

GENERAL MICROBIOLOGY BIOL 310

Fall Semester 2016

Lecture: 9:55--11:10 am TR

Dr. Susan J. Morrison

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Microbiology Lab: Med Univ. of SC, School of Pharmacy Bldg (280 Calhoun St) Room 402

Lab Instructors: Ms. Tracy Hirsch (Sections 2, 3, 5, 6 Tuesday, Wed 11:30 am-2:30 pm section), Thursday

Phone messages for lab instructor: 953-5504 (Biology Office) to leave message

Dr. Susan Morrison (Sections 1 & 4 , Monday & Wednesday 2:30-5:30 pm)

Mailboxes(mail goes *below* the name) : Biology Office, SSMB 2nd floor [Note that I don't pick up my mail daily in SSMB, so if there is any urgency, please deliver it to HWWE and let me know by e-mail. In HWWE, it should be slid under my office door (if it isn't too thick) OR placed in my primary mailbox in HWWE Room 304 (except door is usually locked).

SCOPE OF COURSE--CATALOG DESCRIPTION

An introduction to the microbial world with special emphasis on bacteria. Topics include cellular structures, bacterial metabolism, microbial genetics, bacterial growth and its control, virology and the epidemiology and pathogenicity of disease-producing microorganisms. The laboratory emphasizes proper handling techniques, identification methods, & properties of microorganisms.

STUDENT LEARNING OUTCOMES

At the completion of this course, a student should:

IN LECTURE

1. be able to integrate prerequisite knowledge of basic chemistry and college-level mathematics with the study of microorganisms;
2. be able to identify and explain the basic concepts of microbiology and describe the properties of microorganisms (primarily bacteria and viruses), including: (a) cell structure, function and growth; (b) methods of growing and studying microbes; (c) metabolism; (d) genetics and molecular biology; (e) factors affecting microbial growth and survival, including environmental and chemical agents; (f) the major groups of bacteria; (g) the role of microorganisms in daily life, including such topics as human health and disease, food, and/or biogeochemical cycling; and (h) the major groups of bacteria and their characteristics;
3. be able to define, understand, use, and spell and pronounce correctly the basic vocabulary of microbiology;
4. be able to summarize the historical development of microbiology and to explain the contributions of microbes in modern day events;
5. display the ability to apply factual knowledge to new situations, such as interpretation of results, analysis of current news events, or understanding of a phenomenon;
6. be able to apply critical thinking skills to the subject of microbiology and its applications.

IN LABORATORY

1. display the ability to work with Class I microorganisms safely and correctly in laboratory;
2. display the ability to perform basic microbiology laboratory techniques (including stains, dilutions, streak plates, microscopy, media preparation, biochemical tests);

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3. display the ability to explain the theoretical basis of the tests, procedures and the observed microbial activity;
4. be able to state the key characteristics of the groups of bacteria used in lab;
5. display the ability to identify bacteria, including culture isolation and maintenance, laboratory analysis, use of references and reporting of results using professional (American Society for Microbiology) journal format

TEXT: In lieu of *requiring* you to purchase a specific text, there is a list of possible text books. You may choose to purchase any one of these from a discount source, borrow one from someone else, use a next-to-the-last edition (rather than the current one), and/or use an online source (such as the free textbook by Todar). Several different texts are on reserve in the library under my name.

COURSE PACK (required): at SAS-E-Ink (219 Calhoun St) (*Bring appropriate part to every lecture & lab class.*)

Suggestions for making more effective use of the course pack:

- a. **get some dividers and split into sections** corresponding with the major topic areas:
Intro & History; Medical Intro; Microscopy & Cell Structures; Nutrition & Metabolism; Growth & Environment; DNA, RNA, Protein & Regulation; Viruses; Genetics; other
- b. provide **additional 3-hole paper** for notes too extensive to fit on the printed pages
- c. **develop your own additional pages** to help you study, e.g. charts comparing two things or references to specific pages or topics in the text
- d. **use the coursepack as a means to *reduce* your note taking, *not* as a substitute** for taking notes, for reading a text or for attending lecture
- e. **use a new copy** to get the full benefit.
- f. **Separate** the lab portion (pages with an L before the page number; second half of book) & put it in a different binder

RECOMMENDED BOOKS (Optional):

1. *Control of Communicable Diseases Manual*, 20th edition, December 2014. David Heymann, editor. American Public Health Association. 746 pp.
2. Borror, Donald J. *Dictionary of Word Roots and Combining Forms* (or similar sources)
3. Campbell, Neil A., & Jane B. Reece. *Biology*. Current or earlier editions. [the BIOL 111-112-211 lecture text; this introductory biology text or comparable text books will be a useful reference for basic concepts in biology]

Some additional books may be found in the non-text book section of the college bookstore. These include:

- Oshinsky, David M. 2005. *Polio: An American Story* Oxford University Press 352 pp. [Winner, 2006 Pulitzer Prize for History]
- deKruif, Paul, and F. Gonzalez-Crussi. 1926, 2002. *Microbe Hunters* Harcourt 357 pp. [a classic, though it has the faults & perspective of a book written 90 years ago]
- Preston, Richard. 1994. *The Hot Zone* (about Ebola) & 2002. *The Demon in the Freezer* (about smallpox) [Both are best-selling, non-technical, non-fiction books. You should critique as a microbiologist.]
- Pittet, Didier. 2016. *Hand Hygiene: A Handbook for Medical Professionals / Edition 1* Wiley, 392 pp.
- Books by Garrett, Laurie.

Two recent trade books are

- Blaser, Martin J. 2015. *Missing Microbes: How the Overuse of Antibiotics Is Fueling Our Modern Plagues*
- Yong, Ed. 2016. *I Contain Multitudes: The Microbes Within Us and a Grand View of Life*, 368 pp.

LABORATORY MANUAL (required): *Microbiology Laboratory Theory & Application 3rd edition BRIEF* by Michael Leboffe & Burton Pierce. 2016. ISBN-13: 978-1-61731-477-3. (Morton Publishing)

LABORATORY PORTION OF COURSEPACK (required): back part of manual, pages have an L before the number.

i-CLICKERS *may* be employed. You will receive instructions.

OAKS *may* be used for class information, announcements and other material related to the class. If we are using it, you should check it regularly.

OFFICE HOURS I will be available immediately following lecture on most Tuesdays (11:15 am-noon) & Thursdays (11:15 am-noon), as well as most Wednesdays from 10:30 to 11:30 am. You are encouraged to see me at these times *or* to arrange an appointment. Additional hours &/or review sessions will be announced for critical times in the semester. If I am available, I will also be happy to meet with you on a walk-in basis. Please introduce yourself by full name each time you come to see me to help me learn your name. Feel free to call ahead to be sure I am in before you trek from Main Campus to Harbor Walk.

TRANSIT to/from class is a challenge that we are adapting to. Since Harbor Walk courses are off-set by 30 minutes, you should have no problem reaching class on time. Options include bicycling, walking or the DASH shuttle. To reach MUSC, you will need to ride two different shuttles or ride half-way & walk the other. There is a bike rack between 2 buildings just west of 280 Calhoun.

E-Mails If you send me an **e-mail**, please lead off the subject with the words "CLASS" or "MICRO." I get inundated daily with e-mails and am less likely to overlook your message with this word displayed prominently. Please remember that I can send confidential information only to your official College of Charleston e-mail account or MUSC e-mail account.

A TENTATIVE **LECTURE SEQUENCE** is attached. It is highly beneficial to read the corresponding text material before each topic is covered in lecture and to also familiarize yourself with what is in the course packet.

PREREQUISITES for this course are BIOL 111, 111L, 112, 112L and 211 and One Year of Chemistry. "One Year of Chemistry" means you must have already completed, with passing grades, CHEM 101-101L-102-102L or CHEM 111-111L-112-112L, or the equivalent. For transfer students, the course must have transferred to the CofC as equivalent to the above. BIOL 305 is a prerequisite or corequisite, although CHEM 231 can be substituted for BIOL 211 & 305. Biology also requires MATH 250 Statistics as a prerequisite to all of its upper-level classes.

