

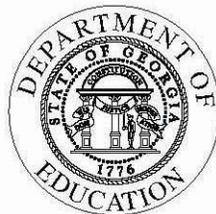


# CRCT Content Descriptions

Based on the State-Mandated Content Standards

## Science

Grades 3–8



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**Criterion-Referenced Competency Tests (CRCT)**

## Content Descriptions Science

Georgia law, as amended by the A+ Education Reform Act of 2000, requires that all students in grades one through eight take the CRCT in the content areas of Reading, English/Language Arts, and Mathematics. Students in grades three through eight are also assessed in Science and Social Studies. The CRCT are administered in the late spring of each year. These tests are designed to measure student achievement of the state-mandated content standards for Reading, English/Language Arts, Mathematics, Science, and Social Studies.

*Implementation of the CRCT program is subject to appropriation by the General Assembly. Due to budget constraints, the CRCT will not be administered in grades one and two in spring 2014.*

### **Program Purpose**

The CRCT are designed to measure student acquisition and understanding of the knowledge, concepts, and skills set forth in the state-mandated content standards. The assessment program serves as a measure of the quality of education in the state. Reports yielding information on academic achievement at the student, class, school, system, and state levels are produced annually.

In accordance with Georgia law and State Board rule, CRCT in specified grades and subjects are used for promotion criteria. Third grade students are required to show proficiency on the Reading CRCT in order to be considered for promotion to the next grade level. Fifth grade and eighth grade students are required to show proficiency on both the Reading and Mathematics CRCT in order to be promoted to the next grade level. Students who do not achieve proficiency must be offered remediation and a retest.

### **CRCT Content Descriptions**

The CRCT Content Descriptions are provided to acquaint Georgia educators with the content coverage of the CRCT. Only the knowledge, concepts, and skills reflected in the state-mandated content standards will be assessed on the CRCT. Committees of Georgia educators reviewed the standards and provided guidance for the assessment program.

It is important to note that some standards are better suited for classroom or individual assessment rather than large-scale paper-pencil assessment. While those standards designed for classroom/individual assessment are not included in the CRCT Content Descriptions, the knowledge, concepts, and skills outlined are often required for the mastery of the standards that are assessed. Therefore, the CRCT Content Descriptions are in *no way* intended to substitute for the state-mandated content standards; they are provided to help educators better understand how the standards will be assessed. Further, the CRCT Content Descriptions *by no means* suggest *when* concepts and skills should be introduced in the instructional sequence; rather, their purpose is to communicate when concepts and skills will be assessed on the CRCT. Georgia law requires educators to teach the standards set forth in the state-mandated content standards. The state-mandated content standards are located at: <http://www.georgiastandards.org>

## Science Content Domains

To provide reliable measures as well as structure to the assessment program, the state-mandated content standards are grouped into content domains. Each domain is comprised of standards with similar content characteristics. The domains for Science are:

Grades 3–5

Earth Science

Physical Science

Life Science

Grade 6: Earth Science

Astronomy

Hydrology and Meteorology

Geology

Grade 7: Life Science

Cells and Genetics

Interdependence of Life

Evolution

Grade 8: Physical Science

Structure of Matter

Force and Motion

Energy and Its Transformations

The state-mandated content standards in science require that content be taught in conjunction with process skills identified as the Characteristics of Science. Characteristics of Science refers to the process skills used in the learning and practice of science, such as testing a hypothesis, record keeping, using correct safety procedures, using appropriate tools and instruments, applying mathematics and technology, analyzing data, interpreting results, and communicating scientific information. It also refers to understanding how science knowledge grows and changes and the processes that drive those changes. The concepts and skills inherent in Characteristics of Science are integrated in items across the content domains for each grade level.

## Using the Science CRCT Content Descriptions

The Science CRCT Content Descriptions provide information about the content and skills assessed by the CRCT. The documents are organized by grade and content domain. The standards assessed in each domain are provided, as are the related concepts, skills, and abilities assessed. The state-mandated content standards are conceptual in nature, requiring instruction to be integrated; the concepts, knowledge, skills, and abilities described in this document should not be viewed as discrete or taught in isolation. Deep understanding by students, resulting in higher achievement, is best achieved when all the content standards are taught in an integrated, conceptual fashion.

