COLORADO STATE UNIVERSITY GLOBAL

BIO204: INTRODUCTION TO MICROBIOLOGY WITH LAB

Credit Hours: 4

Contact Hours: This is a 4-credit course, offered in accelerated format. This means that 21 weeks of material is covered in 8 weeks. The exact number of hours per week that you can expect to spend on each course will vary based upon the weekly coursework, as well as your study style and preferences. You should plan to spend 20-25 hours per week in each course reading material, interacting on the discussion boards, writing papers, completing projects, and doing research.

Faculty Information: Faculty contact information and office hours can be found on the faculty profile page.

COURSE DESCRIPTION AND OUTCOMES

Course Description:

This course introduces the core concepts of microbiology including microbial identification, physiology, genetics, and ecology. The interactions between microbes and humans are emphasized by discussion of infectious diseases, immunology, epidemiology, and biotechnology. In this course, you will learn the fundamentals of microbiology lab techniques by conducting virtual experiments. This course fulfills the microbiology-for-nursing requirement. This course is an approved gtPathways course.

Course Overview:

In this course, you are introduced to the core concepts of microbiology including microbial identification, physiology, genetics, and ecology. There is an emphasis on healthcare topics including infectious diseases, immunology, and epidemiology. You will conduct experiments in Labster to learn microbiological lab techniques.

Course Learning Outcomes:

1. Demonstrate an understanding of the terminology and principles of basic chemistry, cell structure and function, bioenergetics, cell reproduction and genetics, microbial taxonomy, and Darwinian evolution.
2. Demonstrate an understanding of microbial cell biology, and genetics.
3. Demonstrate technical laboratory skills, such as microscopy, aseptic techniques, culturing and isolation, and media and material preparation and sterilization.
4. Demonstrate cognitive laboratory skills, such as collection and analysis of data, identification of microbes, and communication of results.
5. Demonstrate an understanding of terminology and principles immunology, epidemiology, and virology.
6. Integrate themes by examining microbial evolution, diversity, and disease.

Participation & Attendance

Prompt and consistent attendance in your online courses is essential for your success at CSU Global Campus. Failure to verify your attendance within the first 7 days of this course may result in your withdrawal. If for some reason you would like to drop a course, please contact your advisor.

Online classes have deadlines, assignments, and participation requirements just like on-campus classes. Budget your time carefully and keep an open line of communication with your instructor. If you are having technical problems, problems with your assignments, or other problems that are impeding your progress, let your instructor know as soon as possible.

Course Materials

Required:

- Parker, N., Schneegurt, M., Tu, A.-H. T., Forster, B. M., & Lister, P. (2018). *Microbiology*. Houston, TX: OpenStax. Retrieved from https://openstax.org/details/books/microbiology
- **Labster Virtual Labs**: To circumvent the expense (and safety hazards) of trying to set up a microbiology lab in your home, you will use Labster, a virtual lab environment, to conduct your lab experiments. Make sure you read the Theory sections within the lab each week and follow the directions closely! ***Important note: This virtual environment is much more sophisticated than a simple walkthrough. If you make a mistake it is entirely possible for your experiments to fail, and then you would have to repeat sections to complete the experiment.*** If you suspect this is the case, you can start over at different points in the lab by clicking on "Mission" and selecting the location where you want to start over.

NOTE: *All non-textbook required readings and materials necessary to complete assignments, discussions, and/or supplemental or required exercises are provided within the course itself. Please read through each course module carefully.*

Course Schedule

Due Dates

The Academic Week at CSU Global begins on Monday and ends the following Sunday.

- **Discussion Boards:** The original post must be completed by Thursday at 11:59 p.m. MT and Peer Responses posted by Sunday 11:59 p.m. MT. Late posts may not be awarded points.
- **Opening Exercises:** Take the opening exercise before reading each week's content to see which areas you will need to focus on. You may take these exercises as many times as you need. The opening exercises will not affect your final grade.
- **Mastery Exercises:** Students may access and retake mastery exercises through the last day of class until they achieve the scores they desire.
- **Critical Thinking and Labs:** Assignments are due Sunday at 11:59 p.m. MT.
- **Midterm and Final Exams:** The exams will close at the end of their assigned weeks, on Sundays at 11:59. p.m. MT

Weekly Reading and Assignment Details

Module 1

Readings

- Chapters 1, 2, & 3 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Lab Assignment: Microscopy (40 points)

Read through these instructions in entirety before completing the lab. There is a point when you need to stop the lab to write a hypothesis.

Time for your first lab! This week complete the Microscopy lab in Labster, where you will learn how to use different kinds of microscopes. Be sure to review the Theory behind the topics within the lab setting to help support your progress through the lab. Take notes on the Theory sections to help you write up your lab report after you are done. Take screen shots when you think important images are presented to include in your lab report.

After the issue with the three viruses in chickens is described, defining the focus of the lab, stop for a few minutes to think about what has been presented to you. Create a hypothesis to describe why the chickens have inflamed small intestines after two days when infected with two viruses, but do not show signs of infection when infected with three viruses. Refer back to the Interactive Lecture for information on writing a hypothesis.

