

# Unit 1: From Exploring Molecules to Organisms: Structures and Processes

Content Area: **Science**  
Course(s):  
Time Period: **Marking Period 1**  
Length: **13-14 weeks**  
Status: **Published**

## Unit 1: From Exploring Molecules to Organisms: Structures and Processes

### INTRODUCTION:

**Exploring Life:** Students will explore the features, needs and origins of living things using scientific methods and problem solving. Students will also demonstrate proper use and care of laboratory instruments including the compound light microscope.

**Microscopes and Cells:** Students will learn the importance of the development of microscopes in the discovery of cells and how the Cell Theory is an important theory in science. Students will understand that cells differ in function depending on their role in a multicellular organism. Students will compare and contrast prokaryotic and eukaryotic cells. Students will explore the life processes of cells and how cells and organisms reproduce. Various cell processes support molecule movement to satisfy the needs of living things.

**Human Systems:** Students will learn that different body systems work together to ensure survival of the organism. Students demonstrate age appropriate abilities to plan and carry out investigations to develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models. Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

**Revision Date:** July 2020

### STANDARDS:

CS.6-8.NT	Nature of Technology
CS.6-8.ETW	Effects of Technology on the Natural World
LA.W.7.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.RI.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.SL.7.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.

MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
SCI.MS.LS1.A	Structure and Function
SCI.MS.LS1.D	Information Processing
SCI.MS.LS4.A	Evidence of Common Ancestry and Diversity
SCI.MS.LS4.D	Biodiversity and Humans
SCI.MS.PS3.D	Energy in Chemical Processes and Everyday Life
SCI.MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
SCI.MS-ESS3	Earth and Human Activity
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
SCI.MS-LS4-3	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
SCI.MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
SCI.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.

SCI.MS-LS1	From Molecules to Organisms: Structures and Processes
SCI.MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
SCI.MS-LS4	Biological Evolution: Unity and Diversity
SCI.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
SCI.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.
SCI.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.
WRK.9.2.8.CAP	Career Awareness and Planning
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
TECH.8.1.8.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.9.4.2.TL	Technology Literacy
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.8.CT	Critical Thinking and Problem-solving
TECH.9.4.8.DC	Digital Citizenship
TECH.9.4.8.TL	Technology Literacy
	Engineering design is a systematic, creative, and iterative process used to address local

and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.

Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Planning and carrying out investigations in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

#### Constructing Explanations and Designing Solutions

##### Energy and Matter

Digital tools have a purpose.

Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

##### Systems and System Models

Develop and use a model to describe phenomena.

Cause and effect relationships may be used to predict phenomena in natural systems.

Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.

##### Cause and Effect

Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.

Phenomena that can be observed at one scale may not be observable at another scale.

##### Structure and Function

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

##### Scale, Proportion, and Quantity

Constructing explanations and designing solutions in 6–8 builds on grades K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

## **Essential Questions**

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What characteristics and basic needs are required for life?

In single and multicellular organisms, how do organelles work together to keep the organism alive and maintain equilibrium within the environment?

How does the cycle that exists between photosynthesis and respiration allow organisms to provide themselves with energy?

How do bacteria and viruses impact our lives in both negative and positive ways?

### **Enduring Understandings**

All organisms share common characteristics and needs that separate them from non living things.

Organ systems work together to meet the needs required to keep an organism alive.

### **Objectives**

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Students will be skilled at applying the scientific method to problem solve.

Students will be skilled in using microscopes.

Students will know that living things have certain features and certain needs that must be met.

Students will know that living organisms have a variety of observable features that enable them to obtain food and reproduce.

Students will know that the Cell Theory serves as the basis for scientists who study the parts of cells, how cells are organized, and how cells and organisms reproduce and change through time.

Students will know that organelles are important in the functioning of eukaryotic cells.

Students will know that viruses are nonliving things.

Students will know that some viral diseases can be prevented by vaccines.

Students will know that the heart pumps deoxygenated blood to the lungs and oxygenated blood to the body cells.

Students will know that valves help control the flow of blood through the heart.

Students will know that digestion is the breaking down food into nutrients the body's cells can use, absorption is the taking up of these nutrients by the body and elimination removes wastes from the body.

Students will know that breathing and cellular respiration are different processes.

Students will know that the kidneys are the major excretory organs and help the body to maintain homeostasis.

Students will know how cells are organized in multicellular organisms and how organ systems must work together to ensure survival.

Students will know that photosynthesis is one way autotrophs create their own food.

Students will know that a cycle exists between autotrophs and heterotrophs that work to maintain a balance of oxygen and carbon dioxide in the environment.

Students will know that cells undergo various processes to break down food for energy such as cellular respiration and fermentation.

## **Learning Plan**

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Preview the essential questions and connect to the learning throughout the unit.

View video microscope demonstrations

Participate in microscope usage activities

Use [www.cellsalive.com](http://www.cellsalive.com) interactively

Read and complete the “What’s Cooking” reading activity.

