

BIOL 2321: Microbiology for Science Majors

Lecture: 3 Semester Credit Hours

BIOL 2302

MWF 9am – 9:55am

BIOL 2121: Microbiology for Science Majors Lab

Lab: 1 Semester Credit Hour

BIOL 2102L

Wednesday 1pm – 3:20pm
ADMIN 207

CLARENDON COLLEGE
Division of Science and Health
Course Syllabus
Spring 2026

Instructor: Dr. Edward Caraway

Office: Admin 207

E-mail: edward.caraway@clarendoncollege.edu

Mailing Address: Clarendon College, P.O. Box 968, Clarendon, TX 79226

Office Hours: Pampa Monday, Wednesday, and Friday 8:00 am – 9:00 am and 3:30 – 5:00 pm

Tuesday & Thursday 1:30pm – 5:00pm

Other hours by appointment

Course Description: Study of the morphology, physiology, and taxonomy of representative groups of pathogenic and nonpathogenic microorganisms. Pure cultures of microorganisms grown on selected media are used in learning laboratory techniques. Includes a brief preview of food microbes, public health, and immunology.

Statement of Purpose: Microbiology for Science Majors partially satisfies the requirements for the Associates Degree at Clarendon College and is designed for transfer to a senior college.

Required Texts: Good news: your textbook for this class is available for free online! You can also purchase a print version, if you prefer, via OpenStax on Amazon.com.

You can use whichever formats you want. Web view is recommended -- the responsive design works seamlessly on any device. If you buy on Amazon, make sure you use the link on your book page on openstax.org so you get the official OpenStax print version.

Microbiology from OpenStax, Print ISBN 1938168143, Digital ISBN 1947172239,
[www.openstax.org/details/microbiology](https://openstax.org/details/microbiology)

Laboratory Theory and Application, Brief. 2nd edition by Michael J. Leboffe, Burton E. Pierce.

Class lectures will be based on the book chapters, but not all of the material in the text will be covered in class. **You are, nevertheless, responsible for reading the text.** Further, supplemental material may be presented that is not in the book, and thus it is essential that you attend the class regularly.

Supplies: Textbook, Lab Manual, Sharpie pen, lab coat, paper towels, small plastic squirt bottle, and pencils.

Student Rights and Responsibilities: Student Rights and Responsibilities are listed on the College website at: <http://www.clarendoncollege.edu/Resources/Student%20Services/StudentRightsResponsibilities.pdf>

Methods of Instruction: This course will utilize lecture/discussion, audio-visual materials, and individualized lab instruction.

In accordance with recommendations from the Texas Higher Education Coordinating Board, all life and physical science courses at Clarendon College will address the following core objectives:

- **Critical Thinking Skills** – including creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
- **Communication Skills** – including effective written, oral, and visual communication.
- **Empirical and Quantitative Skills** – including application of scientific and mathematical concepts.
- **Teamwork** – including the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

Student Learning Outcomes for Lecture: Upon successful completion of Microbiology for Science Majors, the student should demonstrate these core objectives by being able to...

Critical Thinking Skills

- Provide examples of the impact of microorganisms on agriculture, environment, ecosystem, energy, and human health including biofilms.
- Identify unique structures, capabilities, genetic information flow of microorganisms.
- Compare the life cycles and structures of different types of viruses.
- Give examples of the range of metabolic diversity exhibited by microorganisms, impact of metabolic characteristics on growth, and control of growth.

Communication Skills

- Discuss how microscopy has revealed the structure and function of microorganisms.
- Describe evidence for the evolution of cells, organelles, and major metabolic pathways from early prokaryotes and how phylogenetic trees reflect evolutionary relationships.
- Describe the causes and consequences of mutations on microbial evolution and the generation of diversity as well as human impacts on adaptation.

Empirical and Quantitative Skills

- Classify interactions of microorganisms on human and non-human hosts as neutral, detrimental, or beneficial.

Student Learning Outcomes for Lab: Upon successful completion of Microbiology for Science Majors, the student should demonstrate these core objectives by being able to...

Critical Thinking Skills

- Provide examples of the impact of microorganisms on agriculture, environment, ecosystem, energy, and human health including biofilms.
- Identify unique structures, capabilities, genetic information flow of microorganisms.
- Compare the life cycles and structures of different types of viruses.
- Give examples of the range of metabolic diversity exhibited by microorganisms, impact of metabolic characteristics on growth, and control of growth.