When you are done with the lab, use the following outline either to write a report or to create a presentation. Label each portion of the lab as follows:

Introduction: Start with a broad discussion of celiac disease and the issues it causes in the intestines. Tie that to malabsorption syndrome (MAS) in chickens and how we can learn from MAS to address questions about celiac disease in humans. Narrow your focus down to a specific question for the lab comparing the impacts of infection with two viruses versus three. Conclude the introduction with the hypothesis you created while performing the lab. It's OK if you were not correct.

Methods: Describe how you conducted the lab. Include the samples used, the types of microscopes needed, and the visualization methods for the samples to see them in the microscopes, such as staining and filters. Why did you need different microscopes? What do the stains highlight? Do not discuss results here but rather in the next section "Results/Data."

Results/Data: Describe your results here, including what you learned from the different microscopes. Tables and charts would be appropriate. If you took some during the lab, images from the microscopes are also good to support your results.

Discussion: Review your results and determine if your experiment supports or refutes your hypothesis. Explain why. Then expand your discussion and address how your results can be applied to celiac disease. Be specific and give details.

Requirements:

- If you are writing the report, it should be 4-5 pages long, not including the required title and references pages. If you are creating the presentation, it should be at least 10 slides long, not including the required title and references slides.
- Reference at least two journal articles.
- Follow APA formatting.
- Include a title page/slide and references pages/slides as well.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Mastery Exercise (10 points)

Module 2

Readings

- Chapters 4, 5, 6, & 7 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Critical Thinking (40 points)

Option #1: Compare and Contrast Microbes

Choose one prokaryote and one eukaryote. Write a short paper comparing and contrasting the microbes. Start with one paragraph for each microbe explaining:

1. Morphology
2. Where it is found
3. How it is transmitted
4. Treatment options
5. A recent example of infection and how it was handled.

Finally, compare and contrast the microbes. Would they be able to survive in the same location? Why or why not? If their methods of transmission differ, why do they differ? Why do treatment options differ? Does any of this relate to the morphology of the microbes?

Your well-written paper should meet the following requirements:

- Be 2-3 pages in length, not including your title/cover and reference pages.
- Format the entire paper, including references and any appendices, according to the CSU-Global Guide to Writing & APA.
  Cite a minimum of **three** academic peer-reviewed scholarly sources, not including the text, to support your responses.

Option #2: Compare and Contrast Microbial Infections

Visit the CDC Current Outbreaks List or search the internet for an outbreak or a case of infection caused by a prokaryote and one caused by a eukaryote. Write a short paper comparing and contrasting the outbreaks or infections. Start with one paragraph for each case of infection explaining:

1. Microbe morphology
2. Where it is found
3. Where the infection occurred
4. What caused the infection and how it spread
5. How the morphology of the microbe contributes to its ability to spread.

Finally, compare and contrast the cases of infection. Do they occur in different locations? Why? If methods of transmission differ, why do they differ? Was infection with one microbe more severe? Why would that be? Why do treatment options differ? How does all of this relate to the morphology of the microbes?

Your well-written paper should meet the following requirements:

6. Be 2-3 pages in length, not including your title/cover and reference pages.
7. Format the entire paper, including references and any appendices, according to the CSU-Global Guide to Writing & APA.
8. Cite a minimum of **three** academic peer-reviewed scholarly sources, not including the text, to support your responses.

Mastery Exercise (10 points)

Portfolio Milestone (10 points)

Options #1 & 2: Select a Portfolio Option and Microbial Disease

In Module 7 you will submit a Portfolio Project about a microbial disease that infects humans. This week you will review the options for the Portfolio Project in Module 7 and the microbial diseases discussed in Chapters 21-26 of the textbook.

This week, submit a short paragraph identifying which Portfolio Project option you will be completing, the microbial disease you will focus on for your project, and why you chose that disease. If you know of a microbial disease not discussed in the textbook, that is fine to use as well.

Module 3

Readings

- Chapters 8, 9, and 10 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Lab Assignment 1: Eutrophication (30 points)

Read these instructions through before completing the lab.
This week you will be completing the Eutrophication lab in Labster. The lab has two parts. It may be helpful to complete the sections of the lab report as you go through the lab. Review the Theory sections to support your report. When you are done, please submit an APA-formatted report **or** presentation as outlined below.

Part 1

Introduction: Introduce the problem observed by the fishery. What impact could this have on people? Conclude with a hypothesis about what could be causing the problem.

Methods: Describe how you analyzed the water and fish samples.

Results/Data: Describe your results here. What did you find when you viewed the samples in the microscope?

Discussion: Review your results and determine if your experiment supports or refutes your hypothesis. Explain eutrophication with a focus on limiting factors that contribute to algal growth.

Part 2

Introduction: Introduce the geographical area of interest and the possible cause of increased nitrogen in the area. Create a hypothesis identifying an industry that could be the cause of the problem.

Methods: Describe how you gathered and analyzed the water samples.

