

BIOL 210

Microbiology

Spring 2022

Prerequisites - None

Instructor - Dr. Engle

Office - 211 Pierce Hall

Phone - 886-6552

Email - JEngle@mtaloy.edu

Office Hours - MWF 2-3; TR 12-2; F11-12

Credit Hours - 4 (3h lecture/2h lab)

Lecture - 01 MW 12:30-1:15 208 Pierce Hall

02 TR 2:00-3:15 208 Pierce Hall

Lab - 01 F 9:00-10:50; 103 Pierce Hall

02 F 12:00-1:50; 103 Pierce Hall

Web page - www.DrEngle.net

Text - Tortora, , G.J., B.R. Funke, and C.L. Case. 2016. Microbiology: an introduction, 13th ed. Pearson. Boston. 960 pages ISBN-13: 978-0134605180

Course description - This course presents the fundamentals of microbiology with emphasis on the study of microorganisms, their metabolic processes, and their relationship to disease. Laboratory work includes culturing, staining, studying, and identifying microorganisms.

Grading Policy:

Exams - There will be seven lecture exams. Exams will consist of multiple choice, matching, short written answers, and labeling of diagrams. Exams will be based on lecture notes and corresponding readings from the text. The number of questions on each exam will vary depending on the amount of material covered. Spelling counts, as does the correct use of binomial nomenclature. If you have to miss an exam, it is your responsibility to contact the instructor prior to the exam and explain your absence.

Quizzes - There will be the equivalent of six laboratory quizzes worth 20-25 points each administered at the beginning of the appropriate lab. Content will be based on material from the lab manuals, available on my web site (address above), laboratory results, and unknown identification.

Term paper - 75 points. The paper will focus on a notifiable disease, and must contain a minimum of six references. The paper topics are due (your name on a sheet) by **4 February** (5 points). The written paper is due **25 March**.

Presentations - Your presentation is worth 25 points. The information from student term papers will be presented by each student during the last several laboratory sessions. Presentations must include some visual aid (presentation software, posters, or even the chalk board). Presentations should last 4 - 9 minutes. The absolute minimum should include, infectious agent, symptoms, and treatment(s). Information from the presentations will be on the final exam.

Grading Scale - A=100-92% B+=91-88% B=87-83% C+=82-79% C=78-74% D=73-65% F=64-0%

Grades are NOT curved. Grades are based on the total amount of points accumulated. Your grade can be calculated by dividing the sum of all your correct answers by the total number of possible points. Other grades (E, W, WP, WF) will be assigned as described in the College Catalog.

Tutoring Help

Learning Commons: Library 1st floor; <https://www.mtaloy.edu/academics/library/tutoring-help/>

Library Holdings - Bibliography

Anderson, R.A. Algal culturing techniques. 2005. QK565.2 .A44 2005

Baker, S., J. Michlin, C. Griggiths. Microbiology 4th ed. 2011. QR41.2 .B34 2011

Bronze, M. Biodefense: principles and pathogens. 2005. RC88.9.T47B532005 1

Burton, G.R. & P.G. Engelkirk. Microbiology for the health sciences. 2000. QR41.2.B882000 C.1

Friend, T. The third domain. 2007. QR82.A69F75 2007

Gaynes, R. Germ theory:medical pioneers in infectious diseases. 2011. RB153 .G39 2011

Hurst, C.J. & R.L. Crawford. Manual of environmental microbiology. 2007 QR100.M36 2007

Irving, W., D. Ala'Aldeen, T. Boswell. Medical microbiology. 2005. QP46 .I78 2005

Kowalchuk, G.A. Molecular microbial ecology manual. 2008. QR74 .M64 2004 V. 1

Magner, L.N. A history of infectious diseases and the microbial world. 2009. RA643.M32.2009

Sherman, I.W. Twelve diseases that changed our world. 2007. RA649 .S44 2007

Wassenaar, T. Bacteria: the benign, the bad, and the beautiful. 2012. QR74.8 .W37 2012