ATTENDANCE at all lectures is expected and can be an important factor in your class performance; roll will be taken regularly though not necessarily every time. Signing someone else's name or permitting someone else to sign your name is a violation of the Honor Code. An excessive number of unexcused absences from lecture (excessive = more than 2 in lecture) or from lab (one = excessive in lab) constitutes grounds for dismissal from class and assignment of

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a grade of WA (equivalent to an F) or voiding eligibility for bonus/project/score adjustment points. Roll will also be taken in laboratory where no unexcused absences are permitted. Official absence notices are handled by the Absence Memo Office, located in the white house at the corner of Glebe & George Streets (67 George Street) next to the Stern Center. If you will be absent on official college business (e.g. athletic events, professional conference), please provide documentation in advance. The usefulness of the coursepack will be sharply reduced if you aren't present in lecture, since *it serves to make note-taking easier, not replace the lecture.*

Please make every effort to be on time. Leaving the end seats vacant will help accommodate anyone who does come late. Once class has begun, you are expected to remain seated unless you have a genuine emergency. Please do not bring food to class; beverages will be disregarded as long as they aren't spilled and aren't heard. Electronic devices such as cell phones and smart pads may not be used. Texting and similar activities during class are forbidden. Laptops or netbooks may be used only for note-taking during class. Also, be sure there will be no audible signals from cell phones or other devices.

IF you have a DISABILITY that qualifies you for academic accommodations, please provide a letter from Disability Services at the beginning of the semester. I will be happy to discuss your situation in my office. For more information regarding accommodations, please contact the Office of Disability Services at (843)-953-1431, stop by their office in Lightsey Center Room 104 &/or refer to their web site at <http://www.cofc.edu/~cnds/> Any SNAP student must turn in their envelope at least 48 hours before the scheduled test.

The **deadline for WITHDRAWAL** from the course with a grade of "W" is **Thursday, October 27, 2016**. In accordance with College regulations, withdrawal from the course after that date will be permitted only under dire and unpredictable circumstances, such as sudden serious illness (see "Withdrawal from Courses" in the Undergraduate Catalog). [Note that this deadline is after Express II begins, so if you need an Express II course to replace a dropped class, you will need to make your decision before the **W** date.]

You will be expected to do a variety of **mathematical calculations** in this class, including use of exponents and logarithms. The computations are simple enough that CALCULATORS should *not* be necessary for most of the calculations you will do in this class (lecture or lab). *Programmed* and/or wireless-compatible calculators are not acceptable on lecture tests. Very inexpensive scientific calculators, can be found at the major office supply stores or general stores. If you bring a calculator, it is your responsibility to know how to use it.

The **LABORATORY SCHEDULE is in your course pack**. Come to the first lab and all other labs prepared. This semester, **labs begin on August 29 –September 1**, the second week of classes (but the first one when all sections can meet). The **FIRST TWO** lab weeks, where many basic techniques are introduced, are *critical* for your success in lab. There is a zero tolerance policy for unexcused absences in lab. You do not receive separate credit or grade for lab; instead, your lab grade comprises almost 25% of the grade for the entire course. **You must sign a safety statement for lab, and then observe the safety rules** which are extensive.

All students are expected to **attend lab at their assigned lab time**. There is limited space for additional students in most lab sections. If you cannot attend at your scheduled time, you must get permission in advance for each time you need to come to a different lab and you must have a reason the instructor deems valid.

All students are expected to be very familiar with and to adhere to **THE HONOR SYSTEM OF THE COLLEGE OF CHARLESTON**. In this class, removal of a test or copies of test questions from the classroom is a violation of the Honor Code. Anyone who shares contents of tests from prior semesters with someone in the class or anyone who uses this material for study for a test is also in violation of the Honor Code. Material from other sources must be properly attributed. Work *claimed* as your own (e.g. for mini-projects, posters, unknown report) must be your own work. Plagiarism is unacceptable.

NAMETAGS: MUSC requires all of its faculty, staff, students & contractors to wear nametags. Be sure you have your ID available at all times in case you are asked to show it. If you want a holder to clip on your lab coat, we can issue one.

FINAL GRADE DETERMINATION:

Three one-hour tests (130 points each)	390 points
Mini-projects for lecture	30
Final examination	200
Laboratory	200
820 points total	

GRADING SCALE:

93-100%	A Superior	(762.5---820 points)
90-92.9%	A-	(738.0---762.4 points)
87-89.9%	B+ Very Good	(713.5---737.9 points)
82-86.9%	B Good	(672.5---713.4 points)
80-81.9%	B-	(656.0---672.4 points)
77-79.9%	C+ Fair	(631.5---655.9 points)
73-76.9%	C Acceptable	(598.5---631.4 points)
-----Grades below C do not transfer-----		
71-72.9%	C-	(582.0---598.4 points)
69-70.9%	D+	(566.0---581.9 points)
66-68.9%	D Barely acceptable	(541.0 ---565.9 points)
≤65.9%	F	less than 541 points

QUESTIONS about semester tests and assignments must be addressed *no later than* the start of the final exam.

In your coursepack is a tally sheet where you can keep track of your scores.

There will be three (3) full-period TESTS based on lectures, text and assigned reading. Tests are tentatively scheduled for the following dates:
September 27 (Tuesday)
October 25 (Tuesday)
November 22 (Tuesday before Thanksgiving)

Make-up tests will be given only if your absence from an examination is due to illness certified by a physician's excuse or, at the discretion of the instructor, to a documented occurrence beyond your control. You must notify the
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instructor in advance when possible or immediately after a missed test; if you can't reach me personally, you should send an e-mail and/or leave a voice message. Scheduling of the make-up test will be determined by the instructor, and must be at the earliest possible opportunity. Make-up tests must be taken *before* the graded test is shown to other students (except in extraordinary circumstances).

Tests & other assignments will usually be reviewed in class. Tests must be returned & will be kept on file by the instructor. If you are absent, it is your responsibility to examine your test during office hours or to arrange an appointment. There will be blocks of scheduled times for you to review your old tests prior to the final exam.

The **FINAL EXAMINATION** will be cumulative and will be an objective test (with the likely exception of the bonus questions). Final exams are scheduled for December 7--14, 2016; the **final exam** for this class (9:55 TR) is scheduled for **8:00—11:00 am on Thursday, December 8, 2016**. [The acceptable reasons for moving the time of a final exam are clearly defined---3 exams in a 24-hour period or two conflicting exams). Changing the time of an exam requires approval by the department chair and possibly others who must sign the form.

SOME OTHER IMPORTANT DATES---Subject to Change

Return to lab at 24-48 hours to read test results

Storm Makeup Day (if needed)

Lab Test #1

Unknown Reports Due for Lab

Pathogen Posters (Lab)

Mini-projects Due for Lecture

Cumulative Lab Test #2

Tues-Fri, September 27—30, 2016

Saturday, October 8, 2016

Mon-Thurs, October 10-13, 2016

Mon-Thurs, October 17-20, 2016, Start of lab

Mon-Thurs, Oct 31—Nov 3, 2016

Friday November 11, 2016, 5:00 pm***

[all turned in at same time in a packet]

Mon-Thurs, November 14--17, 2016*

*For lab test #2 only, you may take yours with an *earlier* section.

[***Please don't wait until the last minute! All of these should be done as you go along.]

See lab schedule for other lab dates.

CODE OF ETHICS: The following statement is derived from the Code of Ethics of the **American Society for Microbiology** (to which Dr. Morrison belongs) and a statement by the ASM Council Policy Committee.

The American Society for Microbiology is dedicated to the utilization of microbiological sciences for the promotion of human welfare and for the accumulation of knowledge. This long-standing position of the Society affirms that microbiologists will work for the proper and beneficent application of science and will discourage any use of microbes contrary to the welfare of humankind. Bioterrorism violates the fundamental principles expressed in the Code of Ethics of the society and is abhorrent to the ASM and its members.

College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php>

8/22/2016/sjm

LECTURE TOPIC SEQUENCE & READINGS---SYLLABUS

BIOL 310 GENERAL MICROBIOLOGY

Dr. Susan Morrison

Fall 2016

TEXT (required): see notes on information handout. Text details are in coursepack.

COURSEPACK: Morrison, Susan J. BIOL310 & BIOL310L Coursepack for Fall 2016 (available at SAS-E-Ink, 219 Calhoun St)

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TEXT: In lieu of *requiring* you to purchase a *specific* text, there is a list of possible text books in your coursepack. You may choose to purchase any one of these from a bookstore or discount source, borrow one from someone else, use a next-to-the-last edition (rather than the current one), and/or use an online source (such as the free textbook by Todar). Several different texts are on reserve in the library under my name.

