CEDAR CREST COLLEGE

Biology 227 –Microbiology

Fall 2011 – Course Syllabus & Policies

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Office hours: W and F 10:00 – 10:50
W 1:30 – 2:30
in Science Center 110
and by appointment

Course Description:

This course surveys microbial life including bacteria, fungi, protozoa, and viruses (with an emphasis on bacteria). Topics covered include microbial characteristics, physical and chemical control, metabolism, enzymes, regulation of enzyme activity, bacterial genetics, bacterial diversity, microbial control and applications of microbiology. The laboratory includes aseptic technique, staining procedures, culture methods, cultural and physical characteristics, microbial control, microbiology of food, water and soil, microbiology of the body, and identification of unknowns. Lecture three hours, laboratory three hours.

Lecture 3 hours/week in Science Center 139 (Laboratory two 1.5 hour sections/week in Oberkotter Center 2. Lab and lecture must be taken together.

Prerequisites: Completion of Bio 121, Bio 122, Che 111, Che 112, Bio 235 and 236 is required. Completion of Che 205 & 206 is highly recommended.

Required Course Materials:

Lecture textbook: Robert W. Bauman, *Microbiology: with diseases by body system*, 3rd Ed., Benjamin Cummings, 2012. [ISBN 13:978-0-321-71271-4]. You may also consider an etext version for this course, if you prefer.

Classroom response tracker: Radio frequency (RF) keypad "clicker" from the bookstore. The simple one (grey, not blue) is recommended and preferred. If you have not done so before, you can register your clicker on the left side at https://my.cedarcrest.edu after logging in.

Laboratory manual: Michael J. Leboffe and Burton E. Pierce's *Microbiology: Laboratory Theory and Application*, 3nd ed., Morton, 2010 (ISBN: 978-0895828309).

Laboratory notebook: W.H. Freeman & Company paperback Laboratory Notebook with copying carbonless grid paper (ISBN: 0716739003) or an equivalent carbonless notebook that makes copies.

Course Objectives:

This course is designed to address the principles of microbiology necessary for careers across the science fields that either directly or indirectly make use of microbiology. These include but are not limited to careers in medicine, public health, epidemiology, biotechnology, pharmaceutical applications, genetic engineering, molecular biology, cell biology, ecology, bioconservation, green technologies, and quality control positions. Our overall focus is to explore the broad roles that microorganisms have every day life, from the good, to the bad, to the neutral. It is my desire to actively engage students in the classroom. To this end I expect them to have read the selected materials before class in order to participate fully in discussions and learning activities.

For the first part of the course, we are interested in the structures and functions of prokaryotes. We will address historical microbiology and the scientific method and look ahead to how microbiology is a part of many careers. We will address the basic macromolecules and building blocks of cells to allow us to further discuss cell structures and functions and how these can be viewed under the microscope.

For the second part of the course, we will study the metabolism and cell growth, with a strong focus on how microbes do thing differently from other cells. We will try to make these topics "come to life" by various examples. This section will also include applications to food, industrial, environmental and forensic microbiology. Throughout both the first and second portions of the course, we will continue to build on and refer to the prokaryotic organisms adopted individually by students.

For the third part of the course, we will consider how eukaryotic microbes are different from other eukaryotes and from prokaryotes. We will then move to discuss virus structures, reproduction, and their impact on the world. Following viruses we will turn our attention to bacterial genetics and biotechnology applications. And finally, we will scratch the surface of how microbes can be controlled, focusing on physical and chemical control and merely nodding toward antimicrobial control so that we can introduce antimicrobial resistance issues.

Course Outcomes and Assessment:

In 2011, the American Association for the Advancement of Science (AAAS) put out a report entitled *Vision and Change in Undergraduate Biology Education: A Call to Action*. A part of this work listed five overarching concepts that students should understand, not just memorize. In their follow up report, the American Society of Microbiology (ASM) Task Force on Curriculum Guidelines for Undergraduate Microbiology Education expanded on these five concepts in the area of microbiology and added a sixth concept specific to microbiology. They also created a set of scientific skill and competency areas. These key concepts and skills/competencies are the course outcomes and are in quotes below are from the ASM Task Committee on Undergraduate Curriculum Guidelines May 2011 document within http://www.asm.org/index.php/education/curriculum-resources-and-publications-ug.html:

Lecture Outcome (1): Be able to describe and explain the statements made under the *Evolution* overarching concept listed below (ASM Undergraduate Curriculum Guidelines):

"Evolution
1. Cells, organelles and all major metabolic pathways evolved from early prokaryotes.
2. The immense diversity of micro-environments, along with mutations and horizontal gene transfer, have selected for a huge diversity of micro-organisms.
3. Human impact on the environment influences the evolution of microorganisms (for example, emerging diseases and the selection of antibiotic resistance).
4. The biological concept of species is not readily applicable to microbes, due to their rapidly changing genomes and frequent use of asexual reproduction.
5. The evolutionary relatedness of organisms is best reflected in phylogenetic trees."

Lecture Assessment (1): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered chapters #11, 8, 3, 7, and 9. The *Evolution* overarching concepts are addressed in Assignments 1 and 6; Clicker quiz 3; Exams 1 and 3; and the final exam.

Lecture Outcome (2): Be able to describe and explain the statements made under the *Structure and Function* overarching concept listed below (ASM Undergraduate Curriculum Guidelines):

"Structure and Function

1. Microorganisms have unique cell structures that can act as targets for antibiotics, immunity and phage infection.
2. Bacteria have unique structures (flagella, endospores, and pili) that often convey critical capabilities.
3. The life cycles of viruses (lytic and lysogenic) are different from living cells and determined by their unique genomes and structures.
4. The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron)."

Lecture Assessment (2): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered by chapters #2, 3, 4, 12, and 13. The *Structure and Function* overarching concepts are addressed in the Adopted Microbe Projects, Assignments 1, 4, and 5; Clicker quizzes 2 and 5; Exams 1 and 3; and the final exam.

Lecture Outcome (3): Be able to describe and explain the statements made under the *Metabolic Pathways* overarching concept listed below (ASM Undergraduate Curriculum Guidelines).

"Metabolic Pathways

1. Microorganisms exhibit extensive metabolic diversity.
2. The enrichment and growth of a microorganism depends on its metabolic characteristics.
3. The growth of microorganisms can be controlled by physical, chemical, mechanical, and biological methods.
4. Metabolic capabilities determine the interactions of microorganisms among themselves and with their environment."