Communication Skills

- Discuss how microscopy has revealed the structure and function of microorganisms.
- Describe evidence for the evolution of cells, organelles, and major metabolic pathways from early prokaryotes and how phylogenetic trees reflect evolutionary relationships.
- Describe the causes and consequences of mutations on microbial evolution and the generation of diversity as well as human impacts on adaptation.

Empirical and Quantitative Skills

- Classify interactions of microorganisms on human and non-human hosts as neutral, detrimental, or beneficial.
- Be able to apply scientific reasoning to investigate questions, and utilize scientific tools such as microscopes and laboratory equipment to collect and analyze data.

Teamwork

- Use critical thinking and scientific problem-solving to make informed decisions in the laboratory.
- Communicate effectively the results of investigations.

Grading Policies: You will receive one letter grade for BIOL 2321 and one letter grade for BIOL 2121. Those grades come from the components described below.

BIOL 2321 Grading Policies: Microbiology for Science Majors Lecture (3 Credit Hours)

1. **Class participation will count as 15% of your final course grade.**
 - a. This grade comes from your participation in class discussions and exercises.
 - i. If you choose not to participate in class discussions, you will receive no credit.
 - b. For every three unexcused absences (either to lecture or lab) you will have 10 points deducted from your class participation grade.
 - i. If you leave during class, you will receive an unexcused absence.
 - ii. If you arrive late to class, you will receive an unexcused absence.
 - iii. If you are asked to leave class due to disrespectful behavior, you will receive an unexcused absence.
2. **Your Lecture Assignments will count as 15% of your final course grade.**

- a. Assignments will be given throughout the term.
 - b. Completion of these assignments should be neatly presented in class or via email.
 - c. Assignments will be relevant to the current lecture topics.
 - i. Completeness
 - ii. Neatness
3. **Lecture exams will count as 70% of your final course grade.**
- a. Students will not be allowed to take exams until they have signed a course contract.
 - b. All lecture tests, including the final, will be weighted equally.
 - c. Each test covers the material covered since the last test (not comprehensive).
 - d. The tests will utilize a variety of question formats (objective, matching, multiple choice, true/false, etc.)
 - e. I will drop your lowest lecture test grade, excluding the final which must be counted.
 - f. You will take these exams on a **computer**.
 - g. During the exams, electronic communication devices are NOT allowed, and both hands MUST remain on the desktop, in clear view.
 - h. We will be “Flipping Lecture” Your Assignment will count as an additional Exam Grade.

BIOL 2121 Grading Policies: Microbiology for Science Majors Lab (1 Credit Hour)

- 1. **Class participation will count as 15% of your final lab grade.**
 - a. This grade comes from your participation in lab discussions and exercises.
 - i. If you choose not to participate in lab discussions, you won't receive any credit.
 - b. For every unexcused absence you will have 5 points deducted from your class participation grade.
 - i. If you leave during lab, you will receive an unexcused absence.
 - ii. If you arrive late to lab, you will receive an unexcused absence.
 - iii. If you are asked to lab class due to disrespectful behavior, you will receive an unexcused absence.
- 2. **Lab quizzes will count as 45% of your final course grade.**
 - a. Short quizzes will be given each week during the first 15 minutes of lab.
 - b. If you come too late to lab, you will receive a zero on that quiz.
 - c. The weekly quizzes will cover the material from the previous lab.
 - d. At the end of the semester, I will drop your lowest weekly lab quiz.
- 3. **Lab practicals will count as 40% of your final course grade.**
 - a. You will take a midterm practical exam and a final practical exam in lab.
 - b. The average of those two grades will be 40% of your final course grade.

Extra Credit Opportunities: Extra credit will be assigned as a Class or Group project. Teamwork and participation are key to obtaining this credit. Details will be discussed during the first day of class.

Suggested Reading:

Saulnier DM, Ringel Y, Heyman MB, Foster JA, Bercik P, Shulman RJ, Versalovic J, Verdu E, Dinan TG, Hecht G, Guarner F. 2013. [The Intestinal Microbiome, Probiotics, and Prebiotics in Neurogastroenterology](#). Gut Microbes 4:17-27.

Wallace TC, Guarner F, Madsen K, Cabana M, Gibson G, Hentges E, Sanders ME. 2011. Human Gut Microbiota and Their Relationship to Health and Disease. Nutrition Reviews 69:392-403.

