

Introduction to Medical Microbiology

Course

Medical
Microbiology

Unit I

Introduction to
Microbiology

**Essential
Question**

What is Medical
Microbiology?

TEKS

130.207(c)
2A, 3D

**Prior Student
Learning**

n/a

Estimated time

1-2 hours

Rationale

The medical laboratory is important in identifying microorganisms that affect health and wellness.

Objectives

Upon completion of this lesson, the student will be able to:

- Evaluate information about careers in microbiology
- Correlate the relationship of the medical laboratory and microbiology to the field of health care

Engage

Student discussion topic:

How might life on earth be different if Bacteria were not present?

Key Points

- I. Microbiology
 - A. What is it?
 - B. Who studies it?
 - C. Why do we study it?
 - D. Where do we study it?
 - E. What knowledge will a student gain taking this course?
- II. What is it?
 - A. Medical Microbiology is the study of microorganisms affecting health and wellness
 1. Bacteria
 2. Fungus
 3. Parasites
 4. Viruses
 5. Most can only be seen with the microscope!
- III. Who studies it?
 - A. Studies are usually performed on client specimens and are used to identify pathogenic organisms
 - B. Medical Laboratory Technicians and Medical Laboratory Technologists perform the studies
 - C. Education level: 2 year AAS or 4 year BS

- IV. Why do we study it?
 - A. Pathogenic microorganisms cause disease in humans
 - B. Microbiologists determine the pathogen causing the disease and identify a substance, usually an antibiotic, to inhibit the microorganism
 - C. Microbiologists research microorganisms to discover new antibiotics
- V. Safety
 - A. Laboratories post signs as constant reminders of safety and infection control
 - B. Safety hoods are used to avoid splashing and inhaling possible pathogens
 - C. Standard precautions
 - D. Refrigeration is a necessary component of the microbiology laboratory for the accuracy of patient results; reagents, such as those used in this strep screen, aid in the diagnosis of disease
- VI. A hospital laboratory picture is shown in the PowerPoint.
 - A. Blood cultures are incubated and monitored electronically for bacterial and fungus growth
 - B. High tech instruments are used to aid in the identification of microorganisms
 - C. Teamwork is essential in all types of laboratories, including the school laboratory
- VII. What is growing on the agar plate? It is Proteus vulgaris. This bacteria swarms on the plate, creating a “wave” of growth. It is found sometimes in urine cultures.
- VIII. At the end of this course, the student will gain knowledge in the following:
 - A. Normal flora of the human body
 - B. Microbiological disease states related to the human body
 - C. Media/Agar used to grow microorganisms
 - D. Biochemical reactions of microorganisms
 - E. Identification of microorganism
- IX. Key Terms
 - A. Algae: a diverse array of photosynthetic organisms. Both planktonic and macroscopic forms exist in both freshwater and

saline habitats. Some exist terrestrially in soil or on the trunks of trees where they live symbiotically with fungi in lichens.

- B. Colonial: distinct individuals that live together and interact in mutually advantageous ways
- C. Fungi: Mainly many-celled organisms that have a nucleus. They have cell walls that are reinforced with a special compound (a complex carbohydrate) called chitin. Many fungi produce thread-like bodies (e.g. bread mold) or they may be large and fairly hard (e.g. mushrooms)
- D. Microbiology: the study of microorganisms or microbes; branch of biology that studies very small organisms (both plants and animals)
- E. Microorganism or Microbe: very small organisms that require the use of a microscope to see
- F. Monera: usually single-cell organisms; unlike members of the four other Kingdoms, members of the Kingdom Monera do not have a nucleus. Examples of monerans are bacteria; some bacteria are motile because of the possession of one or more flagellum (plural flagella)
- G. Multicellular: consists of many cells
- H. Non-Pathogenic microorganism: a microorganism that usually does not cause disease; are usually helpful to humans and their environment
- I. Pathogenic microorganism: a harmful microorganism that can cause disease
- J. Protista: contains many different kinds of organisms
 1. most protistas single -celled
 2. some simple, many-celled organisms
 3. some animal-like (e.g. Amoeba and Paramecium)
 4. some plant-like (e.g. algae or Euglena)
 5. others "fungus-like" (e.g., slime molds)
 6. all members have nuclei (singular nucleus)
 7. Amoeba can use pseudopodia to move
 8. Paramecium usually use cilia
 9. slime molds "creep" using pseudoplasmodium
- K. Protozoa: Subkingdom of Protista comprising unicellular and colonial microorganisms of varied morphology; are ubiquitous (found in both terrestrial and aquatic habitats) and some are pathogenic to animals and humans (e.g., Plasmodium that causes malaria)
- L. Unicellular: consists of one cell only

