

# Genetics Lab Manual

## BIOL 302L

Summer 2014

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There is a required calculator for this course. Please see the details on Page 7 of this manual.

The calculator is available from the UMBC bookstore as well as most other major retailers.

As noted in the schedule of classes, this course requires some non-scheduled lab work. There will be time when plates will need to be checked and colonies patched, for example, outside of scheduled class hours.



**SUMMER 2014 BIOL 302L  
PRELIMINARY GENETICS LAB SYLLABUS**

Date	Experiment – Lectures are on Mondays and Wednesdays, Labs meet Tuesdays and Thursdays
Mon., Jul. 7 – Tues., Jul. 8	<b>Class starts on Monday, July 7<sup>th</sup></b> , in BS120 <b><u>Human Variation</u></b>
Wed., Jul. 9 – Thr., Jul. 10	Determination if mutations to bacteriophage T-2 resistance are spontaneous or induced and the $f_{Mut}$ : <b><u>Newcombe Experiment</u></b>
Mon., Jul. 14 – Tues., Jul. 15	Mendelian Genetics – Gene Mapping <b><u>Drosophila Simulation I: Karyotyping Genes</u></b>
Wed., Jul. 16 – Thr., Jul. 17	<b>Continue Simulation I</b>
Mon., Jul. 21 – Tues., Jul. 22	<b>Finish Simulation I</b> <b>Streptomycin mutations: Isolation, Characterization and Analysis</b> I: Isolation and Characterization
Wed., Jul. 23 – Thr., Jul. 24	<b>Streptomycin mutations</b> II: PCR amplification of mutant gene
Mon., Jul. 28 – Tues., Jul. 29	<b>Streptomycin mutations</b> III: Sequencing of mutant Gene
Wednesday, July 30, 2014	<b>MIDTERM EXAM – 7/30/14 1:00-3:00 PM (BS120)</b>
Thursday, July 31, 2014	IV: Comparison of Mutant Gene to Wildtype Gene – NCBI – BS165
Mon., Aug. 4 – Tues., Aug. 5	Gene Regulation <b><u>Operon Fusion</u></b>
Wed., Aug. 6 – Thr., Aug. 7	Operon Fusion – Data analysis
Mon., Aug. 11 – Tues., Aug. 12	Mendelian Genetics – Gene Mapping from a Four-Point Cross <b><u>Drosophila Simulation II,</u></b>
Wednesday, August 13, 2014	Population Genetics <b><u>Human Variation Data Analysis</u></b> <span style="float: right;"><b><u>Notebook Grading</u></b></span>
Thursday, August 14, 2014	<b>FINAL EXAM – 8/14/14 1:00-3:00 PM (BS120)</b>

**This course requires some non-scheduled lab time.**



## GENERAL INFORMATION

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

**ATTENDANCE:** Attendance is mandatory. A student who does not perform a given experiment will receive no credit for that experiment. In most cases it is impossible to make up an experiment.

The introductory lecture which meets prior to the wet lab covers the theory behind the experiment and some of the techniques. **Attendance will be taken at these and more than two absences will result in an automatic F in the lab.** Trying to do an experiment without having heard the lead off, results in haphazard work and in some cases can be dangerous to the individual who missed the lead off as well as those students nearby.

**REQUIRED CALCULATOR:** BIOL 302L has a required calculator. You may use the **TI-30Xa**, **TI-30X IIS**, **TI-36X**, **TI-34 II**, or **Fx260**, all of which are available at the UMBC Bookstore or at any local Wal-Mart, Target, Staples, or other stores. These are the same calculators required and allowed by the chemistry department, so you may already own one of them. Please see the instructor with any questions.

**LAPTOPS & CELLPHONES:** Laptop use has proven to be much more of a distraction than an asset to students, and can often distract other nearby students. Cellphone use (even texting) during class is not only rude, but significantly hinders attention and learning. Thus, **THE USE OF LAPTOPS or CELLPHONES IN CLASS IS PROHIBITED.** Failure to comply with the prohibition will result in a request to leave the classroom and a loss of credit for any covered activities, assignments, and exercises.

If you have special circumstances, such as a learning disability or eyesight problem, that require the use of a laptop, you may receive special permission to do so with documentation. This permission will be rescinded if the laptop is not solely used for classwork.

**CLEANING:** Please keep your area clean. When finished with equipment or supplies, return them to their rightful places. After an experiment has been completed, you must dispose of the vials, tubes, petri dishes, etc. Incubators are not storage vaults.

