
Biology Department, College of Arts & Sciences, Valdosta State University
FALL 2013----COURSE SYLLABUS*

BIOL 3100, Sections A & B. Microbiology (CRN 81285 & 81286) - 4 credit hours
BIOL 5100, Sections A & B. Microbiology (CRN 81313 & 81314) – 4 credit hours

Class:	**TR**		**8:00-9:15 am, 2022 Bailey Science Center**
Laboratory:	**TR**	**3100/5100 Section A**	**10:00-11:25 am, 2068 Bailey Science Center**
	TR	**3100/5100 Section B**	**2:00-3:25 pm, 2068 Bailey Science Center**

Instructor:	**Dr. Jenifer Turco**	**Email:**	jturco@valdosta.edu
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Office Hours:	**Tues. 4:15-5:15 pm & Thurs. 12:30-1:30 pm; or by appointment.**		

Course Description: BIOL 3100 Microbiology 3-3-**4 (4 credit hours)** Prerequisites: BIOL 1107K, BIOL 1108K, BIOL 3200, CHEM 1211/CHEM 1211L, CHEM 1212/1212L. Recommended: CHEM 3402. **BIOL 5100 Microbiology** 3-3-**4 (4 credit hours)** Prerequisite: Admission into the graduate program or permission of the instructor. Survey of microbiology covering eubacteria, archaebacteria, protozoa, fungi, algae, and viruses. Includes fundamental techniques, microbial physiology and genetics, biotechnology, medical applications, and applied microbiology. Two 1.5 hour laboratory periods per week.

Required Textbook: **BROCK BIOLOGY OF MICROORGANISMS, Thirteenth Edition**
by Michael T. Madigan, John M. Martinko, David A. Stahl, and David P. Clark.
Benjamin Cummings, 2012. (ISBN 978-0-321-64963-8)

Required Lab Manual: **BENSON'S MICROBIOLOGICAL APPLICATIONS, LABORATORY MANUAL IN GENERAL MICROBIOLOGY (Complete Version), Twelfth Edition**
by Alfred E. Brown. McGraw-Hill, Inc. 2012. (ISBN 978-0-07-730213-9)

Other Required Items: (i) A calculator that is not integrated with a cell phone; (ii) a permanent, fine-tip marking pen ("Sharpie") for labeling cultures in lab; (iii) one compact disk or flash drive for the oral presentation (Email cannot be used to access your PowerPoint presentation); (iv) one thin, light-weight folder for handing in references & other assignments (Please do **not** use a 3-ring binder to hand in assignments); (v) paper clips or stapler/staples for organizing references & assignments; and (vi) a notebook for organizing and recording lab results (this may be a loose-leaf notebook).

Special notes to students:

1. In order to respect the privacy of each student, exam scores and grades will not be posted, given out by telephone, or sent to students by email.
2. Students should consult the VSU Student Handbook, Catalog, Semester Calendar, Schedule of Classes, & Registration Guide (all available online) for information about VSU policies and procedures regarding registration, drop/add, and withdrawal. October 3 is midterm. Students are not permitted to withdraw after midterm except in cases of hardship.
3. Students requesting classroom accommodations or modifications because of a documented disability should discuss this need with the instructor at the beginning of the semester. These students must contact the Access Office for Students with Disabilities. The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY).
4. Cell phones, music players (iPod, mp3, etc.), and other electronic devices may not be used at any time in class or lab. Students are especially cautioned to be certain that cell phones are silenced and put away during examinations. Should a cell phone ring during an exam, or should a cell phone be seen by the instructor during an examination, the student's exam will be terminated and the student will receive a score of "0" on the exam . Students may use cameras during lab to photograph their lab results.
5. Please use the rest room before you come to class to take an exam. Should a student need to leave the classroom during an exam, the student's exam will be terminated.
6. Students are expected to read and adhere to the following: (i) the VSU Student Code of Conduct as described in the VSU Student Handbook and (ii) the Biology Department policy on plagiarism (available online through the departmental Web site). The instructor may use a variety of methods for detecting cheating and plagiarism. Cheating or plagiarism will result in a grade of "0" for the exam or assignment. In addition, the instructor may complete a Report of Academic Dishonesty and submit it to the VSU Student Conduct Office. A student who cheats or plagiarizes on more than one exam or assignment will receive a grade of "F" in the course.
7. No disruptive behavior will be tolerated during class or lab. A student who engages in disruptive behavior will be asked to leave. If necessary, the campus police will be contacted.
8. Students who wish to use laptop computers as part of the class are required to sit in the first three rows of the classroom.

***This is a tentative syllabus. Changes to this syllabus will be announced during class or laboratory periods; alternatively, changes may be posted on BlazeView. Graduate students who are taking BIOL 5100 must meet with the instructor to discuss additional course requirements & grading.**

Course Objectives:

(Pages 2 and 3 show how the objectives below are aligned with the University System of Georgia, VSU and Biology Department Educational Outcomes/Objectives.

After successful completion of this course, the student should be able to:

A. List and describe the three domains of living organisms.
B. List and describe the three types of noncellular infectious agents.
C. List several activities of microorganisms that are beneficial to humans and the environment.
D. List and briefly explain several current challenges in medical microbiology and infectious diseases.
E. Compare and contrast the structure and function of the microorganisms in the domains *Bacteria*, *Archaea*, and *Eukarya*.
F. List and describe the various strageties used by microorganisms to obtain carbon, energy, and electrons.
G. Describe the growth of a pure culture of bacteria in a closed system, and perform mathematical calculations related to the exponential growth phase. Explain several ways in which bacterial growth can be measured.
H. Compare and contrast the following processes as they occur in *Bacteria*, *Archaea*, and *Eukarya*: DNA replication, transcription, and translation.
I. Describe several mechanisms through which gene expression is regulated in bacteria.
J. Describe in detail how viruses replicate.
K. Describe the causes and consequences of mutations.
L. Describe the three mechanisms of horizontal gene transfer in bacteria, and explain their significance.
M. Describe specific examples of the use of microorganisms in genetic engineering and biotechnology.
N. Briefly explain the role of microorganisms in the evolutionary history of life on earth.
O. List and describe a variety of methods and approaches that are used to detect and identify various microorganisms and noncellular infectious agents.
P. Explain how physical methods and chemical agents (antiseptics and disinfectants) are used for controlling microbes.
Q. State the mechanisms of action of various antibacterial, antifungal, and antiviral medications.
R. Discuss the problem of antimicrobial drug resistance, and explain several ways in which the emergence of drug resistant bacteria can be minimized.
S. Give examples of beneficial interactions between: (i) microorganisms and plants, (ii) microorganisms and animals, and (iii) different types of microorganisms.
T. Describe the role of microorganisms in the cycling of nutrients, using examples from the carbon cycle, the nitrogen cycle, and the sulfur cycle.
U. Describe in detail: (i) the innate defenses of humans and (ii) the adaptive immune response of a human to a foreign antigen.
V. Explain how infectious diseases are transmitted, giving specific examples.
W. List the major types of virulence factors observed in pathogenic bacteria, giving specific, detailed examples.
X. List and describe several human diseases that are due to specific bacteria, viruses, protozoa, and fungi.
Y. Describe the general course of the disease caused by human immunodeficiency virus (HIV).
Z. Properly handle microorganisms in a biosafety level 2 laboratory.
ZA. Use a compound light microscope to examine various types of microorganisms.
ZB. Keep accurate records of microscopic observations, as well as other laboratory and field work.
ZC. Use culture media to grow bacteria and fungi in the laboratory, and maintain stock cultures.
ZD. Use staining techniques, physiological tests, and rRNA sequences as aids in bacterial identification.
ZE. Use dilutions to solve problems such as determining the colony-forming units per milliliter in a bacterial suspension and the plaque-forming units per milliliter in a viral suspension.
ZF. Work with others to: formulate an answerable question; develop a hypothesis; design and conduct an experiment; collect, organize and analyze data; and write a formal report in the format used in a scientific journal.
ZG. Use library and electronic resources to obtain formal scientific articles related to a particular topic in microbiology.
ZH. Read the articles mentioned in objective ZG and give an oral presentation based on them.

Alignment of Assignments with Course Objectives:

The course objective(s) aligned with each assignment are given on the last page of this syllabus.

Alignment of Course Objectives with Educational Outcomes:

The **Student Learning Goals for the Core Curriculum in the University System of Georgia (USG)** are available online at http://www.usg.edu/academic_affairs_handbook/section2/C738/. The application of these learning goals in VSU's Core Curriculum is explained at http://www.valdosta.edu/academics/academic-affairs/vp-office/vsu-core-curriculum.php .
Each Core Area (A1, A2, B, C, D, and E) has one or more learning goals. There are also three additional learning goals for the Core Curriculum as follows: Learning Goal I: US Perspectives (US Goal): Students will demonstrate an understanding of the United States and its cultural, economic, political, and social development; Learning Goal II: Global Perspectives (GL Goal): Students will demonstrate an understanding of the cultural, religious, or social dimensions of societies around the world; and Learning Goal III: Critical Thinking (CT Goal): Students will identify, evaluate, and apply appropriate models, concepts, or

principles to issues, and they will produce viable solutions or make relevant inferences. The **VSU General Education Outcomes** (numbered 1-8) are available online at http://ww2.valdosta.edu/gec/documents/matrixGenEdoutcomestocorecourses.pdf ; in this syllabus they are referred to as VSU1-VSU8. The **Biology Undergraduate Educational Outcomes** (numbered 1-5) are available in the VSU Undergraduate Catalog, and the **Biology Graduate Educational Outcomes** are available in the VSU Graduate Catalog and are numbered 1 through 4. Both catalogs are available online through http://www.valdosta.edu. In this syllabus the Biology Undergraduate and Graduate Educational Outcomes are designated as B1-B5 and GB1-GB4, respectively.

The course objectives that are aligned with the USG, VSU and Biology Department Educational Outcomes/Objectives are below.

USG, VSU or Biology Objective	**Course Objective(s)**
Core Area A1Learning Goal	ZF, ZG, ZH
Core Area A2 Learning Goal	G, ZE, ZF
Core Area B Learning Goal	C, D, M, R, U, V, X, Y
Core Area D Learning Goal	all course objectives
Core US Goal	C, D, M, R, U, V, X, Y
Core GL Goal	C, D, M, R, U, V, X, Y
Core CT Goal	E, G, H, R, ZB, ZD, ZE, ZF, ZG, ZH
VSU1	C, D, M, R, U, V, X, Y
VSU2	C, D, M, R, U, V, X, Y
VSU3	ZF, ZG, ZH
VSU4	ZB, ZF, ZH
VSU5	all course objectives
VSU7	C, D, G, H, M, O, R, ZA, ZB, ZD, ZE, ZF, ZH
VSU8	D, M, P, R, U, V, W, X, Y, Z, ZB, ZF, ZG
B1	Z, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH
B2	A, B, D, E, H, J, K, L, N, O, R, U, X, Y
B3	A, B, D, E, F, G, H, I, J, K, L, O, P, Q, U, W, X, Y
B4	B, D, H, I, J, K, L, M, O, R, X, Y
B5	C, D, F, R, S, T, V
GB1	all course objectives
GB2	G, ZB, ZE, ZF, ZG, ZH