Lecture Assessment (3): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered by chapters #5, 6, and 9. The *Metabolic Pathways* overarching concepts are addressed in the Adopted Microbe Projects, Assignments 2 and 3; Clicker quizzes 2 and 5; Exam 2; and the final exam.

Lecture Outcome (4): Be able to describe and explain the statements made under the *Information Flow* overarching concept listed below (ASM Undergraduate Curriculum Guidelines).

"Information Flow

1. Genetic variations impact microbial functions.
2. Although the central dogma is universal in all cells, bacteria, archaea, and eukaryotes are characterized by unique features within the mechanisms of replication, transcription, and translation.
3. Both external and internal cues and/or signals regulate gene expression.
4. The replication of genetic material and cell synthesis in viruses differs from cells and among viruses."

Lecture Assessment (4): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered by chapters #7 and 13. The *Information Flow* overarching concepts are addressed in the Assignments 5 and 6; Exam 3; and the final exam.

Lecture Outcome (5): Be able to describe and explain the statements made under the *Systems* overarching concept listed below (ASM Undergraduate Curriculum Guidelines).

"Systems

1. Microorganisms are ubiquitous and live in diverse and complex ecosystems.
2. Most bacteria in nature live in biofilm communities.
3. Microorganisms and their environment interact with and modify each other.
4. Interactions between a host and microorganism (cellular or viral) can be neutral, detrimental, or

beneficial.
5. Microorganisms, cellular and viral, interact with both human and non-human hosts."

Lecture Assessment (5): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered by chapters #1 and 25. The *Systems* overarching concepts are addressed in the Adopted Microbe Projects, Clicker quizzes 1 and 4, Exam 1 and 2; and the final exam.

Lecture Outcome (6): Be able to describe and explain the statements made under the *Impact of Microorganisms* overarching concept listed below (ASM Undergraduate Curriculum Guidelines).

Impact of Microorganisms
1. Life on this planet, as we know it, depends on microorganisms.
2. Microorganisms provide essential models that provide scientists with fundamental knowledge about all other life.
3. Humans continue to utilize and harness microorganisms and their products for our own benefit.
4. The potential for microorganisms to improve life is not yet fully explored due to our current limited understanding of the true diversity of microbial life."

Lecture Assessment (6): Assigned readings in the textbook are fundamental to class discussions and student learning. The topics above are largely covered by chapters #1, 8 and 25. The *Impact of Microorganisms* overarching concepts are addressed in the Adopted Microbe Projects, Clicker quizzes 1 and 4, Exam 1 and 2; and the final exam.

Course Outcome (7): Be able to perform the tasks as listed under the *Scientific Thinking* overarching skill & competency listed below (ASM Undergraduate Curriculum Guidelines):

"Scientific Thinking
1. Ability to apply the process of science
   a. Demonstrate an understanding of hypothesis testing and experimental design
   b. Analyze and interpret results from a variety of methods used to investigate microbes and apply these methods to other situations
2. Ability to use quantitative reasoning
   a. Apply quantitative reasoning to solving problems in microbiology
3. Ability to communicate and collaborate with other disciplines
   a. Demonstrate interpersonal and collaborative skills
   b. Communicate fundamental concepts of microbiology, both in written and in oral format.
   c. Identify, interpret and evaluate a range of scientific literature
4. Ability to understand the relationship between science and society
   a. Demonstrate an understanding of ethical responsibility as it applies to microbiology"

Course Assessment (7): Scientific thinking and microbiology are covered by chapter 1. The *Scientific Thinking* overarching skill & competency are addressed in the Adopted Microbe Projects, laboratory unknown project, exams and final exams.

Course Outcome (8): Be able to perform the tasks as listed under the *Microbiology Skills* overarching skill & competency listed below (ASM Undergraduate Curriculum Guidelines):

"Microbiology Skills
1. Properly prepare specimens for examination using phase contrast and brightfield microscopy
2. Use aseptic and pure culture techniques
3. Use appropriate microbiological media and test systems to identify microorganisms
4. Estimate the number of microorganisms in a sample
5. Use standard molecular and microbiological equipment
6. Practice safe microbiology, using appropriate protective and emergency procedures"

Course Assessment (8): The *Microbiology Skills* overarching skill & competency are addressed in the experiments, reports, quizzes, pre-labs, and practicals associated with the laboratory component of the course.

Grading:

Course work will be evaluated on a percent scale as follows.

30%	3 lecture exams
17%	Homework assignments & writing to learn exercises (5%), in-class quizzes (2.5%), class preparation & participation, project presentation on adopted prokaryote (5%), eukaryotic creative activity (2.5%), virus letter (2%)
8%	Laboratory unknown report
10%	2 laboratory practicals
15%	5 lab quizzes (8%), evaluation of lab safety & performance, notebooks (5) & prelabs (2%)
20%	Cumulative final exam
100% total	

Your percentages from the above list will be totaled and used to compute your final grade.

Final grade %	A	A-	B+	B	B-	C+	C	C-	D+	D	F
	93-100	90-92.9	87-89.9	83-86.9	80-82.9	77-79.9	73-76.9	70-72.9	67-69.9	60-66.9	<60

Lecture Policies and Student Responsibilities:

A. Academic Policies:

1. I fully support the Honor Code, Honor Philosophy, Community Standards for Academic Conduct, and the Community Standards for Social Conduct set out by the *Cedar Crest College Student Handbook*. This means, but is not limited to, the following:
   - Plagiarism will result in a zero for the assignment.
   - Cheating will result in a zero for the test/assignment and could result in course failure.
   - Plagiarism and cheating violations will be reported to the Provost, Academic Services, and/or the Honor & Judicial Board as necessary, and may result in failure of the course.
   - Violations or violation intensions of these statements should be brought to my attention.
2. I expect the classroom to be an environment in which all students can participate and learn. Behaviors that detract from this ideal environment (as listed in the Classroom Protocol of *Cedar Crest College Student Handbook* and mentioned below) should be avoided at all costs. Repeated classroom disruptions could result in your final grade lowered by up to 10% or by a third of a letter grade. Refrain from all activities that detract from the learning of others. This includes but is not limited to the following: silence cell phones during class unless there is an impending emergency, do not text or instant message, do not routinely come to class late, do not eat or talk

in ways that are distracting to those around you, and do not leave the classroom except for the bathroom or related emergencies. Clear reasonable anticipated interruptions in advance.