Label all experiments properly. Your **name** (not initials) and experimental information should go on anything which leaves your sight.

**TP CLICKER:**

We will be using these during lead off for both attendance, participation, and to assess understanding. We'll also give quizzes using clickers. They are available at the bookstore if you don't already have one from a previous class. You must register your clicker on Blackboard when you initially purchase it, it should be automatically registered afterwards. Clicker questions will generally count as 2pts for a correct answer, 1pt for an incorrect answer, and 0pts for no answer. A curve will be used to account for non-working clickers; otherwise it is your responsibility to make sure the clicker is functional, has working batteries, and to bring it to class.

**Clickers are worth 3% of your grade.**

**LAB REPORTS:**

The due dates of the lab reports will be announced during the lab. There is a penalty (10 percent per day) for reports turned in late. Reports will NOT be accepted more than one week late. A grade of "0" will be given for any reports not turned in. Lab reports are to be **printed** in **ink** or **typed**.

Some lab reports involve shared data (either by partners, groups or in some cases, the whole lab). Regardless of the source of the data, we encourage you to work with fellow students. Discuss the data, what they mean, how they were obtained, and what inferences can be made. HOWEVER, write the report by yourself. If we suspect that work was not done independently, all students involved will receive a zero for that particular report. If there are further incidents involving the same student, the student will receive an "F" for the course. Refer to the Catalog (Appendix V) or to the Student Resources publication, under "Academic Conduct."

Labs reports will not be accepted for labs that were not completed in person. Because of the nature of the experiments, you may not be able to make up a missed experiment. Attending class is essential for labs.

**Lab reports count 25% of the final grade.**

**EXAMS:**

There are one midterm exam and one final exam in the course. These are scheduled so that all of the students will take them at the same time. The final exam is not comprehensive, but there will be a lot of overlap with the midterm exam material.

Each of the exams is worth 20% of the grade. If you know that you are unable to take the exams during the scheduled time, see Steve Caruso to make arrangements to take the exam at a different time. If there is a last minute emergency, a makeup will be administered, but only if proper documentation is submitted (a doctor's note, for example).

Only the required calculators may be used during exams. Cell phones, PDAs, laptops, assistant professors, pagers, alphanumeric and graphic calculators may **NOT** be used during exams and quizzes.

**The use of cell phones during an exam in any manner is expressly prohibited and will result in a zero on the exam and a report filed to the UMBC ACC with no warning.**



## QUIZZES:

There will be two types of quizzes in this course:

### READING QUIZZES:

Reading quizzes are administered on-line (via Blackboard), and are due **PRIOR** to the lead-off covered by the quiz. No quiz submissions will be accepted once the lead-off begins, so plan accordingly (e.g.: don't count on computer access immediately prior to class).

### CONTENT QUIZZES:

Content quizzes will be administered frequently and indiscriminately. For the most part, these will be unannounced. It is **ALWAYS** the student's responsibility to read the background material before the lead off lecture and to come to the lab prepared to do the day's experiment. The quizzes will include questions about the lab to be done that day and past labs. Most quizzes will be given during the wet lab, but a few may be given during the lead off. There may also be several electronic quizzes (about which more later).

**Because interruptions are rude and unfair to other students, the door will be closed during quizzes. If you are late and a quiz is in progress you will not be allowed into the room to take the quiz.** You will be allowed to join the class once the quiz is complete, though, so do not leave. If you have a valid excuse, you will be allowed to make up the quiz in another section. If you miss the quiz altogether, a grade of zero will be administered.

Enough quizzes will be offered so that one quiz grade will be dropped.

**The quizzes will count 20% of the final grade.**

## NOTEBOOK:

A separate lab notebook dedicated to this lab is required for each student. This must be a **bound** notebook, not a loose-leaf binder. If the pages aren't already numbered, number them before coming to the first lab. Page 1 **MUST** be a Table of Contents. Your name and section must be visible on the **OUTSIDE** of the notebook. This notebook will serve you well if you keep it properly. Lead-off lecture notes should not be included in the lab notebook. The following information for each experiment is required. It should be legible and organized enough so that years later you can understand exactly what you've done and why. These will be checked periodically. **Never come to the lab without your notebook.** Loose sheets of paper (including paper in a binder) will NOT be allowed in the lab.

Some guidelines for the lab notebook, for each experiment include

**Rationale:** AKA Objective. This is a short explanation of purpose of the experiment. This should be written **before** you come to the lab. It will be refined later.

