

SCIENCE – UNIFYING STANDARDSTHE NATURE OF SCIENCE

- 1.0 **Research and Investigation:** Students understand that science is a way of learning about the natural world. They use scientific inquiry and develop ideas based on data collected from investigations they design.
- 2.0 **Communication:** Students understand that the universe can be described by principles derived through scientific inquiry. They effectively communicate their understanding of ideas developed in scientific investigation through a variety of media.
- 3.0 **Connections and Implications:** Students review the consequences of the process and products of scientific inquiry. They understand the role that scientific advances have had throughout history.

EARTH SCIENCE

- 1.0 **Characteristics of the Universe:** Students understand Earth-based and space-based astronomy reveals the structure, scale, and dynamic nature of the solar system, stars, galaxies, and the universe.
- 2.0 **The Dynamic Earth:** Students understand that the Earth is constantly changing and being shaped due to a variety of natural events, processes, and human activity. The Earth is a collection of interacting cycles, structures, and processes that can be described in terms of space, time, energy, and matter.

LIFE SCIENCE

- 1.0 **Diversity and Interdependence:** Students understand that living things are diverse and interdependent. They recognize the relationship between cooperation and competition among organisms in ecosystems.
- 2.0 **Cellular Structures and Functions:** Students understand that cells are the basic structures of all living systems. They understand the complementary relationship between the structure and function of cells, organs, organ systems, whole organisms, and ecosystems.
- 3.0 **Change and Evolution:** Students understand that living things grow, develop, change, and evolve through time, depending on environmental influences. They know that traits of species can change through generations and that instruction of traits is contained in the genetic material of organisms.

PHYSICAL SCIENCE

- 1.0 **Forces and Motion:** Students understand the nature of forces and the relationship between forces and motion. They recognize that the relationship is described by one set of laws. They understand that all matter is in motion and that motion changes as a result of forces between matter. They realize that these forces affect everyday life, and that the effects can be identified, measured, and predicted.
- 2.0 **Energy, Momentum and Transformation:** Students understand that when matter interacts with matter, energy and momentum can be transferred or distributed, and that energy may be transformed. When matter interacts the total amount of matter, energy, and momentum remain the same.
- 3.0 **Structure and Properties of Matter:** Students understand that all matter is made up of particles. They understand the relationship between the structure and properties of matter. They know that a finite number of basic elements combine in various ways which determine all properties, characteristics, and behaviors of matter.

**EARTH SCIENCE**  
**Level 7**

**1.0 Characteristics of the Universe:** Students understand Earth-based and space-based astronomy reveals the structure, scale, and dynamic nature of the solar system, stars, galaxies, and the universe.

Focus Goals

1.0 Not addressed at this level.

**2.0 The Dynamic Earth:** Students understand that the Earth is constantly changing and being shaped due to a variety of natural events, processes, and human activity. The Earth is a collection of interacting cycles, structures, and processes that can be described in terms of space, time, energy, and matter.

Focus Goals

2.1 Describe and explain how rocks provide evidence for understanding the process of evolution.

**3.0 Structure and Properties of Matter:** Students understand that all matter is made up of particles. They understand the relationship between the structure and properties of matter. They know that a finite number of basic elements combine in various ways which determine all properties, characteristics, and behaviors of matter.

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**2.1 Describe and explain how rocks provide evidence for understanding the process of evolution.**

- θ Recognize that Earth processes today are similar to those of the past and that slow geologic processes have large cumulative effects over long periods of time (c4a/n)
- θ Explain how major catastrophic events, such as volcanic eruptions or the impact of asteroids have disrupted life processes throughout history. (c4b/n)
- θ Explain how rock cycles include the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom.(c4f/n)
- θ Identify how the evidence from geologic layers and radioactive dating indicate the Earth is approximately 4.6 billion years old, and that life has existed for more than 3 billion years. (c4g/n)
- θ Investigate how movements of the tectonic plates, changes in climate and geographical connections have affected the past and present distribution of organisms. (c4c)
- θ Explain significant developments including extinction of plant and animal life, on the geologic time scale. (c4d)

**3.0 Structure and Properties of Matter:** Students understand that all matter is made up of particles. They understand the relationship between the structure and properties of matter. They know that a finite number of basic elements combine in various ways which determine all properties, characteristics, and behaviors of matter.

**3.1 Not addressed at this level.**

**FOCUS ON LIFE SCIENCE**

**Level 7**

**1.0 Diversity and Interdependence:** Students understand that living things are diverse and interdependent. They recognize the relationship between cooperation and competition among organisms in ecosystems.

Focus Goals

1.1 Understand that living groups of diverse organisms can be classified by characteristics.

**2.0 Cellular Structures and Functions:** Students understand that cells are the basic structures of all living systems. They understand the complementary relationship between the structure and function of cells, organs, organ systems, whole organisms, and ecosystems.

