments in this course, there is no specific required format for citations.

5. In the event that the data that you have collected during an experiment is not suitable for analysis, **it is allowed** and expected that you will **obtain data from other students** (or sample data from the course website) to analyze. If this happens, you should acknowledge the source of the data.

6. **Answer keys or assignments** done by students in previous semesters **may NOT be consulted** when preparing assignments.

Students doing makeup work for excused absences may not consult posted answer keys or assignments turned in by other students.

An example of inappropriate collaboration on a problem set:

Student 1: Sodium azide is not present in Tube 5 and thus will not inhibit the electron transfer from cytochrome a_3 to the O_2 final acceptor. This allows the electrons to be picked up by the artificial electron acceptor. The succinate to fumarate reaction was measured by monitoring the reduction of the artificial electron acceptor, DCIP. In Tube 5 the DCIP was not reduced as much. The P value for Tube 5 is less than the P value for Tube 3 which means that fewer electrons were picked up by the artificial electron acceptor and the DCIP was not reduced as much as if the sodium azide was present.

Student 2: In tube 5, sodium azide is not present and therefore will not inhibit the transfer of electrons from cytochrome a_3 to the final acceptor, O_2 , enabling the electrons to be picked up by the artificial electron acceptor. We are measuring the succinate to fumarate reaction by monitoring the reduction of an artificial electron acceptor (DCIP), and in tube 5 DCIP will not be

reduced as much. Thus, that tube 5 P is less than tube 3 P means only that fewer electrons are picked up by the artificial electron acceptor and DCIP is not as significantly reduced (our method of measurement) as if sodium azide were present.

This example exhibits characteristics of plagiarism discussed in the Honor Code section of the Student Handbook: word-for-word copying (many examples), a change in wording ("This allows the electrons..." and "...enabling the electrons..."), and use of a catchy phrase ("...picked up by the artificial electron acceptor..."). Note also the similarity in sentence structure and order.

Tests

The big picture: Don't cheat. Don't copy.

Details:

1. Although tests are administered by computer, **normal testing expectations apply.**

This includes:

- No notes, books, or aids can be used during the test.
- You should neither look at another's test nor allow your test to be observed.
- You may not remove or copy any part of the test by physical or electronic means.

2. **Tests must be taken in the BSCI 111 lab** during the specified hours and not in any other location.

3. The use of **calculators** is **allowed** for mathematical calculations if desired.

4. **Answer keys may not be copied** by any physical or electronic means.

5. A student authorized to **make up** a test due to emergency situations **may not consult any posted key**, nor discuss the test with anyone until after completing the test.

V. Frequently asked questions

A. *Question:* **Where are the class data?**

Answer: They are on the course website (NOT Blackboard). Go to the supplemental web page for the particular experiment and look for a button at the top of the page that says something about "Class data", "Gel images", etc. You will not find this button until the data have been posted for the first section (usually on Tuesday of the week of the lab).

B. *Question:* **Where are the answer keys?**

Answer: The **problem set** answer keys are posted on Blackboard (NOT the course website). The answer keys should appear at 4 PM on the Friday of the week the assignment was turned in. They will remain available for two weeks. The **test** answer keys are posted in the display case in the hallway outside of the BSCI lab. They generally are posted the Friday after the test and remain up until the key is posted for the next test.

C. *Question:* **Why do I only get one hour of credit for three hours of lab time per week?**

Answer: I do not know the answer to this question. This question would be better addressed to higher levels of administration of the college. It does not seem particularly fair - however this arrangement is found at nearly every university and it has been this way for decades if not centuries. Therefore it is not likely to change any time soon.

D. *Question:* **This lab is supposed to go along with lecture. Why doesn't it correspond more?**

Answer: We try to make the topics in lab correspond to lecture as much as we can. However, practical considerations dictate that we cover some topics at different times than in lecture. This is particularly true during the molecular cloning series of labs when we must perform protocols in a particular sequence that is not the same as the logical order for studying the central dogma of molecular biology. In addition, some topics in lab may not be covered at all in lecture because their study requires physical presence in the lab environment or because there is not time in lecture to explore them to the depth we can in lab. Although it is hoped that lab will compliment the topics covered in lecture, it is not intended to be a "review session" for lecture.

E. *Question:* **Why is the majority of my grade from tests?**

Answer: Although I hear this question repeatedly, students who ask it are not paying attention because less than 50% of the grade comes from tests (see the category weights in the section of the syllabus on grades).

F. *Question:* **Why are the tests so hard?**

Answer: The tests are not intended to be hard or tricky. However, some test questions are designed to test your ability to use higher order thinking skills such as application, analysis, evaluation, and synthesis in addition to the simpler skills of knowledge and application. Questions requiring the use of higher order thinking skills may be harder for some students because generally students have less experience with that type of learning and the thought processes involved in using higher order thinking skills is more complex. If you feel a test question was unclear, incorrect, or confusing, please bring it to Dr. Baskauf's attention.

G. *Question:* **I have an accommodation from the ODC. What should I do?**

Answer: Send an email to Dr. Baskauf to make him aware of your situation. Most accommodations involve either special testing conditions (e.g. taking the test in a quieter environment) or extra time on tests. Since students choose the time at which they take the test, students needing these types of conditions can usually be accommodated by taking the test in the morning when the lab is nearly empty. The time limit set for the tests (30 minutes) is generally 2 to 3 times the amount of time needed by most

students to take the test. So students rarely need additional time beyond the normal time limit. If you need different or additional accommodations, please discuss your situation with Dr. Baskauf

I. Question: Can I use the computers and printers in the lab?

Answer: The computers are available for the use of students in the course at any time that the lab is open (7:30 AM to 5:00 PM on weekdays during the semester). However, if lab is in session priority goes to students enrolled in that section. Printing should be limited to a small number of pages and to assignments for the BSCI 111 course. If you need to do personal printing or to print a large number of pages, please use your own printer or a commercial facility such as Kinkos. *If the guidelines for the use of the printers are abused, we reserve the right to limit printer use.*