Microbial Life: Overview & Introduction; The History of Microbiology (general and medical) Coursepack 31-43

- Brock Chapter 1 Sections 1.6-1.10 (pages 10-23)
- Prescott Chapter 1 (pages 5-12)
- Slonczewski Chapter 1 (pages 11-26, Sec 1.2 & 1.3) Table 1.2
- Tortora Pages 6-15
- Wessner inside front cover, pages 27-33

Basic Concepts & Terminology of Microbial Interactions, Infection, Infectious Disease & Epidemiology Coursepack 44-50

- Brock Chapters 27, 32, 33, 34 (pp. 787-815, pp. 913-943, 961-1003)
- Prescott Part 8 Chapters 30 & 33 (pages 726-745; 787-808)
- Slonczewski Chapters 25 & 26 (pp. 937-1028)
- Tortora Chapters 14 & 15 (pp. 401-450)
- Wessner Part IV, Chapters 18, 21, 24 (pp. 600-635, 714-759, 822-853)

Biological Molecules: Chemical Bonds; Water; Proteins; Polysaccharides; Nucleic Acids; Lipids [no lecture---independent review Refer to appropriate section when needed.]

- Brock none
- Prescott Appendix I
- Slonczewski Appendix I
- Tortora Chapter 2
- Wessner none

Antiseptics & Disinfectants Coursepack 195

There will be little or no lecture on this topic but it will be on a test.

- Brock Chapter 26 Sec. 26.4-26.5 (pages 762-766)
- Prescott Chapter 8 (pages 153-160-167) Fig. 8.1
- Slonczewski Pages 170-172, 175-176
- Tortora Chapter 7 (pages 181-184, 190-203, Table 7.8)
- Wessner Pages 195-199
- Leboffe & Pierce Lab Manual Ex. 2-13

Observing Microbial Cells: Microscopy & Specimen Preparation; Cell Sizes & Shapes Coursepack 51-60

- Brock Chapter 2-Part I, pp 25-31 (See Chapters 16-19 for micrographs)
- Prescott Chapter 2
- Slonczewski Chapter 2
- Tortora Chapter 3 (see Chapter 11 for lots of micrographs)
- Wessner Appendix B; Gram stain on page 55
- Leboffe & Pierce Lab Manual Section 3

Membranes and Transport Coursepack 61-65

- Brock Chapter 2 (Sec. 3.3-3.5, pp. 47-58); pp. 141-143
- Prescott Sec. 3.2 (pp. 38-41); Section 6.6 (pp. 114-118)
- Slonczewski Sec. 3.3 (pp. 82-88); Sec. 4.2 (121-127)
- Tortora Chapter 4 (pp. 88-93, 100-101)
- Wessner Chapter 2 (pp. 45-50), page 79

Prokaryotic Cell Structure and Function Coursepack 61-79

- Brock Chapter 3 (pp. 47-84)
- Prescott Chapter 3 (pp. 33-64)
- Slonczewski Chapter 3 (pp. 73-82, 88-113) Se
- Tortora Chapter 4 (pp 75-110)
- Wessner Chapter 2 (pp. 36-71)

Three Domains; Universal Phylogenetic Tree; Comparison of Prokaryotes & Eukaryotes Coursepack 80-88

- Brock Section 2.7 (pp. 34-36); Chapter 16 (Sec 16.8, pp 459-462; Table 16.1); Sec 7.4 (p. 196)
- Prescott Chapter 17 (pp. 385-388); Sec 3.1, 4.1 and esp. Sec. 4.8 (pages 79-80); Table 4.2; Inside front cover
- Slonczewski Chapter 1 (pp 29-31), Chapter 17 (pp 656-661), inside back cover
- Tortora Chapter 10 (pp. 272-280)
- Wessner Chapter 1 (pp. 8-15); Table 1.3; Appendix C, E

Microbial Nutrition & Metabolism: Energy, Enzymes & Regulation; Coursepack 89--97

- Brock Chapter 4 (pp. 92-94, 111-115)
- Prescott pp. 169-183
- Slonczewski pp. 473-475
- Tortora pp. 113-119
- Wessner pp. 403-404, 418

Microbial Metabolism: Catabolism: Energy Release & Conservation (including Glycolysis, Citric Acid Cycle, Fermentation & Electron Transport) Coursepack 98-108

- Brock Chapter 4, Sec. 4.4-4.16 (pp 92-114); Chapter 14 (pp. 373-383)
- Prescott Chapter 10, Sec 10.1-10.10 (pp. 188-208); Appendix 2
- Slonczewski Chapter 13 (pp. 458-482, 482-496); pp 506-507, 525-529
- Tortora pp. 122-135
- Wessner pp. 400-433
- Leboffe & Pierce Lab Manual Appendix A Biochemical Pathways

Microbial Metabolism: Metabolic Diversity: Phototrophy, Chemolithotrophy, Anaerobic Respiration

Microbial Metabolism: Anabolism; The Use of Energy in Biosynthesis Coursepack 98-108

- Brock Chapter 4. Secs. 4.13-4.16 (pp. 108-114)
- Prescott Sec. 11.1-11.2 (pp. 219-222)
- Slonczewski Chapter 15, Sec. 15.1 (pp. 547-550)
- Tortora Chapter 5, Sec. 5.24-5.25 (pp. 144-147)
- Wessner Sec 13.8 (pp. 447-453)

Microbial Nutrition Coursepack 109-113

There will be little or no lecture on this topic but it will be on a test.

- Brock Sec. 2.8; Chapter 4 (pp. 86-90); Sec. 13.6
- Prescott Chapter 6 (pp. 109-125)
- Slonczewski Sec. 4.1
- Tortora pp. 140-143, 158-166
- Wessner Chapter 6 (Sec 6.1-6.3; pp. 165-184); Sec 13.4 (pp. 428-429)

Culture, Enumeration, Growth & Development of Microorganisms Coursepack 114-124

- Brock Chapter 5 (pp. 128-132) Fig. 5.14-5.17
- Prescott Sec. 7.3 (pp. 134-137)
- Slonczewski Sec. 4.4
- Tortora pp. 171-177
- Wessner Sec. 6.4 (pp. 184-187)
- Leboffe & Pierce Lab Manual Ex. 7-5 & 7-6

Biofilms Coursepack 125-127

- Brock Chapter 5-sidebar (page 133); Chapter 8 (Sec. 8.9), Chapter 23 (Sec. 23.4)
- Prescott Chapter 7 (Sec. 7.6); Chapter 30 (Sec. 30.5, Figs. 3.9-3.10)
- Slonczewski Chapter 4 (Sec. 4.6), Chapter 17 (Special Topic 17.2)
- Tortora Fig. 1.8; page 56—Slime; pages 160-161, 432-433; Fig. 6.5
- Wessner Page 67; Chapter 15 (pages 488-490)

Effects of Environmental Conditions on Growth & Survival of Microorganisms Coursepack 128—140

- Brock Chapter 5 Part IV & V (pages 132-149); Chapter 19 (pages 557-583, 1022-1029)
- Prescott Chapter 8 Sec. 8.4 (pages 157-160, 810-816)
- Slonczewski Chapter 5 (pages 149-180)
- Tortora Chapter 7 (pp. 181-189); pages 800-806
- Wessner pages 119-125, 170-172, 525-534

DNA; Replication Coursepack 141--157

- Brock Chapter 6, Secs. 6.1-6.7 (pp.151-168)
- Prescott Chapter 12, Sec. 12.1-12.5 (pp. 240-255)
- Slonczewski Chapter 7, Sec. 7.1-7.2-7.3 (pp. 221-242)
- Tortora Chapter 8 (pp. 207-214)
- Wessner Chapter 7 (pp. 203-216)

RNA & Protein Synthesis: Transcription, Translation; Metabolic Regulation Coursepack 141-157

- Brock Chapter 7 Sec. 7.1-7.2 (pp 192-195); Chapter 6 Sec 6.16-6.21 (pp. 174-189)
- Prescott Chapter 12 pp. 255-270)
- Slonczewski Chapter 8 Sec. 8.1-8.4 (pages 258-285)
- Tortora Chapter 8: pp. 210-218 Figs. 8.7, 8.9
- Wessner Sec. 7.3-7.4 (pp. 216-228)

Virology: History; Properties of Viruses; Growth & Quantification; Viral Replication; Viral Diversity; Viral Pathogenesis; Subviral Particles—Viroids, Prions Coursepack 158--175

