

Unit 1 | CHARACTERISTICS OF LIVING THINGS

Living Environment

15-20 days



All living things share a set of unique characteristics and processes that define life. While reviewing basic laboratory and microscopy techniques, students will explore the similarity and differences between cell types. Deeply investigating different domains and kingdoms of life allows for an introduction to the history of life on Earth, common ancestry, and evolution, which are key concepts spiraled throughout the remainder of the course.

What makes things living? How can we use evidence to understand the evolution of life on Earth?

UNIT STORYLINE SNAPSHOT



Anchor Phenomenon: The genesis and evolution of life on Earth

How can we use what we know about life on Earth in order to find evidence of life on other planets?

Performance Task: History of Life on Earth



Characteristics of Life

5E Instructional Model Plan

How can we differentiate between life and non-life?



Cell Theory

5E Instructional Model Plan

How are living things both similar to and different from each other?

PLANNING RESOURCES

[Knowledge and Enduring Understandings](#)

[Storyline and Pacing Guide](#)

[Common Core Standards](#)

[NY State Regents Exam Readiness](#)

[NY State Science Standards](#)

[Unit Vocabulary](#)

KNOWLEDGE AND ENDURING UNDERSTANDINGS

Knowledge: (Students will know. . .)

Enduring Understandings



High priority content - required	Mid-priority content - recommended	Low-priority content - not required	
<ul style="list-style-type: none"> Characteristics of life Cell Theory History of life on Earth (Std. 4, Key Idea 1 - PI 1.2, 1.3)	<ul style="list-style-type: none"> Common Ancestry (Evolution of Species) DNA Respiration and photosynthesis (Std. 4, Key Idea 3 - PI 3.1)	<ul style="list-style-type: none"> Dynamic equilibrium (Std. 4, Key Idea 5 - PI 5.1) 	<ul style="list-style-type: none"> Living things have certain characteristics -- ability to reproduce, use of energy, response to stimuli, etc. All living things are made up of cells. There are structures that all cells have in common, and also differences between different types of cells. The similarities among living things can be traced to their common history on Earth.

◆ Storyline and Pacing Guide

Have you taught this unit?
Click to provide feedback!



	Time	Teacher Resource	Driving Questions	What students figure out <i>Ideas that contribute to student thinking about the anchor phenomenon and performance task</i>
 Launch Anchor Phenomenon	1 -2 Days	Link	<i>Can life be found or sustained on other planets such as Mars?</i>	<ul style="list-style-type: none"> Humans are planning to travel to Mars, but we are not certain if life already exists there or can be sustained once we arrive Understanding the history of life on Earth can help us investigate life, or the possibility of life, on other planets



Introduce Performance Task

1 Day

[Link](#)

How did life first appear on Earth?
How has life on Earth changed over time?

- Life on Earth has changed over time
- Environments on Earth have changed over time
- Life and non-life interact



Characteristics of Life

5-6 Days

[5E Plan](#)

How do we define life?
What characteristics does something need to have to be considered alive?

- There are characteristics (life processes) that all living things have in common, which can provide evidence for common descent and insight into possible life elsewhere
- Cells have some structures in common; but also have differences that enable them to exploit different resources



Return to the performance task and engage students in revising their timeline based on the new evidence and ideas generated in the Characteristics of Life instructional sequence. At this point in the unit, students should have been able to clarify their understanding around the difference between a (non-living) protobiont, RNA (non-living), and the first prokaryotic cell. Revisit the **Unit Driving Question Board** - are there questions that have been addressed in this 5E plan? -- have new questions been brought to the forefront?



Cell Theory

5-8 Days

[5E Plan](#)

How do early and current organisms (prokaryotic and eukaryotic animal and plant cells) differ; and why do they differ?
How are they similar?
How do organelles within the cell work together to accomplish life processes (maintain homeostasis?)

- All life is made up of cells -- which come from preexisting cells (Cell Theory)
- All cell types have some structures in common (e.g. cell membrane) and some structures that are different (e.g. nucleus) due to their evolutionary history, ecological role, and/or how they obtain energy from their environment
- Unicellular organisms are able to engage in all life processes
- Multicellular organisms are made up of many (specialized) cells that work together to accomplish all life processes



Return to the performance task and prompt students to revise their timeline based on the new evidence and ideas generated in the Cell Theory instructional sequence. After exploring the similarities and differences between different types of cells (and domains of life) students will have a deeper understanding of the evolutionary relationships between organisms, and the interaction between life and the environment over time.