3. If the College is canceled for weather or related reasons and it is an exam day, we will plan on having the exam on the next scheduled class day unless otherwise notified. If the College is canceled the lecture before we have an exam, the exam will remain as scheduled. If the College is delayed, we will adhere to the delayed timeframe, even if this falls on an exam day.

B. Lecture Attendance Policies:

1. You are expected to attend lecture and to come to class prepared. Attendance will be documented. Extended unexcused absences may result in up to a 10% reduction of the total lecture grade. Unexcused absences for lecture exams or finals will result a zero for that exam.
2. In the unfortunate event of an unplanned absence due to a personal or family medical emergency, you must contact the Acting Dean of Student Affairs (Denise O'Neill: 610-437-4471, x4680; doneill@cedarcrest.edu) to obtain appropriate documentation for an excused absence. These offices will contact me. You should also contact me to make alternative coursework plans.
3. For expected absences or early departures due to Cedar Crest-sanctioned events, please notify me as soon as possible and see your coach or instructor for official documentation in advance.
4. You are expected to be at lecture on either side of Thanksgiving break. Scheduling family vacations during the non-break sections of the semester is highly unadvisable.
5. It is your responsibility to obtain notes and handouts from a classmate for lecture absences.

C. Laboratory Attendance Policies:

1. Laboratory attendance is mandatory by college policy. Each unexcused absence will result in a 10% reduction of your total laboratory grade. Each excused absence without made up work will result in a 5% reduction of your total laboratory grade. Each unexcused absence with made up work will also result in a 5% reduction of your total laboratory grade. See point #4 and its sub-bullets below. Unexcused absences on the day of a practical will result in a zero for that exam.
2. For expected absences or early departures due to Cedar Crest-sanctioned events, please notify me as soon as possible and see your coach or instructor for official documentation in advance. You are responsible for coordinating with me as to how to make up any missed lab work.
3. You are expected to be at lab on either side of Thanksgiving break. Scheduling family vacations during the non-break sections of the semester is highly unadvisable.
4. Only emergencies or special circumstances will be allowed as reasons for any make-up lab. Any adjustments must fulfill the following 3 requirements:
    - You must notify me on the day of or before the lab. This should happen before the time of the scheduled lab, pending valid emergencies.
    - I receive official documentation (such as an email from the Health Center, Dean of Academic Affairs, or Academic Services) that is considered valid (at my discretion) within one week of the absence.
    - The lab must be completed within 48 hours of the absence. It is your responsibility to contact me as soon as possible to schedule any approved make-up lab. Due to the nature of lab work and supplies, some labs may not be able to be made up as performed in class.

D. Lecture & Lab Assignment Policies:

1. Assignments are to be done as scheduled and work to be handed in at the beginning of the class during which it is due unless otherwise instructed. Late penalties are 5% per day and 20% per week, of the total points possible for the assignment.
2. If you miss class on a day on which an assignment is due, it is your responsibility to get the assignment in on time or as soon as possible (to minimize your deducted points). If you miss class on a day on which an assignment is passed out, it is your responsibility to get a copy of the uncompleted assignment from a classmate.
3. Do not use pink or red ink/pencil for assignments you will be turning in.
4. You may work with a friend on class preparation questions. You must write up separate work and should indicate the student with whom you worked. These will be collected periodically.
5. You can access any review questions and additional suggested readings associated with the class through Cedar Online (cedarcrestonline.net) and the eCollege system. You may be asked to submit assignments or other work through eCollege.
6. Your laboratory unknown work is to be handed in and picked up as instructed. This work is only your own, although you make seek guidance from the instructor and course IA.

E. Lecture & Laboratory Quiz, Exam & Final Exam Policies:

1. As with other laboratory courses, there are different lab sections. You are expected to not share or discuss any laboratory quiz, practical, or related materials with others in another section.
2. If you miss a "clicker" quiz, you will forfeit the points associated with that quiz. These quizzes cannot be made up. There may be extra points associated with this portion of your grade or the lowest quiz score may be dropped.
3. You are expected to sit with a space between you and the next student whenever possible and may be given exam seat assignments.
4. You are expected to be at each exam on time and as scheduled. If you arrive late for an exam or quiz, in lab or lecture, you forfeit that time in taking the test. Unexcused absences on the day of an exam will result in a zero for that exam. Excuses exam absences must fulfill the requirements listed above for excused laboratory absences (see C.4 policy for excused lab absences).
5. Some make-up exams may not necessarily correspond to the regular test format. They will be given at a designated time and may also be scheduled during the week of final exams.
6. Before each exam, all material must be placed in the front or side of the room as directed. Purses, papers, notebooks, books, PDAs, cell phones, headphones, guests, calculators or other devices are not allowed unless otherwise directed. Exams should be in ink (not red or pink).
7. Your obligation for this course includes attendance at the final exam on the day and time scheduled by the Registrar's Office. You should not make travel arrangements (nor should anyone else make them for you) until the final exam schedule is published. If you must make plans early, you should schedule your travel after the last final exam day.
8. Final exam times cannot be rearranged unless three or more exams occur within a 24-hour period. Any exception must be petitioned and reviewed by the Department of Biological Sciences within a week of when the final exam schedule is announced in class.

F. Academic Services:

1. Disabilities Services:
   - Students with disabilities who wish to request accommodations should contact the Advising Center or visit http://www2.cedarcrest.edu/acadadvising/ada_file.html within the first two weeks of class.
2. Academic Support:
   - The Advising Center provides many resources, such as study skills resources and peer tutoring, via email at advising@cedarcrest.edu, on campus site, their website http://www2.cedarcrest.edu/acadadvising/index.html, or by phone at 610-606-4628.
3. Course resources:
   - There may be a laboratory instructional assistant or a "super tutor" associated with the course. Peer tutoring is also available.
   - Bonus point for the attendance and a 1 page typed response to approved (microbially relevant) seminars is possible. These opportunities will be announced as they become available.

CEDAR CREST COLLEGE
Biology 227 Microbiology
Course Syllabus – Part II - Lecture Schedule & Assignments

- Lecture textbook: Robert W. Bauman, *Microbiology: with diseases by body system*, 3rd ed., Benjamin Cummings, 2012.
- Masteringmicrobiology.com course: CCCBIO227REESE2011
- Lecture schedule subject to change if needed.