- Brock Chapter 9 (pp. 236-262), Chapter 21 (pp 613-641); Chapter 33 (sec. 33.6-33.8, 33.11, 33.14)
- Prescott Chapter 5 (pages 87-108), Chapter 24 (pages 554-592)
- Slonczewski Chapter 6 (pages 181-217), Chapter 11 (pages 389-430), Sec. 25.8 (pages 971-978)
- Tortora Chapter 13 (pp. 369-400; Part 4 (pp. 626-631, 662-5, 685-6, 697-701, 727-734, 763-4)
- Wessner Chapter 5 (pages 130-201); Chapter 22 (pages 760-791)

Bacterial Genetics: Gene Transfer, Mutation & Recombination, Genome Evolution Coursepack 176--194

- Brock pp. 157-162; pp. 273-279 (Figs. 10.9, 10.14, 10.15); pp. 270-290
- Prescott Chapter 14 (pp. 312-324) (pp. 324-327; Fig 14.28-14.29)
- Slonczewski Chapter 9 (pp. 303-344) (pp. 311-314; Fig. 9.7, 9.9)
- Tortora Chapter 8 (pp. 231-243, Fig 8.29); Chapter 13 (p. 384, Fig 13.13)
- Wessner pp. 203-207, 231-243; Chapter 9 (pp. 297-298)

Antimicrobial Chemotherapy; Antibiotics Coursepack 196--200

- Brock Chapter 26 (pp. 767-786)
- Prescott Chapter 31
- Slonczewski Chapter 27
- Tortora Chapter 20
- Wessner Chapter 24, Sec. 24.1-24.3 (pp. 822-849) Perspectives 24.1-24.3

For the following topics, we will cover selected examples as time permits and/or incorporate the topics into other parts of lecture

- Microbial Diversity & Ecology; Origins & Evolution
- Prokaryotic Diversity: Bacteria & Archaea

- **Food Microbiology**
 - Brock Chapter 36 (pp. 1022-1043)
 - Prescott Chapter 34 (pp. 809-830)
 - Slonczewski Chapter 16 (pp. 589-615)
 - Tortora Chapter 28 (pp. 799-810)
 - Wessner Chapter 16 (pp. 522-543)

- **Water and Wastewater**
 - Brock Chapter 35 (pp. 1004-1021)
 - Prescott Chapter 35 (pp. 831-847)
 - Slonczewski Chapter 22, Sec. 22.3 (pp. 839-842)
 - Tortora Chapter 27 (pp. 782-796)
 - Wessner Chapter 16 (pp. 541-559)

- **Biotechnology, aka Genetic Engineering, Bioengineering, Molecular Technology, DNA Technology, Recombinant DNA Technology, Genetic Modification Technology**
 - Brock pp. 291-312
 - Prescott pp. 351-380
 - Slonczewski pp. 431-457
 - Tortora pp. 244-263
 - Wessner pp. 362-399

- Microbial Ecology
- Microbes and Biogeochemical Cycles
- Host Defenses; Immunology
- Microbial Pathogenesis
- Microbial Diseases
- Virulence Factors
- Genomics

- **Vaccines, Serology, Diagnostic Immunology**
 - Brock pp. 892-906
 - Prescott pp. 779-786
 - Slonczewski pp. 906-907
 - Tortora pp. 504-526
 - Wessner pp. 853-857

▪ **Diagnostic Microbiology & Immunology; Clinical Microbiology**

- Brock pp. 879-912
- Prescott pp. 768-786
- Slonczewski pp. 1063-1096
- Tortora pp. 281-198; Appendix C
- Wessner pp. 164-180

S. Morrison

SELECTED MICROBIOLOGY TEXTBOOKS

In lieu of *requiring* you to purchase a specific text, this is a list of possible text books. You may choose to purchase any one of these from a discount source, borrow one from someone else, use a next-to-the-last edition (rather than the current one), and/or use an online source (such as the free textbook by Todar). Several different texts are on reserve in the library under my name.

BROCK Biology of Microorganisms

This is one of the best general microbiology textbooks. First published in 1970, it was authored by Thomas D. Brock. For the 4th edition, Michael Madigan began coauthoring and subsequently became the lead author with the 7th edition. Tom Brock's scientific contributions include the discovery of hyperthermophiles in the hot springs of Yellowstone National Park. The Brock textbook has been characterized by its breadth and depth of coverage and its currency.

- Madigan, Michael T., John M. Martinko, Kelly S. Bender, and Daniel H. Buckley. 2014. Brock Biology of Microorganisms Fourteenth Edition, Upper Saddle River, NJ: Pearson/Prentice-Hall.
- Madigan, Michael T., John M. Martinko, David A. Stahl, and David P. Clark. 2012. Brock Biology of Microorganisms Thirteenth Edition, Upper Saddle River, NJ: Pearson/Prentice-Hall. 992 pp. + appendices
- Madigan, Michael T., John M. Martinko, Paul V. Dunlap, David P. Clark 2008. Brock Biology of Microorganisms. 12th Edition. Publisher: Benjamin Cummings.

PRESCOTT, HARLEY & KLEIN'S Microbiology

This text is a major long-time competitor with Brock. The first edition was published in 1990, emphasizing its broad-based coverage of the subject matter. A new team of authors took over with the 7th edition, which is reflected in the content and style but continuing the high standard of this text.

- Willey, Joanne, Linda Sherwood, and Chris Woolverton. 2016. Prescott, Harley & Klein's Microbiology 10th edition McGraw-Hill Higher Education Publishing
- Willey, Joanne, Linda Sherwood, and Chris Woolverton. 2013. Prescott, Harley & Klein's Microbiology 9th edition McGraw-Hill Higher Education Publishing
- Willey, Joanne, Linda Sherwood, and Chris Woolverton. 2011. Prescott, Harley & Klein's Microbiology 8th edition McGraw-Hill Higher Education Publishing
- Willey, Joanne, Linda Sherwood, and Chris Woolverton. 2008. Prescott, Harley & Klein's Microbiology 7th edition. McGraw-Hill Higher Education. 1088 pp. + appendices

Slonczewski & Foster

This text is one of the newcomers to the textbook market. It aims to provide a balanced approach to microbial ecology, molecular biology and medical microbiology.

- Slonczewski, Joan, and John W. Foster. 2014. Microbiology: An Evolving Science, Fourth Edition, New York City: W.W. Norton & Co., Inc
- Slonczewski, Joan, and John W. Foster. 2014. Microbiology: An Evolving Science, Third Edition, New York City: W.W. Norton & Co., Inc. 1184 pp. + appendices (Softcover)
- Slonczewski, Joan, and John W. Foster. 2011. Microbiology: An Evolving Science, 2nd Edition, New York City: W.W. Norton & Co., Inc.
- Slonczewski, Joan, and John W. Foster. 2009. Microbiology: An Evolving Science, First Edition, New York City: W.W. Norton & Co., Inc. 1096 pp. + appendices

This text is available on-line directly from the publisher for \$51.66 at

<http://books.wwnorton.com/books/webad.aspx?id=4294990210>

Swanson, Reguera, Moselio Schaechter, & Frederick C. Neidhardt. 2016. Microbe. 2nd edition (Published by American Society for Microbiology) This is a high-quality text, at a lower cost than most

Wessner, Dupont & Charles

This text is the latest addition to the textbook market. They aim to connect physiology, genetics and ecology with an exciting, readable style. They devote ~equivalent space to bacteria, eukaryal microbes, Archaea, and viruses in Part I-The Microbes. The other sections are II-Microbial Genetics; III-Microbial Physiology & Ecology; IV-Microbiology & Disease.

- Wessner, David, Christine Dupont and Trevor C. Charles. 2016. Microbiology, Second Edition, Wiley. 867 pp. + appendices
- Wessner, David, Christine Dupont and Trevor C. Charles. 2013. Microbiology, First Edition, Wiley. 867 pp. + appendices

Todar's On-line Textbook of Bacteriology

Todar, a faculty member at the University of Wisconsin, publishes his textbook on-line and at no-cost to the user. As the title indicates, the focus is bacteria. The first portion is general microbiology, while the second half is about bacterial pathogens. While it may not include all of the topics and may lack the depth of some other texts, it provides a respectable content at the perfect price.

- Todar, Kenneth. Todar's On-line Textbook of Bacteriology.

<http://www.textbookofbacteriology.net/>

Caution: one student reported a trojan on this site in a previous semester.

TORTORA

One of the best and most used non-majors microbiology texts is the one by Tortora et al. It is well-suited to students interested in the allied health professions, nursing, food science, agriculture or just learning the basics of microbiology. The first half of the book is general microbiology while the second half is medical in scope. [Note that you do *not* want the *brief* edition.]