Course Outline:	<u>Lecture Topics and Learning Objectives</u>	<u>Chapter</u>
Introduction; Fundamentals of Microbiology	Employ the use of binomial nomenclature Match important scientists and their discoveries	1
Chemical Principles	List the main chemical constituents of living matter Describe ionic, covalent, and hydrogen chemical bonds	2a
Biochemistry	List and describe the four macromolecules found in living cells	2b
Microscopy	Compare and contrast the different forms of illumination Discriminate between different staining methods	3
Anatomy of Prokaryotes vs. Eukaryotes	Differentiate between prokaryotic and eukaryotic cell structure Explain the difference between Gram + & – cell wall structure Describe eukaryotic organelles & their functions	4
Microbial Metabolism	Explain the need for enzymes and how they function Breakdown cellular respiration into the various pathways Contrast fermentation with cellular respiration	5
Microbial Growth	List organism categories based on physical and chemical growth requirements Explain the difference between selective and differential media Detail the phases of prokaryotic growth	6
Microbial Control	Recall the classes of compounds used to control growth Describe the physical methods of microbial control	7
Microbial Genetics & Biotechnology	Describe the structure of DNA and how it is replicated Explain the processes of transcription and translation Differentiate between the different forms of genetic recombination Define mutations and what causes them	8 & 9
Classification of Microbes	Differentiate the three domains Explain the different processes used to classify organisms	10
The Eukaryotes	Identify the eukaryotic micro taxonomic divisions Describe the structure of fungi, algae, & protozoa Describe the different categories of helminths	12
Viruses	Describe the structure of the typical virus Explain how a virus infects a cell and replicates List at least three diseases caused by viruses	13
Principles of Disease	Define the vocabulary related to the occurrence, severity, & duration of disease Explain Koch's postulates & how they relate to disease Describe how infections are spread	14
Host Defense	Distinguish the differences between innate and adaptive immunity Discuss immune responses and describe diagnostic immunologic reactions Describe the different white blood cells and their functions Explain phagocytosis Differentiate the different types of lymphocytes and what they do	16 & 17
Selected Diseases	Memorize the infectious agents, symptoms, and treatments from the student presentations	21 - 26

Exam 7

Microbiology Laboratory Syllabus and Information

Laboratory Schedule	Topics and Learning Objectives
Lab 1	Introduction to the Microbiology Lab, Equipment, Safety, and Regulations Explain the meaning of GMP. List and differentiate between the different safety levels for microorganisms. Locate safety equipment in the laboratory.
Lab 2	Bright field microscopy, prepared slides & wet mounts Correctly set up and focus a bright field microscope. Demonstrate the proper handling, cleaning, and storage of a microscope. Demonstrate the correct use of all lenses. Label the different parts of a microscope.
Lab 3 Quiz 1	Fungal Identification and making a Negative Stain of Bacteria Explain how to Clean and dispose of slides. Differentiate between molds & yeasts. Perform a negative stain.
Lab 4	Aseptic Techniques, making a Smear, and Simple Staining Explain how to sterilize and maintain sterility of transfer instruments. Perform aseptic transfer. Perform a streak plate to isolate a bacterial colony. Make a bacterial smear and stain for microscopic observation.
Lab 5 Quiz 2	Colony Morphology & Gram Stain Describe colony characteristics. List the steps in the Gram stain. Demonstrate the proper technique for performing a Gram stain.
Lab 6	Differential and Selective Media Explain the difference between selective and differential medium. Be prepared to explain how presented media are selective and differential.
Lab 7 Quiz 3	Differential and Selective Media Continued
Lab 8	Endospore staining & UV Radiation exposure Perform a spore stain. Expose bacteria to ultraviolet radiation.
Lab 9 Quiz 4	Quorum sensing & Serial Dilution Demonstrate the correct use of pipeting devices. Extrapolating plate counts to obtain the correct CFU in the starting sample.
Lab 10	Control of Microbial Growth by Disk Diffusion Explain the concept of antimicrobial measurements by disk diffusion. Define zone of inhibition.
Lab 11 Unknowns	Identification of Unknown bacteria Perform a Gram stain then culture accordingly.
Lab 12	Unknown Bacteria Continued Explain how to test for the presence of catalase. Perform a negative stain. Read your results and identify your unknowns.
Lab 13	Food Microbiology Make yogurt and "wine".
Lab 14	Student Presentations Be able to associate the symptoms, treatment, and infectious agent with the presented diseases.
(week 15)	Finals week. No lab.