Date	Lecture topics & assignments	Read or do BEFORE class
Aug 29, M Lecture 1	• Brief course overview & tips • Discuss Adopt-A-Microbe project • Topic: Introduction to course • *What is microbiology?*	• Read chapter 1: pg1-18 (though the Golden Age of microbiology)
Aug 31, W Lecture 2	• **Clicker quiz 0**: syllabus policies • Determine if schedule conflicts • Establish adopted prokaryotes for the class • Adopted prokaryote handout • Topic: Modern microbiology • *How could microbiology be in your future?*	• Register clicker if you haven't already • Read Chapter 1: pg18-22 • Find a prokaryote to adopt & love from somewhere in your book (such as Chapter 11) or resources at the eCollege class site. Be prepared to share (& spell) your adopted prokaryote (bring choices #2 & #3) & its impact.
Sept 2, F Lecture 3	• **Clicker quiz 1**: on Chapter 1 and Chapter 2- macromolecules basics & their building blocks • Topic: macromolecules • *What do you need to build a cell?*	• Read Chapter 2: 34-52; Chemical reactions - > organic molecules (you may wish to read pg27-34 for review)
Sept 5, M	NO CLASS, LABOR DAY	
Sept 7, W Lecture 4	• Topic: Microscopy & staining • *How can microscopes help you view cells and cell structures?*	• Read Chapter 4: p97-113; Units of measurement -> Staining • Are there images available for your prokaryote? Track them, but you don't need to bring them to class.
Sept 9, F Lecture 5	• Topic: classification & identification • *How are organisms classified? What is a species?* • *Bergey's Manual* handout • **Assignment 1:** Chapter 4 critical thinking questions 1-5 pg 124. You may discuss them with a friend, but answer on your own. Due:	• Read Chapter 4: p114-125; Classification & Identification • Read Chapter 11: pg322-323; Modern Prokaryotic Classification • How will we identify lab unknowns and how is this different from how you will study your adopted prokaryote?

Sept 12, M Lecture 6	• Topic: external bacterial features • *What external features might microbes possess (that may differentiate them from other types of cells)?*	• Read Chapter 3: pg57-64; Processes of life -> External structures • Determine what external structures your prokaryote may possess.
Sept 14, W Lecture 7	• Topic: Cell membranes, cell walls, & Gram staining • *Why do Gram positive and negative cells stain differently?* • Cell wall handout	• Read Chapter 3: pg65-73; Bacterial cell walls -> Bacterial cytoplasmic membrane • Does your prokaryote stain Gram + or -
Sept 16, F Lecture 8	• Topic: bacterial insides • *What are some of the ways in which some bacteria can survive dry conditions?*	• Read Chapter 3: pg73-76; Cytoplasm of bacteria -> nonmembranous organelles • Does your prokaryote possess any special internal structures? What type(s) of microscopy might be used to view them?
Sept 19, M Lecture 9	• **Clicker quiz 2**: on Chapter 3 • Topic: general prokaryotic features & arachael organisms • *Are all bacteria the same shape?*	• Read Chapter 11: pg319-322; General prokaryotic characteristics • Read Chapter 3: pg76-778; Archaeal structure sections • Read Chapter 11: pg323-325; Archaeal diversity sections
Sept 21, W Lecture 10	• **Clicker quiz 3:** Chapter 3 & 11 as covered • Topic: metabolism & enzymes • *What types of reactions do enzymes do and what impacts their function?*	• Read Chapter 5:pg127-135; Basic chemical reactions underlying metabolism
Sept 23, F	**EXAM 1 Chapters 1 – 4**	
Sept 26, M Lecture 11	• Topic: glycolysis and alternative methods • *What do you recall about glycolysis?*	• Read Chapter 5:pg135-144; Carbohydrate catabolism (through Alternatives to glycolysis) • Does your prokaryote do any of these glycolysis alternative reactions?
Sept 28, W Lecture 12	• Topic: fermentation and anaerobic respiration • *What is fermentation?*	• Read Chapter 5:pg144-148; Carbohydrate catabolism (fermentation) • Does your prokaryote do any of these fermentation reactions?
Sept 30, F Lecture 13	• Topic: other catabolic pathways besides of carbohydrates • *How does the source of some fish odors (highlight box p149) relate to this chapter?*	• Read Chapter 5:pg148-149; Other catabolic pathways • Does your prokaryote do any special catabolic reactions?

Oct 3, M Lecture 14	• Topic: Photosynthesis • *What do you recall about photosynthesis?* • **Assignment 2:** Chapter 5 critical thinking questions #s 1, 2, 3, 4, 5, 6, 8, 11, 15, and 18 pg164. You may discuss them with a friend, but answer on your own. Due:	• Read Chapter 5:pg149-154; Photosynthesis • Does your prokaryote do any of these photosynthesis reactions?
Oct 5, W Lecture 15	• Topic: other anabolic pathways • *What does the cell need to make in order to grow or reproduce?*	• Read Chapter 5:pg154-158; Other anabolic pathways, Integration & regulation of metabolic functions
Oct 7, F Lecture 16	• Topic: cell growth requirements • *How do microbes get what they need (S, P, O, N, C, H and trace elements) to grow?*	• Read Chapter 6:pg 167-175, Growth requirements • What nutritional type (see Fig 6.1) is your prokaryote and why?
Oct 10, M	NO CLASS, FALL BREAK	Ponder the marvels of microbes….
Oct 12, W Lecture 17	• Topic: Culturing bacteria • *What steps must be taken to identify a culturable bacterium from a sample?*	• Read Chapter 6:pg 175-183, Culturing microorganisms
Oct 14, F Lecture 18	• Topic: Microbial growth • *What do you recall about bacterial growth?*	• Read Chapter 6:pg 183-195, Growth of microbial populations
Oct 17, M Lecture 19	• Topic: Microbes in food and industry • *What role do microbes play in food?* • **Assignment 3:** Chapter 6 critical thinking questions #s 1-10 pg 194. You may discuss them with a friend, but answer on your own. Due:	• Read Chapter 25:pg 768-775, Food microbiology • Read Chapter 25: pg775-785; Industrial microbiology
Oct 19, W Lecture 20	• Topic: Microbes in environmental and forensic microbiology • *What role could microbes play in forensic science?*	• Read Chapter 25:pg 786-794; environmental microbiology, • Read Chapter 25: pg794-796; Biological warfare and bioterrorism • Prokaryotic presentation due in .ppt or .pptx format into eCollege dropbox
Oct 21, F	• **Clicker quiz 4:** Chapter 25 • Adopted prokaryote presentations:	

