2014

451-01 General Microbiology Lab

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Class time: Mon and Fri 10:00-12:00 (Sec 01)
Location: Albers 207
Credit: 2 credit hours
Instructor: Dr. Kathryn Morris, 304 Albers Hall, 745-3554, morrisk10@xavier.edu
Office Hours: Wed 10:00-11:00, Thurs 1:30-2:30 or by appointment
Lab manual: Techniques in Microbiology: A Student Handbook, Lammert
Photographic Atlas for the Microbiology Laboratory 4th ed., Leboffe and Pierce
Microbiology Coloring Book, Alcamo and Elson
You will also need a permanently bound (i.e. not spiral bound) research notebook that makes carbon copies of your entries (you may use up the remainder of a notebook used in another science class. And finally, you need a lab coat clearly labeled with your name and left in lab all semester.
Skype: (Dr.Morris.Xavier) I will be available on Skype during office hours, 7-10PM evenings before exams, and other random times throughout the semester. Anytime you see me online you are welcome to chat. Often, my computer will be online even though I may be away from my computer or talking with someone else, so please do not be offended if I do not reply to you immediately. I will get back to you as soon as possible.

Welcome to BIOL451, the laboratory that accompanies BIOL450. This course will offer you the opportunity to improve your knowledge of bacteria and other microorganisms, and is required to be taken concurrently with General Microbiology lecture BIOL450.

Because of their size and growth characteristics, microbes are studied in ways that are unique to the field of microbiology. Our ability to learn about them is based on developing manual and observational skills that are quite different from those needed to study larger organisms. Though most of you are old hands in Biology labs, you should find General Microbiology exciting and interesting because you will be doing new kinds of things in lab. Even if you have had occasion to grow bacteria for procedures in introductory biology or genetics courses, you’ll find that there is a lot more to the science of microbiology that that. Furthermore, their rapid growth means that microbes change their environment literally overnight! We will be studying the outcome of their life activities form lab to lab, so that when you come in for each day’s work something you inoculated in the previous class will be different. Because many of these changes are the basis of microbial importance in environmental, medical, and food-related realms, you should be able to relate these to the broader phenomena you’ve studied in other Biology classes, deal with in everyday life or will encounter in future careers.

How the semester’s work is organized: You will learn microbiological tools and techniques by completing many separate experiments that will each take several lab periods to complete. This should make the course more interesting because even though you will all learn the same tests, tools and techniques your individual results will be very different. I don’t even know what your specific results will be for each experiment, so the semester will be
exciting for all of us! One drawback of this sort of schedule is that the order of topics in lab course does not strictly follow that of the lecture course BIOL450 (see the accompanying schedule of lab topics). In order to be prepared for each lab it will be important for you to complete all the recommended reading before you come to class. This reading schedule is included in the Schedule of Exercises. As we progress through the semester you may find that you've already covered some or all of the reading for a particular lab, and in those cases you only need to skim through the reading to remind yourself of important concepts and terms.

COURSE GOAL: The goal of this course is to provide you with the opportunity to develop proper laboratory skills (manual, observational, record-keeping) and critical thinking skills needed to investigate microorganisms, and a body of knowledge on which to base your own further learning in related areas*. You will also have the opportunity to practice scientific communication skills through the completion of several written reports documenting your unique experiments this semester.

LEARNING OBJECTIVES: Each day’s work as described in your Schedule of Exercises for this course begins with a description of the objectives for the new or ongoing activities of the day.

LAB SAFETY PROCEDURES The biology department has compiled a list of Laboratory Safety Guidelines that each lab course modifies to fit its activities. The goals of these guidelines are to greatly limit the possibility for accidental injury to students and other department personnel, and to ensure that laboratory materials and equipment are protected from damage. A copy of this statement is posted as a file on our Canvas course page. Each of you needs to read the guidelines carefully within the first week of class, and then SIGN THE FORM that will be circulated in lab indicating that you have done so. Please review the document from time to time to make sure you are thoroughly familiar with its contents and prepared to follow them. Note that similar safety guidelines are found in your lab manual as assigned reading.

SOME GENERAL GUIDELINES THAT APPLY TO YOUR PARTICIPATION IN THIS LABORATORY ARE AS FOLLOWS:

1. Attendance at ALL lab sessions in Bacteriology is CRITICAL. Cultures are prepared to be ready on a particular day and materials are normally discarded after the lab is completed. Also, the cultures you make on a particular day are usually observed in the next lab. Therefore, please schedule activities such as interviews, doctor’s appointments, and the like for a time which does not conflict with your lab session whenever possible. Arrangements for an unavoidable absence should be made in advance; in case of an unforeseen emergency, please notify our departmental secretary (745-3623) or leave a message on my voice mail so that special provisions to preserve your bacterial cultures may be made if possible.