In addition to the above policies and procedures, the instructor reserves the right to alter, augment, or delete from existing policies in order to maintain the proper atmosphere for teaching and learning. All such policy changes will be announced.

Microbiology Paper Requirements

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General Requirements:

Choose a disease from the notifiable CDC disease list (as listed on my Micro web page). Additional diseases not listed are acceptable with instructor permission.

Five full pages of typed with a 12 point font, double spaced, 1 inch margins on 8.5 by 11 inch paper.

Minimum of 5 pages of text (not counting literature cited).

Indent paragraphs, and sure to use binomial nomenclature (except viruses).

Do not use I/we/you.

Specific Requirements:

NO COVER PAGE! Put your name on the first page, in upper left hand corner.

Then, center your creative title.

Provide a blank line and then begin!

Staple your final copy together to hand in.

Grading:

15 pts. Introduction	Organism name, disease name, history, relevance, geographic distribution, how many cases worldwide and/or in the United States.
25 pts. Body	This section should include: description of the disease causing organism, disease symptoms, diagnosis, treatments, prevention, future research (Note: treatment and prevention are NOT the same thing!)
10 pts. Conclusion	One paragraph summary, do not introduce new information here
10 pts. Literature Cited	At least 3 peer reviewed journal articles are required!!!! There must be at least six references total (books, medical literature and others). Use the reference style of one of your cited journal articles. The literature cited section should be on a new page. Single space within a reference, a blank line between references. All references must be cited within your paper text! (Wikipedia or any encyclopedia is not a valid source to reference.)
15 pts. Overall	Grammar/ Spelling/binomial nomenclature Page numbers on the bottom of the pages Flow- does the paper make sense. Were the directions followed? Try not to quote!

Notes:

- Don't cite proquest or other database used to find sources, it's like saying "I used a card catalog to find a book"
- Each reference should only have one date, the date of publication, not the date you accessed the article. Internet sources should have the date they were created, updated, or the date you accessed the page. But remember there is only one date per reference.
- NO PLAGIARISM, ask me if you don't know the "rules"
- No extra line between paragraphs

PROOF YOUR PAPER

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MAC Policies

Weather Delays and Compressed Schedule

In the event of a delayed opening, MAC will follow a compressed schedule. This will provide students with the opportunity to attend all scheduled classes on delay days with each class meeting for a shorter than usual session. For the Compressed Schedule for delay days, go to the following link:
<http://www.mtaloy.edu/delays-cancelations>

Technology and Communication Assistance Statement

All students are expected to regularly log in to the Canvas course website. The site contains the syllabus and assignments, and supplementary materials will be placed there on a regular basis. Furthermore, important announcements will be posted on the site (especially if a class period is canceled due to weather, illness, etc.). For assistance in using Canvas, please contact the Canvas administrator at (Canvas@mtaloy.edu).

College offices and instructors often communicate important information through the MAC email system. Students should check their school email account regularly. For technical or log-in credential questions, please contact the help desk at (helpdesk@mtaloy.edu or 886-6502).

College Academic Integrity Statement

Mount Aloysius College is committed to the academic integrity of the entire community. All share responsibility for maintaining high standards of academic integrity, and no forms of academic dishonesty are tolerated. Forms of academic dishonesty include but are not restricted to: giving or receiving unauthorized assistance on an examination, project, or assignment; using unauthorized forms of assistance such as crib notes or cell phones on an examination; falsification of data or plagiarism (using another person's ideas or words as your own); and lying or falsifying reasons for missing examinations or class.

A student found guilty of lying, cheating, or plagiarism, depending on the nature of the offense and the history of the student, is usually subject to one or both of the following: a grade of zero on the assignment, project, or examination or a grade of F in the course. All cases of lying, cheating, or plagiarism where a punishment is incurred are reported to the Senior Vice President of Academic Affairs, who maintains a record of all offenses. Serial offenders may be subject to suspension or dismissal.

College Accommodations Statement

Mount Aloysius College is committed to providing reasonable accommodations to students with disabilities. Students with disabilities who wish to request an accommodation are required to contact Ms. Marisa Evans, MA, LPC, NCC, Director of Counseling and Disability Services to formally request accommodations and provide supporting documentation. Her office is located in St. Joseph Hall, Room 101, (814) 886-6336. If you receive approval for accommodations, it is important that you stop in during my office hours at the start of the semester so necessary arrangements can be made.