Oct 24, M	• Adopted prokaryote presentations:	
Oct 26, W	• Adopted prokaryote presentations:	
Oct 28, F Lecture 21	• **Clicker quiz 5**: on eukaryotic cell basics (chapter 3 & 12) • Topic: Eukaryotic history & structures • *How do eukaryotic and prokaryotic cells differ?* • Eukaryotic microbe adoption handout	• Read Chapter 3: pg78-89; External structure of eukaryotic cells -> cytoplasm of eukaryotes • Read Chapter 12: pg348-352; General characteristics of eukaryotic organisms
Oct 31, M	**EXAM 2 Chapters 5, 6, 25, and adopted prokaryote examples**	
Nov 2, W Lecture 22	• Topic: Protozoa • *How would you describe protozoa?*	• Read Chapter 12: pg 353-360; Protozoa • If you adopted a protozoa, be prepared to share highlights about its habitat, classification, reproductive life cycle, and impact/applications.
Nov 4, F Lecture 23	• Topic: Fungus fun • *How would you describe microscopic fungi?*	• Read Chapter 12: pg 360-370; Fungi • If you adopted a fungus, be prepared to share highlights about its habitat, classification, reproductive life cycle, and impact/applications.
Nov 7, M Lecture 24	• Topic: Algae, water molds and eukaryotes of microbial interest • *How do today's microbes differ from fungi and protozoa?* • **Assignment 4:** Chapter 12 critical thinking questions 1-10 pg 380. You may discuss them with a friend, but answer on your own. Due:	• Read Chapter 12: pg 370-377; Algae -> Other eukaryotes of microbiological interest • If you adopted an organism from here, be prepared to share highlights about its habitat, classification, reproductive life cycle, and impact/applications.
Nov 9, W Lecture 25	• Virus adoption handout • Topic: Intro to viruses, structures & classification • *What does "virus" mean to you?*	• Read Chapter 13: pg383-389; Characteristics of viruses -> Classification of viruses • By the end of class, determine how your adopted virus is classified
Nov 11, F Lecture 26	• Topic: Viral replication • *Does viral infection always result in host cell lysis?*	• Read Chapter 13: pg390-399; Viral replication • What does your virus infect & what is the result, how does it replicate?

Nov 14, M Lecture 27	• Topic: impact of viruses, studying viruses & virus-like oddballs • *How can viruses be involved in cancer?* • **Assignment 5:** Chapter 13 critical thinking questions 1-5 pg 409. You may discuss them with a friend, but answer on your own. Due:	• Read Chapter 13: pg399-405; The role of viruses in cancer -> other parasitic particles
Nov 16, W Lecture 28	• Topic: genomes & gene function • *What are plasmids?*	• Read Chapter 7: pg197-206; The structure and replication of genomes, and pg206-216; Gene function (to regulation of genetic expression)
Nov 18, F Lecture 29	• Topic: various bacterial operons • *What are operons?*	• Read Chapter 7: pg216-220; Regulation of genetic expression
Nov 21, M	• **Presentation of creative eukaryotic projects**	• Be prepared to share your project while you learn about others.
Nov 23-25, W-F	THANKSGIVING BREAK	
Nov 28, M Lecture 30	• Topic: identifying mutants & mutagens, method applications • *What can cause DNA mutations?*	• Read Chapter 7: pg220-227; Mutations of genes
Nov 30, W Lecture 31	• **Virus letters due** • Topic: genetic recombination & transfer • *What is genetic recombination?* • **Assignment 6:** Chapter 7 critical thinking questions #s 4, 5, 6, 7, & 9 pg 237-238 as well as the critical thinking in text pg 233. You may discuss them with a friend, but answer on your own. Due:	• Virus letters due in .doc or .docx format into eCollege dropbox as well as 2 printed copies brought to class • Read Chapter 7: pg227-233; Genetic recombination & transfer •
Dec 2, F Lecture 32	• Topic: Recombinant DNA technology • *How are microbes used in recombinant DNA technology?*	• Read Chapter 8 (focus on the roles of microbes)
Dec 5, M	**EXAM 3 Chapters 3/12, 13, 7, 8, and adopted eukaryotes & viruses**	

Dec 7, W Lecture 33	• Topic: principles of controlling microbial growth in the environment, physical methods • *What microbes are the hardest to kill?* • Microbial control handout	• Read Chapter 9: 262-275; Basic principles of microbial control -> physical methods of microbial control
Dec 9, F Lecture 34	• Topic: chemical methods of microbial control • *What's under or above the sink?*	• Read Chapter 9: pg275-281; Chemical methods of microbial control
Dec 12, M Lecture 35	• **Clicker quiz 6**: microbial control • Topic: The very basics of how antimicrobials target cells and the issues of resistance • *What causes resistance?*	• Read Chapter 10; pg 288-290 (Fig 10.2) • Read Chapter 10 pg 301-305 Resistance to antimicrobial drugs
TBA	**FINAL EXAM**	• Chapters 9-10 tested for the first time • The rest of the final will be cumulative over the entire semester.

LECTURE TIPS:

- I expect you to have read before class and you will be responsible for material in the book not directly covered in class.
- As you collect information about your adopted prokaryote for class, track your resources so that you have everything you need later for your presentation.

CEDAR CREST COLLEGE
Biology 227 Microbiology, Fall 2011
Course Syllabus – Part III – Laboratory Schedule & Assignments

- Required: *Microbiology: Laboratory Theory & Application*, 3rdnd ed., 2010 & a carbonless notebook that produces a copy
- Recommended: Index cards, colored pencils, and a two pocket folder or 3-ring binder
- *Labs, lab strains, and materials subject to change as needed.*