2. PLEASE-do not come late for lab! This is RUDE behavior. Your late entry is distracting to all of us. You will miss essential information and then will have to impose

* This course involves content or activities addressing the following standards in the NSTA Reporting Standards for Science: 1a, 1b, 1c, 1d, 2a, 3a, 3b, 5d, 9a, 9c, 9d
on your classmates to fill you in on instructions or to carry on with group exercises while you try to figure out what’s going on.

3. **NO eating or drinking may be done in the lab**, unless it is part of a lab exercise! Some of the bacteria we work with (ex. *Salmonella, Staphylococcus aureus*) are pathogens and can cause very nasty illnesses by an oral route.

4. I request that you **do not enter the lab until shortly before class is due to start**. I am often involved with last-minute preparations and distribution of materials just before class begins, and federal safety regulations require that we keep the door locked when I am not in attendance because potential pathogens are in use.

5. When you arrive in lab you should hang coats and backpacks on the hooks on the side walls to get them out of the way of the lab benches – in this lab we move around a lot. **Cell phone, tablets, etc... must remain in your bag during lab.** Facebook updates and texts to your friends can wait. We work with many pathogens, and if you contaminate your phone you will spread them all over campus. In order to encourage adherence to this important safety guideline **I will dock 10 points from your score every time I see an unapproved device in lab.**

6. Please **report all injuries or spills of cultures** to your lab instructor immediately so that safety precautions may be taken. We will work with some bacteria that are potentially capable of causing disease by invasion through breaks in your skin. If you have any **cuts on your hands**, cover them with a band-aid before class starts. **If your hair is long**, tie it back at the start of the period to avoid lighting it on fire from the Bunsen burners. This **has** happened in lab before so be careful!

7. Please note that your success in carrying out the day’s activities will in large part arise from your personal effort in **preparing for class**. You must read the description of each day’s work in your lab/lecture texts and/or on a handout **BEFORE** coming to lab. This is why information is provided on your class schedule about the background resources available to you. Preparation is especially important in Bacteriology lab since we will be doing parts of several exercises each day – you will become very CONFUSED and overwhelmed if you don’t review mentally the progression of ongoing work **before you get to class**. You must also understand the background for the content of all aspects of the day’s work. A handout giving particulars of each day’s work will be available when you arrive. Please read it over as you wait for class to begin. Follow it during the class period – you may want to make checks as you complete the day’s activities. **I am happy to answer any question you have in class, except procedural/methodological questions addressed in your reading material.** Come to class prepared! A series of verbal explanations and directions will be given at the beginning of each lab period. I will try to keep these as short as possible, but they can get lengthy when several new exercises are beginning as well as when we are reviewing previous work together as a class. The background material we discuss at the start of lab or which you obtain from your reading in preparation for lab will be the basis for exam questions.

8. **At the end of the period**, it is YOUR responsibility to:
   - Turn off the Bunsen burner
   - Return all equipment items to their proper places, taking special care with your microscope
   - Deposit discarded materials on the cart by the door
   - Make sure your newly-inoculated items are put into the proper racks or tubs
   - Clean the bench top with disinfectant, close drawers, and return lab chairs to their places
➢ Wash your hands!
➢ Remember that there are many, many other lab sections using our classroom throughout the week, so be considerate and do not borrow items belonging to another student or neglect to return equipment to its proper place in good condition.

RECORDING DATA AND OBSERVATIONS
1. You may keep notes on information given at the start of class, and your own observations and data from experiments, etc. in any kind of notebook you find convenient.
2. For isolation and identification exercises (see below) you will keep daily records of all procedures and observations in a special bound (not spiral) research notebook used only for this purpose. The duplicate copies of your daily work will ultimately be submitted. Additional instructions about this notebook will be provided in class.

EXAMS. Exam dates are listed in your class schedule. Each of the three exams will be arranged as lab practicals. This means that you will get to move around the room to different question stations and demonstrate your practical recognition of microbiological structures, your ability to perform analytical techniques, your skill at reading graphs and tables, your expertise at interpreting test results, and similarly wow me with your astounding proficiency in many other practical areas of microbiology.

Only the GRAVEST EXCUSE will be accepted for a missed exam!

It is very difficult to arrange make-ups for practical exams because of the large quantity of living materials and chemical reactions that are involved. I also cannot leave a lab exam set up for more than one day because we share the room. If you experience an emergency and cannot make the scheduled exam, you must inform me on that same day by phone or e-mail.

If you foresee an unavoidable conflict that is outside your power to correct (i.e. medical school interview, away games of your team, university organizations with conferences out of town, etc.), please inform me well in advance of the problem and I'll try to work with you. However, our options are now severely limited so do everything in your power without exception to avoid missing a lab exam.