O'Flaherty S, Saulnier D, Pot B, Versalovic J. How can probiotics and prebiotics impact mucosal immunity? Gut Microbes 2010; 1(5): 293-300. Open access:
<http://www.landesbioscience.com/journals/30/article/12924/>

Grading Scale for the course:

90% - 100%	A
80% - 89.4%	B
70% - 79.4%	C
60% - 69.4%	D
59.4% and below	F

Academic Integrity: An Excerpt from Clarendon College's Student Handbook

Failure to comply with lawful direction of a classroom instructor is a disruption for all students enrolled in the class. Cheating violations include, but are not limited to: (1) obtaining an examination, classroom activity, or laboratory exercise

by stealing or collusion; (2) discovering the content of an examination , classroom activity, laboratory exercise, or homework assignment before it is given; (3) using an unauthorized source of information during an examination , classroom activity, laboratory exercise, or homework assignment ; (4) entering an office or building to obtain unfair advantage; (5) taking an examination for another person; (6) completing a classroom activity, laboratory exercise, homework assignment, or research paper for another person; (7) altering grade records; (8) using any unauthorized form of electronic communication device during an examination, classroom activity, or laboratory exercise; (9) Plagiarism. Plagiarism is the using, stating, offering, or reporting as one's own, an idea, expression, or production of another person without proper credit.

Disciplinary actions for cheating in a course are at the discretion of the individual instructor. The instructor of that course will file a report with the Executive Vice President of Academics and Student Affairs when a student is caught cheating in the course, whether it be a workforce or academic course. The report shall include the course, instructor, student's name, and the type of cheating involved.

Students who are reported as cheating to the Executive Vice President of Academics and Student Affairs of Instruction more than once shall be disciplined by the Executive Vice President of Academics and Student Affairs. The Executive Vice President of Academics and Student Affairs will notify all involved parties within fourteen days of any action taken.

Classroom Conduct

I will show you the respect you deserve as a student. I, in return, expect respectful behavior from you. Because the following actions cause disruption in the classroom and therefore affect the ability of students to learn, I have strict policies concerning them. Disrespectful behavior on your part will result in deductions from your class participation grade.

Disrespectful behavior includes...

- **Arriving late.**
- **Leaving the room during class time.** Plan restroom visits before or after class—not during class. If special needs exist, please make prior arrangements.
- **Using electronic communication devices.** This includes cell phones, pagers, etc. These are not allowed during class time. If special needs exist, please make prior arrangements.
- **Sleeping in class.**
- **Talking in class.** Class time is not the time to visit with your fellow classmates. If you do, I will ask you to leave the classroom.
- **Using headphones.** If you do, I will ask you to leave the classroom.
- **I do NOT allow abusive, obscene, or offensive clothing, jokes, or behavior.**

Class Policies:

1. **Absences:** Please take class attendance seriously. You are here to learn all you can learn, to build a body of knowledge to help you in your career and/or to give you satisfaction in the future. Students who are motivated come to class. **You are responsible for the material covered in class (lecture or lab) even if you are absent.** Unexcused absences will count against your class participation grade as discussed in the grading policies.
2. **Excused absences:** Make-ups for tests will be allowed *only* if absences are excused. Excused absences can result from...
 1. illness on the part of the student
 2. severe illness or death in your *immediate* (not extended) family
 3. college sanctioned extracurricular events
 4. unfavorable weather conditions that prevent students from reaching the college

If you wish for your absence to be excused, you should telephone or e-mail me *in advance* of the absence (leave a message if necessary). Even in emergencies, it usually is possible for you to get word to me about an absence. When you return, you must furnish proof of the reason for your absence if you wish for it to be excused.

3. **Make-up work:** Late or unexcused work will not be accepted. Students who have excused absences MUST let me know **before** the test is given that we need to schedule a make-up. In most cases, the tests must be taken PRIOR to the absence in order to receive full credit. **If you take the test after it has been given to the class, you will receive a 10% penalty per school day that passes until you take the make-up.** To avoid the penalty, **MAKE SURE YOU TAKE A MAKE-UP TEST BEFORE YOU LEAVE.**
4. **There will be NO make-up lab midterm or final.** Because these tests involve practical sections, they can't be set up time & again. If you miss one of these tests, you will have to take a significantly harder essay test. The take home message is: **PLAN TO ATTEND THESE TWO DAYS!**
5. **Final Exams:** Students must take a final for each of their academic courses. The schedule of final exam times is published at the beginning of the semester. Do not make plans to leave school before your scheduled final exam. I will not give any early finals except in extreme emergencies after students have provided documentation of said emergency.
6. **Scholastic Honesty:** I adhere to a strict policy regarding academic honesty. Anyone who is dishonest in any way will receive a zero on that assignment or exam with no opportunity to make up the zero and may be dropped from the course with a grade of F. That student, if allowed to remain in the course, will not be allowed to receive any

extra credit points from the time of the infraction through the remainder of the course. Furthermore, that student will not be allowed to drop their lowest quiz grade or exam grade. A second act of dishonesty will result in an F for the course. Note that dishonest behavior includes both the act of copying someone else's work as well as allowing someone to copy your work. Both students are equally guilty and will be equally punished.