Week	First lab	Second lab
Aug 29 – Sept 2	Lab 1 • Introduction to lab procedures, safety rules • Lab notebooks, study aids • Review microscope use & cleaning & lab resources (no slides) • 2-1 Ubiquity of microorganisms (2 plates, environmental & body) • "Pre"-lab 1, safety quiz	Lab 2 • Pre-Lab 2 • 2-1 Record observations • 1-3 Aseptic technique (transfer to nutrient broth, agar slant & agar plate) • 3-1 Bright-field microscopy, focus in oil w/ prepared slides • 8-1 Extra credit, on your own, Sherry Schoenberger may be material resource
Sept 5 – Sept 9	**NO LAB** • Labor Day holiday	Lab 3 • Pre-Lab 3 • 2-2, 2-3 & 2-4 Growth on plate, slant & broth • 3-5 Smear preparation & simple stain • 3-6 Negative stain
Sept 12 – Sept 16	Lab 4 • Pre-Lab 4 • 3-7 Gram stain • 3-9 Observe pre-made capsule stains	Lab 5 • **Quiz I (through lab 4)** • Pre-Lab 5 • 3-8 Acid-fast staining [with cold carbolfuchsin] • 1-4 Pure cultures, quadrant streak
Sept 19 – Sept 23	Lab 6 • Pre-Lab 6 • 3-10 Endospore stain (Schaeffer-Fulton method) • 3-13 Observe pre-made flagella stains • 1-4 Evaluate quadrant streak	Lab 7 • Pre-Lab 7 • Discuss unknown project • 1-2 Prepare media (with assigned media type) • 5-31 Inoculate nutrient plate with unknown mix and work on separating (unknowns go beyond listed ones) • **Slant pure unknown 16-24 hr before next lab**

Sept 26 – Sept 30	Lab 8 • **Slant pure unknown 16-24 hr before next lab** • Pre-Lab 8 • Inoculate unknown (UK) working & reserve cultures, nutrient broth • Gram stain of 16 hour culture • 16-24 hr macroscopic plate colony observations & measurements of unknown on nutrient agar	Lab 9 • Pre-Lab 9 • Observe, describe & record characteristics of UK in broth, slant, & plate (keep age in mine) • Consider acid fast or endospore test on unknown if appropriate • Respiration tests (cat & oxi from plate) o 5-5 Catalase o 5-6 Oxidase (swab, read in 30 sec) o 5-7 Nitrate reduction, may do broth & plate methods
Oct 3 – Oct 7	Lab 10 • Pre-Lab 10 • **Quiz II (labs 5-8)** • Respiration analysis • Oxidation/Fermentation & other fermentation tests & o 5-2 Glucose oxidative fermentation, OF o 5-3 Phenol red broth fermentations (glucose, lactose, mannitol) o 5-4 Methyl Red (no VP) • Utilization media test o 5-8 Citrate test	Lab 11 • Pre-lab 11 • Notebook quiz 1 (labs 1-8) • Catch-up, endospore or acid-fast stains if needed • 5-20 Combo differential media for sulfur reduction, indole production & motility (SIM) • 5-28 Motility test • Ferm/ox, fermentation & utilization test analysis • Discuss unknown strategy (3-14, 7-7, 7-8, 7-9), write-up, flow charts, *Bergey's Manuals*, metabolism chart, additional tests & [write-up handout]
Oct 10 – Oct 14	**NO LAB** Fall break	Lab 12 • **Quiz III (on labs 9-11)** • Pre-Lab 12 • Aerotolerance (of UK), discuss possible results now, check tubes in 24 hrs, check anaerobic jar results on day of practical o 2-6 Modified for tryptone glucose yeast extract (TGYA) o 2-7 (FTM) Fluid thioglycollate medium o 2-8 Anaerobic agar & GasPak jar

Oct 17 – Oct 21	**<u>LAB PRACTICAL I</u>**
	<u>(on labs 1 – 11)</u>
	
	Analysis of anaerobic jar
		<u>Lab 13</u>
		• Pre-Lab 13
		• Combo. diff. media
		  o 5-23 Litmus milk
		• 2-9 Temp. effects (5) on UK growth
		• Discuss aerotolerance tests
		• Detection of Hydrolytic enzymes (UK)
		  o 5-12 Starch hydrolysis
		  o 5-13 Urea hydrolysis, modified
		  o 5-15 Gelatin hydrolysis
		  o 5-17 Lipid hydrolysis, modified

Oct 24 – Oct 28	<u>Lab 14</u> • Pre-Lab 14 • Analysis of 2-9 temp. effects and hydrolytic &litmus milk reactions • 2-11 Osmotic pressure effects on growth (nutrient agar, glucose & NaCl plates, 4 strains/ plate using UK + control strains @ RT)	<u>Lab 15</u> • Pre-Lab 15 • Evaluate osmotic plates & group chart, analyze combo. diff. media tests • 8-11 Soil microbial count (with method slightly different than the lab manual) • Analysis of any extra credit columns • *Candida* plate swab
Oct 31 – Nov 4	<u>Lab 16</u> • Pre-Lab 16 • 8-11 Evaluations • 12-1 The Fungi: yeasts & molds, make a slide from *Candida*, 8-11 plates or other sample & look at prepared slides	<u>Lab 17</u> • Pre-Lab 17 • 12-3 Protozoans & algae; hay infusion or termite/microbe gut experiment
Nov 9 – Nov 11	<u>Lab 18</u> • Pre-Lab 18 • 3-2 Ocular micrometers & UK measurements • 6-5 Plaque assay, phage titering • **Quiz IV (labs 12-15)**	<u>Lab 19</u> • Pre-lab 19 • Notebook quiz 2 (labs 9-16) • 6-5 analysis • 10-3 pGlo bacterial transformation
Nov 14 – Nov 18	<u>Lab 20</u> • Pre-Lab 20 • Evaluate 10-3 • 8-12 Membrane filter method (3 groups/lab) EMB later • 8-13 Multiple tube fermentation method for total coliform detection (3 groups/lab), day 1-2, EMB for day 3 • Inoculate broths for 7-3 & GI sample	<u>Lab 21</u> • Pre-Lab 21 • Analysis of membrane filter and tube method of coliform determination • 9-1 Reductase test • 7-3 Antimicrobial & antiseptic/disinfectant testing • GI control broths

Nov 21 – Nov 25	Lab 22
	• Pre-Lab 22
	• **Quiz V (on material from labs 16-19)**
	• Kirby-Bauer analysis
	• Gastrointestinal (GI) sample
	  o 4-6 (EMB) Eosin methylene blue agar
	  o 4-5 MacConkey agar
	• 4-4 Inoculate Mannitol Salt Agar (MSA) with skin sample
	• 5-25 Inoculate Blood Agar Plate (BAP) with throat culture (check next day, if limited growth, leave in until before leaving for break, be sure to store in refrigerator over break!)
		NO LAB
		Thanksgiving break

Nov 28 – Dec 2
 	
UK report due Friday, Dec. 2
	Lab 23
	• Pre-Lab 23
	• Analyze GI plates
	• Skin sample
	  o Analyze MSA plate
	  o 5-27 Coagulase test
	  o BAP
	• Throat sample
	• Analyze BAP & study 3 normal/ pathogenic biota from the throat
		Lab 24
		• Pre-lab 24
		• **Quiz VI (on material from labs 20-23)**
		• Analyze coagulase and BAP skin sample tests
		• 9-2 Making yogurt

Dec 5 – Dec 9	Lab 25 • Clean drawer, incubator & fridge • Notebook quiz 3 (labs 17-24) • 1-1 GloGerm demonstration • Yogurt taste-testing	**PRACTICAL TEST II** (on labs 12 – 24)

GRADING

Lab grading policies:

1. Your lowest laboratory quiz grade will be dropped in the final laboratory component calculation.
2. You must observe proper laboratory technique, behavior, and safety rules as described below and as instructed by the professor. Failure to observe these rules will result in a lower grade and possible expulsion from the laboratory for the day or permanently.
3. Laboratory attendance is mandatory, as described in the syllabus. Failure to observe these rules will result in a lower grade.

