Unit 06: Cycles and Systems in Science (Week 31 - Week 36)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

Structure and Function of Cells and Organisms (MS-LS1-1):

- Students explore the basic structure of cells and how those structures support the functions of organisms.
- Key concepts include how cells work together to form tissues, organs, and organ systems.

Human Body Systems (MS-LS1-3):

- Students learn about how the human body systems function together to support life.
- They explore the **structure and function** of various organ systems, including the digestive, respiratory, circulatory, and excretory systems.
- The interaction between the systems (e.g., how the circulatory system delivers oxygen to cells) is emphasized.

Interdependence of Human Body Systems (MS-LS1-4):

- Students investigate how different organ systems interact to maintain homeostasis (balance within the body).

Body Systems and Health (MS-LS1-2):

- Students continue to explore how human body systems maintain homeostasis, with a focus on how systems interact.
- This may also include a discussion of health issues, disease prevention, and the impact of lifestyle choices on body function.

Effects of Environmental and Behavioral Factors on Body Systems:

- Students can investigate how environmental factors (like toxins or pollution) and behaviors (like exercise or diet) affect the body's systems.

New Jersey Student Learning Standards

Crosscutting Statements

4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

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

5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and

within systems helps one understand their system's behavior.

Matter is conserved because atoms are conserved in physical and chemical processes.

Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

LS1: From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function

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)

ESS1: Earth's Place in the Universe
ESS1.A: The Universe and Its Stars

Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)

This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)

The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

ESS2: Earth's Systems
ESS2.A: Earth Materials and Systems

All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

ESS2.D: Weather and Climate

Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)

PS3: Energy
PS3.A: Definitions of Energy

Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers

to energy transferred when two objects or systems are at different temperatures. (secondary to MS-PS1-4)

Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (secondary to MS-PS1-4)

SCI.4-PS3	Energy
SCI.4.PS3.A	Definitions of Energy
SCI.1-LS1	From Molecules to Organisms: Structure and Processes
SCI.1.LS1.A	Structure and Function
SCI.1-ESS1	Earth's Place in the Universe
SCI.1.ESS1.A	The Universe and its Stars
SCI.2-ESS2	Earth's Systems
SCI.2.ESS2.A	Earth Materials and Systems
SCI.1.ESS1.B	Earth and the Solar System
SCI.2.ESS2.B	Plate Tectonics and Large-Scale System Interactions
SCI.MS-PS3	Energy
SCI.MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
SCI.3.ESS2.D	Weather and Climate
SCI.MS-LS1	From Molecules to Organisms: Structures and Processes
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-ESS1	Earth's Place in the Universe
SCI.MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
SCI.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
SCI.MS-ESS2	Earth's Systems
SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
3-LS1	From Molecules to Organisms: Structures and Processes
3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.

CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
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.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.8.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.8.A.1	Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e., telephone for communication - smart phone for mobility needs).
TECH.8.2.8.A.2	Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually

	and quantitatively, as well as in words.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.RI.8	Reading Informational Text
LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.RI.8.7	Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
LA.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit…

This unit ties together all fields of science (chemistry, geology, astronomy, and biology) through a common theme of cycles and systems. The purpose of this unit is to (1) to teach science in a way that maintains the integrity of the field as an integrated understanding of our natural world and (2) to review concepts previously taught in middle school in order to prepare students for the NJ state standardized test.

Meaning

Essential Questions

Essential Questions

1. How do scientists classify matter in the universe and how can the interactions of matter be predicted?

2. How do scientists classify astronomical objects and how can their interactions be predicted?

3. How do scientists classify geologic structures and how can their interactions be predicted?

4. How do smaller parts of a larger living system work together to carry out functions required for life

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

1. Matter and atoms are constantly being CYCLED through the universe. Matter is not created or destroyed, but does change form.

2. All matter in the universe is part of a dynamic SYSTEMS of elements, stars, solar systems, and galaxies. The structure, movement, and properties of these astronomical bodies are governed by laws of physics and motion.

3. Minerals, rocks, and landforms, are constantly going through CYCLES that change both their chemical composition and physical composition. These changes help shape the earth and provide us with natural resources.

4.Living things are compromised of smaller parts that interact to form a larger SYSTEM.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

1. Students will know how the terms below are cycled through the universe and contribute to our dynamic understanding of the natural world.

- atoms/matter
- compounds
- minerals/rocks

2. Students will know how the terms/concepts below are smaller parts that interact to form a larger system

- atoms/matter
- compounds
- planets, stars, solar systems, galaxies
- weather patterns
- earth's plates/plate tectonics
- cells, tissues, organs, organ systems, organisms

Skills

Skills

Student will be skilled at …

Identifying the parts of an atom

Classifying matter

Identifying when a chemical reaction has occured

Classifying astronomical bodies based on structure and composition

Predicting interactions and phenomenon of astronomical bodies

Identifying weather patterns

Classifying minerals and rocks based on structure and composition

Modeling and identifying the products of the rock cycle

Identifying the different types of plate (earth) movement and their effect on earth's landforms

Explaining the classification of cells to organisms

Identifying the organ systems of multi-cellular organisms and their function

Explaining how different body systems work together to carry out the functions of life

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

1. Projector

2. Lab Materials (see learning activities for more detail)

3. Elmo

4. Interactive notebooks

5.Interactive notebook materials

6. Student copies (see learning activities for more detail)

Formative Assessment Strategies

Formative Assessment Strategies

1. Quizzes (Wrap-ups)

2. Virtual labs

3. Interactive notebook activities/assignments

4. Labs (based on lab availability/scheduling conflicts).

5. Informal questioning

Learning Activities/Unit of Study

Learning Activities/Unit of Study

1. J-Lab content questions for each standard (see attachment)

2. Lab stations to review related unit standards including board games and interactive websites.

- Chemistry & the Cycling of Matter
- Astronomy and the Universe
- Plate tectonics & Earth systems
- Body Systems

3. Frog pre-lab

4. Frog Dissection

J-Lab content questions for each standard
Frog Dissection

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native

language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.