M. Viruses: (NOT A TRUE KINGDOM) a group of minute infectious agents that are unable to reproduce and multiply except inside the living cell of a host. viruses are usually classified according to the type of nucleic acid (DNA or RNA) that they may have

Activity

- I. Complete the Key Terms.
- II. Research microbiology career information, including where the programs are offered in the state, admission requirements, and the occupational outlook. Present the findings to the class. See the activity sheet.
- III. Complete the Introduction to Medical Microbiology Worksheet.

Assessment

Successful completion of the Key Terms
Successful completion of First Day Quiz
Oral Presentation Rubric

Materials

Introduction to Medical Microbiology PowerPoint Presentation
Key Terms -- KEY
Introduction to Medical Microbiology Worksheet Key
<http://texashotjobs.org/> -- H.O.T. Jobs
<http://www.cdc.gov/> - Center for Disease Control (CDC)

Accommodations for Learning Differences

For reinforcement, the student will write a report about why the study of microbiology is important in health care.

For enrichment, the student will research and identify the functions performed by the Center for Disease Control (CDC).

National and State Education Standards

National Healthcare Foundation Standards and Accountability Criteria:

Foundation Standard 4: Employability Skills

4.3 Career Decision-making

4.31 Discuss levels of education, credentialing requirements, and employment trends in healthcare.

4.32 Compare careers within the health science career pathways (diagnostic services, therapeutic services, health informatics, support services, or biotechnology research and development).

TEKS

130.207(c)(2)(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section

130.207(c)(3)(D) evaluate the impact of scientific research on society and the environment

Texas College and Career Readiness Standards

English and Language Arts

I. Writing

A. 2. Generate ideas and gather information relevant to the topic and purpose, keeping careful records of outside sources.

II. Reading

A. 11. Identify, analyze, and evaluate similarities and differences in how multiple texts present information, argue a position, or relate a theme.

Key Terms

Define the following terms.

- 1. Algae:**
- 2. Colonial:**
- 3. Fungi:**
- 4. Microbiology:**
- 5. Microorganism or Microbe:**
- 6. Monera:**
- 7. Multicellular:**
- 8. Non-Pathogenic microorganism:**
- 9. Pathogenic microorganism:**
- 10. Protista:**