4. Students must observe the policies outlined in *Bio227 Syllabus – Part I – Overview* handout, the Honor Code Philosophy, the Academic Standards of Integrity & the Statement on Academic Dishonesty or Plagiarism. Cheating and plagiarism will result in failure of the assignment and may be reported to the Vice President for Academic Affairs and the Dean of Faculty.

LABORATORY NOTEBOOKS

General Advice:

I have been known as a notebook stickler. There are useful notebook examples in a binder in the drawer in the front of the room. If you section and label your notebook in the following way for each day, you and I will be able to read your notebook with greater ease and this will be a good thing for your notebook grade. It will also help you find information. Spend time on your notebook while you have small bits of down time in lab. Don't be afraid to leave spaces in your notebook. We will often have several experiments going on, so you should establish a good method early on in the semester. You may group labs together in your conclusions etc. At the beginning of most labs, I will do a pre-lab introduction with board notes. These notes are often appropriate to incorporate later into your procedures, but I do not recommend trying to write it all in the beginning of your notes for the day. If you do record these notes, I would label them as "prep notes" etc.

Table of Contents:

1. The more details you put here, the easier it will be for you to find material in lab, when working on your unknown, and on the open notebook checks throughout the semester.
2. List the experiment number and a name for the experiment for easy reference.
3. I recommend you list certain techniques from the labs separately to find them easily later.
4. The best TOCs I have seen include additional information, such as the sub-sections of the experiment (such as where the conclusions can be found) or the lab purpose.

Date, time & personnel:

1. Record the date that the experiment (or part of the experiment) was started. You also must date any subsequent entries made for each experiment.
2. Your lab times will be the same every day, but sometimes you will come into lab between classes. You will want to keep track of the time when you began and ended incubation of a sample, so recording times will be helpful.
3. You should indicate when you do work with labmates. This will also help you track samples.

Project number and a brief title:

1. You might want to use the experiment number from the lab manual for easy referencing.
2. Some students also want to label all of their experiments in numerical order.
3. It will also help you find a particular experiment later if you give it a descriptive title.

Purpose, goal or aims of the experiment(s):

1. This can help you clarify what you are trying to do. If you aren't sure, find out!
2. On days when we do several experiments, it may be useful to connect them if they are related, or have separate aims that relate to each experiment.
3. Example: "We will use plate quadrant streaking to isolate pure strains from a mixed culture."

Procedure:

1. Do not simply write out what is in the lab manual. You also do not need complete sentences. You should record enough information that you would be able redo the experiment from your notebook. Do not simply refer to the lab manual (that won't be available during an exam). How you phrase the information will be in a way that is best for you to redo the work.
2. If you follow a standard protocol, such as a Gram stain, it needs to appear at least once in your notebook (probably the first day you did it). If it appears in your table of contents, it will be easy to find later. In later experiments of your notebook, you can refer back to it.
3. You should reference a protocol source if it is different from the laboratory manual.
4. Do not write these in advance of the lab. You will almost always make adaptations. Record incubation times and temperatures, and record any deviations from the intended protocol.

Observations and Results:

1. Record what you observe while you are in lab. Include the color of the result, and how long it took, then record your interpretations of these results (either with results or with conclusions).
2. If you only record an interpretation, how do you know what the result would look like again? This is an important distinction in this class (result vs. interpretation).
3. For example, what will "The test was positive for indole production" mean if you don't describe what led you to decide it was positive?
4. Pretend you are writing notes you will need to read and interpret 2 years from now in Bio 327 Microbial Pathogenesis and Human Immunology. It has worked well for some folks to use their Bio 227 Microbiology notebook later on in that class.

Conclusions.

1. The conclusions of an experiment can be the easiest to skip, but it can be the most useful later. I think section is when students learn most about what they did. I have found when students don't do much thought for this part, they often didn't get anything out of the experiment.
2. You may want to summarize what you learned or how you might do a particular technique differently next time or what worked well. For your unknown data, you might be able to make a statement about what you learned about your unknown.
3. Perhaps you will address statements like: How well did the experiment work? Did you get the expected outcome? Why or why not? If not, why? What could be done next time?
4. For some experiments, there won't be much to say because it is part of a larger project, but you should say something at the end of each protocol, such as – "Streaked plate was placed in 35 °C

incubator. Check tomorrow and record time then."

5. It may be helpful to refer to notes you made in your pre-lab while writing up this section. You may want to readdress a question from the pre-lab now that you have done the lab.
6. The questions at the end of the lab manual may also be useful to address here. This way you might better tie the material together and help yourself remember the experiment performed.

NOTEBOOK AND PRE-LAB POLICIES

1. In a scientific research lab, notebooks belong in to the lab itself, not the researcher. Notebooks must remain in the lab and entries are made only while in the laboratory. We will follow the second part of this policy where your laboratory notebook must remain in the lab during the course. By only make entries when in the lab, this maintains the integrity of the data.
2. By using a carbonless notebook you can and should remove the tear-out pages for study purposes.
3. By keeping your notebook in the lab, you also do not accidentally remove microorganisms from the lab that might adhere to your notebook. At the conclusion of the semester, you may clean the front and back of the notebook and remove it from the lab.
4. Your notebook will be graded on at least 2 unannounced occasions. If your notebook is not in your lab drawer at the time of grading, a zero will be recorded for a notebook grade. As part of the grade, you may be asked to participate in locating and marking specific information.
5. Pre-laboratory assignments (pre-labs) or quizzes are to help you prepare for lab. If you know what you are doing, you will know better what you are doing and why, you will be safer when you do it, and you will also be more efficient. These will be available through eCollege and should be completed at least one hour before your scheduled lab period. At any point in time, completion of the pre-labs may be monitored and a zero recorded for missing pre-labs. You may also be asked to leave the lab to complete the pre-lab before being able to proceed.
6. You are not required to do and turn in the report sheets at the end of the lab manual that correspond to each lab, but you may find the questions useful in guiding your understanding of the lab and may help you in writing up conclusions.