- Tortora, Gerard J., Berdell R. Funke and Christine L. Case. 2015 Microbiology : An Introduction - 12th edition Publisher: Benjamin Cummings
- Tortora, Gerard J., Berdell R. Funke and Christine L. Case. 2012 Microbiology : An Introduction - 11th edition Publisher: Benjamin Cummings
- Tortora, Gerard J., Berdell R. Funke and Christine L. Case. 2010 Microbiology : An Introduction - 10th edition Publisher: Benjamin Cummings
- Tortora, Gerard J., Berdell R. Funke and Christine L. Case. 2007 Microbiology : An Introduction - 9th edition Publisher: Benjamin Cummings

Other non-major texts

The Tortora text is one of several which target the very large non-major audience. Others include books by:

- Eugene Nester *et al.*, Microbiology: A Human Perspective (most recent, 7th edition, 2013);
- Robert Bauman, Microbiology with Diseases by Taxonomy (most recent edition, 4th edition, 2010);
- Robert Bauman, Microbiology with Diseases by Body System (most recent edition, 4th, 2014); and
- Jacquelyn Black and Laura Black, Microbiology: Principles and Explorations (most recent edition, 9th, 2014).

Many texts are available in various forms: the traditional hardbound copy, and some less expensive options such as: softcover, electronically downloadable with purchase, use on-line for one year for a fee, purchase of entire text electronically, purchase of single chapter electronically. You may need to do some investigating to locate your preference.

MICROBIOLOGY LABORATORY BIOL 310L

LAB: Medical University of South Carolina School of Pharmacy Bldg, 280 Calhoun St, Room 402

Laboratory Instructors: Ms. Tracy Hirsch (Sections 2, 3, 5, 6)

Dr. Susan Morrison (Section 1 & 4)

1. **YOU** are **REQUIRED to PROVIDE** the following items for use in lab:

- Black marking pen with waterproof ink, e.g. a "**Sharpie**" (wide tip and/or narrow tip)
- Three-ring binder to hold supplemental laboratory materials and coursepack pages
- a bound composition book (Ms. Hirsch only)
- Safety goggles (for use when doing designated procedures)
- **Laboratory Coat** (required by the School of Sciences & Math). It will protect your clothing from accidental contamination which, if it occurs, will require that your clothing be decontaminated) and prevent the transport of microorganisms out of the lab on your clothing. It will also protect your clothing against the stains, disinfectants and reagents used in lab.
- **Disposable laboratory gloves** (non-latex)

You may also want/need to bring:

- an inexpensive, flexible, six-inch ruler with metric scale
- a 3-gallon plastic zipper bag to hold your lab coat if the one-gallon size isn't big enough
- plastic zipper sandwich or storage bags to protect your laptop, i-pad or cell phone from contamination if you use it to record results. [Of course, it will be put away and not used for anything except for lab procedures.]

2. The COURSE PACK, purchased at SAS-E-Ink contains supplemental materials for laboratory as well as for lecture and is **required**.

The LABORATORY MANUAL is *Microbiology Laboratory Theory & Application 3rd edition BRIEF* by Michael Leboffe & Burton Pierce. 2016. ISBN-13: 978-1-61731-477-3.

- Please **write your name in ink on the outer edge and inside the front cover**.

Used lab books are **not** acceptable, unless the results and questions sections are mark-free. Students repeating the course should see their lab instructor for the procedure to follow.

The lab portion of the coursepack & additional handouts (if given) should be placed in an inexpensive, three-ring notebook for this lab class to keep them all together.

Your lab results should be completed as you do the work in class and should be written so that it can serve as a future reference for you.

Keep your lab book UP-TO-DATE. Place the results directly into the manual (not on loose scraps of paper) as you do the work and answer the questions as you go along.

Lab results & questions will be examined in class at unannounced times and/or at the end of the semester. The grade will be based on pop spot-checks and possibly on a timed, pre-announced open book quiz given during lecture or lab. Your success on the lab tests will correspond with the accuracy, completeness, scientific understanding, organization and presentation of your results, and the responses to questions.

In addition to the questions for exercises which you do, you are also responsible for questions in exercises listed as "reading only," for the questions and results for exercises done as demonstrations, and for exercises from handouts as well as from the coursepack & manual. Additional questions may also be provided by your instructor.

3. Read and understand the laboratory exercises in your manual and/or your coursepack **before** coming to lab. Plan your time in advance. Keep in mind that you don't need to do exercises in the order listed. You might also overlap tasks, e.g. prepare smears and let them air dry while you move on to another procedure.
4. Most lab stations have three DRAWERS for use that will be shared by students in all six sections. Shared equipment & supplies should include lens paper, bibulous paper, inoculating loop, inoculating needle, staining bowl & u-rod, wax pencil. There should also be six slide boxes, one per person; you should write your name (in permanent ink) on a piece of time-tape and stick it on the cover of your dedicated box so you can save your slides. If you want you can also put in an envelope with such items as a marker or gloves or goggles, keeping in mind that the drawers will not be locked.

Lab coats may be left in 1-gallon plastic zip-lock bags with your name in a designated space, or you can take your lab coat with you in the bag.

5. ATTENDANCE in laboratory is required and roll will be taken. Laboratories are scheduled for three (3) hours. You will attend the assigned lab section and use the same lab station and microscope throughout the semester. All students are expected to attend lab at their assigned lab time. There is very limited space for additional students in most lab sections. If you cannot attend at your scheduled time, you must explain why & get permission in advance for each time you need to come at a different time.

Almost none of the experiments can be completed in one lab period since cultures must be incubated. While we are in the temporary location at MUSC, **all procedures that require follow-up in 24 to 48 hours** in order to yield accurate results **are scheduled for one week. Therefore it will be necessary for you to come in to read those experimental results. See the course schedule for that specific week & mark it on your calendar. Plan accordingly.** We can manage the other weeks so you don't need to come in after 24-48 hours. For reasons of safety and building access, working in the lab in the evenings or on weekends is restricted. You should not work in the lab alone, even during the day.

If you come into the lab to do follow-up when another section is in progress, you should avoid disrupting the class. Specific bench stations will be designated to use at these times.

6. Each student will be expected, 3-4 times during the semester, as scheduled, to assist with laboratory clean-up in addition to routine duties or experimental work. (In effect, you are washing your own glassware just as you do in Chemistry lab, except that everything must be sterilized before it can be washed.) Each person is also expected to keep his/her work area clean and organized and aid in maintaining the rest of the lab.

Students may also volunteer to help with preparation of media and other materials for lab.

7. Information on LAB SAFETY is provided in several forms: a section in the coursepack, the safety rules of the School of Sciences & Math, and notes in the Leboffe & Pierce lab manual. Each student is required to become thoroughly familiar with this information, to use safe practices and common sense in lab at all times, and to accept responsibility for personal safety and the well-being of everyone in lab. All students are required to sign a statement agreeing to comply with all safety rules before they may participate in laboratory. A pop quiz covering safety may be given at any time.

We will follow the safety guidelines of the School of Sciences & Math (SSM). However, there may be situations when we deviate because the rules were written for a chemistry lab and may not be appropriate for a Microbiology lab. For example, SSM says you must wear long sleeves but does not state that they must be tight around the wrist. However, unless you are using caustic chemicals, long sleeves pose a hazard around open flames and cultures. In addition, it is not possible to properly wash your hands and lower arms to rid them of microbes when wearing long sleeves.

8. The LABORATORY GRADE will comprise approximately 24.5% of the grade for the entire course. It, in turn, will be determined as follows:

Midterm; Final--closed book (28% + 30%)	58.0%	of lab grade
Lab Manual/Notebook	5.0 %	" " "
Unknown Culture Identification and Report	17.0%	" " "
		<i>(8.5% for the identification; a separate 8.5% for the report)</i>
Skills Tests (Aseptic Technique, Streak Plate)	8.5%	of lab grade
Pathogen Poster (group project)	7.0%	" " "
Attendance, Participation, Safety, Care of equipment	5.0%	

MICROBIOLOGY LABORATORY (BIOL 310L) SCHEDULE

Fall 2016

Lecture Professor: Dr. Susan Morrison

Lab Instructors: Ms. Tracy Hirsch

Dr. Susan Morrison

Required:

- (1) Leboffe & Pierce, Microbiology Laboratory & Theory Application, Brief, 3rd edition.
- (2) Coursepack for BIOL310
- (3) Sharpie marker, Safety Glasses, Lab Coat; Ms. Hirsch also requires a **bound** composition notebook.