Results/Data: Describe the spectrophotometry results here. A table would be useful.

Discussion: Review your results in relation to your hypothesis and what needs to be done now.

Requirements:

- If you are writing the report, it should be 3-4 pages long not including the required title and references pages. If you are creating a presentation, it should be at least 8 slides long, not including the required title and references slides.
- Follow APA formatting.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Lab Assignment 2: Bacterial Isolation (30 points)

Read these instructions through before completing the lab.

This week you will be completing the Bacterial Isolation lab in Labster. This lab has three parts. Your goal is to identify the bacteria causing an infection, trace its origin, and verify the strains. It may be beneficial to complete the sections of the lab report or presentation as you go through the lab. Review the Theory sections to support your report. When you are done, please submit an APA-formatted report **or** presentation as outlined below.

Part 1: Identify the bacteria

Introduction: Introduce the problem observed in the hospitalized boy. Conclude with a hypothesis about what could be causing the problem.

Methods: Describe how you analyzed the sample from the hospital. Include details on how the agar plate can be created to promote or inhibit growth in certain bacteria, and what was used in your *Salmonella Shigella* agar plates here.

Results/Data: Describe your results here. What did you find when you viewed the *Salmonella Shigella* agar plates? How did you identify the bacteria?

Discussion: Review your results and determine if your experiment supports or refutes your hypothesis. Explain how you identified this as an antibiotic-resistant bacteria and how the boy was treated following diagnosis.

Part 2: Trace the origin of the bacteria

Introduction: Provide background on what led to infection in the boy. Create a hypothesis regarding the cause of infection that can be tested.

Methods: Describe how you gathered and analyzed samples, including the kind of agar plate used and why you needed to streak the samples.

Results/Data: Describe the streaking results here, including how you can identify the different bacteria present.

Discussion: Review your results in relation to your hypothesis and what needs to be done now.

Part 3: Isolating bacteria

Introduction: Introduce the need for a comparative analysis to verify the origin of the bacteria.

Methods: Describe how you isolated a bacterial colony from the sample.

Results/Data: Did you successfully isolate the bacteria?

Discussion: What are the next steps after isolation? How will the results be used?

Requirements:

- If you are writing the report, it should be 3-4 pages long, not including the required title and references pages. If you are creating a presentation, it should be at least 8 slides long, not including the required title and references slides.
- Follow APA formatting.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Module 4

Readings

- Chapters 11, 12, and 13 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Critical Thinking (40 points)

Option #1: DNA Technology

Research a non-therapeutic use of DNA technology. This application may be actively in use, or still in development. Write a paper addressing the following:

1. Introduce the technique. What is it? How was it developed? (Or how is it being developed?)
2. What is the value of this technique? (What "problems" is it used to solve?)
3. Summarize the protocol for its use.
4. Describe the mechanism behind this application. What is happening on the molecular level?
5. What are the pros and cons of using this technique?
6. Find an example of a scientific journal article, forensics article or case study, or agricultural field study where this technique is being implemented or developed. Briefly, explain how it was used in the context of the paper.

Your well-written paper should meet the following requirements:

- Be 2-3 pages in length, not including your title/cover and reference pages.
- Be formatted according to according to the CSU-Global Guide to Writing & APA.
- Cite a minimum of **three** academic peer-reviewed scholarly sources to support your responses.

Option #2: Gene Therapy

Choose a therapeutic application of DNA technology. This method may be actively in use, or still in development. Write a paper addressing the following:

1. Introduce the therapeutic technique. What is it? How was it developed? (Or how is it being developed?)
2. Which disease(s) does it treat or prevent?
3. Summarize the protocol used for this intervention.
4. Describe the mechanism behind this application. What is happening on the molecular level?
5. What are the pros and cons of using this technique?
6. Find an example of a scientific journal article or medical case study where this technique is being implemented or developed. Briefly, explain how it was used in the context of the paper. Make sure that you properly cite the journal articles or case study referenced in your paper.

Your well-written paper should meet the following requirements:

- Be 2-3 pages in length, not including your title/cover and reference pages.
- Be formatted according to according to the CSU-Global Guide to Writing & APA.
- Cite a minimum of **three** academic peer-reviewed scholarly sources to support your responses.

Midterm Exam (75 points)

This exam covers the first four modules of the course. There are 50 questions to answer in 75 minutes. The questions will be similar in nature to those in the Mastery Exercises and multiple-choice Review Questions at the end of the chapters in your textbook. Finish the Mastery Exercises through Module 4 before completing the exam. Using a timer while you complete the Review Questions may help you study for the exam. While the exam is technically "open book," there is a 75-minute time limit and you will need to have a good understanding of the material to complete the questions successfully within the time limit.

Important Notes:

Your exam must be completed this week. Your midterm exam will be open all week—and ONLY this week—until 11:59 p.m. MT Sunday.

The exam is timed. Once you begin, you only have **75 minutes** to finish and submit your exam. Do not begin the exam until you are ready to take it.

You will only be able to submit the exam once. Do not open the exam until you are ready.

