

## **Science**

**Grade:** 6

**Domain:** Astronomy

### **Domain Description**

Astronomy refers to understanding the history and progression of scientific views of the universe. This domain also refers to determining the position and motion of Earth, the Moon, and the Sun, recognizing the relationship of gravity to the motions within the Solar System, and comparing and contrasting the basic characteristics of planets, asteroids, and meteors.

### **Standards Associated with Domain**

S6E1

S6E2

### **Associated Concepts, Skills, and Abilities**

- Demonstrate understanding of current scientific views of the universe and how those views evolved
- Describe the position of the Solar System in the Milky Way and the universe
- Compare and contrast planets in terms of:
  - size relative to Earth
  - surface and atmospheric features
  - relative distance from the Sun
  - ability to support life
- Explain the motion of objects in the day and night sky in terms of relative position
- Explain that gravity is the force that governs the motions in the Solar System
- Differentiate between the characteristics of comets, asteroids, and meteors
- Interpret models and describe the alignment of Earth, the Moon, and the Sun during the phases of the Moon
- Interpret models and describe the alignment of Earth, the Moon, and the Sun during solar and lunar eclipses
- Relate the tilt of Earth to the distribution of sunlight throughout the year
- Distinguish how the various angles of the sunlight on the surface of Earth affect climate and seasons

## Science

Grade: 6

Domain: Hydrology and Meteorology

### Domain Description

Hydrology and Meteorology refers to describing the physical characteristics of oceans and other sources of water, and explaining the cause of ocean movements. This domain also refers to understanding the interactions between land, water, and the atmosphere, recognizing the formation of weather events, interpreting weather patterns, and identifying the tools used to observe, measure, and forecast weather.

### Standards Associated with Domain

S6E3

S6E4

S6E6

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding that a large portion of Earth’s surface consists of water, such as:
  - oceans
  - rivers
  - lakes
  - underground water
  - ice
- Relate various atmospheric conditions to stages of the water cycle
- Describe characteristics of the world’s oceans, such as:
  - composition
  - location
  - subsurface topography
- Explain the causes of ocean movements, such as:
  - waves
  - currents
  - tides
- Demonstrate understanding that land and water absorb and lose heat at different rates
- Explain the effects of unequal heating of land and water surfaces, such as:
  - wind systems
  - weather patterns
  - weather events
- Relate how moisture evaporating from oceans affects weather patterns and weather events
- Demonstrate understanding of the conditions under which clouds form
- Explain the role of the Sun as the major source of energy and the Sun’s relationship to wind and water energy

## Science

Grade: 6

Domain: Geology

### Domain Description

Geology refers to comparing and contrasting Earth's interior and surface, describing the formation of rocks, soils, and fossils, and explaining the effects of physical processes on geological features. This domain also refers to describing methods for conserving natural resources, identifying renewable and nonrenewable resources, and understanding how scientific knowledge is achieved and organized.

### Standards Associated with Domain

S6E5

S6E6

### Associated Concepts, Skills, and Abilities

- Compare and contrast the characteristics of Earth's crust, mantle, and core, such as:
  - temperature
  - density
  - composition
- Describe the composition of rocks in terms of minerals
- Classify rocks by their process of formation
- Describe processes that change rocks and the surface of Earth
- Demonstrate understanding that lithosphere plates constantly move and cause major geological events on Earth's surface
- Describe the physical processes that affect Earth's surface, such as:
  - plate tectonics
  - erosion
  - deposition
  - volcanic eruption
  - gravity
- Identify how fossils show evidence of the changing surface and climate of Earth
- Describe soil as consisting of weathered rocks and decomposed organic material
- Explain the effects of human activity on the erosion of Earth's surface
- Determine methods for conserving natural resources such as water, soil, and air
- Distinguish between renewable and nonrenewable resources

## Science

Grade: 6

### Characteristics of Science

Characteristics of Science items are integrated across the three content domains.

Characteristics of Science refers to understanding the process skills used in the learning and practice of science. These skills include testing a hypothesis, record keeping, using correct safety procedures, using appropriate tools and instruments, applying math and technology, analyzing data, interpreting results, and communicating scientific information. Characteristics of Science also refers to understanding how science knowledge grows and changes and the processes that drive those changes.