“Pack” pages refer to the laboratory portion of BIOL 310 coursepack from SAS-E-Ink.

The Leboffe & Pierce manual pages are listed as “Leboffe.”

Everything that is listed must be read before coming to class.

I August 29-Sept 1 INTRODUCTION; SAFETY; ASEPTIC TECHNIQUE; USE OF MICROSCOPES; OBSERVATION OF PREPARED SLIDES; ENVIRONMENTAL SAMPLE

Leboffe pages 1--6; Pack pages L7-24 **Safety & Laboratory Guidelines**

(read thoroughly, understand and apply throughout the semester)

Leboffe Ex. 1-4

Common Aseptic Transfers & Inoculation Methods

Leboffe pages 59-60

Microbial Growth, Ubiquity & Diversity (read)

Leboffe Ex 2-1

Ubiquity of Microorganisms

& Pack pages L29-30

Distribution of Microorganisms in the Environment

Leboffe pages 141-142

Microscopy & Staining (read)

Leboffe Ex 3-1

Introduction to the Light Microscope

Pack pages L25-28

Observation of Prepared Slides of Bacteria (3 bacterial morphologies at 3 magnifications each)

II September 5-8 ASEPTIC TECHNIQUE, ENVIRONMENTAL SAMPLE & CULTURE CHARACTERISTICS (continued); PREPARATION OF SLIDES & OBSERVATION OF SIMPLE STAINS & NEGATIVE STAINS; STREAK PLATES

Leboffe Ex. 1-5 & Pack L36-37 **Streak Plate Methods of Isolation**

Leboffe Ex. 1-4

Review Common Aseptic Transfers & Inoculation Methods

Leboffe pages 173-176

Bacterial Structure & Simple Stains (read)

Leboffe Ex 3-4

Simple Stains (includes making a bacterial smear)

Leboffe Ex 3-5

Negative Stains

Leboffe page 87 (Top)

Environmental Factors Affecting Microbial Growth

Leboffe Ex 2-1

Continue: Ubiquity of Microorganisms

& Pack L29-30

Continue: Distribution of Microorganisms in the Environment

Leboffe Ex 2-2

Colony Morphology

Leboffe Ex. 2-3

Growth Patterns On Slants

Leboffe Ex. 2-4

Growth Patterns in Broth

Notes:

- + indicates exercise for which follow-up will be necessary. The time in brackets [] indicates the approximate time span at which follow-up should be done.

- ⁹“Pack” pages refer to the BIOL 310 coursepack from SAS-E-Ink. Leboffe refers to the manual by Leboffe & Pierce.
- Appendix = an appendix in the lab manual. You should familiarize yourself with it, but do NOT memorize it. It is for reference only.
- ****NOTE:****In addition to the questions for exercises which you do, you are also responsible (on tests and in your notebooks) for questions in exercises requiring only reading and for results and questions for exercises done as demonstration. You are also responsible for all parts of the exercises done from the coursepack or handouts, as well as from the lab book.
- **Important Note:** If the schedule needs to be shifted because of class cancellation for a hurricane, influenza, or other emergency during the term, the date of the lab final and/or other activities may change.
- Lab books may be collected and graded at ANY time during the semester; this could occur once or more than once and may be announced OR unannounced. You should come to class at all times with your lab book(s) organized, complete and up-to-date.

III September 12-15 PATHOGEN POSTER PROJECT SIGN-UP; BEGIN IDENTIFICATION OF “UNKNOWN” BACTERIAL CULTURE; GRAM STAIN; USE OF SPECIAL PURPOSE MEDIA (SELECTIVE & DIFFERENTIAL); NITRATE TEST; ISOLATION OF PURE CULTURES; PREPARATION OF CULTURE MEDIA; THE AUTOCLAVE

Pack L57-62 Sign up & begin **pathogen poster project** ---Organize teams of **4** students; select pathogen & area of body for normal microbiota

Leboffe Ex. 1-5 & Pack pp. L36-37 **Streak Plate Methods of Isolation** (use for Unknown culture)

Leboffe page 545 **Identification of Unknowns** (read)
Pack L38-L50 **Identification of Unknown Bacterial Cultures**
Leboffe Ex 3-12 **Morphological Unknown** (read)

Leboffe page 187 (top) **Differential & Structural Stains** (read)
Leboffe Ex. 3-7 **Gram Stain**

Leboffe pp. 227-229 **Selective Media & Differential Media**
Leboffe Ex. 4-1 **β -phenylethylalcohol Agar**
Leboffe Ex. 4-2 **Columbia CNA Agar** (read only, pay particular attention to figure)
Leboffe Ex. 4-4 **Mannitol Salts Agar**
Leboffe Ex. 4-5 **MacConkey Agar**
Pack _____ **CLED Agar**
Leboffe Ex. 5-6 **Nitrate Reduction Test** [24-48 hr] (Biochemical Test)

Leboffe Ex 2-2 **Cultural Characteristics of Microorganisms & Colony Morphology** Use this to describe Environmental Samples & for all future observations

Leboffe Ex 2-3 **Growth Patterns In Slants**
Leboffe Ex 2-4 **Growth Patterns In Broth**
Pack L34-35, L44 **Dichotomous key practice**—begin today (& continue in subsequent weeks)

Leboffe Ex 1-2 **Nutrient Broth & Nutrient Agar Preparation** [read & understand; we will not be able to carry this out because our temporary lab is not adequately equipped.]
& Pack L31-33

Leboffe Ex 2-5 **Evaluation of Media** (read only)
Leboffe Ex 2-11 **Steam Sterilization** (read only)

IV September 19--22 DETERMINATION OF OXYGEN REQUIREMENT; METHODS FOR GROWING ANAEROBES; BIOCHEMICAL TESTS; SPORE STAIN; CONTROL OF MICROBIAL GROWTH---with ULTRAVIOLET LIGHT

DEADLINE: for **pure working cultures** of your unknown; **reserve & working** culture slants of unknown

Leboffe page 95 (top) **Aerotolerance (read) & Oxygen Requirements**
Pack pages _____ **Determination of Atmospheric Oxygen Requirements** (using Agar Deep Stabs)
Leboffe Ex 2-6 **Fluid Thioglycollate Medium** for culturing anaerobes [Read]
Leboffe Ex 2-7 **Anaerobic Jar** for culturing anaerobes [Read]

Leboffe pages 267-270 **Differential Tests** (Read)
Leboffe Ex. 5-4 **Catalase Test**
Leboffe page 331 **Tests Detecting Hydrolytic Enzymes** (read)
Leboffe Ex. 5-10 **Starch Hydrolysis** (Amylase Test)
Leboffe Ex. 5-13 **Casein Hydrolysis** (Caseinase or Casease Test)

Leboffe Ex. 3-9 **Endospore Stain** (a structural stain)
Leboffe Ex. 2-13 The **Lethal Effect of Ultraviolet Radiation on Microbial**

Continue or complete ongoing exercises & identification of unknown cultures
Pack L34-35, 44 Continue Dichotomous Key practice
Pack L57-62 Continue group work on Pathogen Poster & Normal Microbiota

V September 26-29 BIOCHEMICAL TESTS—SUGAR FERMENTATIONS; EXTRACELLULAR ENZYMES; OTHER BIOCHEMICAL TESTS

Leboffe pages 267-270 **Differential Tests** (Review)
Leboffe page 279 (Top) **Fermentation Tests**
Leboffe Ex. 5-2 Carbohydrate Fermentation using **Phenol Red Fermentation Broth** [24hr]
Leboffe Ex. 5-19 Carbohydrate Fermentation using **Triple Sugar Iron Agar** ****[18-24hr]****
 IMViC Test Battery
Leboffe Ex. 5-4 **Methyl Red Test**
Leboffe Ex. 5-8 **Citrate Test**
Leboffe Ex. 5-20 **SIM Medium: Motility, Indole and Hydrogen Sulfide Test**

Pack L34-35, 44 Continue Dichotomous Key practice
 Continue or complete ongoing exercises & identification of unknown cultures
Pack L57-62 Pathogen Poster/Normal Microbiota Project continued

IMPORTANT SCHEDULE NOTE: You will need to return to the lab the next day (ideal) or the day after to read these test results. If reading of the results is delayed, they won't be accurate.