## **Science**

**Grade:** 3

**Domain:** Earth Science

### **Domain Description**

Earth Science refers to explaining the differences between rocks and minerals and the physical characteristics of each, comparing and contrasting types of soils, and recognizing how wind and water can change them over time. This domain also refers to describing how fossils are formed and distinguishing fossils as evidence of organisms that lived long ago.

### **Standards Associated with Domain**

S3E1

S3E2

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

- Differentiate between a rock and a mineral
- Determine the physical attributes of rocks and minerals through investigations, such as:
  - simple observation (shape, color, and texture)
  - measurement
  - tests (hardness)
- Compare and contrast top soils (clay, loam or potting soil, and sand) by observable properties, such as:
  - texture
  - particle size
  - color
- Determine using observation and research how water and wind can change rocks and soil over time
- Distinguish fossils as evidence of organisms that lived long ago by using investigations, such as:
  - identifying authentic fossils
  - analyzing models of fossils
  - using information resources about fossils
- Describe how a fossil is formed

## **Science**

**Grade:** 3

**Domain:** Physical Science

### **Domain Description**

Physical Science refers to categorizing ways to produce heat and explaining how heat can be transferred. This domain also refers to recognizing materials that are attracted to magnets and understanding the behavior of magnets.

### **Standards Associated with Domain**

S3P1

S3P2

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

- Categorize different ways to produce heat energy, such as:
  - burning
  - rubbing (friction)
  - mixing one thing with another
- Determine how insulation affects heating and cooling
- Evaluate the transfer of heat energy from the Sun to various materials
- Measure using thermometers the changes in temperature over time of water samples (hot, warm, and cold)
- Identify common objects that are attracted by magnets
- Recognize that magnets attract and repel each other

## **Science**

**Grade:** 3

**Domain:** Life Science

### **Domain Description**

Life Science refers to differentiating between habitats of Georgia and the features of plants and animals that live there, and recognizing how changes to habitats affect these organisms. This domain also refers to describing the effects of pollution and ways to protect the environment.

### **Standards Associated with Domain**

S3L1

S3L2

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

- Differentiate between the habitats of Georgia (including the organisms that live there), such as:
  - mountains
  - marsh/swamp
  - coast
  - Piedmont
  - Atlantic Ocean
- Determine which features of green plants allow them to live and thrive in different regions of Georgia
- Determine which features of animals allow them to live and thrive in different regions of Georgia
- Infer what will happen to an organism if its habitat is changed
- Describe the effects of pollution (such as littering) on the habitats of plants and animals
- Describe ways to protect the environment, such as:
  - conservation of resources
  - recycling of materials

## Science

### Grade: 3

#### 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 mathematics 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

S3CS1	S3CS4	S3CS7
S3CS2	S3CS5	S3CS8
S3CS3	S3CS6	

#### Associated Concepts, Skills, and Abilities

- Demonstrate understanding that records of investigations and observations should not be altered
- Offer reasons for findings and consider reasons suggested by others
- Add, subtract, multiply, and divide whole numbers through different means, such as:
  - mentally
  - on paper
  - with a calculator
- Compute scientific calculations using commonly encountered fractions, such as:
  - halves
  - thirds
  - fourths
- Evaluate measurements and computations of quantities and decide if they are reasonable answers to scientific problems by comparing them to typical values in dimensions, such as:
  - length
  - weight
  - time
- Determine appropriate common materials for making simple mechanical constructions and repairing things
- Explain when to use computers, cameras, and recording devices for capturing information
- Implement accepted safety procedures while manipulating science materials and equipment
- Observe and describe how parts influence one another in things with many parts

- Represent features of objects, events, and processes in the real world by constructing representations, such as:
  - geometric figures
  - number sequences
  - graphs
  - diagrams
  - sketches
  - number lines
  - maps
  - stories
- Contrast ways in which representations do not match their original counterparts
- Construct instructions that others can follow in carrying out a scientific procedure
- Recognize when to use a sketch to aid in explaining scientific procedures or ideas
- Use numerical data to describe and compare objects and events, and to explore scientific or technological matters
- Evaluate sources of scientific information, such as:
  - reference books
  - back issues of newspapers and magazines
  - CD-ROMs
  - computer databases
- Explain that similar scientific investigations seldom produce exactly the same results due to circumstances, such as:
  - unexpected differences in what is being investigated
  - unrecognized differences in the methods or circumstances of the investigation
  - observational uncertainties
- Demonstrate understanding that although some scientific knowledge is very old, it is still applicable today
- Determine that scientific investigations may take many different forms, such as:
  - surveying what things are like
  - observing what is happening
  - collecting specimens for analysis
  - doing experiments
- Justify the reasons why clear and active communication is an essential part of doing science, such as:
  - enabling scientists to inform others about their work
  - allowing scientists to expose their ideas to criticism by other scientists
  - helping scientists to stay informed about scientific discoveries around the world