#### Standards Associated with Characteristics of Science:

S6CS1	S6CS2	S6CS3	S6CS4
S6CS5	S6CS6	S6CS7	S6CS8
S6CS9			

#### Associated Concepts, Skills, and Abilities:

- Demonstrate understanding of the important factors in keeping records, such as:
  - honesty
  - clarity
  - accuracy
- Demonstrate understanding that hypotheses can be valuable, even if they turn out not to be completely accurate
- Explain the correct procedures for use of scientific apparatus
- Describe appropriate techniques in all laboratory situations
- Explain the correct protocol for identifying and reporting safety problems and violations
- Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as:
  - integers
  - decimals
- Determine the proper units for expressing answers of scientific calculations by using metric input units, such as:
  - seconds
  - meters
  - grams per milliliter
- Describe the importance of accuracy and precision and their relationship to each other
- Analyze data to determine valid conclusions
- Demonstrate understanding of how a change in one part of a system would cause a change other parts of the system

- Read analog and digital meters on instruments and choose appropriate units to make direct measurements, such as:
  - length
  - elapsed time
  - volume
  - rates
  - weight
  - temperature
- Explain how parts are related to other parts in systems
- Demonstrate understanding of how the output from one part of a system can become the input to other parts
- Organize scientific information and determine relationships shown in representations, such as:
  - tables
  - charts
  - graphs
- Evaluate claims based on unclear sources or on statements made by people outside their area of expertise
- Recognize that there may be more than one way to interpret a given set of findings
- Determine whether the results in similar investigations are trivial or significant
- Explain the importance of completing further investigations before accepting results as meaningful
- Demonstrate understanding that when new experimental results are inconsistent with an existing, well-established theory, scientists may require further experimentation to decide whether the results are flawed or the theory requires modification
- Recognize that scientific knowledge may change when prevailing theories are challenged by new information
- Demonstrate understanding that scientific investigations are conducted for different reasons but usually involve similar steps, such as:
  - collecting evidence
  - reasoning
  - devising hypotheses
  - formulating explanations
- Demonstrate understanding that scientists can collaborate to design research. Conduct independent studies to answer the same questions and help prevent bias
- Explain the important factors for maintaining an investigator's credibility, such as:
  - accurate record keeping
  - data sharing
  - replication of results
- Demonstrate understanding that scientists use technology and mathematics to enhance the process of scientific inquiry
- Demonstrate understanding that scientists must adhere to the ethics of science when conducting research, and special care must be taken when human and animal subjects are used in scientific research

## Science

Grade: 7

Domain: Cells and Genetics

### Domain Description

Cells and Genetics refers to differentiating between the component parts of cells and understanding their functions and interactions, categorizing groups of cells and recognizing the functions and interactions of these groups, identifying the roles of genes and chromosomes in reproduction, and comparing and contrasting types of reproductive processes.

### Standards Associated with Domain

S7L2

S7L3

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding of how cells take in nutrients in order to grow, divide, and make needed materials
- Correlate cell structures to basic cell function, such as:
  - cell membrane
  - nucleus
  - cytoplasm
  - chloroplast
  - mitochondria
- Categorize cells and groups of cells by levels of cellular organization, such as:
  - cells are organized into organs
  - organs are organized into systems
  - systems are organized into organisms
- Explain the role of the functions of the tissues, organs, and major organ systems in the human body and demonstrate understanding of the interactions of these systems, such as:
  - digestion
  - respiration
  - reproduction
  - circulation
  - excretion
  - movement
  - control
  - coordination
  - protection from disease
- Explain the role of genes and chromosomes in the process of inheriting a specific trait
- Compare and contrast asexual and sexual reproduction for organisms, such as:
  - animals
  - plants
  - fungi
  - bacteria

- protists
- Demonstrate understanding that selective breeding can produce plants or animals with desired traits

## Science

Grade: 7

Domain: Interdependence of Life

### Domain Description

Interdependence of Life refers to recognizing the relationships that organisms have with themselves, each other, and their environments, understanding food webs and how environmental change and competitive and beneficial relationships affect individual organisms and entire species, and comparing and contrasting Earth's major terrestrial and aquatic biomes.