Some practical information about the course:

Time for review and self-help: We share Albers 207 with another course so I cannot leave materials out indefinitely for you to review. This also means that you do not have open access to the lab during other classes’ meeting times. I will negotiate with other instructors using the lab to try and arrange for review and open work times, and will announce these as they come up. It is therefore important that you take notes as you work through each exercise so that you can review outside of lab.
**Academic Honesty:** Science is collaborative, and seldom does any scientist work alone. You may work with others on homework, but make sure you are benefiting intellectually from the collaboration—**not simply copying.**

Otherwise the policy is simple: don’t cheat. Demonstrate integrity. You or someone you love is paying a lot of money for you to attend Xavier. The value of your education decreases whenever you or one of your peers cheats to earn grades or a degree. Cheating hurts other students and harms the reputation of the university. Therefore, the **penalty for intentional academic dishonesty in this course is a failing grade.** Per university policy, academic dishonesty will be reported to the dean’s office. It is your responsibility to educate yourself about what constitutes academic dishonesty.

Some guidelines in regard to academic integrity that are particular to this laboratory are as follows:

1. Your isolation notebook must be entirely the result of your own efforts. **Entries during isolations and identifications should record your work IN LAB AT THE TIME THE OBSERVATIONS ARE MADE,** not that night or over the weekend. Many of you will have careers in medicine or science where such prompt recording of observations or clinical information is essential. I will not accept recopies or photocopies of your work. So, be sure to **bring your isolation notebook to every lab.** I will from time to time check that you do indeed have your lab notebook and are making that day’s entries into it. If you fail to do so, penalties will regretfully be deducted under the “Evaluation of Lab Habits” component of your lab score.

2. Experiments done in pairs or groups will, of necessity, have data accumulated jointly. However, the **lab reports based on such data, including tables and graphs incorporating your data, must be the work of the individual student only.**

3. Occasionally, you may need to **borrow a subculture** from another student in order to continue an isolation. This may be done only with permission of your instructor, and the fact that you have done so must be fully documented in your isolation notebook.

**Grading.** Your final grade will be calculated by dividing the points you earn on the three exams (total 450 pts), on the written reports and other lab activities (total 320 points), and for your conscientious application of good lab habits (30 points) by the total possible points of 800.

A summary of evaluated components of the lab is as follows:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>VALUE</th>
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</thead>
<tbody>
<tr>
<td>3 exams (150 points each)</td>
<td>450</td>
</tr>
<tr>
<td>Dilution Problem Set</td>
<td>20</td>
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<tr>
<td>Isolations from nature</td>
<td></td>
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<tr>
<td><em>Pseudomonas</em> isolation</td>
<td></td>
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<tr>
<td>Carbon copies of lab notebook</td>
<td>20</td>
</tr>
<tr>
<td>Written report (CANVAS)</td>
<td>20</td>
</tr>
<tr>
<td>Culture</td>
<td>10</td>
</tr>
<tr>
<td><em>Streptomyces</em> isolation</td>
<td></td>
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<tr>
<td>Spot check of lab notebook</td>
<td>10</td>
</tr>
<tr>
<td>Written report (CANVAS)</td>
<td>30</td>
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<tr>
<td>Culture</td>
<td>10</td>
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<tr>
<td>Phage isolation</td>
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<td>Spot check of lab notebook</td>
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<tr>
<td>Written report (CANVAS)</td>
<td>30</td>
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<tr>
<td>Culture</td>
<td>10</td>
</tr>
<tr>
<td>Rock Paper Scissors Report</td>
<td>50</td>
</tr>
</tbody>
</table>
Lab reports

Limiting factors and growth curve (CANVAS) 50
Enteric unknown identification reports
  Unknown 1 – tube tests 25
  Unknown 2 – API 20E strip 25
Evaluation of lab habits ***30

*** includes the following: attendance (no unexcused absences are acceptable); being on time for lab instructions at the start of lab; showing good preparation for class activities; following safety procedures during class; having your lab notebook on hand whenever required in the day’s work; MAKING SURE OIL IS CLEANED OFF THE 100X (“OIL IMMERSION”) OBJECTIVE LENS before storage of your microscope; cleaning out all stored materials at the conclusion of your team’s research project.

Late reports: All written work (including isolations and identifications) is due on the date indicated in the syllabus unless a change in this schedule has been announced. All written assignments, except the carbon copies of your lab notebook, will be submitted through Canvas. I will accept late lab reports submitted within 24 hours of the due date with the deduction of a penalty of 20%. No report will be accepted more than 24 hours after the due date, unless special permission has been given. Mark due dates on your calendar at the beginning of the semester. It is not up to me to remind you a report is due!