Genetics Lab Manual

BIOL 302L

Summer 2017

Course Instructor:
Steven M. Caruso

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.

Turning Point clickers are also required

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 2017 BIOL 302L
PRELIMINARY GENETICS LAB SYLLABUS

Date	**Experiment –** Lectures are on Mondays and Wednesdays, Labs meet Tuesdays and Thursdays
Tues., May 30	**Class starts on Tuesday, May 30th,** (in TBD) **Human Variation**
Wed., May 31 – Thr., Jun. 1	Determination if mutations to bacteriophage T-2 resistance are spontaneous or induced and the f_{Mut}: **Newcombe Experiment**
Mon., Jun. 5 – Tues., Jun. 6	**Streptomycin mutations: Isolation, Characterization and Analysis** I: Isolation and Characterization
Wed., Jun. 7 – Thr., Jun. 8	Mendelian Genetics – Gene Mapping ***Drosophila* Simulation I: Karyotyping Genes**
Mon., Jun. 12 – Tues., Jun. 13	**Continue Simulation I**
Wed., Jun. 14 – Thr., Jun. 15	**Streptomycin mutations** **Finish Simulation I** II: PCR amplification of mutant gene **Simulation I Due**
Mon., Jun. 19 – Tues., Jun. 20	**Streptomycin mutations Due at end of lab** III: Sequencing of mutant Gene
Wednesday, June 21, 2017	**MIDTERM EXAM – 6/21/17, 1:00-3:00 PM** (in TBD)
Thursday, June 22, 2017	IV: Comparison of Mutant Gene to Wildtype Gene – NCBI – BS165
Mon., Jun. 26 – Tues., Jun. 27	Gene Regulation **Operon Fusion**
Wed., Jun. 28 – Thr., Jun. 29	Operon Fusion – Data analysis
Monday, July 3, 2017	**Population Genetics**
Tuesday, July 4, 2017	UMBC closed for Independence day
Wednesday, July 5, 2017	Optional review after **Notebook Grading**
Thursday, July 6, 2017	**FINAL EXAM – 7/6/17, 1:00-3:00 PM** (in TBD**)**

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.

INSTRUCTOR: Dr. Steven Caruso x5-2246, BS462 scaruso@umbc.edu

PRE-REQUISITES A "C" or better in both BIOL 300L and BIOL 302. Participation in the course without the required pre-requisites is not permitted and will result in receiving an "F" should the course not be dropped.

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 other local 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. Any disruption of the class or other students' learning will result in the offending student being asked to leave the class.

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.

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

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.

Starting with the second week, the background material for all labs will be provided as downloadable PDF documents on Blackboard. Unless otherwise indicated, the Lab Report to be turned in will be a fillable form to be completed individually and submitted to Blackboard for grading by your instructor or TA.

Some lab reports involve shared data (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."

Lab reports count 25% of the final grade.

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. **The formal lab will be worth 10% of your grade.**

EXAMS: There is 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 online (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 about 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 (either reading quiz or content quiz) 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 the 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 flowchart 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. Also add times, volumes, and 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. Flowcharts are included for some experiments for use as models. The procedure is often revised at the last minute, so be sure to note any changes (whether you are instructed to make them or you deviate from the procedure on your own).

Data: Here you record the results. Include drawings or photocopies if describing a gel and record things like 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 are to be recorded as you collect them. 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 those of 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 experiments by page numbers.

The notebook is worth 5% of the grade. It will be checked periodically and graded at the end of the semester.

BLACKBOARD: There is a web page for this course. The public page is at **http://blackboard.umbc.edu/** (the address is case-sensitive). 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 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 discussion 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 subscribed. 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.

POSTERS: You will be completing one poster. You will receive instructions on how to complete the assignment in class.

GRADING: The breakdown of points is:

Lab Reports	**25%**
Notebook	**5%**
Exams	**40%**
Quizzes	**20%**
Presentation/Formal Lab Report	**10%**

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

CHALLENGING GRADES: Questions about your grade or specific answers will be handled as follows: Bring me your graded paper and point out your question(s). 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 <u>seven days</u> 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 lab manual, you will have plenty of opportunities 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 years' 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 given for email which I modified from those given by Dr. Catania in Psychology, with his permission. They should have been cited as coming from him even though I had his permission to use them. 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 notebook) to provide an example of how to do the write up. This will be detected and both 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 that 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 others' thoughts and words tells us nothing about what you know.
Material used to provide information that you use to develop your own words must also be cited. I see this lack of citation 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 and Posters: Plagiarism will result in a 0 (zero) on the paper as a minimum response.

Formal presentations and Poster 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.

Exams: If you cheat, you fail. Period.

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 that 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, preparing 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 first day of 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 are covered with a bandage 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.