EAST PENN SCHOOL DISTRICT

Microbiology
July 14, 2025

Microbiology Unit 1 - Overview of Microbiology

STAGE 1 | DESIRED RESULTS

Standards	Transfer	
3.1.9-12.A Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.	*Students will be able to independently use their learning to...* ❑ Microbes are essential to our survival	
	Meaning	
	UNDERSTANDINGS *Students will understand that...* ☐ Microbiology includes many disciplines and career opportunities. ☐ Microbes have many beneficial applications for humans. ☐ Microbes are essential to our survival.	ESSENTIAL QUESTIONS *Students will keep considering...* ☐ How do the different fields of Microbiology impact society? ☐ What is the role of microbes in infections and disease? ☐ What role do microorganisms have in earth's ecosystems? ☐ How are microorganisms used to create solutions for human problems?
	Acquisition	
	Students will know... ☐ Fields of study included in Microbiology. ☐ Career opportunities applicable to Microbiology. ☐ General characteristics of microorganisms. ☐ Classification of microorganisms. ☐ Current research and technological advances in areas of Microbiology. ☐ Essential role of microorganisms.	*Students will be skilled at...* ☐ Research current technological advances in the field of Microbiology. ☐ Present identifying specialist and microorganisms. ☐ Identify microorganisms and structures utilizing the microscope. ☐ Evaluate the impact microorganisms have on humans.

Microbiology Unit 2 - How Bacteria are Unique

STAGE 1 | DESIRED RESULTS

Standards

3.1.9-12.G
Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

3.1.9-12.H
Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions

3.1.9-12.A Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

3.1.9-12.Q Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

3.1.9-12.I
Use mathematical and/or computational representations to support explanations

Transfer

Students will be able to independently use their learning to understand to...

- ❑ Demonstrate bacteria can be studied safely and accurately following appropriate laboratory guidelines.
- ❑ Analyze mechanisms for bacteria resistance.

Meaning

UNDERSTANDINGS

Students will understand that...

- ☐ Structural components are used to classify bacteria.
- ☐ The single celled bacteria cell carries out all functions necessary for life.
- ☐ Bacteria have different habitats based on their nutritional adaptations for carbon and energy sources.
- ☐ Environmental factors influence growth patterns of microbes.
- ☐ Bacteria utilize various metabolic pathways.
- ☐ Bacteria are identified by their ability to utilize various substrates based on their biochemical enzymatic activity.
- ☐ Microorganisms react differently to physical and chemical control methods.
- ☐ Antimicrobial therapy is constantly evolving as microorganisms evolve.

ESSENTIAL QUESTIONS

Students will keep considering...

- ☐ What structures provide specific functions in the bacterial cell?
- ☐ Why are bacteria the most numerous organisms on Earth?
- ☐ How are bacteria biochemically classified?
- ☐ What techniques are utilized to grow and and identify bacteria in the clinical laboratory?
- ☐ What safety precautions are necessary when working with bacteria?
- ☐ What are the best methods for controlling bacteria?
- ☐ How can we determine the effectiveness of an antibiotic?

Acquisition

Students will know...

- ☐ Structures and functions of bacterial cells.
- ☐ Gram Stain Procedure
- ☐ Growth Factors
- ☐ Nutritional categories
- ☐ Reproduction by binary fission

Students will be skilled at...

- ☐ Evaluate Gram Stains to classify bacteria based on cell wall structures and bacterial shapes.
- ☐ Demonstrate asceptic technique for isolation of bacteria.
- ☐ Analyze bacterial growth curves for

of factors that affect carrying capacity of ecosystems at different scales.	☐ Population Growth Curves-phases and limiting factors. ☐ Enzymes and regulation of pathways ☐ Metabolic pathways utilized by different types of bacteria. ☐ Physical and chemical microbial control methods. ☐ Bacterial identification and classification systems. ☐ Antimicrobial drugs-mechanisms of action. ☐ Narrow vs Broad spectrum of drug activity. ☐ Laboratory safety protocols.	population limiting factors. ☐ Analyze the effectiveness of different categories of antibiotics with different types of bacteria utilizing the Kirby Bauer Susceptibility Test Method. ☐ Design and explain a flow chart of the main metabolic pathways utilized by bacterial groups including substrates, products and ATP generated. ☐ Compare growth patterns and colony morphologies of different bacteria in broth, tube and plate media. ☐ Perform and evaluate key biochemical tests to identify bacterial isolates. ☐ Demonstrate appropriate laboratory safety procedures. ☐ Evaluate an ideal antimicrobial drug.

Microbiology Unit 3 - Microbe and Human Interactions

STAGE 1 | DESIRED RESULTS

Standards

3.1.9-12.A
Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

Transfer

Students will be able to independently use their learning to understand...

- ❑ Bacteria interact with the human host

Meaning

UNDERSTANDINGS
Students will understand that...

- ☐ Humans have a complex symbiotic relationship with bacteria.
- ☐ Our normal resident microbes (microbiota) provide protection and aid our immune system.
- ☐ Infectious diseases are caused by specific microbial pathogens that invade, multiply and damage specific host sites.
- ☐ Epidemiologists study the incidence and distribution of disease in populations with the goal of preventing disease.
- ☐ Humans have nonspecific and specific defenses.
- ☐ Bacteria have numerous virulence factors to invade human hosts.

ESSENTIAL QUESTIONS
Students will keep considering...

- ☐ What role do bacteria play in our normal microbiota?
- ☐ What role do bacteria play in infectious processes?
- ☐ What mechanisms help humans to resist bacterial infections?
- ☐ What is the scope of epidemiology?

Acquisition

Students will know...

- ☐ Normal resident microbiota by body site.
- ☐ Sterile body sites.
- ☐ Biofilms and quorum sensing.
- ☐ Pathogenic relationships
- ☐ Virulence factors of specific infectious bacteria.
- ☐ Infectious diseases by specific bacteria at specific body sites.
- ☐ Koch's postulates for causative agent of disease.
- ☐ Scope of Epidemiology
- ☐ Nosocomial Infections
- ☐ Cells, tissues and organs of the immune system.
- ☐ Physical, mechanical and chemical barriers to infection.
- ☐ Nonspecific and Specific Immunity
- ☐ Vaccines

Students will be skilled at...

- ☐ Investigate the role of microbiota in current medical applications.
- ☐ Explain how biofilms participate in quorum sensing.
- ☐ Explain how Koch's postulates are used to identify the causative agent of disease.
- ☐ Research an infectious disease and prepare a case study correlating mode of transmission, symptoms, diagnostic tests and treatment.
- ☐ Design a concept map comparing Humoral and cell-mediated immunity.
- ☐ Discuss methods for preventing nosocomial infections.
- ☐ Analyze the efficacy of vaccines in disease prevention.