7. **Electronic Communication/Entertainment Devices/Laptops:** Below is an excerpt from Clarendon College Policy 1541.

...Cell phones, pagers, and other personal electronic devices must be off and out of sight in classrooms, laboratories, the library, study spaces, and other academic settings and during such events as plays, concerts, lectures, and College ceremonies...These electronic devices may be turned on and set on silent mode only with the expressed consent of the instructor...faculty members may have individual policies related to cell phones, pagers, and other personal electronic devices outlined in their syllabi...(that) may include penalties for violation...

The use of cell phones, iPods, other electronic communication or entertainment devices, or laptops is prohibited unless you are using them to research material being presented during class. An offense will result in the device being taken up.

8. **Accommodations:** Accommodation Statement. REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT: In accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, any student who feels that he or she may need any special assistance or accommodation because of an impairment or disabling condition should contact the Associate Dean of Enrollment Services at 806-874-4837 / janean.reish@clarendoncollege.edu or visit the Clarendon campus at Clarendon College. It is the policy of Clarendon College to provide reasonable accommodation as required to afford equal educational opportunity. It is the student's responsibility to contact the Associate Dean of Enrollment Services. Nondiscrimination Policy. Clarendon College, in accordance with applicable federal and state law, prohibits discrimination, including harassment, on the basis of race, color, national or ethnic origin, religion, sex, disability, age, sexual orientation, or veteran status. It is the policy of Clarendon College not to discriminate based on gender, age, disability, race, color, religion, marital status, veteran's status, national or ethnic origin, or sexual orientation. Harassment of a student in class, i.e., a pattern of behavior directed against a particular student with the intent of humiliating or intimidating that student will not be tolerated. The mere expression of one's ideas is not harassment and is fully protected by academic freedom, but personal harassment of individual students is not permitted.

9.

10. **Withdrawal:** If you decide that you are unable to complete this course or that it will be impossible to complete the course with a passing grade, you may drop the course and receive a "W" on your transcript instead. Withdrawal from a course is a formal procedure that you must initiate. If you do not go through the formal withdrawal procedure, you will receive a grade of "F" on your transcript.

A student is permitted to drop a course if he/she obtains an official drop slip from the office and has the instructor sign the slip before the 12th class week.

Remember, a student is only allowed to drop the same class twice before he/she will be charged up to triple the tuition amount for taking the class a third time or more. Furthermore, beginning with the Fall 2007 semester, students in Texas may only drop a total of 6 courses throughout their entire undergraduate career. After the 6, he/she will no longer be able to withdraw from any classes.

If you think you need to drop this course, please talk with me about it first. It is possible that there is something you can do to still pass the course. Don't hurt your chances for a passing grade in the course by not attending labs or taking exams before we have discussed your situation.

The last day to withdraw from this course with a "W" is Thursday, April 15, 2026.

Microbiology for Science Majors: Course Calendar and Outline – Spring 2026

The essence of life is change and so too this syllabus. As situations in the classroom and laboratory arise, modifications may have to be made, particularly regarding the course calendar. All attempts will be made to keep these changes to a minimum.

Week of	Lecture Topics	Student Learning Outcome	Lab Activities	Student Learning Outcome
Jan 19	Welcome to Class, Syllabus, Introduction to Student Portal, and First Assignment Course Contracts due 26 January Studying and Test-taking Strategies <i>Fri., Jan. 23 - last day to last day to register and add/drop</i>	Classify interactions of microorganisms on human and non-human hosts as neutral, detrimental, or beneficial.	No biology labs this week	
Jan 26	Ch 1: Humans & the Microbial World	Discuss how microscopy has revealed the structure and function of microorganisms.	Introduction: Lab Safety & Protocol Ex. 1-1: A Comparison of Hand-Cleansing Agents Ex. 1-2: Glo Germ Hand Washing Education	Compare the life cycles and structures of different types of viruses.
Feb 2	Ch 3: Microscopy & Cell Structure	Compare the life cycles and structures of different types of viruses.	Results of Ex. 1-1 Ex. 2-1: Ubiquity of Microorganisms Ex. 1-4: Common Aseptic Transfers and Inoculation Methods Ex. 1-5: Streak Plate Methods of Isolation	Classify interactions of microorganisms on human and non-human hosts as neutral, detrimental, or beneficial.
Feb 9	EXAM 1 Ch 4: Dynamics of Prokaryotic Growth		Results of Ex. 1-4 Results of Ex. 1-5 Ex. 2-2: Colony Morphology (using plates from 2-1) Ex. 2-3: Growth Patterns on Slants Ex. 2-4: Growth Patterns in Broths	Identify unique structures, capabilities, genetic information flow of microorganisms.
Feb 16	Ch 5: Control of Microbial Growth	Give examples of the range of metabolic diversity exhibited by microorganisms, impact of metabolic characteristics on growth, and control of growth.	Ex. 2-7: Anaerobic Jar Ex. 2-8: The Effect of Temperature on Microbial Growth Ex. 2-9: The Effect of pH on Microbial Growth Ex. 2-10: The Effect of Osmotic Pressure on Microbial Growth	Give examples of the range of metabolic diversity exhibited by microorganisms, impact of metabolic characteristics on growth, and control of growth.

