MICROBIOLOGY 401

MICROBIAL PHYSIOLOGY AND STRUCTURE

FALL SEMESTER, 2009

102 Chemistry Building

MWF 9:05-9:55

INSTRUCTOR: **Dr. Don Bryant**
S-235 Frear Building
Telephone: 865-1992
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OFFICE HOURS BY APPOINTMENT ONLY

TEXT: ***The Physiology and Biochemistry of Prokaryotes.*** David White. Oxford University Press, New York, 2007. (3rd edition).

ON RESERVE: ***Physiology of the Bacterial Cell.*** F. C. Neidhardt, J. L. Ingraham & M. Schaechter. Sinauer Associates, Inc., Sunderland, MA, 1990

The Physiology and Biochemistry of Prokaryotes. David White. Oxford University Press, New York, 2007. (3rd edition).

RECOMMENDED: ***Biology of Microorganisms.*** Michael T. Madigan, John M. Martinko, and Jack Parker. Prentice Hall, New York, 2002 (Any recent edition).

CLASS NOTES: Class notes and other materials for this course are available on the World Wide Web. To access these materials, open a link using your Web browser (*e. g.*, Firefox, Safari, etc.) to: **http://www.bmb.psu.edu/courses/micro401/default.htm** You may find it convenient to establish a bookmark for this link. Materials may be added to the site at any time, but I will attempt to have materials available to you prior to lectures. ***Please note***: these materials are supplemental and will not serve as a substitute for attending lectures. A critical element that is missing in the notes is emphasis, and there is much too much material to sift through if you don't have some idea of what is most important. There will also be quite a significant number of handout materials throughout the semester.

The primary textbook is the best available in this area that is presently in print, and this textbook is not as expensive as many. I have used it extensively as a background resource in recent years but do not intend to cover the material in the order presented there. However, I prefer the philosophical approach to the subject taken by Neidhardt et al., which is on reserve. Unfortunately, this textbook is no longer available nor has it been updated.

ADDITIONAL GENERAL REFERENCES

1. *Annual Review of Microbiology* and *Microbiology and Molecular Biology Reviews*
2. *Escherichia coli* and *Salmonella typhimurium*: Cellular and Molecular Biology, 2nd ed. American Society for Microbiology, Washington, D. C. 1996
3. Methods of General and Molecular Bacteriology. P. Gerhardt, American Society for Microbiology, Washington, D. C. 1993.
4. *Bacillus subtilis* and Its Closest Relatives. A. L. Sonenshein, J. A. Hoch, and R. Losick. American Society for Microbiology, Washington, D. C. 2002.
5. Microbial Physiology, 3rd Edition. Albert G. Moat and J. W. Foster. Wiley-Liss, New York, 1995.
6. Biology of the Prokaryotes, J. Lengeler, G. Drews, and H. Schlegel. Blackwell Science Publishers, Blackwell Science Ltd., 1998.
7. *Journal of Bacteriology*, *Molecular Microbiology*, *Microbiology*, and other specialty journals

EVENING EXAMS

Examinations will **NOT** be multiple-choice and will consist of a variety of essay and short-answer questions (e.g., List the major components of an *E. coli* cell). **No sample examinations will be provided**. You **WILL** have to explain things to me in sufficient detail that I can see that you understand major concepts. You may be asked to draw general diagrams, cellular structures, etc. but you will **NOT** be asked to draw chemical structures (e.g., draw the structure of tryptophan) or identify a chemical structure. Likewise, you will not be asked to regurgitate all steps in the glycolytic pathway or the TCA cycle or the enzymes involved. I will sometimes specifically tell you things that you **WILL** have to know. If you are in lecture, you will hear this. If you are not—it's not my fault.

The first two examinations will be given in the evening, and the 3rd examination will be given in the period scheduled by the University as the final exam. Conflict exams will be given the same day as the evening exam by pre-determined appointment (usually the conflict exam will be at 4:00-4:30 on the same day of the evening exam). **Only in extraordinary circumstances will make-up exams be given, although accommodation for course scheduling conflicts in the evenings will be made. Exams that are missed will be scored as a zero and considered the "drop" score. In those cases for which make-up examinations are given, the exam will be an oral examination.**

Exam 1	**September 29, 2009**	**6:30 to 7:45 P. M.**	**104 Thomas Building**
Exam 2	**November 05, 2009**	**6:30 to 7:45 P. M.**	**104 Thomas Building**
Exam 3	**As scheduled by the University in Final Exam Period.**		

TERM PAPER

A paper (minimum length for text, 10 pages, double spaced, 1-inch margins; maximum length for text, 15 pages) is required and will count for approximately **33%** of your final grade (and may **NOT** be dropped; see below). The paper should be formatted to have margins of **one inch** on the top, bottom and sides, and should be printed in **12-point font** (**Times or Times New Roman**). Headings should be printed in bold font, and a title page should be included (not included as part of the 10-pages for text required!). I must approve the subject of the paper by e-mail no later than **October 9, 2009**; the subject