VI October 3-6 ACID-FAST STAIN; BIOCHEMICAL TESTS; MOTILITY (using WET MOUNTS & a SEMI-SOLID AGAR); BIOCHEMICAL I.D. SYSTEMS

Leboffe Ex. 3-7
Leboffe Ex. 3-12
Leboffe Ex. 48

Acid Fast Stain (a differential stain)
Wet Mount & Hanging Drop Preparations
Identification of Enteric Microorganisms Using Computer-Assisted Multi-Test Microsystems (demonstration)

Leboffe L71-74, Pack L57-L62
Pack L34-34, 44
Pack L38-50

Pathogen Poster project continued
Continue Dichotomous Key practice
Continue or complete ongoing exercises & identification of unknown cultures
Continue identification of unknowns [See message below about media requests.]
Review for next week's test

*****Friday October 7---noon (for Monday & Tuesday lab sections); Monday, October 10-noon (for Wednesday & Thursday lab sections)---Deadline for requesting supplemental media for unknown culture identification.***** You may request new media not previously used, and will be advised whether it can be provided. All requests must be in writing or by e-mail to your instructor using the subject line : Special Media Request. Please explain why this medium is of value for identification of your unknown. For previously used media, you should indicate why it is necessary for you to repeat the test now if you did not repeat a test immediately after first reading the results. It may take 3-4 days to get these media prepared. Forgetting to come in to read test results is **NOT** a valid reason to request more media. **HINT:** Request media sooner than this date to permit more time to apply those results.

VII October 10—13

***** ****LABORATORY TEST (closed book)**** [practical set-ups & written only sections]
***** ****PRACTICAL TESTS IN ASEPTIC TECHNIQUE; PLATE STREAKING; MICROSCOPE FOCUSING****

Continue or complete ongoing exercises & identification of unknown cultures

REMINDER: Lab books may be collected and graded at ANY time during the semester; this could occur once or more than once and may be announced OR unannounced. You should come to class at all times with your lab book(s) organized, complete and up-to-date.

VIII October 17-20 Unknown Reports due; Pathogen Poster project; Dilutions

Deadline For Submitting Unknown Reports

Submit to your lab instructor during your lab section; 10% penalty for each day late, including each weekend day; reports over 10 days late will not be accepted

Posters L57-L62
Leboffe Ex. 7-3
Pack pp. L63-72

Continue work on **pathogen poster & normal microbiota project** with your team
Morbidity & Mortality Weekly Report (MMWR) Assignment (use your pathogen poster microbe)
Dilutions Tutorial [to prepare for Viable Count (Standard Plate Count) next week]

IX October 24—27 DILUTIONS & PLATE COUNTS; WATER QUALITY TESTING (MPN); CONTROL OF MICROBIAL GROWTH---with ANTIBIOTICS, ANTISEPTICS & DISINFECTANTS;

Leboffe pages 441-442 **Medical, Environmental & Food Microbiology** (read)
Leboffe Ex. 7-3 **Antimicrobial Susceptibility Test: Disk Diffusion (Kirby-Bauer) Method**
Leboffe Ex. 2-13 **Effectiveness of Chemical Germicides: The Use-Dilution Test for Disinfectants & Antiseptics**

Leboffe pages 405-406 **Quantitative Techniques** (read)
Leboffe Ex. 6-2 **Standard Plate Count (Viable Count)**
& Pack L63-72

Leboffe Ex. 7-6+ **Multiple Tube Fermentation Method for Total Coliform Determination**
+ A. Presumptive Test: Determination of the Most Probable Number (Demo);
+ B. Confirmed Test
+ C. Completed Test
Pack pages L63-72 **Methods for Preparation of Dilutions & Dilution Problems** (work)
Handout Continue exercise on pathogenic bacteria and normal microbiota
----- Continue or complete ongoing experiments

X October 31—November 3 PATHOGEN POSTER PRESENTATIONS; MEDICAL MICROBIOLOGY; NORMAL MICROBIOTA; EPIDEMIC; CHECKOUT & CLEANUP

Student presentations **Presentation of Pathogen Posters**
Assemble composite poster showing **Normal Microbiota** of human body
Leboffe page 441 **Medical Microbiology-Introduction** (read)
Leboffe Ex. 7-4 **Epidemic Simulation**
Leboffe Ex. 7-3 **Morbidity & Mortality Weekly Report (MMWR) Assignment** (about your pathogen poster microbe)
----- Complete ongoing exercises
----- **Laboratory Checkout and Cleanup**
See Week XIII **Sign up** for your Food Microbiology lab food selection

XI November 7—10 Fall Break & Election Day no lab meeting

XII November 14—17 ***Cumulative LABORATORY TEST #2 (closed book)*******

XIII November 21—24 Thanksgiving Week no lab meeting

XIV November 28---December 1 Food Microbiology (Demonstration & Presentation)

Leboffe page 491 (top) **Microbiology of Food**
Pack L77-78 **Microbial Production of Food Products**
Pack 77-78 ****Advance Assignment**** Sign up for the food item on sign-up sheets posted in the lab.
Leboffe Ex. 7-8 **Making Yogurt**

SAFETY PROCEDURES

MICROBIOLOGY LABORATORY (BIO310L)

Note: The School of Science & Math Safety Guidelines are included with these in the required coursepack.

There are two main objectives to the *special* procedures employed in microbiology laboratories:

- (a) to prevent contamination, i.e. the introduction of unwanted organisms into the cultures and supplies being used; and,
- (b) to protect those people working in the lab---you, your colleagues, the instructors, maintenance personnel, etc.---from possible infection by an organism.

The microorganisms you will be working with are usually not highly virulent, but *all* microorganisms are potential pathogens and should be treated with respect. It is wise to develop careful habits no matter what the organism. The following guidelines should help you meet this goal.

Additional safety procedures address the fact that we are using chemicals, glassware, heat and flame.

PERSONAL BEHAVIOR, ATTIRE, POSSESSIONS & RISK FACTORS

1. Concentrate on your lab work. Conversations not relevant to the work you are doing must be kept to a minimum. Cell phones, texting, etc., are not permitted.
2. If you use electronics to take pictures of results, you must have the device covered with a sealed plastic bag. That bag should be discarded when you leave the room. If we know the device is contaminated, it will need to be decontaminated which will likely destroy it (no matter what its cost). If you unknowingly get it contaminated, you run the risk of exposing your face and mouth to the microbe. Best advice: don't use your electronics in lab. Instead record results the old-fashioned way.
3. Do not eat, drink, or chew gum in the lab. Containers of food or beverage must be secured within your book bag before you enter the lab and not placed on the counter or on the floor outside the laboratory entrance.
4. Do not apply make-up or smoke in lab. Pencils, pens, labels, fingers, or other objects should never be placed in your mouth while in lab. Keep your hands away from your face.
5. A lab coat is required to protect you and your clothing from accidental spills of cultures, stains and chemicals. Preferably, this clothing should be worn in and not removed from the laboratory. However, if it is carried out of the lab, it should be kept in a plastic zipper bag. Lab coats should be laundered separately, using bleach in addition to detergent.
6. Come to the laboratory properly dressed---never with bare feet, "flip-flops," unstable high heels or loose clothing. Acceptable shoes are closed toe with no perforations. Long hair must be tied back so it does not catch fire in a burner or fall into sterile media or culture media. False fingernails ignite easily and should never be worn in lab. Hair spray is highly flammable! Loose sleeves/ clothing must be restrained under your lab coat.

7. Books, purses, coats, etc., not in use must be placed out of the way---not on the lab bench, shelf above the bench, or side benches. You should use the large cupboard under your bench for all items not in use in the lab.
8. Working in the lab in the evenings and on weekends will be limited to those times when the instructor is present in the building or when special arrangements have been made. Under no condition may a student work in lab at night or on weekends unless the instructor opens the lab for this purpose. Students performing lab procedures should not work alone in the laboratory.
9. Contact lens wearers should consult their ophthalmologist or optometrist for instructions. [CDC guidelines require anyone wearing contact lenses to wear goggles or a face shield.] Be aware that trace amounts of stains on fingers can be transferred to soft lenses & that soft lenses absorb chemicals, including vapors. Be especially careful to follow sterilization procedures recommended.
10. Fabrics, especially cotton, can burn if exposed to the heat of flame. Fabrics with a fuzzy surface or open weave are more easily ignited. Use of fabric softeners increases the flammability of such fabrics. Therefore, choose your lab attire carefully, even that which is under a lab coat.
11. Clothing worn in the microbiology laboratory should not be subsequently worn in a facility where there are compromised hosts, such as a hospital, clinic or nursing home. It should also not be worn in an area of public food preparation.
12. Safety goggles should be worn for certain procedures, specifically those involving handling of hot liquids (e.g. boiling agar), caustic chemicals or heated slides. [See the note above re: contact lenses.] Obviously, goggles can't be worn when you are doing microscopy.
13. Children, unless permission has been granted, or pets are not allowed in the laboratory.
14. Students at high-risk for infection (e.g. persons with uncontrolled diabetes, those with a suppressed immune system, someone on steroids or chemotherapy), or those in whom an infection could be especially devastating (e.g. severely impaired kidneys) should (a) preferably notify the instructor, and (b) seek and receive permission of their physician. Students with potential life-threatening chemical sensitivities or medical conditions are required by the SSM policy to wear MedicAlert identification.

