Unit 2: Cells

Content Area: **Science**
Course(s): **Science**
Time Period: **Marking Period 2**
Length: **8-10 Weeks**
Status: **Published**

Unit Overview

In this unit, students will discover that all life is made of cells, be it a single cell or many cells of various types. Students will develop and use a model in order to describe the function of a cell. They will include in their cell the function of all the parts of the cell and how they all contribute to the overall function. Students will understand and construct evidence for how plants create energy (photosynthesis) and how animal cells create energy (respiration) and be able to compare/contrast the chemical equations of each. Students will use arguments supported by research and provide evidence for how the body system works. This system consists of subsystems composed of groups of cells.

Performance Expectations

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.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-6	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.
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.

Three Dimensions

Science and Engineering Practices

SEP.1	Asking Questions and Defining Problems
SEP.2	Developing and Using Models
SEP.3	Planning and Carrying Out Investigations
SEP.4	Analyzing and Interpreting Data
SEP.5	Using Mathematics and Computational Thinking
SEP.6	Constructing Explanations and Designing Solutions

SEP.7	Engaging in Argument from Evidence
SEP.8	Obtaining, Evaluating, and Communicating Information

Disciplinary Core Ideas

LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1- 6)
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

PS3.D: Energy in Chemical Processes and Everyday Life

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)
- 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. (secondary to MS-LS1-7)

Crosscutting Concepts

Cause and Effect

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5)

Scale, Proportion, and Quantity

- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)

Systems and System Models

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex

systems. (MS-LS1-3)

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1- 1)

Connections to Nature of Science

Science is a Human Endeavor

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

Knowledge, Skills, and Assessment

Essential Insights and Understandings/Guiding Questions	Critical Knowledge and Skills	
All life consists of cells. Who discovered cells?What inventions were developed then and now to aid in the cell theory? Where do cells originate from?	**Cells are the basic units of structure and function in living things. The first observations of cells resulted from the invention of the microscope. A microscope is an instrument that makes small objects look larger. Microscopes vary in types such as a simple microscope that contains only one lens or a compound microscope that has more than one lens. Robert Hooke in 1663 was the first to observe a cell when he built his own microscope, looking at a cork and coining the term cell. Simultaneously, scientist Leewenhoek observed tiny objects that were moving in small drops of water and teeth/gum scrapings. He called these tiny moving objects "animalcules." Schleiden, Schwann, and Virchow added to the cell theory to include all plants are made of cells, all animals are made of cells, and all living things are made up of cells. Finally, Virchow concluded all cells come from other cells.**	**A** th ti w **A** ba ce ce m pa **A** m

Skill; SWBAT:

- define the three parts of the cell theory
- provide evidence to support the cell theory
- explain what contributed to the cell theory in regards to technological advancements
- identify the parts of the microscope and functions of the parts
- model proper use of the microscope

A cell consists of smaller parts referred to as organelles.

What are the smaller parts of the cell? How is the cell organized? How do the organelles function as one so the cell can carry out its role within the living organism? What is an organic molecule? Where can organic molecules be found?

The cell is made up of even smaller parts known as organelles. Each organelle carries out specific functions within the cell. Plants and animal cells are both made of cells, but vary in their organelles. They include the following: cell wall, cell membrane, nuclear envelope, nucleus, nucleolus, mitochondria, smooth endoplasmic reticulum, rough endoplasmic reticulum, ribosomes, cytoplasm, chloroplast, golgi body, lysosome, and vacuole.

All cells consist of organic compounds, which all contain Carbon: carbohydrates, lipids, proteins, and nucleic acids. Recall a compound is when two or more elements combine chemically. Many of the organic compounds can be found within the real world in such things as the foods we eat.

Skill; SWBAT:

- compare and contrast plant cell organelles and animal cell organelles
- model the cell and its organelles
- explain the function of each organelle within the cell
- distinguish between an organic and inorganic compound
- identify organic compounds makeup and examples in the real world

Cells to tissue to organ to body system. How does the body function as a whole system that consists of many sub-systems? What is a group of cells tissues, and organs?	**The body of a living thing works as an entire unit with all the parts functioning as one. A group of cells make a tissue, a group of tissues make an organ, organs working together make a system, and all the systems make up the human body working as one.** Skill; SWBAT: • compose a human body • categorize organs • identify connections between each body system	
Plants create their own energy through the process of photosynthesis. How does a plant use the sun as its energy source? How does a plant convert sunlight into energy? What occurs during the process of photosynthesis?	**The sun provides a plant with the energy it needs in order to perform a chemical reaction. The chemical reaction in the plant occurs when a chloroplast captures sunlight. This sunlight is used to produce sugars and oxygen from water and carbon dioxide (carbon dioxide enters in the stomata). The sugar gives the plant its energy while oxygen is produced as a bi-product.** Skill; SWBAT; • formulate the chemical reaction of photosynthesis • trace the movement of matter and the flow of energy within the plant • decipher and compare the two parts of photosynthesis (light dependent and light independent)	

Cells obtain energy through the process of respiration.