- Describe ways scientists use technology to increase their acuity in such activities as:
  - observing
  - measuring
  - comparing
- Demonstrate understanding that science involves many different kinds of work and engages men and women of all ages and backgrounds

## Science

Grade: 4

Domain: Earth Science

### Domain Description

Earth Science refers to comparing and contrasting stars, constellations, and planets, identifying the technology used to observe them, and explaining how the motions of Earth, the Moon, and the Sun cause the day/night cycle, the phases of the Moon, and the seasons. This domain also refers to describing how the states of water are related to the water cycle and weather and using tools to measure and predict weather conditions.

### Standards Associated with Domain

S4E1

S4E3

S4E2

S4E4

### Associated Concepts, Skills, and Abilities

- Recognize the physical attributes of stars in the night sky such as number, size, color, and patterns
- Compare and contrast planets and stars in characteristics, such as:
  - appearance
  - position
  - number in the night sky
- Explain why the pattern of stars in a constellation stays the same, but a planet can be seen in different locations at different times
- Identify how technology is used to observe distant objects in the sky
- Explain the day/night cycle of Earth using a model
- Explain the sequence of the phases of the Moon
- Describe the revolution of Earth around the Sun and Earth's tilt to explain the seasonal changes
- Describe the relative size and order from the Sun of the planets in our Solar System
- Demonstrate how water changes states, such as:
  - solid to liquid
  - liquid to gas
  - gas to liquid
  - liquid to solid
- Identify the temperatures at which water becomes a solid and at which water becomes a gas
- Explain how clouds are formed
- Differentiate between evaporation, condensation, and precipitation in the water cycle

- Demonstrate understanding of different forms of precipitation and sky conditions, such as:
  - rain
  - snow
  - sleet
  - hail
  - clouds
  - fog
- Identify and explain how to gather weather data by using weather instruments, such as:
  - thermometer
  - rain gauge
  - barometer
  - wind vane
  - anemometer
- Analyze data gathered through the use of weather instruments to formulate weather forecasts
- Use a weather map to identify weather data, such as:
  - fronts
  - temperature
  - precipitation
- Interpret weather conditions using the information gathered in a weather map
- Predict weather patterns throughout the year using observations and records of weather conditions
- Distinguish between weather and climate

## Science

Grade: 4

Domain: Physical Science

### Domain Description

Physical Science refers to describing how tools affect light, and explaining how sound is produced and changed. This domain also refers to explaining how simple machines are used, and describing the relationship between force and motion.

### Standards Associated with Domain

S4P1

S4P2

S4P3

### Associated Concepts, Skills, and Abilities

- Determine the nature of light to classify materials, such as:
  - transparent
  - opaque
  - translucent
- Explain the reflection of light using a mirror and a light source
- Distinguish between a convex lens, a concave lens, and a prism by:
  - identifying physical properties
  - explaining where each is used
- Explain how sound is produced
- Recognize the conditions that cause pitch to vary
- Identify and explain the use of simple machines, such as:
  - levers
  - pulleys
  - wedges
  - inclined planes
  - screws
  - wheels and axles
- Evaluate how force affects the speed and motion of different-size objects
- Explain what happens to the speed or direction of an object when a greater force than the initial one is applied
- Determine the effect of gravitational force on the motion of an object

## **Science**

**Grade:** 4

**Domain:** Life Science

### **Domain Description**

Life Science refers to differentiating between the roles of organisms, describing the flow of energy in an ecosystem, and predicting how changes to part of the system affect the other parts. This domain also refers to identifying features that affect the survival of organisms or factors that may cause the extinction of organisms.