YOUR WORK AREA

15. Wipe off the counter with disinfectant before and after your lab work, always. A surface should also be decontaminated at any other time you feel it may have become contaminated.
16. All reagents, dyes and stains, cultures, equipment and lab benches must be returned to the proper place at the end of each lab period. However, during lab, you should place the tray of stains *on* your bench (not on the shelf) to avoid reaching over the flames.
17. Work over the lab bench, not over the floor or your lap.

18. Equipment, including storage racks, which contains cultures should be handled in a safe manner, so as to minimize the chance of accidents.
19. Several areas of the laboratory are "off-limits" unless you have the specific permission of the instructor. These include the drawers, cupboards, and supplies in the Prep Lab, the refrigerators, and the shelves labeled with the instructor's name in the walk-in incubator.
20. Turn the gas burner down or off when it is not in use during the lab period. Double check to be sure the gas is turned off at the end of the lab period.
21. Always turns the burner off at the gas jet; never turn it off at the burner.
22. Do not push the burner under the shelf or over the red line.
23. Avoid reaching over a lit burner.
24. In the event of a power outage, be sure your gas jet is off. When power is restored, the gas will come on.
25. If gas burns from a leak in the burner or tubing, turn off the gas.

OOPS!

26. Keep cuts, open wounds or rashes covered. Report any injuries, no matter how minor, incurred in lab to the instructor.
27. Avoid spilling cultures!!! But, if you accidentally spill a culture on yourself, the bench, the floor, or elsewhere:
 - (a) always notify the instructor;
 - (b) wear gloves for the clean-up;
 - (c) place paper toweling on the spill to absorb it;
 - (d) never touch broken glassware with your fingers;
 - (e) without letting your hands touch the absorbed liquid, place the paper towel in the proper container for sterilization (not in the waste basket);
 - (f) disinfect the area thoroughly with disinfectant. This includes letting the disinfectant stay on the spill area for at least ten minutes.
 - (g) Discard the gloves. Wash your hands with disinfectant and soap. Do not touch anything else, including water faucets, with your contaminated hands. [Ask someone to turn the water on for you.]
28. Remember to not spread contamination. For example, don't place a tube with culture spilled on the outside back in a rack where it could contaminate the rack and the hands of the next person.
29. Spills of reagents and stains should be cleaned using paper towels, followed by a thorough rinsing with water. For large spills or spills with hazardous liquids, notify the instructor.

30. Broken glass, if uncontaminated, should be placed in the container labeled "broken glass" in the Prep Lab. If it is contaminated, it should be safely contained before autoclaving.
31. Know where the First Aid Kit is and what to do in case of fire.

STANDARD PRACTICES

32. Before coming to lab, read each exercise and familiarize yourself with the principles, methods, and specific safety precautions. By doing so, you will lessen the chances of an accident and enable you to use your time more efficiently.
33. All cultures in the incubators or refrigerator must be labeled, with your name (no initials), identity of culture, and date. Include additional information as needed.
34. Label tubes and plates before inoculating them to help avoid confusion and spills.
35. Learn and practice the proper procedure for flaming an inoculating loop or needle. Begin flaming at the handle end and move slowly toward the loop. Flame completely; reduce aerosol production.
36. Do not mouth pipette. Pipette bulbs and manual pipettors are provided for your use.
37. Pick up test tubes by the glass tube, not by the cap, to avoid dropping the tube. Don't tilt test tubes beyond a 45° angle. The plastic caps do not prevent leakage.
38. Cultures are never to be taken from the laboratory.
39. Wash your hands before leaving lab at any time. Also wash your hands after cleaning up spills or anytime you suspect they may have become contaminated. Since bar soaps may become contaminated, you should use liquid or powder soap.
40. Dispose of all cultures, glassware, plastic-ware, pipettes and other supplies in the manner described by your instructor. **There is usually a special container (labeled) for almost every type of item.**
41. An area in the back of the lab has been set aside for contaminated tubes and plates.
 - (a) Tubes should be sorted as directed and placed upright in racks. Care should be taken that nothing can spill. Supplies and media which have been used for culturing bacteria, fungi or viruses must be autoclaved or disinfected before discarding or washing. Only supplies and equipment which have not been in direct contact with bacteria and fungi can be washed and stored without sterilization.
 - (b) Tape should be removed before placing materials in the discard area

SUMMARY

42. Use common sense and good safety practices in everything you do in lab, whether it is specifically stated here or not.
43. Each student must become familiar with all safety rules and must abide by them to remain in the laboratory. Listed below are additional specific safety hazards.

SALIVA, BLOOD, TEARS, URINE & OTHER BODILY SECRETIONS & EXCRETIONS

It is highly unlikely we will work with any of these fluids. However, if we do:

- a. Work only with your own body fluids.
- b. Wear gloves and safety goggles.
- c. Discard all contaminated items in specially designated containers and heed any precautions named by the instructor.
- d. Wash hands immediately if contaminated with blood or other fluids and always at the end of a procedure.
- e. Follow above guidelines for safe handling of microorganisms.

FIRST AID

- a. For serious injuries, notify Public Safety to reach our campus emergency responders
If using campus phone, call: 3-5611 for an emergency
If using cell phone, call: (843) 953-5611 for an emergency
- b. Report all accidents, no matter how small, immediately to the instructor.
- c. For spills in or near the eyes, use the eyewash.
- d. For large spills on your person, use the sink and drench hose.
- e. For heat burns, the affected part should be chilled with ice as soon as possible and kept chilled, but the ice should not be placed directly on the skin.

FIRE

Your response to a fire will differ depending on how large the fire is, the substance which is burning, and immediate danger to persons. Not all eventualities can be listed here.

- a. If gas burns from a leak in the burner or tubing, turn off the gas.

- b. If you have a smoldering sleeve, run water on the fabric.
- c. If you have a very small fire, the best way to put it out is to smother it with a towel or book (not your hand) or the fire blanket. Smother the fire quickly. In some cases (e.g. burning paper or wood), water may be appropriate. Smother an alcohol fire.
- d. If a larger fire occurs, such as in a waste basket or sink, use a fire extinguisher.
- e. If a person is on fire, use the fire blanket.
- f. In case of a large fire involving the lab itself (or a fire alarm), the room and building should be evacuated:

To evacuate:

1. Turn off all gas burners and unplug accessible electrical equipment.
2. Leave the room in an orderly manner, proceed down the stairs (either next to Room 200-to left when you leave our lab) or across from Rooms 203-204-to right), and immediately exit the building. Move away from the building.

NATURAL DISASTERS

Hurricane: In the likelihood of a hurricane, you may be asked by your instructor to assist in securing the lab to lessen the risk of cultures being spread and minimize damage to equipment and supplies caused by wind and rain if a window breaks and the inevitable leaky ceilings.

Earthquake: Turn off your gas jet and get under your lab desk during the temblor. If you can't get under the bench, get down and protect your head and face the best you can.

OTHER EMERGENCIES

Information and directions will be issued by the campus via several conduits, including Cougar Alert, e-mail, and postings.

Be sure you have signed up for Cougar Alert via multiple sources following the directions on the College website.

ASSEMBLY POINT FOR CLASS EVACUATIONS

In the event we must evacuate the building for an emergency, the entire class should assemble at one location to be sure all are accounted for and to await instructions. Please do not wander off.

At MUSC, the assembly point will be in front of 268 Calhoun Street (the Alumni Office) at the corner of Ashley & Calhoun Streets). Walk toward the College of Charleston to get there.

At HarborWalk, the assembly point will be at the closest corner of the Aquarium Parking Garage.

On main campus, assemble at the clock at Green & College Ways.