### Standards Associated with Domain

S7L4

### Associated Concepts, Skills, and Abilities

- Evaluate how matter is transferred in a food web from one organism to another, such as:
  - from producer to consumer
  - from consumer to consumer
  - from consumer to decomposer
- Demonstrate understanding of how matter can recycle between organisms and their environments
- Demonstrate understanding that energy that originates from the Sun moves from organism to organism within a food web
- Predict how changes in environmental conditions can affect the survival of both individuals and entire species
- Categorize relationships between organisms that are competitive or mutually beneficial, such as:
  - predator/prey
  - competition
  - commensalism
- Compare and contrast the characteristics of Earth's major terrestrial and aquatic biomes:
  - tropical rain forest
  - savannah
  - temperate
  - desert
  - taiga
  - tundra
  - mountain
  - freshwater
  - estuaries
  - marine

## **Science**

**Grade:** 7

**Domain:** Evolution

### **Domain Description**

Evolution refers to understanding how organisms adapt to their environment over time and generations through natural selection, determining how natural selection affects the survival of species, and using the fossil record to study the evolution of life.

### **Standards Associated with Domain**

S7L5

### **Associated Concepts, Skills, and Abilities**

- Explain how physical characteristics of organisms have changed over successive generations, some examples may include:
  - Darwin's finches
  - peppered moths
- Demonstrate understanding of the processes of natural selection
- Determine how the reproduction and survival of species is impacted by natural selection, some examples may include:
  - mimicry
  - camouflage
  - venom
- Demonstrate understanding that the fossil record found in sedimentary rock provides evidence for evolution

## Science

Grade: 7

### Characteristics of Science

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### Standards Associated with Characteristics of Science

S7CS1	S7CS2	S7CS3	S7CS4
S7CS5	S7CS6	S7CS7	S7CS8
S7CS9	S7L1		

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding of the important factors in keeping records, such as:
  - honesty
  - clarity
  - accuracy
- Demonstrate understanding that hypotheses can be valuable, even if they turn out not to be completely accurate
- Explain correct procedures for using scientific apparatus
- Describe appropriate techniques in laboratory situations
- Explain the correct protocol for identifying and reporting safety problems and violations
- Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as:
  - integers
  - fractions
  - decimals
  - percents
- Distinguish between the mean, median, and mode of scientific data
- Apply the metric system to scientific investigations
- Convert between metric units
- Analyze data to determine valid conclusions
- Determine what degree of precision is adequate, and round off appropriately
- Describe the importance of accuracy and precision and their relationship to each other
- Identify appropriate tools for measuring objects and/or substances
- Explain how parts are related to other parts in a system

- Organize scientific information and determine relationships shown in representations, such as:
  - tables
  - charts
  - graphs
- Evaluate claims based on unclear sources or on statements made by people outside their area of expertise
- Identify the flaws of reasoning that are based on poorly designed research, such as:
  - facts intermingled with opinion
  - conclusions based on insufficient evidence
  - small samples of data
  - biased samples
  - samples for which there was no control
- Recognize that there may be more than one way to interpret a given set of findings
- Determine whether the results in similar investigations are trivial or significant
- Explain the importance of completing further investigations before accepting results as meaningful
- Demonstrate understanding that when new experimental results are inconsistent with an existing, well-established theory, scientists may require further experimentation to decide whether the results are flawed or the theory requires modification
- Recognize that scientific knowledge may change when prevailing theories are challenged by new information
- Demonstrate understanding that scientific investigations are conducted for different reasons, such as
  - exploring new phenomena
  - confirming previous results
  - testing how well a theory predicts
  - comparing competing theories
- Demonstrate understanding that scientific investigations usually involve similar steps, such as:
  - collecting evidence
  - reasoning
  - devising hypotheses
  - formulating explanations
  - effects of one variable on another
  - keeping a constant
- Demonstrate understanding that scientists can collaborate to design research. Conduct independent studies to answer the same questions and help prevent bias
- Explain the important factors for maintaining an investigator’s credibility, such as:
  - accurate record keeping
  - data sharing
  - replication of results
- Demonstrate understanding that scientists use technology and mathematics to enhance the process of scientific inquiry
- Demonstrate understanding that scientists must adhere to the ethics of science when conducting research, and special care must be taken when human and animal subjects are used in scientific research

- Classify organisms based on physical characteristics using a dichotomous key of the six-kingdom system

## Science

Grade: 8

Domain: Structure of Matter

### Domain Description

Structure of Matter refers to distinguishing between atoms and molecules, pure substances and mixtures, physical and chemical properties, and physical and chemical changes in matter. This domain also refers to understanding the organization of the Periodic Table of Elements and explaining the Law of Conservation of Matter.

