

MCB424- Microbial Biochemistry

Spring Semester, 2018

Time: M, W, F 10:00 – 10:50 PM, 1065 Lincoln Hall

Instructor: William W. Metcalf
B415 C&LSL
244-1943
metcalf@illinois.edu
Office Hours: Monday 4:00-5:00 PM; or by appointment

Description: The course examines the biochemical and physiological adaptations that allow microbes to compete and succeed in diverse environments. Emphasis is placed on the role of metabolism in the living organism and on the specific evolutionary advantages conferred by different metabolic strategies.

Grading: **Option I:** An initial grade based on 400 total points will be assigned after the third exam. If the student is satisfied with this grade, then the Final Exam is not required.

3 exams	= 300 points
6 problem sets	= 60 points
10 muddiest points	= 10 points
1 quiz	= 30 points
Total	400 points

Option II: If the student is not satisfied with the initial grade, the final exam may be taken. In this case, the grade will be based on 600 total points. The percentage score required to achieve each grade will be identical to that used for Option I. You **cannot** lower the initial grade by taking the final.

3 exams	= 300 points
6 problem sets	= 60 points
10 muddiest points	= 10 points
1 quiz	= 30 points
Final exam	= 200 points
Total	600 points

Problem Sets: Six problem sets will be given over the semester, two for each third of the course. Each will be worth 10 points. Grading will be based on whether an effort was made to solve the problems, not on whether the right answer was obtained. Partially complete homework will receive partial credit. Problem sets will be due as indicated below. (They can always be turned in before this time at my office (B415 C&LSL) or the mailbox B112 C&LSL).

Answers will be posted online after the due date. Fully completed, late homework will be accepted prior to the last day of class, but will only be worth 5 points each. No partial credit will be given for late homework.

February 5	Problem set #1 due in class
February 16	Problem set #2 due in class
March 5	Problem set #3 due in class
March 26	Problem set #4 due in class
April 11	Problem set #5 due in class
April 30	Problem set #6 due in class

Help Sessions: Help sessions will be held on the on the evening prior to each Exam. Help sessions will be at 5 PM.

Thursday, February 15	Help Session #1	B124 CLSL
Tuesday, March 27	Help Session #2	B126 CLSL
Tuesday, May 1	Help Session #3	B124 CLSL

Muddiest Point: Students often feel that certain topics covered in class are not well explained or confusing. When this occurs, please write a short email (1-2 sentences) asking that this be explained again. Send these to me (metcalf@illinois.edu) with the subject heading "Muddiest point". Each Monday at the beginning of class the most commonly asked question(s) will be discussed. ***To encourage participation in this feedback exercise, these will be worth 1 point each, up to a maximum of 10 points.*** You can submit as many questions as you like, but you will receive credit for a maximum of one point per week (*i.e.* you can't submit ten questions in the last week of class to improve your grade).

Quiz: One quiz covering basic metabolic pathways will be given in class on **Monday, January 22**. This will cover material you should have learned previously in prerequisite courses. **The answers are available online prior to the quiz.**

Exams: Exams are given in class and will be in essay/problem solving format. ***Makeup Exams will not be given, if you miss an exam you must take the final, which will then count the same as a regular exam. Grading option II is not available if you miss a test.***

Exam Schedule:

Exam I-	Monday, February 19 in class
Exam II-	Wednesday, March 28, in class
Exam III-	Wednesday, May 2, in class

This is a tentative schedule and may change depending on the pace of lectures.

Final Exam: Wednesday, May 9, 7:00-10:00 PM, 1065 Lincoln Hall.

Web Site: <http://www.life.illinois.edu/mcb/424>

The web page contains lecture slides, problem sets and problem set answers. ***(Important: the lecture slides are NOT meant as a substitute for class notes. If you rely on these as your sole source of class material, you are unlikely to do well on the exams.)***

Suggested Text: *The physiology and biochemistry of prokaryotes*, by David White, Oxford University Press

Other useful texts: *Biology of the Prokaryotes*, edited by Joseph W. Lengeler, Gerhart Drews and Hans Schlegel, 1999, Blackwell Science

Bacterial Metabolism, by Gerhard Gottschalk, 1985, Springer-Verlag

The Prokaryotes, an electronic resource for microbiology available on-line:
http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_6042517

Reading: Periodic reading will be assigned as the course progresses. These will be from a variety of sources, including the recommended text cited above. Whenever possible I will have links for these readings on the course web site.