**Protocol:** AKA Procedure. **Before the lab** draw a flow chart of the day's experiment(s). Base your flowcharts on the protocols listed in the Manual. As you do the experiment, check off the steps you've performed (appending times, volumes, or other pertinent information). In almost every experiment, you will be modifying the protocol slightly. Write in the modifications next to the flowchart, whether they are by direction or by accident. Flow charts are included for some experiments for use as models. The procedure is often revised at the last minute, be sure to note any changes whether you are instructed to make them or deviate from the procedure on your own.

**Data:** Here you record the results. Include drawings or photocopies if describing a gel and record colony numbers, phenotypes, numbers of flies, etc. Draw graphs if appropriate. Also note which results differ from what you expect. Record ALL observations. The data is to be recorded as you collect it. Most data fit nicely into tables. Set up the tables before you collect the data. **Don't** record your data on scrap paper and then transcribe it to the notebook. Set up any calculations you need next to the data.

**Conclusions:** Write a brief summary of the conclusions drawn. Compare experimental results to controls.

Some experiments are long-term. Try to keep enough space set aside for the data, so that all the data are together. An alternative is to cross-reference data and experiment by page numbers.

**The notebook is worth 5% of the grade.** It will be checked periodically and collected when you take the final exam. You will be able to retrieve it after the grades are compiled, usually before the end of Final Exam week.

**BLACKBOARD:** There is a Web Page for this course. The public page is at <http://blackboard.umbc.edu/> (case counts). Directions to enroll yourself can be found at <http://www.umbc.edu/oit/NewMedia/blackboard/enteringbb.htm>. For more help sheets, see <http://www.umbc.edu/oit/NewMedia/blackboard/>. From there you will be able to access the guts of the web page only if you have a login ID and password. Your login ID and password are will be the same as your UMBC login and password.

A variety of information will be available inside the web page, including: A course calendar, lecture notes, quizzes, exams from the previous semester, a course discussion board, links to interesting sites, space for student content, and space for a personal web page.

The bulletin board is for posting questions and answers about the lab material and protocols. (Personal questions about grades, absences, etc... should be sent via email.)

**CONTACTING ME OR YOUR TA:** Any time during the wet lab is a good time to talk to us. Immediately after lead-off is a fine time too. The TAs will hold office hours. I am in my office or in the lab all the time. Just stop by.

When you send email to us, here are some ground rules:

- (1) Recognize that inboxes can get crowded, so allow some time for our reply.
- (2) To avoid being bounced by our spam filters, always include an informative subject line.
- (3) You must read email to your UMBC email address. Blackboard automatically sends to this address and I can't keep track of multiple addresses for students. If you have a different preferred email address, set things up so your UMBC email is forwarded to it. There is a link to do this on myUMBC under the 'Personal' tab, 'Create an email forwarding address'.
- (4) I prefer you send us email out of your regular mail account rather than out of the Bb email utility, because Bb email does not show to whom a message was /cc'ed. If you do send email out of Bb, include the /cc information at the top of your message. Often emails sent from other providers wind up in my Spam folder, even if it is legitimate. This means a delay in getting your answer.
- (5) Always include your name in your text, even if you think it should be obvious to us from your email address.
- (6) If your question involves the syllabus or lab instructions or lead-off notes, paste the relevant text into your email message along with your question; this will help us to answer you more quickly and more accurately.
- (7) As with any other course activity, we expect you to be professional and that your writing be at the university level, so communicate to us in full sentences with proper capitalization and punctuation (and do not be surprised if we occasionally offer corrections should we find errors in spelling or grammar in your messages).
- (8) If you send us a message and don't receive an answer within a couple of days, check out whether your mailbox was full; that is one of the most common email communication problems we encounter.
- (9) And also check your copy of the message: if a message to us ignores too many of the above recommendations, we might return it with instructions to consult the syllabus about how to send email. In cases that are particularly egregious we might simply not reply.

## **SAFE ASSIGN**

We will be using the Safe Assign plagiarism detection system to which UMBC has recently subscribed. Specifically, you will be submitting your formal lab report to Safe Assign. You may be submitting additional assignments as indicated by your instructor or TA. Safe Assign scans all of the submitted papers and compares them to each other and any other materials we have uploaded and searches for instances of plagiarism. You will be submitting to Safe Assign through Blackboard.

**FORMAL LAB/PRESENTATIONS:** You will be completing one formal lab report or presentation. You will receive instructions on how to complete the assignment in class.