Lab Assignment: Molecular Cloning (40 points)

Read these instructions through before completing the lab.
Complete the Molecular Cloning lab in Labster. In this lab you will be observing gene expression following radiation exposure in a living cell using a reporter gene. Be sure to review the Theory behind the topics within the lab setting to help support your progress through the lab. Take notes to help you write up your lab report. You may even want to write part of the report while you are performing the lab. Take screen shots when you think important images are presented to include in your report.

When you are done with the lab, use the following outline either to write a report or create a presentation. Label each portion of the lab as follows:

Introduction: Give background on damage to DNA caused by UV radiation and the issues caused when DNA cannot repair itself properly. Discuss how DNA repairs itself with a specific focus on *RAD52*. Introduce the importance of monitoring DNA expression to assess functionality of *RAD52*.

Methods: Include the following explanations:

- how you isolated *RAD52* and *eGFP* DNA including DNA extraction, amplification, restriction enzyme digestion, and gel electrophoresis;
- assembly of the fusion gene and expression plasmid using DNA ligation;
- transformation of the plasmid into yeast cells and the use of antibiotic selection after transformation; and
- the UV radiation experiment.

Results: Describe your results here. Images from the lab are also good to support your results if you took some.

Discussion: Review your results and discuss the importance of being able to observe gene expression. Why is this important for studying DNA repair? What implications does this have for cancer patients?

Requirements:

- If you are writing the report, it should be 4-5 pages long not including the required title and references pages. If you are creating the presentation, it should be at least 10 slides long not including the required title and references slides.
- Reference at least two journal articles.
- Follow APA formatting.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Module 5

Readings

- Chapters 14, 15, and 16 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Lab Assignment 1: Bacterial Quantification by Culture (30 points)

Read these instructions through before completing the lab.
This week you will be completing the Bacterial Quantification by Culture lab in Labster. This lab focuses on antibiotic resistance and finding new methods to fight antibiotic-resistant bacteria. Your goal is to test a fungal compound from the Amazon to see if it has antibiotic properties. It may be beneficial to complete the sections of the lab report or presentation as you go through the lab. Review the Theory sections to support your report. When you are done, please submit an APA-formatted report or presentation as outlined below.

Introduction: Introduce the problem with antibacterial resistance, how it arises, and ways scientists are working to solve this problem. Discuss why scientists may look to other species to fight bacteria. Conclude with an introduction to the sample provided to you in the lab and why you want to test it for antibacterial properties.

Methods: Describe how you analyzed the fungal compound. Include your preparation of cultures and quantification of bacterial growth in the culture with the fungal compound compared to the control, which may require serial dilutions. Then describe how you tested the functionality of the fungal compound using multiple serial dilutions.

Results/Data: Report your results here. What did you see when you compared the control culture to the one with the fungal compound? What was your colony count and cfu/mL for the culture with the fungal compound after incubation on the agar plate? How many viable cells were in one milliliter of the culture with the fungal compound compared to the control? Then report the results from the multi-serial dilution test on the fungal compound. Include a table.

Discussion: Review your results and what they mean about the effect of the fungal compound on bacterial growth. What implications does this have about developing an antibiotic with this fungal compound?

Requirements:

- If you are writing the report, it should be 3-4 pages long, not including the required title and references pages. If you are creating the presentation, it should be at least 8 slides long, not including the required title and references slides.
- Follow APA formatting.
- Include a title page/slide. Include a references page/slide at the end.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Lab Assignment 2: Biosafety (30 points)

Read these instructions through before completing the lab.
This week you will be completing the Biosafety lab in Labster. The lab introduces HazMat containment of a powdery envelope and how to work in a Biosafety Level 3 lab to identify the powder. Instead of writing up a lab report for this lab you will be submitting a paper or presentation focused on managing Hazardous Material. After completing the lab, please submit a paper or presentation addressing the following points:

1. Introduce anthrax, including symptoms associated with exposure and its virulence.
2. Find an article discussing an incident of anthrax release in public and discuss the procedures taken to contain it, or what should have been done if specific details are not present.
3. Discuss why scientists work with anthrax in a Biosafety Level 3 Lab.
4. Review safety procedures for working with anthrax in a Biosafety Level 3 Lab, including laboratory setup, entry and exit procedures, protective gear, and the use of a biosafety cabinet.
5. Reflect on your experience working in the virtual level 3 lab. Was it cumbersome? Are all the precautions necessary? How important is it to have biosafety labs to identify hazardous microorganisms?
6. In 2019 the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) at Fort Detrick, MD was shut down. Research this incident and discuss pros and cons to shutting the facility down. Was USAMRIID important for maintaining and controlling biosafety within the United States? Was the shut down for valid reasons? Is there information missing about the closure? Did politics play a role? End with the current state of the shutdown and what you think, or hope, will happen next.