Focus Goals

2.1 Understand the characteristics and functions of cells.

2.2 Understand the complementary nature of the structure and function in living organisms.

**3.0 Change and Evolution:** Students understand that living things grow, develop, change, and evolve through time, depending on environmental influences. They know that traits of species can change through generations and that instruction of traits is contained in the genetic material of organisms.

Focus Goals

3.1 Know and understand that cells contain the genetic instructions for traits.

3.2 Understand that the diversity of species occurs as a gradual process resulting from evolution over many generations.

3.3 Understand the various lines of evidence that provide a basis for the theory of evolution.

**FOCUS ON LIFE SCIENCE****Level 7**

**1.0 Diversity and Interdependence:** Students understand that living things are diverse and interdependent. They recognize the relationship between cooperation and competition among organisms in ecosystems.

**1.1 Understand that living groups of diverse organisms can be classified by characteristics.**

θ Construct a simple branching chart that illustrates classification based on shared derived characteristics, and expand the diagram to include fossil organisms. (c3d/n)

**2.0 Cellular Structures and Functions:** Students understand that cells are the basic structures of all living systems. They understand the complementary relationship between the structure and function of cells, organs, organ systems, whole organisms, and ecosystems.

**2.1 Understand the characteristics and functions of cells.**

θ Demonstrate and explain how cells function similarly in all living organisms. (c1a/n)

θ Define how plant cells and animal cells can be distinguished by characteristics including chloroplasts and cell walls. (c1b/n)

θ Identify the nucleus as the repository for genetic information in plant and animal cells. (c1c/n)

θ Demonstrate how Mitochondria liberate energy for the work that cells do, and chloroplasts capture sunlight energy for photosynthesis. (c1d/n)

θ Explain the process of mitosis in which cells divide resulting in two daughter cells with identical sets of chromosomes. (c1e/n)

θ Explain how cells differentiate and multicellular organisms develop. (c1f/n)

**2.2 Understand the complementary nature of the structure and function in living organisms.**

θ Identify and describe levels of organization for structure and function, in plants and animals, including cells, tissues, organs, organ systems, and the whole organism. (c5a/n)

θ Demonstrate how bones and muscles work together to provide a structural framework for movement. (c5c/n)

θ Recognize how the reproductive organs of humans generate eggs and sperm, and how sexual activity may lead to fertilization and pregnancy. (c5d/n)

θ Define the function of the umbilicus and placenta during pregnancy. (c5e)

θ Define structures and processes by which flowering plants generate pollen and ovules, seeds, and fruit. (c5f/n)

θ Demonstrate how the structures of the eye and ear relate to their functions. (c5g/n)

θ Demonstrate how contractions of the heart generate blood pressure, and heart valves prevent back flow of blood in the circulatory system. (c6j/n)

**3.0 Change and Evolution:** Students understand that living things grow, develop, change, and evolve through time, depending on environmental influences. They know that traits of species can change through generations and that instruction of traits is contained in the genetic material of organisms.

**3.1 Know and understand that cells contain the genetic instructions for traits.**

- θ Identify the differences between the life cycles and reproduction of sexual and asexual organisms. (c2a)
- θ Recognize that sexual reproduction produces offspring that inherit half their genes from each parent. (c2b/n)
- θ Explain how inherited traits can be determined by one or more genes. (c2c/n)
- θ Explain that plant and animal cells contain thousands of different genes, and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive. (c2d)
- θ Explain how dominant and recessive traits are determined in plant and animal cells.
- θ Know that DNA is the genetic material of living organisms, and is located in the chromosomes of each cell. (c2e/n)

**3.2 Understand that the diversity of species occurs as a gradual process resulting from evolution over many generations.**

- θ Recognize how genetic variation and environmental factors cause evolution and diversity of organisms. (c3a/n)
- θ Explain the reasoning used by Darwin in making his conclusion that natural selection is the mechanism of evolution. (c3b/n)
- θ Know that fossils provide evidence of how life and environmental conditions have changed. (c4e/n)
- θ Explain how extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival. (c3e/n)

**3.3 Understand the various lines of evidence that provide a basis for the theory of evolution.**

- θ Identify independent lines of evidence from geology, fossils, and comparative anatomy. (c3c/n)

**PHYSICAL SCIENCE****Level 7**

**1.0 Forces and Motion:** Students understand the nature of forces and the relationship between forces and motion. They recognize that the relationship is described by one set of laws. They understand that all matter is in motion and that motion changes as a result of forces between matter. They realize that these forces affect everyday life, and that the effects can be identified, measured, and predicted.

Focus Goals

1.1 Understand the physical principles that underlie biological structures and functions.

**2.0 Energy, Momentum and Transformation:** Students understand that when matter interacts with matter, energy and momentum can be transferred or distributed, and that energy may be transformed. When matter interacts the total amount of matter, energy, and momentum remain the same.