BIOLOGY 3100/5100. Microbiology - Class and Lab Schedule

Date	**Topics/Lab Exercises** (Additional notes for lab exercises)	**Related material in text**
Tues. Aug. 13	General course information Microorganisms and microbiology	 **Chap. 1**
Tues. Aug. 13L	>*Program #1, The Microbial Universe* – **Begin keeping records in your lab notebook today.** SUPPL. EX., HANDWASHING **Wash your hands before leaving lab!**	
Thurs. Aug. 15	Microorganisms and microbiology An overview of microbial life Cell structure/function	**Chap. 1** **Chap. 2** **Chap. 3**
	Review the following topics that you covered in introductory biology: **Basics of chemistry and biochemistry** **DNA structure & replication** **Transcription & translation**	
Thurs. Aug. 15L	>EX. 19, CULTURE MEDIA PREPARATION (We will follow the directions in the course packet for preparing nutrient broth and nutrient agar.) After completing this lab, students should be able to explain how nutrient broth, nutrient agar plates, and nutrient agar slants are prepared. Complete questions, p. 137-138, except question 3 on page 138. **Continued on the next page……**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Aug. 15L	**.....continued from the preceding page** **>PLEASE READ THE FOLLOWING BEFORE NEXT WEEK:** LABORATORY SAFETY (Read handout & p. xi-xvi in lab manual.) EX. 9, ASEPTIC TECHNIQUE SUPPL. EX., WINOGRADSKY COLUMN; EX. 52 WINOGRADSKY COLUMN (IN LAB MANUAL), AND PAGES 643-646 IN THE TEXTBOOK. **Wash your hands before leaving lab!**	
Tues.	Aug. 20	Cell structure/function	**Chap. 3**
Tues.	Aug. 20L	**Please note that missing this particular lab period will result in a deduction of 25 points, except in the event of a documented, serious emergency.** >LAB ORIENTATION & LABORATORY SAFETY >EX. 9, ASEPTIC TECHNIQUE **Wash your hands before leaving lab!** PLEASE REMEMBER TO READ THE INFORMATION FOR EACH DAY'S LAB **BEFORE** COMING TO LAB.	

- ***Discuss the Winogradsky Column Project with your lab group. Decide on a question, formulate a hypothesis, and decide how you will conduct the experiment. Discuss your experimental design, plans for data collection, and plans for your lab report. Decide on your assignments for the Winogradsky Column Project, and bring any required materials to lab next Thursday, Aug. 29. Each group of 4 students will build at least two columns.***
- **YOUR GROUP'S LAB REPORT ON THE WINOGRADSKY COLUMN PROJECT** must be written in the style of a scientific paper and must contain the following sections: Title, Authors, Abstract, Introduction, Materials and Methods, Results, Discussion, Literature Cited, and an Appendix. The Results section must include your group's organized data and observations on the Winogradsky columns, charts and/or graphs, selected drawings (or photographs), and a written description of the results. Reports must be typed.
- The Appendix must contain each lab group member's original, written notes and drawings (or photographs) for the project. **Each group member's work must be labeled with his or her name.**
- The overall format for the report must follow the "Instructions for Authors" for the Journal of Bacteriology (available online at http://jb.asm.org/misc/ifora.shtml
- The evaluation criteria for this lab report are detailed on the form in the course pack.
- Group members will evaluate each other on the day the report is submitted and these evaluations will be included in each student's grade on the report.

Thurs.	Aug. 22	Cell structure/function	**Chap. 3**
Thurs.	Aug. 22L	>EX. 1, MICROSCOPY; answer questions on pages 9-11. >MICROSCOPE CARE & USE ; MICROSCOPE CHECKLIST (course packet) >EX. 11, SMEAR PREPARATION & EX. 12 , SIMPLE (POSITIVE) STAINING (On a single slide, prepare a smear of *Saccharomyces cerevisiae*, and a separate smear of *Escherichia coli.* Use the technique for preparing smears from solid media [see Ex. 11, p. 94], & stain with crystal violet for 30 seconds [See Ex. 12 for basic guidelines].) We will use paper towels instead of bibulous paper. Use this slide in the exercise below (SUPPL. EX.). >SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *ESCHERICHIA COLI* **(Hand in your drawings to the instructor at the end of lab, 15 points)** >FINISH EX. 9, ASEPTIC TECHNIQUE (Answer questions, p. 77-78.)	
Tues.	Aug. 27	Cell structure/function Eukaryotic microorganisms	**Chap. 3 & 8 (pages 220-221)** **Chap. 20; see also p. 971; 991-994; 998-1000; 1015-1016; 1040-1041**
Tues.	Aug. 27L	>**Additional simple stain:** Aseptically remove a sterile swab from wrapping paper & swab your gums and teeth. Gently rub swab onto a DRY slide. Allow smear to air dry; then heat fix. Stain with **methylene blue**, rinse, and blot dry. Examine with oil immersion objective. Draw epithelial cells and bacteria on page 104 or 105. **Continued on next page……**	