11. Protozoa:

12. Unicellular:

13. Viruses:

Key Terms - **KEY**

1. **Algae:** A diverse array of photosynthetic organisms. Both planktonic and macroscopic forms exist in both freshwater and saline habitats. Some exist terrestrially in soil or on the trunks of trees where they live symbiotically with fungi in lichens.
2. **Colonial:** Distinct individuals that live together and interact in mutually advantageous ways.
3. **Fungi:** Mainly many-celled organisms that have a nucleus. They have cell walls that are reinforced with a special compound (a complex carbohydrate) called chitin. Many fungi produce thread-like bodies (e.g., bread mold) or they may be large and fairly hard (e.g., mushrooms).
4. **Microbiology:** The study of microorganisms or microbes; branch of biology that studies very small organisms (both plants and animals).
5. **Microorganism or Microbe:** Very small organisms that require the use of a microscope to see.
6. **Monera:** Usually single-cell organisms. Unlike members of the four other Kingdoms, members of the Kingdom Monera do not have a nucleus. Examples of monerans are bacteria. Some bacteria are motile because of the possession of one or more flagellum (plural flagella).
7. **Multicellular:** Consists of many cells.
8. **Non-Pathogenic microorganism:** A microorganism that usually does not cause disease. They are usually helpful to humans and their environment.
9. **Pathogenic microorganism:** A harmful microorganism that can cause disease.
10. **Protista:** Contains many different kinds of organisms. Most protistas are single-celled, some are simple, many-celled organisms. Some are animal-like (e.g., Amoeba and Paramecium), some are plant-like (e.g. algae or Euglena) while others are "fungus-like" (e.g., slime molds). All members of the Protista have nuclei (singular nucleus). Amoeba can use pseudopodia to move, Paramecium usually use cilia and slime molds can "creep" using pseudoplasmodium.
11. **Protozoa:** Subkingdom of Protista comprising unicellular and colonial microorganisms of varied morphology. They are ubiquitous (found in both terrestrial and aquatic habitats) and some are pathogenic to animals and humans (e.g., Plasmodium that causes malaria).
12. **Unicellular:** Consists of one cell only.
13. **Viruses:** (NOT A TRUE KINGDOM) These are a group of minute infectious agents that are unable to reproduce and multiply except inside the living cell of a host. Viruses are usually classified according to the type of nucleic acid (DNA or RNA) that they may have.

Microbiology Career Investigation

Name of the Career –

What are the college degree(s) you must have to achieve this career goal?

How many years of college does it take to earn the degree(s)?

What college(s) can you attend locally to achieve or begin to achieve this career goal?

Name 3 activities of interest to you that someone in this career does on a regular basis.

Name 3 skills you need to be successful in this career.

Which skill do you believe is the most important?

Why?

Name 3 traits you have that would make this career a good fit for you.

What is the average annual pay for a career like this?

Name 3 careers that go hand-in-hand with the one you have selected

Is this career growing in the U.S.?

Based on what you discovered about this career, is it still one you think you would like to pursue?

Why?

Oral Presentation Rubric

Student: _____

Date: _____

Scoring criteria	4. Excellent	3. Good	2. Needs Some Improvement	1. Needs Much Improvement	N/A
Clearly and effectively communicates the main idea or theme.					
Presenter is self-confident and clearly expresses ideas.					
Presenter answers questions with well thought out responses.					
Holds audience attention and maintains eye contact.					
Visual aids are clear and add to the presentation.					

NOTE: N/A represents a response to the performance which is "not appropriate."

MEDICAL MICROBIOLOGY INTRODUCTION

NAME: _____ DATE: _____
CLASS: _____

Please answer the following questions in **complete sentences**.

1. Define Medical Microbiology.
2. Name two types of professionals employed in a Medical Microbiology laboratory.
3. Why is it important to study Medical Microbiology?
4. Why is teamwork an essential component of any medical laboratory?
5. What do you expect to gain by taking this course in Medical Microbiology?

BONUS: What was growing on the agar plate shown in the PowerPoint presentation?

KEY
MEDICAL MICROBIOLOGY
INTRODUCTION

NAME:
CLASS:

DATE:

Please answer the following questions in **complete sentences**.

1. Define Medical Microbiology.

Medical Microbiology is the study of microorganisms affecting health and wellness.

2. Name two types of professionals employed in a Medical Microbiology laboratory.

Medical Laboratory Technicians & Medical Laboratory Technologists

3. Why is it important to study Medical Microbiology?

Pathogenic microorganisms cause disease in humans.

Microbiologists determine the pathogen causing the disease and identify a substance, usually an antibiotic, to inhibit the microorganism.

Microbiologists research microorganisms to discover new antibiotics.

4. Why is teamwork an essential component of any medical laboratory?

Answers may vary.

5. What do you expect to gain by taking this course in Medical Microbiology?

Answers may vary.

BONUS: What was growing on the agar plate shown in the PowerPoint presentation?

Proteus vulgaris