Tentative Course Schedule

Day	Date	Time	Lecture #	Topic	Notes
Wednesday	1/17/18	10 AM	1	Introduction to Microbial Diversity	
Friday	1/19/18	10 AM	2	Phylogeny/Classification of Prokaryotes	Quiz, in class
Monday	1/22/18	10 AM	N/A	Quiz-Glycolysis	
Wednesday	1/24/18	10 AM	3	No Class	
Friday	1/26/18	10 AM	4	Basic Microbial Physiology	
Monday	1/29/18	10 AM	5	Basic Microbial Physiology/Basic Thermodynamics and Glycolysis	
Wednesday	1/31/18	10 AM	6	Basic Thermodynamics and Glycolysis/Pyruvate Oxidation and TCA Cycle	
Friday	2/2/18	10 AM	7	Pyruvate Oxidation and TCA Cycle/Electron Transport	
Monday	2/5/18	10 AM	8	Electron Transport	Problem set #1 due
Wednesday	2/7/18	10 AM	9	Electron Transport/Energetics of Redox Reactions/ATPase	
Friday	2/9/18	10 AM	10	Energetics of Redox Reactions/ATPase	
Monday	2/12/18	10 AM	11	Energetics of Redox Reactions/ATPase	
Wednesday	2/14/18	10 AM	12	Biosynthesis and Metabolic Diversity	
Thursday	2/15/18	5 PM	help session	Lectures 1-13	B124 CLSL
Friday	2/16/18	10 AM	13	Anaplerotic Reactions	Problem set # 2 due
Monday	2/19/18	10 AM	Exam #1	Lectures 1-13	in class
Wednesday	2/21/18	10 AM	14	Catabolism of Polymers	
Friday	2/23/18	10 AM	15	Catabolism of Polymers/Hydrocarbons	
Monday	2/26/18	10 AM	16	Hydrocarbons and the Anaerobic World	
Wednesday	2/28/18	10 AM	17	Fermentation I	
Friday	3/2/18	10 AM	18	Fermentation I	
Monday	3/5/18	10 AM	19	Fermentation I/FermentationII	Problem set #3 due
Wednesday	3/7/18	10 AM	20	Fermentation II	
Friday	3/9/18	10 AM	21	Fermentation II	
Monday	3/12/18	10 AM	22	Fermentation III	
Wednesday	3/14/18	10 AM	23	Fermentation III/Decarboxylation	
Friday	3/16/18	10 AM	24	Anaerobic respiration: denitrification	
Monday	3/19/18	10 AM	Spring Break	Spring Break	
Wednesday	3/21/18	10 AM	Spring Break	Spring Break	
Friday	3/23/18	10 AM	Spring Break	Spring Break	
Monday	3/26/18	10 AM	25	Anaerobic respiration: denitrification/metals	Problem set #4 due
Tuesday	3/27/18	5 PM	help session	Lectures 14-25	B126 CLSL
Wednesday	3/28/18	10 AM	Exam #2	Lectures 14-25	in class

Friday	3/30/18	10 AM	26	Anaerobic respiration: metals/sulfur	
Monday	4/2/18	10 AM	27	Anaerobic respiration: sulfur	
Wednesday	4/4/18	10 AM	28	Acetogenesis	
Friday	4/6/18	10 AM	29	Acetogenesis/Methanogenesis	
Monday	4/9/18	10 AM	30	Methanogenesis	
Wednesday	4/11/18	10 AM	31	Methanogenesis/Syntrophy	
Friday	4/13/18	10 AM	32	Syntrophy	Problem set #5 due
Monday	4/16/18	10 AM	33	Aerobic Methanotrophs/Methylotrophs	
Wednesday	4/18/18	10 AM	34	Chemolithotrophic Growth	
Friday	4/20/18	10 AM	35	Chemolithotrophic Growth	
Monday	4/23/18	10 AM	36	Photosynthesis I	
Wednesday	4/25/18	10 AM	37	Photosynthesis I	
Friday	4/27/18	10 AM	38	Photosynthesis II	
Monday	4/30/18	10 AM	39	Photosynthesis II	Problem set #6 due
Tuesday	5/1/18	5 PM	help session	Lectures 26-39	B124 CLSL
Wednesday	5/2/18	10 AM	Exam #3	Lectures 26-39	in class
Thursday	5/9/18	7-10 PM	Final Exam	Lectures 1-39	1065 Lincoln Hall