Requirements:

- If you are writing the report, it should be 3-4 pages long, not including the required title and references pages. If you are creating the presentation, it should be at least 8 slides long, not including the required title and references slides.
- Follow APA formatting.
- Include a title page/slide. Include a references page/slide at the end.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Module 6

Readings

- Chapters 17, 18, 19, and 20 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Critical Thinking (40 points)

Option #1: Vaccination

Create a brief, persuasive essay defending the importance of vaccination. You may choose a specific vaccine—such as one to prevent your disease of focus for your Portfolio Project—or you may discuss vaccines in general. Address the following points:

- How the vaccine works and why we need it
- Reasons why vaccination rates are falling
- Public health risks of falling vaccination rates
- The importance of herd immunity.

You are not limited to these points, but they should be included in your argument.

Your well-written paper should meet the following requirements:

- Be 2-3 pages in length, not including your title/cover and reference pages.
- Be formatted according to the CSU-Global Guide to Writing & APA.
- Include a title page and reference page.
- Cite a minimum of **three** academic peer-reviewed scholarly sources to support your responses.

Option #2: Innate and Adaptive Immunity

Create a brief essay describing innate and adaptive immunity, and why these are not enough to protect people from diseases. Address the following points:

- What is innate immunity? Include at least one physical, one chemical, and one cellular defense in your discussion.
- What is adaptive immunity? Be sure to discuss the primary and secondary response, along with specificity and memory.
- How do microbes evade our immune system to cause disease? Can the microbe you are using for your Portfolio Project evade the immune system?
- What other ways can people protect themselves from disease?

You are not limited to these points, but they should be included in your paper.

Your well-written paper should meet the following requirements:

- Be 2-3 pages in length, not including your cover and reference pages.
- Be formatted according to according to the CSU-Global Guide to Writing & APA.
- Include a title page and reference page.

- Cite a minimum of **three** academic peer-reviewed scholarly sources to support your responses.

Lab Assignment: ELISA (40 points)

Read these instructions through before completing the lab. There is a point when you need to stop the lab to write a hypothesis.

Complete the ELISA lab in Labster. Be sure to review the Theory behind the topics within the lab setting to help support your progress through the lab. Take notes on the theory sections to help you write up your lab report after you are done. This lab is heavy on methods, so make sure you take detailed notes there. Take screen shots when you think important images are presented to include in your lab report. The goal of this lab is to determine the type of cells that produce the most Factor IX to create cheaper medicine for patients with Hemophilia. After the three cell types are discussed, stop for a few minutes to think about what has been presented to you. Create a hypothesis to predict which cell type will produce the most Factor IX.

When you are done with the lab, use the following outline to write a report or presentation. Label each portion of the lab as follows:

Introduction: Start with a broad discussion of Hemophilia and the issues it causes. Narrow your focus down to factor IX. Conclude the introduction with the hypothesis you created while performing the lab. It's OK if you were not correct.

Methods: Describe how you conducted the lab. Include the specific steps you took to perform the ELISA and analyze the results so someone reading the lab could replicate the experiment.

Results/Data: Describe your results here. Tables and charts would be appropriate. Images from the lab are also good to support your results.

Discussion: Review your results and determine if your experiment supports or refutes your hypothesis. Explain why. Then expand your discussion and address how your results can be applied to Hemophilia. Be specific and give details.

Requirements:

- If you are writing the report, it should be 4-5 pages long, not including the required title and references pages. If you are creating the presentation, it should be at least 10 slides long, not including the required title and references slides.
- Reference at least two journal articles.
- Follow APA formatting.
- Include a title and references pages/slides.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

Module 7

Readings

- Chapters 21, 22, and 23 in Microbiology

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Portfolio Project (70 points)

Option #1: Disease Presentation

Now that you have gained a solid understanding of microbiology and microbial diseases, it is time to share that information with your colleagues. Your supervisor has informed you that it is your turn to provide the weekly lunch seminar on a microbial disease of your choice that affects the human body. Review the diseases discussed in Chapters 21-26 of the Microbiology textbook. Choose one disease there or another one of interest to you. Create a presentation that covers the following topics:

1. The microbe responsible for the disease
    a. Where it is found
    b. How it is transmitted
2. Patient presentation with the disease
    a. Symptoms
    b. Diagnostic testing
    c. Methods of treatment
    d. Prognosis
3. Pathogenicity of the disease
    a. Precautions to take when caring for a patient with the disease. Include precautions for yourself and to prevent spread of the disease in the hospital.
4. Methods used to control the disease in public (regularly and when there is an outbreak)
5. Threats that could prevent control.

Your presentation should meet the following requirements:

- 10-12 slides in length, not including your title page and reference pages.
- Formatted according to the CSU-Global Guide to Writing & APA. Include a title page and reference page.
- Cite a minimum of **five** sources in addition to the textbook and any relevant course materials. At least three sources should be academic peer-reviewed scholarly sources.
- Demonstrate thoughtful consideration of the ideas and concepts that are presented in the course. The CSU-Global Library is a great place to find resources, but feel free to venture beyond.