Date		Topics/Lab Exercises	Related material in text
Tues.	Aug. 27L	**……..continued from preceding page** >EX. 13, NEGATIVE STAINING (We will use nigrosin & the method in Fig. 13.1. On page 100, follow steps 1-7, but **omit steps 2 & 4**. Draw a few representative *Staphylococcus aureus* cells and *Bacillus subtilis* cells in your lab notebook. Answer questions 1-5, page 104; and answer questions on page 105. (You may need to consult Ex. 14 to answer the questions about the capsule stain.) **>If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *ESCHERICHIA COLI* **(Hand in your drawings to the instructor at the end of lab, 15 points)**	
Thurs.	Aug. 29	Eukaryotic microorganisms	**Chap. 20 & additional pages-see Jan. 22**
Thurs.	Aug. 29L	>EX. 7, UBIQUITY OF BACTERIA Complete steps 1-7, but omit step 6. >EX. 8, THE FUNGI (Page 62, Fungi Study. You will prepare the plates we will use next week. Work in groups of 4 and expose 2 plates of Sabouraud dextrose agar to air for 45 minutes. Expose one plate inside the building and the other plate outdoors. Incubate the plates at room temperature until next week.) >SUPPL. EX., WINOGRADSKY COLUMN (WE WILL USE THE PROCEDURE IN THE SUPPL. EX., BUT PLEASE READ EX. 52 IN THE LAB MANUAL AS WELL.) **Discuss your experimental design, plans for data collection, and plans for the lab report with your group.** **>If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *ESCHERICHIA COLI* **(Hand in your drawings to the instructor at the end of lab, 15 points—last day)**	**TEXT, P. 643-646**
Tues.	Sept. 3	Eukaryotic microorganisms Nutrition, culture, & metabolism of microorganisms	**Chap. 20 & additional pages-see Jan. 22** **Chap. 4, 14, 13, 17, & 18**
Tues.	Sept. 3L	>EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY You will use a loopful of water from one of your Winogradsky columns as the mixed sample of microorganisms in this exercise. Use a prepared plate of MacConkey agar, desoxycholate agar, or Eosin methylene blue agar for doing the quadrant streak (**method B** on page 83). Each person will do his/her own streak plate. **Begin keeping records for your general unknown today (in your lab notebook).** >CHECK WINOGRADSKY COLUMNS (Make macroscopic observations of columns, and record this information. Observe biofilm slides. You may also prepare wet mounts, if desired. Make neat, detailed drawings of any microorganisms observed in your lab notebook. Use the information in EX. 6 , PROTOZOA, ALGAE, & CYANOBACTERIA to aid you in recognizing different groups of organisms. At some point during the semester, be sure you see and draw examples of protozoa, algae, & cyanobacteria. Keep in mind that you may also see some microscopic invertebrate organisms in your samples. **Discuss issues related to data collection & organization with your group members.**) OPTIONAL: EXAMINE PREPARED SLIDES OF *Plasmodium falciparum* in blood smear; *Trichomonas vaginalis, Trypanosoma cruzi, & Entamoeba histolytica*	
Thurs.	Sept. 5	Nutrition, culture, & metabolism of microorganisms	**Chap. 4, 14, 13, 17, & 18**
Thurs.	Sept. 5L	**>FOR EX. 59, YOU WILL WORK IN GROUPS OF 4. PICK UP TWO STERILE, 50 ML TUBES FOR EACH GROUP. OBTAIN A FRESHWATER SAMPLE AND BRING IT TO LAB THIS COMING TUESDAY FOR EX. 59.** >EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plate from Tuesday. Pick a well-isolated colony, and use it to do another streak plate (using method B on page 83) on the prepared plate of medium provided by the instructor. If you do not have a well-isolated colony, take a VERY TINY sample from your plate and perform another streak plate, using method B on page 83. >FINISH EX. 7, THE BACTERIA (Complete table, p. 57, as well as items 2, 3, & 4 on the top of p. 58. Answer short answer questions 1 & 2 on page 58**.)** **Use plates with fungal colonies in Ex. 8.** **Continued on next page……**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Sept. 5L	**……..continued from preceding page** >FINISH EX. 8, THE FUNGI (Fungi Study – Do NOT open fungal cultures in the lab. Open them only in the biological safety cabinet. You will use clear cellophane tape to prepare slides of two or more different molds. The instructor will demonstrate this procedure, which is described in the lab manual on p. 64. Examine the slides using the low power (10x) objective and the high dry (40x) objective. Draw the specimens on p.65, part A2; or you may draw them in your lab notebook. Also record a description of the appearance of the fungal colonies. Answer the questions on p. 66.)	
Tues.	Sept. 10	Nutrition, culture, & metabolism of microorganisms	**Chap. 4, 14, 13, 17 & 18**
Tues.	Sept. 10L	**REMEMBER TO BRING 2 TUBES WITH FRESH WATER SAMPLE FOR TODAY'S LAB.** >EX. 59, BACTERIOLOGICAL EXAMINATION OF WATER (You will work in groups of 4 and use the fresh water collected in 2 sterile, 50 ml tubes for this exercise.) >EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plates from Thursday. Hopefully, each group of 4 students will be able to decide today on an isolate to use for their general unknown. If you are looking at a streak plate prepared **from** a well-isolated colony, pick a well-isolated colony and transfer it to a nutrient agar slant. This can be your group's general unknown culture; please label it clearly with "**UNKNOWN", your lab section, and seat numbers**. If your group has no plates that were prepared **from** a well-isolated coloony, then pick a well-isolated colony and use it to do another streak plate (using method B on page 83) on the prepared plate of medium provided by the instructor. During the next lab you will pick a well-isolated colony from the new plate to transfer to a nutrient agar slant for use as your group's unknown. >MONITOR WINOGRADSKY COLUMNS-- **Discuss plans for the Winogradsky lab report with your group.** OPTIONAL: EXAMINE PREPARED SLIDES OF *Plasmodium falciparum* in blood smear; *Trichomonas vaginalis, Trypanosoma cruzi, & Entamoeba histolytica* (if not done last week)	
Thurs.	Sept. 12	**EXAM 1** (will include both class and lab material)	
Thurs.	Sept. 12L	>CONTINUE EX. 59, BACTERIOLOGICAL EXAMINATION OF WATER (MPN+EMB/MAC) We will use MacConkey agar instead of Endo agar. Record results on board. FINISH EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plates from Tuesday. If your group hasn't yet established a general unknown nutrient agar slant culture, please do this today. If you are looking at a streak plate prepared **from** a well-isolated colony, pick a well-isolated colony and transfer it to a nutrient agar slant. This can be your group's general unknown culture; please label it clearly with "**UNKNOWN", your lab section, and seat numbers. If, for some reason, your group has no suitable colonies, please consult the instructor.** > SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE (SPREAD-PLATE TECHNIQUE) WORK IN GROUPS OF 2 FOR THIS EXERCISE. **ALSO, PLEASE READ EX. 21 (P. 143-147) TO LEARN ABOUT THE POUR-PLATE TECHNIQUE AS WELL AS ADDITIONAL TOPICS. HOWEVER, PLEASE NOTE THAT WE WILL NOT ACTUALLY DO EX. 21 IN THE LAB. ANSWER QUESTION 1 ON P. 153.** **>BEGIN TO WORK DILUTION PROBLEMS IN COURSE PACKET**	
Tues.	Sept. 17	Metabolism of microorganisms	**Chap. 14, 13, 17, 18, & 19**
Tues.	Sept. 17L	>FINISH EX. 59, BACTERIOLOGICAL EXAMINATION OF WATER (Read results of EMB/MAC. We will omit the "completed test procedure" and the IMViC tests.) Answer questions 4-9 on p. 390-391. >COMPLETE SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE Record your results on board. **>WORK DILUTION PROBLEMS IN COURSE PACKET** >MONITOR WINOGRADSKY COLUMNS. **Discuss plans for lab report with your group.**	
Thurs.	Sept. 19	Microbial growth	**Chap. 5**