What events occur during respiration? What molecular elements and compounds are needed for the chemical reaction to occur? Where does respiration take place?

Respiration is the process by which cells obtain energy from glucose. It is the opposite chemical reaction of photosynthesis. Cells break down simple food molecules like sugar and release the energy. Stage 1 occurs in the cytoplasm of the cell and stage 2 occurs in the mitochondria where oxygen is added, producing water and carbon dioxide.

Skill; SWBAT;

- formulate the chemical reaction of respiration
- trace the movement of matter and the flow of energy within the cell
- compare and contrast respiration and photosynthesis
- decipher and compare the two parts of respiration (stage 1 and stage 2)

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Suggested Resources

Cell Theory

- http://ed.ted.com/on/HFCVlRcL
- http://www.softschools.com/timelines/cell_theory_timeline/96/

Cells and Organelles

- http://www.ck12.org/life-science/Cell-Biology-in-Life-Science/lesson/Cell-Biology-MS-LS/
- http://sciencespot.net/Media/CellsOrganellesWkst.pdf
- http://www.cellsalive.com/cells/cell_model.htm
- http://www.iknowthat.com/ScienceIllustrations/cell/science_desk.swf

Photosynthesis:

- http://www.ck12.org/biology/Photosynthesis/
- http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html
- https://www.biologycorner.com//worksheets/photosynthesis_rate.html
- http://www.biology.emory.edu/multimedia/animation/source2/CH10ReviewRespirationPhotosynthesis.swf

- http://www.eduweb.com/portfolio/studyworks/photosynthesis3b.swf
- http://www.pbs.org/wgbh/nova/nature/photosynthesis.html

Respiration

- http://www.ck12.org/biology/Cellular-Respiration/
- http://www.ck12.org/assessment/tools/geometry-tool/plix.html?eId=SCI.BIO.230&questionId=55c91769da2cfe625ba49d9c&artifactID=2116526&backUrl=http%3A//www.ck12.org/search/%3Fq%3DPhotosynthesis%2520and%2520Cellular%2520Respiration%26source%3Dck12%26grade%3D6%26grade%3D7%26grade%3D8%23interactive
- http://www.sumanasinc.com/webcontent/animations/content/cellularrespiration.html
- http://www.biomanbio.com/GamesandLabs/PhotoRespgames/photoresp.html
- http://www.mhhe.com/biosci/bio_animations/MH01_CellularRespiration_Web/index.html

Technology Integration

- Ck-12 Flexbook
- Chromebooks
- i-Pads
- Cellular Devices
- internet
- SmartBoard
- Google Docs
- Google Apps
- Google Classroom
- quizlet

Differentiation

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments

- Content specific modifications may include: Brain Pop/Crash Course

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher
- Content specific vocabulary important for ELL students to understand include: theory, microscope, cell, organelle, (organelle types), photosynthesis, respiration, body systems, cell wall, cell membrane, nuclear envelope, nucleus, nucleolus, mitochondria, smooth endoplasmic reticulum, rough endoplasmic reticulum, ribosomes, cytoplasm, chloroplast, golgi body, lysosome, and vacuole, organic compounds, carbohydrates, lipids, proteins, and nucleic acids.

Differentiation to extend learning for gifted students may include:

- **Specific Cell Newsletter** Students create a newsletter of a specific type of cell to be distributed as a class article reading.
- **Microscope** Students create and design a simple microscope.
- **Endosymbiotic Hypothesis** Students present and research how symbiotic bacteria lead to specific organelles.
- **Cell Diversity** Work with fungi or protists to study their cell development.
- **What is New in Cellular Technology** Students together write an article weekly about what is new in cellular technology.
- **Earth's Atmosphere** Students learn about how the Earth's atmosphere has changed over time and the role of photosynthesis.
- **Photosynthesis and Respiration** Always the Case? Demonstrate that there are other forms of energy processes.
- **Measuring Food Energy** Students calculate calories in various foods and energy output.

21st Century Skills

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
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.CRP3.1	Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.
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.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
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.CRP8.1	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.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths

	require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.