Option #2: Disease Fact Sheet

Now that you have gained a solid understanding of microbiology and microbial diseases it is time to share that information with your colleagues. Your supervisor has informed you that it is your turn to provide the weekly lunch seminar on a microbial disease of your choice that affects the human body. Review the diseases discussed in Chapters 21-26 of the Microbiology textbook. Choose one disease there or another one of interest to you. Create a fact sheet to go with your presentation that covers the following topics:

1. The microbe responsible for the disease
    a. Where it is found
    b. How it is transmitted

2. Patient presentation with the disease
    a. Symptoms
    b. Diagnostic testing
    c. Methods of treatment
    d. Prognosis
3. Pathogenicity
    a. Precautions to take when caring for a patient with the disease. Include precautions for yourself and to prevent spread of the disease in the hospital.
4. Methods used to control the disease in public (regularly and when there is an outbreak)
5. Threats that could prevent control.

Your presentation should meet the following requirements:

- 3-4 pages long, not including your title page and reference pages.
- Formatted according to the CSU-Global Guide to Writing & APA. Include a title page and reference page.
- Cite a minimum of **five** sources in addition to the textbook and any relevant course materials. At least three sources should be academic peer-reviewed scholarly sources.
- Demonstrate thoughtful consideration of the ideas and concepts that are presented in the course. The CSU-Global Library is a great place to find resources, but feel free to venture beyond.

Module 8

Readings

· Chapters 24, 25, and 26 in *Microbiology*

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (10 points)

Final Exam (175 points)

This exam covers the entire course. There are 100 questions to answer in 150 minutes. The questions will be similar in nature to those in the Mastery Exercises and the multiple-choice Review Questions at the end of the chapters in your textbook. Finish the Mastery Exercises through Module 8 before completing the exam. Using a timer while you complete the Mastery Exercises and Review Questions will help you study for the exam. While the exam is technically "open book," there is a 150-minute time limit and you will need to have a good understanding of the material to complete the questions successfully within the time limit.

Important Notes:

Your exam must be completed this week. Your final exam will be open all week - and ONLY this week—until 11:59 p.m. MT Sunday.

The exam is timed. Once you begin, you only have **150 minutes** to finish and submit your exam. Do not begin the exam until you are ready to take it.

You will only be able to submit the exam once. Do not open the exam until you are ready.\

Lab Assignment: Viral Gene Therapy (30 points)

Read these instructions through before completing the lab.

This week you will be completing the Viral Gene Therapy lab in Labster. The goal of this lab is to design a virus to help treat heart failure patients. It may be helpful to complete the sections of the lab report as you go through the lab. Review the Theory sections to support your report. When you are done, please submit an APA- formatted report or presentation as outlined below.

Introduction: Introduce heart failure and its causes. Discuss the role of the SERCA2a gene in heart functionality and the need for a vector to deliver the gene into a cell. How does it work? Describe the vector that will be used here and why. Create a hypothesis for what you expect to observe when you test your gene therapy.

Methods: Describe the mice used in the experiment. How are they different and why is this difference significant? Discuss the initial tests performed on the mice. Describe how you created the viral vector including preparing cells for co-transfection and testing the recombinant AAV-SERCA2a. Be specific enough that someone else could replicate these methods, but do not copy content from the lab. Use your own words to discuss the methods used.

Results/Data: Describe your results here. What did you find when you tested the mice?

Discussion: Review your results and how they can be applied to heart failure patients.

Requirements:

- If you are writing the report, it should be 4-5 pages long, not including the required title and references pages. If you are creating the presentation, it should be at least 8-10 slides long, not including the required title and references slides.
- Three peer-reviewed resources are required as support for your report.
- Follow APA formatting.
- Include the title and references pages or slides.

Note: If you experience any technical issues with Labster, contact Labster's technical support. Your instructor and CSU-Global's technical staff will not be able to assist you with technical issues that may occur in Labster.

COURSE POLICIES

Course Grading

20% Discussion Participation
0% Opening Exercises
8% Mastery Exercises
8% Final Portfolio Project
25% Exams
27% Labs
12% Critical Thinking Assignments

Grading Scale	
A	95.0 – 100
A-	90.0 – 94.9
B+	86.7 – 89.9
B	83.3 – 86.6
B-	80.0 – 83.2
C+	75.0 – 79.9
C	70.0 – 74.9
D	60.0 – 69.9
F	59.9 or below

IN-CLASSROOM POLICIES

For information on late work and incomplete grade policies, please refer to our **In-Classroom Student Policies and Guidelines** or the Academic Catalog for comprehensive documentation of CSU-Global institutional policies.

Academic Integrity
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /re-purposing your own work (see *CSU-Global Guide to Writing and APA Requirements* for percentage of repurposed work that can be used in an assignment), unauthorized possession of academic materials, and unauthorized collaboration. The CSU-Global Library provides information on how students can avoid plagiarism by understanding what it is and how to use the Library and Internet resources.

Citing Sources with APA Style
All students are expected to follow the *CSU-Global Guide to Writing and APA Requirements* when citing in APA (based on the APA Style Manual, 6th edition) for all assignments. For details on CSU-Global APA style, please review the APA resources within the CSU-Global Library under the "APA Guide & Resources" link. A link to this document should also be provided within most assignment descriptions in your course.