**GRADING:** The breakdown of points is:

<b>Lab Reports</b>	<b>25%</b>
<b>Notebook</b>	<b>5%</b>
<b>Exams</b>	<b>40%</b>
<b>Quizzes</b>	<b>20%</b>
<b>Presentation/Formal Lab Report</b>	<b>10%</b>

In addition, up to a three-point bonus may be given by the instructor to each student. This is based on attendance, attitude, preparation, organization, neatness, integrity and participation.

**HOWEVER**, a satisfactory grade will not be received for any student who misses two or more exercises.

**CHALLENGING GRADES:** I will randomly sample lab reports and exams and photocopy the sample before they are graded. Questions about your grade or specific answers will be handled as follows:

Bring me your graded paper and point out your question(s). I will keep the paper overnight and compare it to the grading key and the photocopy copy, if it exists. Changes in your grade will be recorded, or the reason for not changing the grade will be explained to you. **All challenges to a grade must be submitted within seven days of receiving your graded work.**

**SOME GENERAL NOTES AND OBSERVATIONS:** We are working with live organisms in this course. (We would be cheating you if the lab were set up primarily with demos.) Consequently, you will be required to count colonies, or to perform steps in an experiment, outside of the scheduled class time. Most of the labs are completed before the scheduled three hours are up. If you are unable to complete an experiment when you are expected to, see your instructor. We will try to place your plates under refrigeration until you can count them or otherwise work around your schedule.

There is a lot of information in this course. Between the handouts, the lead off lectures, the discussion sessions, the Web Page, the postings on the Internet, E-mail questions, and the textbook, you will have plenty of opportunity to learn this information.

In addition to memorizing information, you will be expected to solve problems. You will do poorly on the exams and quizzes if you merely memorize facts and read over problems. One learns to shoot baskets by shooting baskets. One learns to solve genetics problems the same way (solving genetics problems, not shooting baskets). Do all the problems assigned, and try to find more to do.

We want this course to be as interactive as possible. We will often answer your questions with questions of our own. Don't be put off by this practice; it will force you to think.

Previous year's exams will be posted on the course Blackboard site. We've changed the lab somewhat, in both the order and in the content of some of the experiments done. So the exams will not have covered the exact same material. Use these wisely. If you study from these, you will not do as well as you wish. Study your notebook and the handouts, and then tackle the exams. The answers will not be posted.

## **ACADEMIC INTEGRITY:**

The following paragraph and definitions are from the UMBC Faculty Senate (2/13/01):

“By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC’s scholarly community in which everyone’s academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.”

If you’re observant, you’ve noticed that this was the first paragraph in this syllabus. You may or may not have noticed that there was no citation given there. That was my first act of plagiarism in this manual. The second act of plagiarism was the guidelines for email which I modified from those given by Dr. Catania in Psychology, with his permission. The definitions below are from the UMBC handbook.

Definitions:

**Cheating:** Knowingly using or attempting to use unauthorized material, information, or study aids in any academic exercise.

**Fabrication:** Intentional and unauthorized falsification or inventions of any information or citation in an academic exercise.

**Facilitating Academic Dishonesty:** Intentionally or knowingly helping or attempting to help another commit an act of academic dishonesty.

**Plagiarism:** Knowingly representing the words or ideas of another as one’s own in any academic exercise, including works of art and computer-generated information/images.

My Comments:

Although I have no reason to believe that any of you have or will engage in academic dishonesty, I want to be certain that all of you know my policies on dishonesty. I feel very strongly that the cheating student denigrates and lessens the value of the grades received by those students who are honest. Cheating cheapens the degrees offered by this university.

In this course, penalties for academic dishonesty will range from a '0' on an assignment to an 'F' in the course with recommendation for expulsion from the university. I will expound a bit on each of the items listed above. All instances, even those with minimal penalty will be reported to the Academic Conduct Committee of the University.

**Cheating:** Unauthorized material can be a crib sheet, another student's quiz, exam, or lab report, a discussion with a student who has already taken the quiz or exam or completed the lab report, cell phone calls and other methods upon which I wish not to expound.

**Fabrication:** This infraction usually involves 'made up' data. Don't do that. You will be recording all your observations in your lab notebook; you will be reporting these results on your lab report. If your results don't make sense, see me or your TA. We will help to make sense of them or maybe give you some data to work with. If this occurs, you must \*still\* report your own data and give attribution for any data provided.

**Facilitating Academic Dishonesty:** Simply refuse to discuss any work you have completed. Don't give another student your lab report (or note book) to provide an example of how to do the write up. This will be detected and you and the student who 'borrowed' your work will receive '0's the first time, an 'F' the second time.