Date		Topics/Lab Exercises	Related material in text
Thurs.	Sept. 19L	*Program #3, Metabolism* **WORK SESSION ON DILUTION PROBLEMS; ASK QUESTIONS ABOUT PROBLEMS** >>**OPTIONAL: Hand in 3 stapled articles in a folder** (formal articles from peer-reviewed, professional, scientific journals). These articles will be used to prepare your oral presentation. The instructor will provide feedback if you hand in the articles today; however, points will not be awarded until you submit the articles immediately after your oral presentation during lab.	**Chap. 35 (p. 1007-1010); Chap. 15 (p. 425-427), & Chap. 23 (p. 693-695)**
Tues.	Sept. 24	Molecular biology of *Bacteria, Archaea, & Eukarya*	**Chap. 6 & 7**
Tues.	Sept. 24L	>EX. 15, GRAM STAINING, Prepare smears from nutrient agar slant cultures as described on p.94 of lab manual. Complete drawings/questions, p. 117-120.) >GENERAL UNKNOWN CULTURES-----READ ABOUT STOCK CULTURES IN EX. 20. **Prepare subcultures (stock cultures) of the unknown and also gram stain it.** Record dates, work done, drawings, etc., in your lab notebook. Also record your results on the descriptive chart on page 255. WITH THE NUTRIENT AGAR PLATE PROVIDED, PREPARE A STREAK PLATE USING YOUR UNKNOWN CULTURE . >**THE LAB REPORT ON THIS GENERAL UNKNOWN MAY BE DONE INDIVIDUALLY OR WITH OTHER GROUP MEMBER(S).** It must be organized in a thin folder that contains the following items: **(i-individually graded and worth 15% of grade)** each person's individual unknown records and drawings from his/her lab notebook (labeled with the person's name); **(ii-worth 20% of grade)** one **neat and complete** copy of the descriptive sheet (p. 255 in lab manual) with the results of all of the tests performed (do not make your own table—use the one in the lab manual or a photocopy of it); **(iii-worth 15% of grade)** a statement of your conclusion about the group to which the unknown bacterium belongs (based on *Bergey's Manual of Determinative Bacteriology*, which is on reserve in the library; and **(iv)** an explanation and discussion of the following points: how you arrived at your conclusion **(worth 10% of grade)**; any test results that are inconsistent with your conclusion **(worth 10% of grade)**; & what you have learned about the properties and metabolism of your unknown organism from the work you did **(worth 30% of grade)**. Part (iv) must be typed (double-spaced) and approximately 2 to 3 pages long. **Do NOT describe the methods used for performing the various tests.** >MONITOR WINOGRADSKY COLUMNS – **Discuss plans for lab report with your group.**	
Thurs.	Sept. 26	Molecular biology of *Bacteria, Archaea & Eukarya*	**Chap. 6 & 7**
Thurs.	Sept. 26L	>CONTINUE WORK ON GRAM STAINING KNOWN AND UNKNOWN CULTURES. >EXAMINE STREAK PLATE OF UNKNOWN. Measure diameter of colonies and record a description of the colonies in your notebook and on the descriptive chart on p. 255. Consult p. 260 (Ex. 38).	
Tues.	Oct. 1	Regulation of gene expression	**Chap. 8**
Tues.	Oct. 1L	>SUPPL. EX., VARIOUS MEDIA (CULTURES FOR DESOXYCHOLATE AGAR AND PHENYL ETHYL ALCOHOL AGAR: *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa,* & unknown) (CULTURES FOR BLOOD AGAR: *E. coli, S. aureus, Bacillus cereus,* & unknown) >A **THROAT CULTURE** WILL ALSO BE PERFORMED ON A BLOOD AGAR PLATE. >EX. 17, ACID-FAST STAINING (Ziehl-Neelsen method procedure) Use 0.1% albumin solution instead of water for preparing the smears. On one slide prepare a smear of a mixture of *Mycobacterium smegmatis* & *Staphylococcus aureus,* as well as a separate smear of your unknown. Allow the smears to air dry, and then heat fix them. Put on gloves, and try to be neat. (You are responsible for cleaning up any spills of carbol fuchsin.) Cover the smears with a cut piece of paper towel that does not extend over the edges of the slide. Hold the slide with a clothespin or slide holder and soak the towel with carbol fuchsin. Heat the slide intermittently over the flame of the bunsen burner so that it "steams" for 5 minutes. Do NOT let the paper towel dry out—add more carbol fuchsin as needed. Allow the slide to cool and then remove the paper towel. Proceed with steps 2 through 7 as described in the lab manual in Figure 17.1 on page 116. Complete drawings/questions, p. 117-120. Record results for unknown culture in lab notebook and on the descriptive chart on p. 255. >MONITOR WINOGRADSKY COLUMNS. **Work on lab report with your group.**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Oct. 3	Viruses	**Chap. 9 & 21**
Thurs.	Oct. 3L	>EX. 31, ULTRAVIOLET LIGHT: LETHAL EFFECTS >FINISH SUPPL. EX., VARIOUS MEDIA -- Record results in the table provided with the exercise. **ALSO, record results for your unknown in your notebook, and on the descriptive chart on p. 255.** **Consider the following question: Is the pattern of growth of your unknown on the selective media consistent with the results you obtained in the Gram stain?** >EX. 16, SPORE STAINING (Modified Schaeffer-Fulton Method) On one slide prepare a smear of the *Bacillus* species provided as well as a separate smear of your unknown. Allow smears to air dry, and then heat fix them. Put on gloves, and try to be neat. (You are responsible for cleaning up any spills of malachite green.) Complete drawings/questions, p. 117-120. Record results for unknown culture in lab notebook and on the descriptive chart on p. 255.	
Tues.	Oct. 8	Viruses	**Chap. 9 & 21**
Tues.	Oct. 8L	>FINISH EX. 31, ULTRAVIOLET LIGHT (Observe demonstration. Record results today or Thurs.; answer questions on p. 213-214.) >PREPARE NEW STOCKS OF GENERAL UNKNOWNS >EX. 38, CULTURAL CHARACTERISTICS (You will inoculate your unknown in/on the following: nutrient agar slant [use a straight inoculation line], nutrient broth, motility medium [deep], nutrient gelatin deep, & fluid thioglycollate medium.) >EX. 18, MOTILITY DETERMINATION (TUBE METHOD ONLY) You will inoculate tubes of motility medium with *Staphylococcus aureus*, *Proteus vulgaris*, (& your unknown, as noted above). >EX. 27, EFFECTS OF OXYGEN – We will not do this exercise, but you should read it with particular attention to the information about oxygen requirements and fluid thioglycollate medium, which you will use for your unknown, as noted above. >SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – WORK IN GROUPS OF 2 READ pages 159-161 in the lab manual. **Ask questions on dilution problems.** >MONITOR WINOGRADSKY COLUMNS (today &/or Thurs.)	
Thurs.	Oct. 10	**EXAM 2** (will include both class and lab material)	
Thurs.	Oct. 10L	>FINISH EX. 31, ULTRAVIOLET LIGHT (Observe demonstration. Record results if not done on Tues.; answer questions on p. 213-214.) >EX. 39, OXIDATION & FERMENTATION TESTS, **VOGES PROSKAUER (VP) TEST ONLY** (Inoculate one tube of MRVP broth with your unknown and another tube of MRVP broth with *Enterobacter aerogenes*.) >FINISH EX. 38. (Record results in notebook and on descriptive chart on p. 255. Consult Ex. 27 for information about oxygen requirements and fluid thioglycollate medium.) .>FINISH EX. 18, MOTILITY (TUBE METHOD & WET MOUNT) (On pages 125, draw the motility tubes and answer questions 3 & 5 in part B. Prepare a wet mount of the nutrient broth culture of your unknown and examine for motility using the microscope. Record the results of the motility tube test and wet mount for the unknown in your notebook and in the descriptive chart on p. 255.) >**FINISH** SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – Record results on board. >MONITOR WINOGRADSKY COLUMNS (if not done on Tues.)	
Tues.	Oct. 15	Genetics of *Bacteria & Archaea*	**Chap. 10**
Tues.	Oct. 15L	>EX. 39, OXIDATION AND FERMENTATION TESTS >EX. 41, MULTIPLE TEST MEDIA (We will do ONLY the test for hydrogen sulfide production using SIM medium.) >EX. 40, HYDROLYTIC/DEGRADATIVE REACTIONS (Modification: we will use tributyrin agar rather than spirit blue agar for the lipid hydrolysis test. On tributyrin agar, a clear zone around the bacterial growth indicates a positive test for lipid hydrolysis.) **continued on next page……**	