Engage and collaborate in the Magna Cell Activities

Create a cell travel brochure and/or cell storybook.

View video “The Secret Life of 118 Green Street”

View video “The Invisible Cell”

Explore PHSchool.com CODE: CEP1011

Conduct Pasteur’s Lab

Conduct Bacterial/Mold growth and/or Bacterial Culture Lab and/or Antibacterial Lab

Conduct Virus Hunters Lab (science kit)

Conduct Glow-Germ Lab

Participate in the “Who’s the Source of the Infection” activity.

Explain the function of a selectively permeable membrane.

Perform Research projects

Describe the processes of diffusion and osmosis. Compare and contrast active and passive transport.

Computer use: [www.edtech.clas.pdy.edu/osmosis\\_tutorial](http://www.edtech.clas.pdy.edu/osmosis_tutorial):

Conduct Osmosis and Diffusion

Summarize diffusion demonstrations/Diffusion balloons/Carrot diffusion lab

View United streaming video: Maintaining equilibrium

Conduct Internet research on viruses and/or bacteria

Identify how viruses reproduce, grow and cause disease.

Describe some helpful uses of viruses.

Explain how vaccines fight viral infections.

Recognize the work of scientists in the discovery and prevention of disease through a research project.

Explain the natural defenses that your body has against diseases.

Describe the difference between active and passive immunity.

View United streaming video “Understanding Viruses”

View PH video explorations DVD: Viruses and Bacteria

Perform Microscope Lab activities

Discuss the roles of organic and inorganic compounds in cells.

Create drawings of the stages of Mitosis.

Construct Mitosis models

Conduct Photosynthesis/respiration/fermentation labs.

Explain the relationship between diet and health.

Explain how homeostasis is maintained in organisms.

Perform Smart Board Digestive System Activities

View “Food into Fuel” video from Discovery Streaming

View “Digestive and Excretory Systems” video

Perform Frog dissection Laboratory

Conduct “FROGUTS Virtual Dissection”

Create Digestive System model.

Conduct Nutrient Identification lab.

Explore websites [www.yucky.kids.discover.com](http://www.yucky.kids.discover.com), [www.kidshealh.org/kid/body/digest](http://www.kidshealh.org/kid/body/digest)

Discuss the three functions of the respiratory system.

Describe how oxygen and carbon dioxide are exchanged in the lungs and the tissues.

Research three effects of smoking on the human body system.

Perform Lung Function Laboratory

View Respiratory and Circulatory system video

Discuss Heimlich Maneuver and Choking

Compare arteries, veins, and capillaries.

Trace the pathway of blood through the chambers of the heart and through the lungs.

Describe pulmonary, systemic and coronary circulation.

Describe the characteristics and the functions of the parts of blood.

Explain the importance of checking blood types before a transfusion is given.

Perform Pig Heart Dissection Laboratory

Conduct Simulated Blood Typing Laboratory

View “Pumping Life” Video; Discovery Streaming

View “Blood” Video; Discovery Streaming

View Video series: “100 Greatest Discoveries” by the Science Channel

## **Assessment**

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Science courses are designed to promote skill attainment. Student progression and pace through which they proceed through the performance tasks is based on their affinity for and ability to reach skill attainment. The teacher will determine formative and summative skill attainment; alternative assessments will be incorporated for each student based on their strengths and challenges.

### **Formative Assessments:**

Worksheets

Exit Tickets

Class Discussion



*Quizzes:*

Microscope Parts and Functions

Functions of Organelles

Characteristics/Needs of Living Things

Cell Processes - Cell Respiration and Photosynthesis

Body Systems

**Bench Marks:**

*Formal Lab Reports/Lab Write-ups:*

Pasteur Lab

Scientific Method

Fermentation Lab

Photosynthesis Lab

**Alternative :**

Model of Digestive System

Frog Dissection

Heart Dissection

Create Cell Travel Brochure/Cell story

Cell Division Models

**Summative:**

*Unit Tests:*

Scientific Method

Living Things

Cell Processes and Energy

Body Systems

## Cells and Cell Organelles

### *Research Project - Bacteria and Viruses*

#### **Materials**

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Prentice Hall Life Science - Science Explorer

NEWSELA

Computer(s) .

Smartboard .

Powerpoints .

Relevant worksheets/notes .

Relevant videos .

Relevant virtual activities .

Relevant interactive programs .

Safety Equipment .

Microscopes .

Various prepared slides .

Slides/coverslips .

Protozoan samples .

Magnetic cell models .

Bunsen burners .

Flasks .

Test tubes .

Graduated cylinders .

Petri dishes .

Agar .

Spot plates .

Dialysis Tubing .

Glucose solution .

Starch solution .

Glucose test strips .

Iodine .

Bromothymol blue .

Simulated blood .

Elodea .

Cotton swabs .

Frog specimens .

Pig hearts .

Dissection kits .

Circulatory system model .

Heart model .

Digestive system model .