### Standards Associated with Domain

S8P1

### Associated Concepts, Skills, and Abilities

- Distinguish between atoms and molecules
- Recognize pure substances as elements or compounds
- Explain the difference between pure substances and mixtures
- Describe the movement of particles in different states of matter, such as:
  - solid
  - liquid
  - gas
  - plasma
- Recognize physical properties of matter, such as:
  - density
  - melting point
  - boiling point
- Recognize chemical properties of matter, such as:
  - reactivity
  - combustibility
- Distinguish between properties of matter as physical properties or chemical properties
- Differentiate between changes in matter as physical changes or chemical changes
- Recognize that more than 100 elements can be organized based on similar characteristics
- Explain that some elements have similar properties as shown on the Periodic Table of Elements, such as metals and nonmetals
- Demonstrate understanding of the Law of Conservation of Matter

## Science

Grade: 8

Domain: Force and Motion

### Domain Description

Force and Motion refers to describing the relationship between force, mass, and the motion of objects including the effects of simple machines. This domain also refers to explaining the relationship between mass and gravity, comparing and contrasting series and parallel circuits, and recognizing that electric currents and magnets can exert force on each other.

### Standards Associated with Domain

S8P3

S8P5

### Associated Concepts, Skills, and Abilities

- Determine the relationship between velocity and acceleration
- Demonstrate understanding of the effect of balanced and unbalanced forces
- Explain the relationship between the amount of force needed to move an object and its mass (inertia)
- Explain the effect of forces (gravity and friction) on the motion of an object
- Demonstrate understanding of the effect on work by simple machines, such as:
  - levers
  - inclined planes
  - pulleys
  - wedges
  - screws
  - wheels and axles
- Explain that every object exerts gravitational force on every other object
- Explain that the gravitational force exerted on objects depends on how much mass the objects have and how far apart they are
- Describe the advantages and disadvantages of series and parallel circuits
- Distinguish between how series and parallel circuits transfer energy
- Explain that electric currents and magnets can exert force on each other

## Science

Grade: 8

Domain: Energy and its Transformation

### Domain Description

Energy and its Transformation refers to understanding the Law of Conservation of Energy, the relationship between potential and kinetic energy, comparing and contrasting forms of energy, and describing how heat is transferred. This domain also refers to investigating light, sound, electromagnetic, and mechanical waves.

### Standards Associated with Domain

S8P2

S8P4

### Associated Concepts, Skills, and Abilities

- Explain energy transformation in terms of the Law of Conservation of Energy
- Describe the relationship between potential and kinetic energy
- Compare and contrast different forms of energy, such as:
  - heat
  - light
  - electricity
  - mechanical motion
  - sound
- Describe the transfer of heat by different processes, such as:
  - the collision of atoms in matter by conduction
  - the movement through space by radiation
  - the flow of currents in a liquid or gas by convection
- Recognize the characteristics of electromagnetic and mechanical (sound) waves
- Describe how the behavior of light waves is manipulated in different processes, such as:
  - reflection
  - refraction
  - diffraction
  - absorption
- Explain how the human eye sees objects and colors in terms of wavelengths
- Describe how the behavior of waves is affected by medium, such as:
  - air
  - water
  - solids
- Relate the properties of sound to everyday experiences
- Identify the parts of a wave using a diagram
- Explain how the parts of a wave are affected by changes in amplitude and pitch

## Science

Grade: 8

### Characteristics of Science

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### Standards Associated with Characteristics of Science

S8CS1	S8CS2	S8CS3	S8CS4
S8CS5	S8CS6	S8CS7	S8CS8
S8CS9			

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding of the important factors in keeping records, such as:
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- Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as:
  - integers
  - fractions
  - decimals
  - percents
- Determine the mean, median, and mode from a set of scientific data
- Analyze scientific data using the mean, median, and mode
- Apply the metric system to scientific investigations
- Convert between metric units
- Determine what degree of precision is adequate and round off appropriately
- Describe the importance of accuracy and precision and their relationship to each other
- Solve problems using ratios, proportions, and constant rates
- Identify appropriate tools for measuring objects and/or substances
- Explain how parts are related to other parts in a system

- Organize scientific information and determine relationships shown in representations, such as:
  - tables
  - charts
  - graphs
- Evaluate claims based on unclear sources or statements made by people outside their area of expertise
- Identify the flaws of reasoning in arguments that are based on poorly designed research, such as:
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  - formulating explanations
  - observing the effects of one variable on another
  - keeping a constant
- Demonstrate understanding that scientists can collaborate to design research. Conduct independent studies to answer the same questions and help prevent bias
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  - replication of results
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- Demonstrate understanding that scientists must adhere to the ethics of science when conducting research, and special care must be taken when human and animal subjects are used in scientific research