SAFETY REGULATIONS

No eating or drinking in the lab:

1. **No food or drink of any kind is ever allowed in the laboratory**. Imagine all the things we grow in the lab. Now imagine them in your food.
2. **No closed beverages in the lab**. This goes for beverage bottles as well. I don't care if you don't plan to keep it closed in the lab. Leave it in the hallway. I don't want to see it in the lab.
3. **No lipstick or gum chewing**. Putting on lip balm or lipstick and gum chewing is not far from eating. Neither of these is a good idea either. Consider what is in the lab.

Laboratory dress:

4. **A laboratory coat is mandatory whenever working with live organisms or hazardous chemicals.** For biological safety reasons, your lab coat must also not leave the lab. Disposable coats will be provided. Your coat should be left in a designated location in the lab. Work in the lab will not be allowed without a lab coat unless advised by the instructor.
5. **Covered toed-shoes are required for lab activity**. Flip-flops will not be allowed in the lab. You know when you have lab and should plan your footwear accordingly.
6. **Your pants must not be too short nor too long**. Shorts are not ideal. If a test tube of media and bacteria drops (and trust me, it will), you want to protect your feet and below your lab coat. Long pants that drag on the floor are dangerous as well. If you spill a culture, you may pick it up on your pants and track it elsewhere. Also, tripping is more likely with dragging pants.
7. **Long hair should be tied back when in lab**. Pony-tails on top of the head are not as safe as on the back. I've seen one hair fire and I never need to see another.

Laboratory safety:

8. Above laboratory food, drink & dress rules must be followed. Any additional verbal or written instructions must also be followed.
9. Learn where the eye-wash, shower, first-aid, and other safety devices of the room are placed.
10. Do not touch your hands to your face during the laboratory period. This increases the chance of self-contamination. Before any personal intervention, remove any gloves and wash hands. If you must answer your phone with your gloves on, you may wish to disinfect it after use.
11. Mouth pipetting is obviously strictly forbidden. When needed for pipets, you will use bulb or other mechanical devices.
12. When you are doing any procedures that may splash hot or dangerous liquids, or acids or bases, you should wear safety goggles or glasses.
13. Your fingernails should not be so long that you cannot work safely in the lab.
14. Igniting objects on fire during lab is grounds for dismissal.
15. In addition to this list, you should review the "OBC2 Laboratory Operation & Safety Precaution Statement."

Laboratory spills:

16. If you spill bacteria on your lab coat, notify me, and it will be autoclaved.
17. Report all accidents or breakage immediately. This is for your safety, not to place blame.
18. Blood and blood products can be involved in disease transmission. Place any blood-contaminated materials in the large red biohazard canister by the entrance.
19. Report all spills immediately. If biological, cover with paper towels, and spray down with bleach or 70% ethanol. Leave for 15 minutes before discarding. Spray and wipe the area down again.
20. Gloves are available. Whenever handing cultures or stains, gloves are recommended. Specialty gloves are available upon request to those with special allergies.

Daily laboratory preparation & lab work:

21. Lab benches should be clear of other items not needed for the day. Do not put purses or backpacks on the lab surface. Use the hanger and floor space near the entrance of the room.
22. At the beginning of the laboratory session, you should clear and wipe your bench area with cleaning solutions available.
23. Keep papers neat and tidy on your desk to reduce fire or contamination possibilities.
24. You should not be using your favorite pen in the lab and then taking it back to your room to chew on it (and any bacteria you took with you). A pen has been assigned to your desk drawer for use in lab. Do not chew on lab pens or remove them from the lab.
25. A microscope will be assigned to you. It is your job to keep the microscope clean for both your use and those who share that microscope with you. If you get oil on the dials, clean them off.
26. During aseptic technique, you must remember to flame loops at the end of your sample inoculation to kill off remaining bacteria from your loop.
27. To avoid sample contamination during aseptic technique, you should keep caps between fingers pointing down towards the counter and you must not place Petri dish lids on the table.

Laboratory clean-up and disposal:

28. At the end of the laboratory session, you should clear and wipe your bench area with cleaning solutions provided.
29. If you used a microscope, clean off any oil from the lenses and dials of your microscope.
30. Tube cultures for disposal should have tape removed and placed in racks on the cart at the front of the room. Plates can be directly written upon and do not need tape. They can go in the autoclave bins on the cart in the front. If these spaces are full, please notify me.
31. Broken glass or heat-fixed slides, on which organisms have been killed, can go in the broken glass disposal containers near the eye-wash station.
32. Slides that have not been heat-fixed, plastic loops, and other organism-contaminated items should go in the grey plastic binds in each laboratory quadrant, as these are periodically autoclaved. If these get full, notify me.
33. Glass pipettes are to be placed, tips up, in the pipette container in the front of the room. If this gets full, please notify me.
34. At the completion of the laboratory session, you should clear and wipe your bench area with cleaning solutions provided, clean and put away microscopes appropriately, and push in chairs completely beneath the laboratory bench.
35. Hands should be thoroughly with soap before leaving the laboratory. You may even wish to wash them again after leaving the laboratory.

Materials that must remain in lab and being in lab outside of lab hours:

36. Your lab notebook must remain in the lab for proper recording purposes and so you do not accidentally remove microorganisms from the lab that might adhere to your notebook. You may come in between lab sessions to review your work and add to conclusions etc.
37. Slides, plates, and other laboratory objects must not be removed from the laboratory without permission from the instructor.

38. During your unknown work, you may wish to come into the lab to check your samples. Please remember the appropriate dress rules. You must also adhere to a buddy system. At all level of lab work, it is safer to work with someone else.
39. If you enter the lab after hours the Bunsen burners do not light easily, check that the gas is on by the entrance door. This can be reset in this lab only (other parts of the building reset for the whole wing). It is safer to turn the gas back off when you leave. If you smell gas in the lab, shut off all gas lines in the front of the room immediately and notify me or campus security.
40. If friends come in with you after hours, instruct them appropriately. They should not be handling anything with which they are not familiar.