Date		Topics/Lab Exercises	Related material in text
Tues.	Oct. 15L	**…….continued from preceding page** >DISCUSSION ON THE USE OF BERGEY'S MANUALOF DETERMINATIVE BACTERIOLOGY BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY is on reserve in the library for your use. **Do NOT use EX. 42 in the lab manual.** >Do the following online exercise on your own: >SUPPL. EX., USING RIBOSOMAL RNA GENE SEQUENCES TO LEARN ABOUT A MICROORGANISM >MONITOR WINOGRADSKY COLUMNS **Optional journals for extra credit are due during lab on this day.**	
Thurs.	Oct. 17	Genetic engineering & biotechnology (selected topics) Microbial genomics	**Chap. 11 & 15 (p. 428-433)** **Chap. 12 & 22 (p. 656-658)**
Thurs.	Oct. 17L	THIS IS THE LAST DAY FOR LAB WORK ON THE GENERAL UNKNOWN. >Finish EX. 39, OXIDATION/FERMENTATION TESTS >Finish EX. 41, MULTIPLE TEST MEDIA (test for hydrogen sulfide production only) >Finish EX. 40, HYDROLYTIC/DEGRADATIVE REACTIONS (Recall that on tributyrin agar, a clear zone around the bacterial growth indicates a positive test for lipid hydrolysis.) Record results in lab notebook, and on descriptive chart on p. 255. Answer: questions 4-9 and 13 in part B on pages 283-284; matching sets 1-4 on pages 285-286. >DISCUSSION ON THE USE OF BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY is on reserve in the library for your use. **Do NOT use EX. 42 in the lab manual.** **Work on lab report on general unknown.**	
Tues.	Oct. 22	Microbial evolution & systematics Microbial identification & clinical microbiology	**Chap. 16** **Chap. 31 (Fig. 31.1)**
Tues.	Oct. 22L	>*Program #9, Microbial Control* >EX. 34, KIRBY-BAUER METHOD (ANTIBIOTICS) >EX. 35, EVALUATION OF ANTISEPTICS (PAPER DISK METHOD- this exercise will be slightly modified) >MONITOR WINOGRADSKY COLUMNS >**Work on lab reports.**	
Thurs.	Oct. 24	>SUPPL. EX., *Staphylococcus aureus* (class work) Microbial identification & clinical microbiology Microbial growth control	 **Chap. 31 (Fig. 31.1)** **Chap. 26**
Thurs.	Oct. 24L	>**HAND IN SUPPL. EX., RIBOSOMAL RNA SEQUENCES (15 POINTS)** >SUPPL. EX., *Staphylococcus aureus* >FINISH EX. 34 & 35. Record data & answer questions in lab manual. >**Work on lab reports.**	
Tues.	Oct. 29	Microbial growth control Microbial ecology (selected topics)	**Chap. 26** **Chap. 23-25**
Tues.	Oct. 29L	>**HAND IN LAB REPORT ON GENERAL UNKNOWN** >CONTINUE SUPPL. EX., *Staphylococcus aureus* (Record results on board. We will omit Kirby-Bauer antibiotic sensitivity tests that are described in this exercise. Remember to streak presumptive *S. aureus* for isolation on a plate of tryptic soy agar. This plate will be used for an agglutination test on Thursday.) SUPPL. EX., BACTERIAL CONJUGATION > MONITOR WINOGRADSKY COLUMNS, **LAST TIME**	
Thurs.	Oct. 31	Innate immunity; adaptive immunity	**Chap. 28-31**

