

NGSS UNIT OVERVIEW

FROM CELLS TO ORGANISMS

Performance Expectation MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

Performance Expectation MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Performance Expectation MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Performance Expectation MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

This unit also builds toward more complete understanding of concepts related to MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. MS-LS1-3 is assessed in the Body Systems unit of *Issues and Life Science*.

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>1. Investigation: Disease Outbreak Students participate in a model of the spread of infectious disease. They analyze data from the model to identify patterns, and then use the patterns supported by the data to determine the cause of the spread of the infectious disease. The problem of diagnosing and treating an infectious disease provides a context for the exploration of cell structure and function that follows.</p>	MS-LS1.A	<p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p> <p>Constructing Explanations and Designing Solutions</p>	<p>Patterns</p> <p>Cause and Effect</p> <p>Scale, Proportion, and Quantity</p> <p>Connections to Nature of Science</p>	ELA/Literacy: RST.6-8.3
<p>2. View and Reflect: An Invisible Organism A video segment introduces the idea that there are some living organisms that cannot be seen without the use of tools such as microscopes. Students consider the role of evidence in developing scientific explanations about the role of microbes in spreading infectious diseases. Over the course of the next few activities, the concept that these microscopic organisms are alive and made of a single cell is developed.</p>	MS-LS1.A	<p>Engaging in Argument from Evidence</p>	<p>Cause and Effect</p> <p>Scale, Proportion, and Quantity</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Connections to Nature of Science</p>	ELA/Literacy: RST.6-8.9

FROM CELLS TO ORGANISMS (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>3. Laboratory: Evidence of Microscopic Organisms Students use microscopes to conduct an investigation that will provide evidence of microscopic living organisms. They begin to observe the pattern that living things are made of cells. They also experience the usefulness of microscope technology in investigating biological structures at scales too small to be observed by the human eye.</p>	MS-LS1.A	<p>Planning and Carrying Out Investigations</p> <p>Analyzing and Interpreting Data</p>	<p>Scale, Proportion, and Quantity</p> <p>Structure and Function</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Connections to Nature of Science</p>	ELA/Literacy: RST.6-8.3
<p>4. Reading: The History of Cell Theory Students read about the relationship between the development of the cell theory and the germ theory of disease. The idea that all living things are made of cells is introduced. The role that advances in microscope technology played in furthering scientific knowledge is highlighted.</p>	MS-LS1.A	<p>Constructing Explanations and Designing Solutions</p> <p>Obtaining, Evaluating, and Communicating Information</p>	<p>Scale, Proportion, and Quantity</p> <p>Structure and Function</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Connections to Nature of Science</p>	ELA/Literacy: RST.6-8.9 WHST.6-8.9
<p>5. Laboratory: Cells Alive! Students explore the idea that both unicellular and multicellular organisms are living. Students carry out and interpret investigations to obtain evidence of cellular respiration by yeast. This concept of how cells obtain and use matter and energy from food is developed and then revisited in later activities.</p>	MS-LS1.A MS-LS1.C MS-PS3.D	<p>Analyzing and Interpreting Data</p> <p>Planning and Carrying Out Investigations</p> <p>Constructing Explanations and Designing Solutions</p> <p>Developing and Using Models</p>	Energy and Matter	ELA/Literacy: RST.6-8.3
<p>6. Reading: Parts of a Cell A reading on cells emphasizes the complementary nature of structure and function. Students learn that cells of all organisms have similar structures (e.g., the cell membrane), and these structures function similarly in each organism.</p>	MS-LS1.A	<p>Obtaining, Evaluating, and Communicating Information</p> <p>Developing and Using Models</p> <p>Constructing Explanations and Designing Solutions</p>	<p>Scale, Proportion, and Quantity</p> <p>Structure and Function</p> <p>Systems and System Models</p>	ELA/Literacy: RST.6-8.7 RST.6-8.9 WHST.6-8.9