Attendance Policy

Attendance at all lecture and lab sessions is mandatory. It is your responsibility to notify the instructor **prior** to missing an exam or laboratory and you must have a valid reason. The instructor reserves the right to judge the validity of the excuse. If you miss an exam, you are responsible for taking the exam within one week of your return. There are no makeup labs unless you are able to come to another section during the same week and obtain instructor permission. *Failure of the student to follow the steps outlined above will result in a grade of "0" for the missed exam or lab!*

Conflict Resolution

Should a student encounter difficulty with course content or other aspects of the course, the first action should be to make an appointment to speak with the instructor. The instructor may suggest resources on campus or other tips to assist student learning. If a student has concerns with their instructor, then the best course of action is to seek out a meeting with the Science and Math Department Chair, Dr. J. Michael Engle, 814-886-6552, jengle@mtaloy.edu. to discuss the difficulties. If an agreeable decision is not reached, the student should then request a meeting with the Dean of the School of Business, Arts, and Sciences, Dr. David Haschak, 814-886-6313, dhaschak@mtaloy.edu. The Faculty, Department Chairs, and Deans are committed to treating all students with respect and fairness. Additional information is outlined in the academic grievance policy in the College catalog.

Laboratory Safety Contract

Every laboratory user should observe the following rules:

1. Know the potential hazards and appropriate safety precautions before beginning work.
2. Know the location and use of emergency equipment, including safety showers, eyewash stations and safety kits.
3. Know the types of personal protective equipment available and how to use it for each procedure. Goggles must be used when there is a risk of splash, when working with Bunsen burners or when doing dissections. Disposable gloves must be used when doing dissections and must be supplied by the student. **Closed-toed shoes** should be worn at all times when using any Pierce Hall laboratory. Loose and torn clothing may pose a hazard in the laboratory. For your protection you must use clothing that is at least knee length when seated during laboratories. Wear clothing that, if damaged, would not be a serious loss, or use aprons or laboratory coats because chemicals may damage fabric.
4. Never block safety equipment or doors and keep aisles clear and free from tripping hazards.
5. Familiarize yourself with the emergency response procedures, alarms and building evacuation routes.
6. Familiarize yourself with the equipment you will be using. Pay extra care when working with glass and when using dissecting equipment, whether cutting or assisting. Take good care of equipment and report any damage to your instructor.
7. Prevent pollution by following waste disposal procedures. Chemical reactions may require traps to prevent the release of toxic substances to the laboratory or to the environment. Use fume hoods if necessary.
8. Combine reagents in the appropriate order and avoid adding solids to hot liquids.
9. Do not prepare, store or consume food or beverages in any Pierce Hall laboratory. Microwaves and refrigerators are for laboratory use only, not to heat or store food.
10. Do not smoke in any Pierce Hall laboratory.
11. Do not apply cosmetics when in the laboratory.
12. Use a pipette bulb or a mechanical pipetting device to provide a vacuum. Never use mouth suction to pipette chemicals or to start a siphon.
13. Be alert to unsafe conditions and actions and bring them to the attention of your supervisor or lab manager immediately so that corrections can be made as soon as possible. Report any injury to your instructor immediately. After dealing with the incident, instructors should fill out an incident report.

Specific Microbiology Laboratory Procedures

1. Book bags, coats, and other personal belongings should be placed inside the door.
2. Wash hands with soap and water at the beginning and just before leaving the lab.
3. Disinfect your work space before beginning and just before leaving.
4. Wash hands before leaving.
5. Never remove equipment, media, or microbial cultures from the laboratory.
6. Never pour cultures or agar down the sink drain; discard cultures in designated areas.
7. Long hair should be tied back.
8. Microscope return procedure
 - Remove the microscope slide from the stage
 - Remove oil from the lenses
 - Rotate the nose piece so the lowest power objective is in place
 - Turn the head so the ocular lenses are over the arm
 - Replace the dust cover
 - Return the microscope to the correct cubicle with the back (cord) facing you

For additional information you can consult Mount Aloysius College Laboratory Chemical Hygiene Plan and the Science and Mathematics Department Safety Manual