Date		Topics/Lab Exercises	Related material in text
Thurs.	Oct. 31L	>FINISH SUPPL. EX., *S. aureus* >LATEX AGGLUTINATION TEST FOR *S. aureus* IDENTIFICATION – There is no writeup for this test. In the lab manual, Ex. 74 describes a similar agglutination test; however we will use reagents from a different manufacturer. The instructor will summarize the principle of the test and will give directions at the beginning of the lab. RECORD RESULTS from *S. aureus* EX. & latex test on board & in chart. FINISH SUPPL. EX., BACTERIAL CONJUGATION – Answer the questions with this exercise & be sure you understand what happened and why it happened. **WORK ON WINOGRADSKY COLUMN PROJECT LAB REPORT** **STUDENT ORAL PRESENTATIONS**	
Tues.	Nov. 5	Adaptive immunity	**Chap. 28-31**
Tues.	Nov. 5L	**STUDENT ORAL PRESENTATIONS** Practical applications of immunology >WORK ELISA AND IMMUNOFLUORESCENCE PROBLEMS (SEE COURSE PACKET) **WORK ON WINOGRADSKY COLUMN PROJECT LAB REPORT**	**Chap. 28-31**
Thurs.	Nov. 7	**EXAM 3 (will include both class and lab material)**	
Thurs.	Nov. 7L	**STUDENT ORAL PRESENTATIONS** Practical applications of immunology >WORK ELISA AND IMMUNOFLUORESCENCE PROBLEMS (SEE COURSE PACKET) **WORK ON WINOGRADSKY COLUMN PROJECT LAB REPORT**	**Chap. 28-31**
Tues.	Nov. 12	Adaptive immunity Human-microbe interactions Epidemiology & public health	**Chap. 28-31** **Chap. 27** **Chap. 32**
Tues.	Nov. 12L	**STUDENT ORAL PRESENTATIONS** **HAND IN WINOGRADSKY COLUMN PROJECT LAB REPORT**	
Thurs.	Nov. 14	Human-microbe interactions Epidemiology & public health	**Chap. 27** **Chap. 32**
Thurs.	Nov. 14L	**LAB EXAM (**will include a substantial number of dilution problems)	
Tues.	Nov. 19	Microbial diseases (selected topics)	**Chap. 33-36**
Tues.	Nov. 19L	**STUDENT ORAL PRESENTATIONS**	
Thurs.	Nov. 21	Microbial diseases (selected topics)	**Chap. 33-36**
Thurs.	Nov. 21L	**STUDENT ORAL PRESENTATIONS**	
		THANKSGIVING BREAK	
Wed.	**Dec. 4**	**COMPREHENSIVE FINAL EXAM** (EXAM 4) – **10:15 am – 12:15 pm**	

ADDITIONAL INFORMATION

Course Content: We will not be covering all of the material in the textbook and lab manual. Please read the sections of the textbook and lab manual that pertain to the topics covered, and make use of the tables and illustrations. Study questions and online resources for the textbook may also be useful. **Specific assigned readings may be announced in class or lab, or they may be posted on BlazeView.**

Laboratory:

1. Laboratory exercises are an integral part of microbiology. Students are expected to attend ALL laboratory sessions, to be on time at the beginning of the period, and to complete all assigned laboratory exercises. There will be no makeups for the laboratory exercises.
2. Microscopes will be assigned and spot checks will be made to ensure that they are clean and properly stored. Misuse or mishandling of the microscopes will result in the loss of points (20 points per occurrence). After you have finished using your microscope, please consult the "microscope checklist" to be certain that you have followed the proper procedures.
3. Each student must **read the laboratory exercises for the day, any additional required readings from the lab manual (noted in the syllabus), and any notes pertaining to the lab exercises (in the syllabus) before coming to the laboratory.** This will allow the student to complete the exercises in an efficient and informed manner.
4. Each student must record the results of the lab exercises and answer the related questions, as noted in the syllabus. In some cases, **lab reports** are due as indicated in the course schedule. If a student misses a portion of the lab work relating to a required lab report, the student's report will be worth a maximum of 85% of the points allotted for the report. Each student must turn in his/her own drawings and rRNA report. However, the Winogradsky Column Project report must be prepared with your lab group**. For this report, each group member will evalulate the percentage of the work contributed by each of the group members, and individual scores will reflect the average percents.** For the general unknown lab report, students may prepare their lab reports individually, or they may work with their lab groups and turn in joint reports. If a joint report is submitted, each student must include his/her own individual records, drawings, and pictures that are labeled with his/her name. This requirement for each student's records, drawings, and pictures applies to the general unknown and Winogradsky Column Project lab reports.
5. One **lab exam** will be given. It will include material covered during the lab, as well as a substantial number of dilution problems. If a student misses the lab exam, the instructor should be notified promptly. Arrangements for a make-up exam must be made within 4 days after a student misses the lab exam; otherwise, a make-up will not be given. The make-up exam will be worth 85% of the points allotted for the regularly-scheduled exam.
6. **Oral Presentations.** During the laboratory portion of the course, each student will give an 8- to 10-minute **oral report** on a primary scientific article or case study selected from a list provided by the instructor. Students will draw numbers to indicate the order in which they will select articles and give their presentations. Once a topic article is chosen it may not be changed. Students should search databases in GALILEO to find related, supporting, formal, peer-reviewed articles in the scientific literature. Some peer-reviewed, scientific and medical journals are available in the Odum library and/or online. Supporting articles may be obtained through interlibrary loan; however, this process takes time. **The major focus of the presentation should be the original article chosen. In addition, at least two supporting, formal articles (in addition to the original article chosen)** from PEER-REVIEWED, PROFESSIONAL JOURNALS must **also** be used to prepare the presentation. Only one of these two supporting articles may be a review article; the remaining article must be a primary source or case study. Articles must list references at the end, and these references must be cited within the article. Informal articles, Web sites, Internet articles or fact sheets, newspaper articles, magazine articles, book reviews, and letters to the editor are NOT acceptable. Students should make every effort to ensure the accuracy of the information in their reports. Should a report contain inaccurate information, the presenter should expect to be questioned about it as well as about the source of the information.