Microbiology for Science Majors: Course Calendar and Outline – Spring 2026				
Week of	Lecture Topics	Student Learning Outcome	Lab Activities	Student Learning Outcome
Feb 23	EXAM 2	Describe evidence for the evolution of cells, organelles, and major metabolic pathways from early prokaryotes and how phylogenetic trees reflect evolutionary relationships.	Results of Exercises 2-7 through 2-10 Ex. 2-11: Steam Sterilization Ex. 2-12: The Lethal Effect of UV Radiation on Microbial Growth Ex. 2-13: Chemical Germicides: Disinfectants and Antiseptics	Describe the causes and consequences of mutations on microbial evolution and the generation of diversity as well as human impacts on adaptation.
Mar 2	Ch 6: Metabolism: Fueling Cell Growth		Results of Exercises 2-11 through 2-13 Ex. 3-1: Introduction to the Light Microscope Ex. 3-3: Microscopic Examination of Eukaryotic Microbes	Describe evidence for the evolution of cells, organelles, and major metabolic pathways from early prokaryotes and how phylogenetic trees reflect evolutionary relationships.
Mar 9	Spring Break			
Mar 16	EXAM 3		Review for Lab Midterm.	Discuss how microscopy has revealed the structure and function of microorganisms
Mar 23	Video: <i>DNA: The Secret of Life</i> Ch 7: The Blueprint of Life, from DNA to protein	Identify unique structures, capabilities, genetic information flow of microorganisms.	Lab Midterm	.
Mar 30	Ch 8: Bacterial Genetics	Describe the causes and consequences of mutations on microbial evolution and the generation of diversity as well as human impacts on adaptation.	Ex. 3-4: Simple Stains Ex. 3-5: Negative Stains	Use critical thinking and scientific problem-solving to make informed decisions in the laboratory.
Apr 6	EXAM 4		Ex. 3-6: Gram Stains Ex. 3-7: Acid-Fast Stains Ex. 3-8: Capsule Stain Ex. 3-9: Endospore Stain	Be able to apply scientific reasoning to investigate questions, and utilize scientific tools such as microscopes and laboratory equipment to collect and analyze data.

Microbiology for Science Majors: Course Calendar and Outline – Spring 2026				
Week of	Lecture Topics	Student Learning Outcome	Lab Activities	Student Learning Outcome
Apr 13	Ch 14: The Innate Immune Response Ch 15: The Adaptive Immune Response <i>Thurs., Apr. 18 – last day to drop with a “W”</i>		Results of Ex. 6-1 Ex. 7-3: Morbidity and Mortality Weekly Report Assignment Ex. 7-4: Epidemic Simulation	Provide examples of the impact of microorganisms on agriculture, environment, ecosystem, energy, and human health including biofilms.
Apr 20			Results of Exercises 7-3 and 7-4 Review for Lab Final	Communicate effectively the results of investigations.
Apr 27	Ch 18: only Immunizations Ch 16: <i>Host-microbe interactions</i>		Lab Final Exam **Bring your lecture notebook for grading!**	
May 10	FINAL EXAM –			

My Flipped Lecture assignment is _____.

Instructions:

1. Prepare a 15 – 20 minute presentation over your assigned Chapter.
 1. Bring it to lecture on a thumb drive or cloud drive.
 2. Make sure it is visually appealing and informative
2. Submit 5 multiple choice or true/false questions for the exam.
 1. I will review them and change wording if necessary.
 2. Do not copy out of the text.
3. This will be an exam grade.
 1. If you fail to do this, your grade will suffer.
 2. If you are absent on your assigned week, a zero will be recorded.