Revisit the **Unit Driving Question Board** - are there questions that have been addressed in this 5E plan? -- have new questions been brought to the forefront?



**Complete
Performance
Task**

2 Days

[Link](#)

How did life first appear on Earth?

How has life on Earth changed over time?

How can we use what we know about the evolution of life on Earth in order to find evidence of life on other planets?

- Life and environments on Earth have changed over time, this evolutionary history may provide clues to finding life on other planets
- Although all forms of life have some similar requirements (e.g. an energy source) organisms have adapted to live in very different environments
- All life on Earth have a common evolutionary history (common ancestor)

◆ NY State Regents Exam Readiness



Regents Topics (from 1996 standards)	Historical Coverage (over the last 5 administrations of LE Regents) ¹	More Details <i>How is this addressed in the unit?</i>
Human body structure and function	4%	Cells and organelles are explored in the Cell Theory 5E Plan
Evolution of Life on Earth	10%	History of Life on Earth Performance Task - introduces students to the ideas of evolution, through their prior knowledge. Evolution is discussed in more depth in later units.
Dynamic equilibrium and biochemistry	6%	The biochemical reactions (such as photosynthesis) are introduced in both the Characteristics of Life and Cell Theory 5E plans. These concepts will be explored in more depth in later units.
Organism complexity	1%	Homeostasis in unicellular organisms is explored in the Cell Theory 5E Plan
<u>Unit 1 Regents Item Bank</u>		

◆ New York State Science Standards

¹ [Regents Tool](#); [Awesome table](#)



NY State MST Standards (1996)

This unit was designed to address the following NY State 1996 Standards.

Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

PI 1.2 Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles).

PI 1.3 Explain how a one-celled organism is able to function despite lacking the levels of organization present in more complex organisms.

Key Idea 3: Individual organisms and species change over time

Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life

PI 5.1 - Explain the basic biochemical processes in living organisms and their importance in maintaining dynamic equilibrium.

[New York State Core Curriculum Standards Crosswalk - Living Environment](#)

NYSSLS (2017)

As designed, this unit works towards the following NYSSLS Performance Expectations, with partial alignment.

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

[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one cell or many and varied cells.]

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.

[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.]
[Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical details related to the functions of cells or cell parts.]

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

[Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

◆ Common Core Learning Standards

Reading	Writing
<p>9-10.R.ST.2 Reading: Key Ideas and Details</p> <p>Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</p> <p>9-10.R.ST.3 Reading: Key Ideas and Details</p> <p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.</p> <p>9-10.R.ST.9 Reading: Integration of Knowledge and Ideas</p> <p>Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</p>	<p>9-10.W.HST.10 Writing: Range of Writing</p> <p>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</p>
Listening	Speaking

◆ Unit Vocabulary

Consider using this list to guide the Explain or Elaborate portions of the 5E plans, and use it as reference for peer to peer vocabulary based discussions.

Unit Vocabulary by 5E / Topic	Domain Specific	Tier II
5E: CHARACTERISTICS OF LIFE	biotic abiotic organism homeostasis* cells* inorganic / organic reproduce evolve/evolution* heredity* stimulus* virus*	characteristic example commonalities respond grows develop complex maintain hypothesis living nonliving dead

<p>5E: CELL THEORY</p>	<p>cell micrograph kingdoms (of life) domains eukaryotes / eukaryotic prokaryotes / prokaryotic Organelles (<i>Regents-aligned organelles and parts in box below</i>)</p> <div data-bbox="747 386 1352 750" style="border: 1px solid black; padding: 5px;"> <p>DNA cytoplasm nucleus plasma/cell membrane ribosomes mitochondria chloroplast vacuole cell wall flagellum</p> </div> <p>iodine unicellular / multicellular endosymbiotic theory tissue / organ / organ system* ameba (amoeba)</p>	<p>observe structure preexisting complex theory evidence hypothesis cooperation scale vs. size materials</p>
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*terms that may be encountered, but not fully defined or explored in this 5E Cycle

[Click here to access the 2016-2017 version of this unit plan](#)