For their presentations, students are required to use PowerPoint software, and they must bring their PowerPoint presentations to the lab on a jump drive or compact disk. Students will NOT be permitted to access their presentations online or via email. Students must use a PowerPoint version that is compatible with the one available in the microbiology lab. If you are in doubt, please bring your PowerPoint presentation to the lab at least one week before the day of your presentation to verify that it will run. If you do not check your presentation ahead of time, you are responsible for having a backup method for showing your illustrations. Full-size print-outs of your PowerPoint slides are useful as backups, since they may be shown using the ELMO projector. Students may use visual aids in addition to PowerPoint. A projector for transparencies is available; handouts may also be used. There will be no makeups for the oral presentations, except in the event of a documented, serious emergency. **Immediately after giving the presentation, a student must turn in the following: complete, readable, paper copies of the 3 references (including readable figures and tables); a readable, paper copy of the PowerPoint slides; a paper copy of any other illustrations and notes used during the presentation. Please particularly note that the copies of the references must include readable copies of all of the figures and tables.**

ADDITIONAL EMPHASIS: IF YOU WANT A GOOD SCORE ON YOUR PRESENTATION, YOU MUST FOLLOW THE GUIDELINES ON THE PROVIDED EVALUATION FORM (see course pack). A STUDENT WHOSE REPORT DOES NOT FOCUS ON THE PRIMARY SCIENTIFIC ARTICLE OR CASE STUDY WILL RECEIVE A SCORE OF ZERO.

Attendance, Participation, and Tardiness: In accordance with VSU policy, attendance and participation will be checked both in class and in the laboratory. The VSU Undergraduate Catalog states, "A student who misses more than 20% of the scheduled classes of a course will be subject to receiving a failing grade in the course." The remainder of this paragraph outlines the laboratory/student oral presentation period attendance policy, except that there is a special policy for the lab period on Aug. 20 (see note in schedule). Attendance is required during ALL labs and student presentation periods. A student who has perfect lab attendance or who misses only one laboratory/student presentation period will receive 20 bonus points. A student who misses (or fails to complete) two to three laboratories/student presentation periods will receive 10 bonus points. Missing (or failing to complete) additional laboratories/student presentation periods will result in the **loss of points** as follows. Ten points will be

deducted from the student's total points for the fourth missed (or incomplete) laboratory/student presentation period; 20 additional points will be deducted for the fifth missed (or incomplete) laboratory/student presentation period; 40 additional points will be deducted for the sixth missed/incomplete laboratory/student presentation period, and 50 additional points will be deducted for each subsequent missed/incomplete laboratory/student presentation period. Students who are habitually late for lab or student oral presentation periods will be marked late. Coming late to lab or student presentation periods two times will be counted as one absence. A student with more than 6 missed or incomplete laboratories/student presentation periods will not pass the course. **There will be no makeups for the laboratory exercises.**

Examinations Given During Class Periods:

1. Examinations 1-4 will cover material presented during both the class and laboratory portions of the course. The first three exams will be worth 170 points each. The final exam will be worth 190 points. Examinations will begin promptly at the times and dates indicated on the class schedule. The final examination will be comprehensive in that it will include material covered throughout the course. Exams 2 and 3 will be comprehensive in that up to 25% of the points on the exam may cover material presented before any earlier examination. Exams may include questions of the multiple-choice, matching, true-false, short-answer, and essay formats. A student who misses an examination should notify the instructor promptly. Arrangements for a make-up exam must be made within one week after the exam date; otherwise, a make-up exam will not be given. Make-up examinations may consist entirely of questions of the short answer and essay formats. Make-up examinations for exams 1, 2, and 3 will be worth 150 points rather than 170 points each.
2. Students must bring TWO #2 PENCILS AND ERASERS to all examinations. The instructor will not provide pencils. Unless otherwise noted, students may NOT use calculators during examinations.
3. Exams will not be returned to students. After grading has been completed, the instructor will bring the exams to one of the lab periods for students to view.

Late Assignments & Failure to Turn in Assignments:

Please make a calendar noting when assignments and lab reports are due. Turning in an assignment/report 1-3 days late will result in a deduction of 20% of the points for that assignment. Turning in an assignment 4-7 days late will result in a deduction of 50% of the points for that assignment. **No points will be awarded for an assignment that is late by more than 7 days.** Students should note that completion of all assignments and reports is required in order to pass the course. Students will not be notified by the instructor for failing to turn in course assignments. Late assignments must be given DIRECTLY to the instructor. They may NOT be placed in the instructor's mailbox. It is also NOT ACCEPTABLE to slide late assignments under the instructor's office door.

Grading: Points for the course are allocated as follows:

EXAMS 1, 2, & 3 (Sept. 12, Oct. 10, & Nov. 7) (170 points each x 3=510)	510	POINTS
EXAM 4 (FINAL EXAM –Dec. 4)	190	POINTS
LAB REPORT (Drawings) (Course objective ZA) - (Aug. 27-29)	15	POINTS
rRNA LAB REPORT (Course objective ZD) – (Oct. 24)	15	POINTS
LAB REPORT ON GENERAL UNKNOWN (Course objectives ZC, ZD) - (Oct. 29)	38	POINTS
LAB REPORT ON WINOGRADSKY COLUMN (Course objective ZF) - (Nov. 12)	65	POINTS
LAB EXAM - (Nov. 14)	73	POINTS
ORAL PRESENTATION (Course objective ZH) - (scheduled Oct. 31-Nov. 21)	70	POINTS
REFERENCES FOR ORAL PRESENTATION (Course objective ZG) – (scheduled)	24	POINTS
TOTAL FOR COURSE	1000	POINTS

There are FOUR REQUIREMENTS TO PASS the course:

1. Do not miss (or fail to complete) any more than 6 laboratories or oral report periods.
2. Complete and turn in all assignments and lab reports.
3. Obtain at least 40% of the points for **EACH** assignment and lab report.
4. Have a total of 600 or more points for the course.

Students should read the entire syllabus carefully so they understand the course policies & procedures.

The grade is "F" for a student who obtains less than 600 total points **or** fails to meet one of the other requirements for passing the course (see above list). **GRADING SCALE: 900-1000, A; 800-899, B; 700-799, C; 600-699, D; < 600, F**

Optional Extra Credit Opportunity: Students may earn up to 35 additional points by keeping a journal focusing on microbiological articles found in the news. The journal must include a copy of each article as well as a **brief** summary of the article and why the article interested the student. Students are encouraged to share information from their journals during class. Sources of articles may include newspapers, magazines, online news sources, scientific publications etc. Articles may not include any that are on the list of articles for student oral presentations. **Journals will be due on Oct. 15, 2013, during lab.**