**Plagiarism:** Any work or results you write about which are not your own should be cited. If material is lifted verbatim it should be quoted and cited. You knew that. Doing this a lot will not be penalized for academic misconduct but will be graded harshly since merely using other's thoughts and words tells us nothing about what you know. Understand that material used to provide information which you use to develop your own words must also be cited. I see this happening often in lab reports. Don't do it.

**The following are general guidelines of the results of academic misconduct by students taking Genetics Lab. Be aware though, that any case of cheating can result in failure of the course and may result in additional sanctions as determined by the UMBC Academic Conduct Committee.**

Quizzes: Anyone caught cheating on a quiz will receive a '0' on the quiz on the first offense; an 'F' in the course the second time.

Lab Reports: Same as with quizzes. This can be a bit tricky. I encourage you to work together to figure out what things mean or to find information in the text or on the web.

However,

- DON'T paraphrase from the lab manual, or any other publication, without citation.
- DON'T copy calculations.
- DON'T write the reports side by side.
- DON'T check your report against another student's.
- DON'T let anyone check his/her report against your completed report.
- DO ask the instructor or a TA if you are having trouble.

Formal papers: Plagiarism will result in a 0 (zero) on the paper as a minimum response.

Exams: If you cheat, you fail. Period.

Presentations (if applicable): You will be working with a group and presumably using reference material. Cite it all. Each of you will have specific jobs within your group. You will be wise to check the others' work to make sure it hasn't been plagiarized. If it has been, all members of the group will receive a "0" on the presentation.

In the past I have simply imposed the minor penalties (0 on a report or quiz) without notifying anyone else of the action. I have done this out of consideration for the student. However, there is a strong (and overdue) movement from the administration encouraging faculty to do everything possible to eliminate academic misconduct. To this end, any infraction will be filed with the Academic Conduct Committee. They keep records which will remain confidential unless subsequent incidents are reported for the same student (in the same class or a different one). If this occurs, the Academic Conduct Committee may impose a more severe penalty than I have imposed, or suggest a change in the penalty I have imposed. J.W. Sandoz, S.M. Caruso

**LAB SAFETY:** Safe practices in the lab serve to protect you, your fellow students, and me.

The lab safety rules are in effect always. That is, they are in effect even when you stop by the lab to collect data. You will be refused entry to the lab if you are not wearing proper footwear. If you have food or drink, leave the stuff in the hallway.

We won't tolerate sloppy and careless techniques. Knowing what you'll be doing in the lab, preparation of a flow chart and writing the rationale will help in this. The following page is a list of safety rules. There is a copy at the end of this manual which you will sign and turn in before the end of the lab.

## Lab Safety Rules – Genetics

(This is your copy, turn in the one from the back of the lab manual)

A copy of the following is provided at the end of the lab manual. Please sign it and return it to me during the first lab. Keep this one in your manual for reference.

- \_\_\_ No eating, drinking, or placing anything into your mouth. This includes pencils and fingernails.
- \_\_\_ No applying cosmetics, lip balm, eye drops, etc. (Just keep your hands away from your face).
- \_\_\_ Report any broken glass. There is a “Sharps Box” in the corner of the lab for broken glass or other sharp objects. Don’t throw these into the regular trash.
- \_\_\_ Closed-toe shoes are required.
- \_\_\_ Tie long hair back. It can be caught in equipment or can catch fire.
- \_\_\_ If there is an alcohol fire, let the people around you know and smother it with an inverted ice bucket. If there is any other type of fire, pull the fire alarm and evacuate the building.
- \_\_\_ If the fire alarm sounds, shut off your gas jet and evacuate the building. Don’t assume it’s a false alarm.
- \_\_\_ Know where the fire extinguisher and the First Aid Kit are.
- \_\_\_ If you have any cuts or scrapes on exposed skin, be sure they’re covered with a band aid BEFORE you come to lab.
- \_\_\_ Report any accidents at once.
- \_\_\_ Report any bacterial or chemical spills at once.
- \_\_\_ Gloves will be worn when working with known or suspected pathogens. If you’re not sure, treat it as a pathogen.
- \_\_\_ Dispose of biologicals properly. They go into the autoclave bag. ONLY biologicals go into the autoclave bag - not paper towels or other trash.
- \_\_\_ No one is allowed into the lab except for students, faculty, and staff. No friends or significant others.
- \_\_\_ No radios/cassette/CD players are allowed, with or without earphones.
- \_\_\_ Use common sense.