Disability Services Statement
CSU–Global is committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Disability Resource Coordinator at 720-279-0650 and/or email ada@CSUGlobal.edu for additional information to coordinate reasonable accommodations for students with documented disabilities.

Netiquette
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom. If you have concerns about something that has been said, please let your instructor know.

APPENDIX A

Colorado General Transfer Pathways Alignment

Course Learning Outcomes	GT Pathways Competencies & Content Criteria	Assessment Methods
CLO1. Demonstrate an understanding of the terminology and principles of basic chemistry, cell structure and function, bioenergetics, cell reproduction and genetics, microbial taxonomy, and Darwinian evolution.	**CC1a. Develop foundational knowledge in specific field(s) of science.**	**For CC1a. Module 1 Discussion** assignment: Student chooses a cellular structure to research and explain in which organisms it is found. **Module 2 Discussion** assignment - student choses a beneficial microbe to research and describes why it is beneficial.
CLO2. Demonstrate an understanding of microbial cell biology and genetics.	**CC1a. Develop foundational knowledge in specific field(s) of science.**	**For CC1a. Module 1 Discussion** assignment: Student chooses a cellular structure to research and explain in which organisms it is found. For the **Module 3** critical thinking assignment, students analyze uses of biotechnology in therapeutic or non-therapeutic applications.

CLO3. Demonstrate technical laboratory skills, such as microscopy, aseptic techniques, culturing and isolation, and media and material preparation and sterilization.	**CC1a. Develop foundational knowledge in specific field(s) of science.**	**For CC1a. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment. **Lab Assignment: Microscopy** – students learn basic microscopy skills as apply to microbiology. **Lab Assignment: Staining** – students learn basic principles of staining techniques and cellular structures for identifying microbes
	CC2a. Perform hands-on activities with demonstration and simulation components playing a secondary role.	**For CC2a.** Students complete various laboratory assignments within the **Labster Virtual Laboratory environment**.
	CC2b. Engage in inquiry based activities.	**For CC2b. Lab Assignment: Cultivation** – students work with bacteria to test a hypothesis based on an observed problem. **Lab Assignment: Unknown Identification** – students use their knowledge of microbial characteristics to identify a bacterium based on several tests that examine its traits.

CLO4. Demonstrate cognitive laboratory skills, such as collection and analysis of data, identification of microbes, and communication of results.	**CC1b. Develop an understanding of the nature and process of science.**	**For CC1b. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment. **Lab Assignment: Bacterial Transformation** – includes section on experimental troubleshooting and design
	CC1c. Demonstrate the ability to use scientific methodologies.	**For CC1c.** Each of the laboratory assignments requires the students to collect data and focus on aspects of the scientific method. Students are also required to incorporate recent research papers into **three Critical Thinking writing assignments**. **Lab Assignment: Scientific Method** – students explicitly practice designing and repeating an experiment to test a hypothesis. **Lab Assignment: Gene Expression** – includes additional experimental troubleshooting exercises requiring students to monitor DNA expression to assess functionality of RAD52 after UV radiation. **Lab Assignment: Unknown Identification** – students use their knowledge of microbial characteristics to identify a specimen based on several tests that examine its traits. Their conclusions and reasoning must be explained.
	CC1d. Examine quantitative approaches to study natural phenomena.	**For CC1d. Lab Assignment: Control of Growth** – students test substances at different concentrations to calculate growth inhibition of microbes. **Lab Assignment: RAD52 and eGFP DNA** – students use quantitative methods to determine size of amplified DNA fragments from an electrophoresis gel. **Lab Assignment: Antibiotic Sensitivity** – students count colonies to compare sensitivity to different types/concentrations of antibiotics.
	CC2c. Demonstrate the ability to use the scientific method.	**For CC2c. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment to test a

		hypothesis. **Lab Assignment: Bacterial Transformation** – includes hypothesis formation and experimental troubleshooting exercises. **Lab Assignment: Staining** – students must explain the rationale behind the experimental design and how they drew their conclusions.
	CC2d. Obtain and interpret data and communicate the results of inquiry.	**For CC2d.** Each of the laboratory assignments requires the students to collect data, interpret it, and communicate their results. Some examples include: **Lab Assignment: Scientific Method** – students practice designing and repeating a quantitative experiment to test a hypothesis. **Lab Assignment: Unknown Identification** – students use their knowledge of microbial characteristics to identify a specimen based on several tests that examine its traits. Their conclusions and reasoning must be explained. **CT Assignment: Microbial identification** – students compare and contrast microbes based on morphology, location, transmittal, and treatments.
	CC2e. Demonstrate proper technique and safe practices.	**For CC2e.** Each of the laboratory assignments requires the students to collect data using appropriate technique – the experiments will fail or give inaccurate results if not executed correctly. **Lab Assignment: Cellular Production** – includes additional experimental troubleshooting exercises requiring students to analyze provided images from labs and discuss whether or not the experiments supports the hypothesis. **Lab Assignment: RAD52 and eGFP DNA** – students use quantitative methods to determine size of amplified DNA fragments from an electrophoresis gel.