Focus Goals

2.1 Understand physical principles that underlie the structure and function of the eye.

**3.0 Structure and Properties of Matter:** Students understand that all matter is made up of particles. They understand the relationship between the structure and properties of matter. They know that a finite number of basic elements combine in various ways which determine all properties, characteristics, and behaviors of matter.

Focus Goals

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**1.1 Understand the physical principles that underlie biological structures and functions.**

θ Compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints). (c6h)

θ Demonstrate how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system. (c6i)

**2.0 Energy, Momentum and Transformation:** Students understand that when matter interacts with matter, energy and momentum can be transferred or distributed, and that energy may be transformed. When matter interacts the total amount of matter, energy, and momentum remain the same.

**2.1 Understand physical principles that underlie the structure and function of the eye.**

θ Know that light emitted by or scattered from an object must enter the eye to be seen. (c6b/n)

θ Explain how light travels in straight lines except when the medium for traveling changes. (c6c/n)

θ Describe how simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope. (c6d/n)

θ Know that white light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths. (c6e/n)

θ Explain how light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). (c6f/n)

θ Demonstrate how the angle of reflection of a light beam is equal to the angle of incidence. (c6g/n)

**3.0 Structure and Properties of Matter:** Students understand that all matter is made up of particles. They understand the relationship between the structure and properties of matter. They know that a finite number of basic elements combine in various ways which determine all properties, characteristics, and behaviors of matter.

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## THE NATURE OF SCIENCE

### Level 7

**1.0 Research and Investigation:** Students understand that science is a way of learning about the natural world. They use scientific inquiry and develop ideas based on data collected from investigations they design.

#### Focus Goals

- 1.1 Understand how to develop questions that can be answered through careful investigations.
- 1.2 Understand the process of scientific inquiry.

**2.0 Communication:** Students understand that the universe can be described by principles derived through scientific inquiry. They effectively communicate their understanding of ideas developed in scientific investigation through a variety of media.

#### Focus Goals

- 2.1 Communicate scientific procedures and explanations.

**3.0 Connections and Implications:** Students review the consequences of the process and products of scientific inquiry. They understand the role that scientific advances have had throughout history.

#### Focus Goals

- 3.1 Recognize and explain the benefits and consequences of technological solutions.
- 3.2 Explore careers in science.
- 3.3 Apply Literacy skills to make scientific connections.

**THE NATURE OF SCIENCE****Level 7**

**1.0 Research and Investigation:** Students understand that science is a way of learning about the natural world. They use scientific inquiry and develop ideas based on data collected from investigations they design.

**1.1 Understand how to develop questions that can be answered through careful investigations.** (c)

- θ Identify control and variable factors when designing and conducting investigations. (\*)
- θ Select and use appropriate tools and technology, including calculators, computers, balances, spring scales, and microscopes to perform test, collect and display data. (c/7a)
- θ Utilize a variety of print and electronic resources to collect information as evidence as a research project. (c/7b)

**1.2 Understand the process of scientific inquiry.** (n)

- θ Practice questioning, skepticism, and evaluation skills.
- θ Think critically and logically to develop the relationship between evidence and explanation.
- θ Recognize that there are multiple explanations to scientific investigations.

**2.0 Communication:** Students understand that the universe can be described by principles derived through scientific inquiry. They effectively communicate their understanding of ideas developed in scientific investigation through a variety of media.

**2.1 Communicate scientific procedures and explanations.**

- θ Develop predictions, descriptions, models, and explanations, based on evidence. (n)
- θ Construct scale models, maps and labeled diagrams to communicate knowledge. (c/7d)
- θ Explain the steps and results from investigations in written reports and oral presentations. (c/7e)

**3.0 Connections and Implications:** Students review the consequences of the process and products of scientific inquiry. They understand the role that scientific advances have had throughout history.

**3.1 Recognize and explain the benefits and consequences of technological solutions.** (n)

- θ Identify influences and contributions of science and technology to society.
- θ Identify intended and unintended benefits of technological solutions.
- θ Describe contributions that have been made by many people and cultures to science and technology.
- θ Learn the ethical codes for research involving humans.

**3.2 Explore careers in science.** (c)

θ Determine the people engaged in science and how they work.

θ Research careers that require scientific skills and knowledge and describe how they are applied.

**3.3 Apply Literacy skills to make scientific connections.** (p-Literacy Standards)

θ Learn and use science vocabulary encountered through reading informational text. (R-1.0)

θ Read, comprehend, analyze, and evaluate scientific information. (R-2.0)

θ Write scientific research and investigation reports. (W-2.0)

θ Use technology and reference sources to locate and interpret information on science topics. (W-3.0)

θ Deliver informative and investigation presentations on scientific topics. (L/S-3.0)