FROM CELLS TO ORGANISMS (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>7. Investigation: Investigating the Cell Membrane The role of the cell membrane within a cell is further investigated as students construct a simple cell model. They use the model to investigate how the cell membrane acts as a boundary that controls what enters and leaves the cell.</p>	MS-LS1.A	Planning and Carrying Out Investigations Analyzing and Interpreting Data Developing and Using Models Connections to Nature of Science	Scale, Proportion, and Quantity Structure and Function	ELA/Literacy: RST.6-8.3 WHST.6-8.2
<p>8. Modeling: Modeling Cell Structure and Function An interactive computer animation helps review the ways that parts of a cell contribute to its function and compares plant and animal cell structures and functions. Students use the knowledge gained over the last few activities to develop and use a model to describe the function of a cell as a whole and ways that parts of cells contribute to the function. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS1-2.</p>	MS-LS1.A	Developing and Using Models Obtaining, Evaluating, and Communicating Information	Scale, Proportion, and Quantity Structure and Function Systems and System Models	ELA/Literacy: RST.6-8.7 WHST.6-8.2 SL.8.5
<p>9. Laboratory: Observing Multicellular Organisms Students use microscopes to further their investigations of the cellular nature of life. They gather additional evidence that living things are made of one or many cells and that cells of different organisms share certain structural components (e.g., the cell membrane). These structures function similarly in different organisms.</p>	MS-LS1.A	Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity Structure and Function Connections to Engineering, Technology, and Applications of Science Connections to Nature of Science	ELA/Literacy: RST.6-8.3
<p>10. Reading: Cells, Tissues, and Organs Students recognize levels of organization in plants and animals, including cells, tissues, organs, organ systems, and organisms. They compare the types of cells found in living things and begin to develop the idea that the body is a system of interacting subsystems composed of cells. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS1-1.</p>	MS-LS1.A	Obtaining, Evaluating, and Communicating Information Constructing Explanations and Designing Solutions Engaging in Argument from Evidence	Scale, Proportion, and Quantity Structure and Function Systems and System Models	ELA/Literacy: RST.6-8.9 WHST.6-8.9

FROM CELLS TO ORGANISMS (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>11. Modeling: Energy and Matter in Cells Students read a series of three text passages about the composition of food, breakdown of food, and use of food for matter and energy. After the first passage, they begin to develop a model to explain how organisms obtain matter and energy. After each additional passage, they modify and elaborate their models to account for the new information provided. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS1-7.</p> <p>The activity also addresses conservation of matter from the perspective of reuse of matter, without going to the atomic level.</p>	MS-LS1.A MS-LS1.C MS-PS3.D	Developing and Using Models Constructing Explanations and Designing Solutions Connections to Nature of Science	Energy and Matter	ELA/Literacy: RST.6-8.2 RST.6-8.9
<p>12. Laboratory: The Cells of Plants Students investigate plant-specific cellular structures through microscopy. By comparing photosynthetic and nonphotosynthetic cells, they will identify structures required for photosynthesis. Students will also explore the structure–function relationship between plant-specific structures and photosynthesis.</p>	MS-LS1.A MS-LS1.C MS-PS3.D	Constructing Explanations and Designing Solutions	Energy and Matter Structure and Function	ELA/Literacy: RST.6-8.3
<p>13. Laboratory: A Plant’s Source of Energy Students plan and carry out investigations to collect evidence that plants produce and break down sugars. Students investigate the role of carbon dioxide and light in photosynthesis. Experimental results should lead students to an understanding of how matter (carbon) cycles through a plant. The activity provides an opportunity to assess student work related to Performance Expectation MS-LS1-6.</p>	MS-LS1.C MS-PS3.D	Analyzing and Interpreting Data Planning and Carrying Out Investigations Constructing Explanations and Designing Solutions	Energy and Matter	ELA/Literacy: RST.6-8.3

FROM CELLS TO ORGANISMS (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>14. View and Reflect: Fighting Disease Students explore how knowledge about cell structure and function has helped scientists develop drugs that treat diseases caused by unicellular organisms. A video segment on the discovery of antibiotics to treat infectious disease highlights how scientists formulate and test their explanations using observations and experiments.</p>	MS-LS1.A	Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information	Scale, Proportion, and Quantity Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to Nature of Science	ELA/Literacy: RST.6-8.7 RST.6-8.9
<p>15. Investigation: Disease Detectives Students analyze data to develop hypotheses for the infectious agent causing a disease outbreak. Slides of cultures from patients allow them to support or confirm their hypotheses. The activity concludes with students explaining how an understanding of cells and infectious agents can help medical professionals with the diagnosis and treatment of diseases.</p>	MS-LS1.A	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Connections to Nature of Science	Cause and Effect	ELA/Literacy: RST.6-8.2 WHST.6-8.1