and a very brief outline of the paper should be provided, and I will approve these by e-mail. Examples of some suitable topics are provided below, and the paper may be focused on a particular aspect of one of these subjects. **The effect of bacterial products on eucaryotic cells/plants/animals is NOT a suitable subject.** Figures and tables may be used and are encouraged, but these are not to be included in the body of the paper and will not count against the page limits. The paper must cite at least 10 references; 8 of these must be primary research articles (for example an article taken from the *Journal of Bacteriology*) while the remaining 2 references may be reviews, books, book chapters, or other reference materials). **Textbooks are NOT suitable as references.** Citations in the paper **MUST** follow the form used by the *Journal of Bacteriology* (**see journal for style**). The references should be listed alphabetically and then numbered per ASM/*Journal of Bacteriology* style; cite the references in the text by number. Failure to follow these very simple instructions will reduce the total possible points for the paper. All references should be listed at the end of the paper, and the references will not count as part of the 10-page minimum page limit for the paper. Papers may be submitted to me for grading at any time **until 5:00 P. M. on Friday, November 20, 2009**. You will submit an **electronic file by e-mail** as well as a **hardcopy** for evaluation and comments. For each 24-h period (or part thereof) that the paper is late, the maximum possible score will be reduced by 10%.

Suitable examples of topics for paper:

1. flagellar structure/assembly
2. chemotaxis
3. bacterial photosynthesis
4. electron transport chains/complexes
5. protein secretion mechanisms
6. nitrogen fixation
7. methanogenesis
8. specific aspects of gene regulation
9. cell division
10. quorum sensing
11. signal transduction

Example of a topic that is NOT suitable for term paper:

1. Mechanism of action of diptheria toxin

Example of a topic that is suitable for term paper:

1. Iron regulation of diptheria toxin expression.

GRADING

Your final letter grade will be determined by your performance on **two mid-term** examinations, the **final** examination, **5 randomly scheduled in-class pop quizzes**, and the term paper (see above). Each examination will be worth 125 points, the term paper will be worth 100 points, and the in-class pop quizzes will be worth 10 points each. **You may drop your lowest exam score,** and thus the total points available for the course will be **400 points**. You may **NOT** take the three exams and drop the term paper--i. e., **the term paper is mandatory**. Attendance is not formally considered, but **attendance and class participation can be used at the discretion of the instructor to adjust scores at grade borders.** The anticipated grade point average for the class will be approximately 2.7 to 3.0 based upon past experience.

POLICY ON ACADEMIC INTEGRITY

All Penn State policies regarding ethics and honorable behavior apply to this course (see links below for policy statements). Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. For any material or ideas obtained from other sources, such as text or things you find on the web, in the library, etc., a source/reference must be given. **Plagiarism is one of the most serious forms of cheating/academic dishonesty!** Direct quotes from any source must be identified as such. **Plagiarism on the term paper led to failing grades for 2 students in 2003.** Each student in this course is expected to work entirely on her/his own while taking any exam, to complete assignments on her/his own effort without the assistance of others unless directed otherwise by the instructor, and to abide by University and Eberly College of Science policies about academic integrity and academic dishonesty. Academic dishonesty can result in assignment of "F" by the course instructors or "XF" by Judicial Affairs as the final grade for the student.

Any instances of academic dishonesty **WILL** be pursued under the University and Eberly College of Science regulations concerning academic integrity. Refer to the following URL for further details on the academic integrity policies of the Eberly College of Science:
http://www.science.psu.edu/academic/Integrity/Index.html

COURSE CONTENT

Some of the writings, lectures, or presentations in this course might include material that some students could find offensive or that they do not personally believe to be true—which is fine. However, because the course content fulfills legitimate pedagogical goals, the instructor does not grant content accommodation requests.

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Approximate order of topics and relevant chapters in text; changes from year to year

1.	August 24			Chapter 1, Web notes
2.	August 26			
3.	August 28			
4.	August 31			
5.	September 2			Chapter 10
6.	September 4			
	September 7	**Labor Day Holiday—NO CLASS**		
7.	September 10			
8.	September 12			Chapters 11 and 17
9.	September 14			
10.	September 16			
11.	September 18			
12.	September 21			
13.	September 22			
14.	September 24			
15.	September 28			Chapters 7 and 12
16.	**September 29**	**FIRST EVENING EXAM**	**6:30-7:45 PM**	**104 Thomas Building**
17.	September 30			
18.	October 2			
19.	October 5			Chapter 8
20.	October 7			
21.	**October 9**	**TERM PAPER TOPICS MUST BE APPROVED BY THIS DATE!!**		
22.	October 12			Chapter 3
23.	October 14			
24.	October 16			
25.	October 19			
26.	October 21			
27.	October 23			Chapter 4
	October 26	**NO CLASS**		
28.	October 28			
29.	October 30			

30.	November 2		Chapter 5 and 13
31.	November 4		
32.	**November 5**	**SECOND EVENING EXAM 6:30-7:45 PM**	**104 Thomas Building**
33.	November 6		
34.	November 9		Chapter 14
35.	November 11		
36.	**November 13**	***(Late Drop Deadline)***	
37.	November 16		Chapter 16
38.	November 18		
39.	**November 20**	**TERM PAPERS DUE AT 5:00 P. M.**	
	November 23-27	**Thanksgiving Holiday—NO CLASS**	
40.	November 30		Chapter 2
41.	December 2		Chapter 15
42.	December 4		
43.	December 7		Chapter 6
44.	December 9		
45.	December 11	***(Last Day of Classes)***	

46. December 14-December 18, 2009 Exam 3 (Scheduled as Final Exam by the University)