	IA5a. Examine evidence to identify patterns, differences, similarities, limitations, and/or implications related to the focus.	**For IA5a. Lab Assignment: Staining** – students learn basic principles of staining techniques and cellular structures for identifying microbes. **Lab Assignment: Unknown Identification** – students use their knowledge of microbial characteristics to identify a bacterium based on several tests that examine its traits.
	IA5b. Utilize multiple representations to interpret the data.	**For IA5b. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment. **Lab Assignment: Unknown Identification** – students use their knowledge of microbial characteristics to identify a bacterium based on several tests that examine its traits.
	IA6a. State a conclusion based on findings.	**For IA6a. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment to test a hypothesis and state conclusions based on their results**. Lab Assignment: Unknown Identification** – students identify a specimen based on several tests that examine its traits and explain their process and reasoning. **Lab Assignment: Control of Growth** – students test substances at different concentrations to calculate growth inhibition of microbes, present data and conclusions
	QL1a. Explain information presented in mathematical forms (e.g., equations,	**For QL1a. Lab Assignment: Scientific Method** – students practice designing and repeating an experiment, data is

	graphs, diagrams, tables, words).	collected in tables. **Lab Assignment: RAD52 and eGFP DNA –** students use quantitative methods to determine size of amplified DNA fragments from an electrophoresis gel and present data and conclusions. **Lab Assignment: Control of Growth** – students test substances at different concentrations to calculate on limiting factors that contribute to growth, present data and conclusions
	QL2a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).	**For QL2a. Lab Assignment: RAD52 and eGFP DNA –** students use quantitative methods to determine size of amplified DNA fragments from an electrophoresis gel and present data and conclusions. **Lab Assignment: Control of Growth** – students test substances at different concentrations to calculate on limiting factors that contribute to growth, present data and conclusions
CLO5. Demonstrate an understanding of terminology and principles immunology, epidemiology, and virology.	**CC1a. Develop foundational knowledge in specific field(s) of science.**	**For CC1a. Module 4 Discussion assignment**: Describe and compare disinfectant chemicals found in the home.
	CC1d. Examine quantitative approaches to study natural phenomena.	**For CC1d. Module 8 Discussion assignment**: students are required to include discussion of epidemiological data from a current CDC outbreak report in their assignment
	QL1a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).	**For QL1a. Module 8 Discussion assignment**: Students must describe a CDC "Epicurve" graph from a recent outbreak and discuss with peers

CLO6. Integrate themes by examining microbial evolution, diversity, and disease.	**CC1b. Develop an understanding of the nature and process of science.** **IA4a. Select or develop elements of the methodology or theoretical framework to solve problems in a given discipline.** **IA5a. Examine evidence to identify patterns, differences, similarities, limitations, and/or implications related to the focus.**	**For CC1b. and IA4a.** All **three critical thinking writing assignments** require students to research and cite at least three articles from scientific literature to support their papers **For IA5a. Module 7 Discussion assignment**: Students critically compare methods and patterns of behavior that healthcare workers use to try to prevent the spread of microbial disease.

CLO – Course Learning Outcome
CC – gtPathways Content Criteria
IA – gtPathways Inquiry and Analysis Competency
QL – gtPathways Quantitative Literacy Competency

Content Criteria for Designating a Natural & Physical Sciences Course as GT Pathways:

1. The lecture content of a GT Pathways science course (GT-SC1 or GT-SC2):
Students should be able to:
    a. Develop foundational knowledge in specific field(s) of science.
    b. Develop an understanding of the nature and process of science.
    c. Demonstrate the ability to use scientific methodologies.
    d. Examine quantitative approaches to study natural phenomena.
2. The laboratory (either a combined lecture and laboratory, or a separate laboratory tied to a science lecture course) content of a GT Pathways science course:
Students should be able to:

    a. Perform hands-on activities with demonstration and simulation components playing a secondary role.
    b. Engage in inquiry-based activities.
    c. Demonstrate the ability to use the scientific method.
    d. Obtain and interpret data, and communicate the results of inquiry.
    e. Demonstrate proper technique and safe practices.

Inquiry and Analysis Competency

4. Select or Develop a Design Process (required for GT-SC1 & GT-SC2)
    a. Select or develop elements of the methodology or theoretical framework to solve problems in a given discipline.
5. Analyze and Interpret Evidence (required for GT-SC1 & GT-SC2)

a. Examine evidence to identify patterns, differences, similarities, limitations, and/or implications related to the focus.

b. Utilize multiple representations to interpret the data.

6. Draw Conclusions (required for GT-SC1 & GT-SC2)

a. State a conclusion based on findings.

Quantitative Literacy Competency

Students should be able to:

1. Interpret Information (required for GT-MA1, GT-SC1 & GT-SC2)

a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).

2. Represent Information (required for GT-MA1, GT-SC1 & GT-SC2)

a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).