Microbiology 4120
Microbial Physiology and Diversity
Autumn 2016

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417A BioSciBldg.
Office hours by appointment

When: Monday, Wednesday, Friday 1:50pm – 2:45pm
Where: Page Hall 20 (John Glenn College of Public Affairs)

Recommended Text:

Joan L. Slonczewski & John W. Foster (authors)
Microbiology – An Evolving Science, Third edition
W. W. Norton & Company
Or
Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, and David A. Stahl (authors)
Brock Biology of Microorganisms
Pearson Education, Inc.

Grading:

There will be **three exams** throughout the semester (Page Hall 20)
Exam 1: Sept. 28th (in class) will count **27 %** of the final grade
Exam 2: Oct. 31st (in class) will count **26 %** of the final grade
Exam 3: Dec. 14th (final, 2 pm) will count **26 %** of the final grade

If you have a special problem that might interfere with taking the exam, please discuss it as soon as possible with me. Please do this **before the exam**, and do not leave it until the last minute.
There will not be make-ups for unexcused absences on exams.

The remaining **21 %** will be based on the **three assignments** (**7 % each**).
Due dates for **assignment #1: Sept. 23rd; #2: Oct. 19th; #3: Nov. 30th**

Assignments may be turned in before the due date but not afterwards.
There will be no make-ups for assignments turned in late.

Final grades are based on the OSU Standard Scheme

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs.
The Office for Disability Services is located at 098 Baker Hall / 113 W. 12th Ave; phone 292-3307, slds@osu.edu

Students are advised to review the Ohio State University Code of Student Conduct (http://studentaffairs.osu.edu/resource_csc.asp), section 3335-23-04 which lists examples of **academic misconduct (including plagiarism)**.

Date	Topic

Part I From elements to cellular structures

August 24 (W)	**L1: Introduction** (Lecture content/format, definition of Microbial Physiology)
26 (F)	**L2: Microbe of the week: *Escherichia coli*** (A model organism for geneticists, biochemists, and physiologists) **Assignment 1 (due in class Friday, September 23rd or before)**
29 (M)	**L3: Composition of a bacterial cell I (Chemist's view)** (Elemental composition, nutritional requirements)
31 (W)	**L4: Composition of a bacterial cell II (Biochemist's view)** (Macromolecules, metabolites)
September 2 (F)	**L5: Dynamic composition of the cell** (Transcriptomics, proteomics, metabolomics)
5 (M)	**No class (Labor Day)**
7 (W)	**L6: Composition of a cell III (Microscopist's view)** (Cellular structures, fluorescent probes to study single cells)
9 (F) Dr. Ruiz	**L7: The bacterial cell envelope** (General overview of bacterial cell envelopes)
12 (M) Dr. Ruiz	**L8: The Gram-negative cell envelope I** (The function of each part, peptidoglycan assembly)
14 (W) Dr. Ruiz	**L9: The Gram-negative cell envelope II** (Lipopolysaccharides, outer membrane assembly)
16 (F)	**L10: Microbe of the week: *Chlamydomonas reinhardtii*** (A model organism to study mitochondrion- and chloroplast-biogenesis)
19 (M)	**L11: Microbial growth I** (Growth parameter: growth rate) – the lecture will be on the chalk board
21 (W)	**L12: Microbial growth II** (Growth parameter: growth yield)
23 (F)	**L13: Microbial growth III** (Carbon/nitrogen limitations, calculations of theoretical yields) **Assignment 1 due**
26 (M)	**L14: Microbes of the week:** ***Ignicoccus hospitalis/Nanoarchaeum equitans*** (An archaeal "symbiosis") **Assignment 1 solution**
28 (W)	**In class exam: Wednesday, September 28th**

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Part II Energy conservation

September 30 (F)	**L15: Microbial diversity defined by phylogeny** (*Archaea, Bacteria, Eukarya*)
October 3 (M)	**L16: Microbial diversity defined by constrains imposed by habitats** (Physical parameters, nutritional requirements, modes of energy conservation) **Assignment 2 (due in class October 19th or before)**
5 (W)	**L17: Background concepts** (Redox reactions, electron carriers, energy transducing membranes chemiosmotic theory)
7 (F)	**L18: Respiration** (Electron transport phosphorylation, reducing potentials, changes in free energy)
10 (M)	**L19: Proton translocation coupled to electron transfer** (The Q cycle)
12 (W)	**L20: Microbe of the week: *Geobacter* sp.** (Anaerobic respiration, metal reduction)
14 (F)	**No class (Autumn break)**
17 (M)	**L21: Diversity in respiratory systems I** (Variety in organic compounds as electron sources and terminal electron acceptors)
19 (W)	**L22: Diversity in respiratory systems II** (Variety in inorganic compounds as electron sources and terminal electron acceptors) **Assignment 2 due**
21 (F)	**L23: Anammox** (Anaerobic ammonium oxidation, the anammoxosome)
24 (M)	**L24: Fermentation** (Homolactic acid fermentation from glucose, substrate level phosphorylation)
25 (W)	**L25: Diversity in fermentative processes** **Assignment 2 solution**
28 (F)	**L26: Chemotrophy – energy considerations/growth yields** (Hierarchy of energy-producing systems, regulation)
October 31 (M)	**In class exam: Monday, October 31st**

Date	Topic

Part III Adaptation to changing environments

November 2 (W)	**L27: Light as a source of energy: Phototrophy** (Reaction center, light harvesting complexes)
4 (F)	**L28: Photophosphorylation** (Fundamental principles)
7 (M)	**L29: Microbe of the week: *Rhodobacter sphaeroides*** (Metabolic diversity – energy metabolism, carbon substrates) **Assignment 3 (due in class November 30th or before)**
9 (W)	**L30: Photoautotrophy (photosynthesis) and photoheterotrophy** (Oxidation state of the carbon, cyclic and linear electron transport)
11 (F)	**No class (Veteran's Day)**
14 (M)	**L31: Diversity in Phototrophy** (Oxygenic and anoxygenic photosynthesis, photoheterotrophy)
16 (W)	**L32: Carbon assimilation** (Central carbon metabolism, concept of precursor metabolites)
18 (F)	**L33: Precursor metabolites and anaplerotic reactions** (Interconversion of precursor metabolites, refilling of precursor metabolite pools)
21 (M)	**L34: Autotrophic CO_2 fixation pathways** (Photosynthesis and chemosynthesis)
23 (W) & 25 (F)	**No classes (Thanksgiving break)**
28 (M)	**L35: The Calvin-Benson-Bassham (CBB) cycle** (Ribulose-1,5-bisphosphate carboxylase/oxygenase, the pentose phosphate cycle)
30 (W)	**L36: Physiological consequences of the CBB cycle** (Photorespiration, carboxysomes) (**Assignment 3 due**)
December 2 (F)	**L37: Nitrogen metabolism** (Nitrogen assimilation, nitrogen fixation)
5 (M)	**L38: Carbon- and Nitrogen cycles** **Assignment 3 solution**
7 (W)	**L39: Microbial Diversity** (Metabolic capabilities have consequences for cellular structures)

Final exam: Wednesday, December 14th 2:00 pm – 3:45 pm