### **Standards Associated with Domain**

S4L1

S4L2

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

- Distinguish between the roles of organisms in a community, such as:
  - producers
  - consumers
  - decomposers
- Describe the flow of energy through a food web or chain beginning with sunlight and including producers, consumers, and decomposers
- Predict how changes in the environment would affect a community (ecosystem) of organisms
- Predict effects on a population if some of the plants or animals in the community are either scarce or overabundant
- Identify the external features of organisms that allow them to survive or reproduce better than organisms that do not have these features, such as:
  - camouflage
  - use of hibernation
  - protection
- Identify factors that may have led to the extinction of some organisms

## Science

Grade: 4

### 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 mathematics 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

S4CS1

S4CS4

S4CS7

S4CS2

S4CS5

S4CS8

S4CS3

S4CS6

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding that records of investigations and observations should not be altered
- Distinguish observations from ideas and speculation about those observations
- Offer reasons for findings and consider reasons suggested by others
- Add, subtract, multiply, and divide whole numbers through different means, such as:
  - mentally
  - on paper
  - with a calculator
- Compute scientific calculations using commonly encountered fractions, such as:
  - halves
  - thirds
  - fourths
  - fifths
  - tenths
  - hundredths
- Evaluate measurements and computations of quantities and decide if they are reasonable answers to scientific problems by comparing them to typical values in dimensions, such as:
  - length
  - area
  - volume
  - weight
  - time
- Determine appropriate common materials for making simple mechanical constructions and repairing things

- Explain how to measure and mix dry and liquid materials in prescribed amounts while exercising reasonable safety precautions
- Explain when to use computers, cameras, and recording devices for capturing information
- Implement accepted safety procedures while manipulating science materials and equipment
- Observe and describe how parts influence one another in things with many parts
- Represent features of objects, events, and processes in the real world by constructing representations, such as:
  - geometric figures
  - number sequences
  - graphs
  - diagrams
  - sketches
  - number lines
  - maps
  - stories
- Describe patterns of change—such as steady, repetitive, or irregular change—using appropriate forms, such as:
  - records
  - tables
  - graphs of measurements
- Construct instructions that others can follow in carrying out a scientific procedure
- Evaluate sketches used to aid in explaining scientific procedures or ideas
- Use numerical data to describe and compare objects and events, and to explore scientific or technological matters
- Evaluate sources of scientific information, such as:
  - reference books
  - back issues of newspapers and magazines
  - CD-ROMs
  - computer databases
- Recognize when comparisons might not be fair because some conditions are different
- Explain that similar scientific investigations seldom produce exactly the same results due to circumstances, such as:
  - unexpected differences in what is being investigated
  - unrecognized differences in the methods or circumstances of the investigation
  - observational uncertainties

- Demonstrate understanding that although some scientific knowledge is very old, it is still applicable today
- Determine that scientific investigations may take many different forms, such as:
  - surveying what things are like
  - observing what is happening
  - collecting specimens for analysis
  - doing experiments
- Justify the reasons why clear and active communication is an essential part of doing science, such as:
  - enabling scientists to inform others about their work
  - allowing scientists to expose their ideas to criticism by other scientists
  - helping scientists stay informed about scientific discoveries around the world
- Describe ways scientists use technology to increase their acuity in such activities as:
  - observing
  - measuring
  - comparing
- Demonstrate understanding that science involves many different kinds of work and engages men and women of all ages and backgrounds

## **Science**

**Grade: 5**

**Domain:** Earth Science

### **Domain Description**

Earth Science refers to identifying surface features caused by weathering, erosion, deposition, earthquakes, volcanoes, faults and organisms. This domain also refers to understanding how technology and human intervention is used to control these processes.

### **Standards Associated with Domain**

S5E1

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

- Distinguish between surface features caused by constructive processes, such as:
  - deposition (deltas, sand dunes, etc.)
  - earthquakes
  - volcanoes
  - faults
  
- Distinguish between surface features caused by destructive processes, such as:
  - erosion (water and wind)
  - weathering
  - impact of organisms
  - earthquakes
  - volcanoes
  
- Determine and evaluate the role of technology and human intervention in the control of constructive and destructive processes, such as:
  - seismological studies
  - flood control (dams, levees, storm drain management, etc.)
  - beach reclamation (Georgia coastal islands)

## Science

Grade: 5

Domain: Physical Science

### Domain Description

Physical Science refers to explaining that objects are made of parts and the mass of an object is the sum of its parts. This domain also refers to comparing and contrasting physical and chemical changes, and describing the relationship between electricity and magnetism.

### Standards Associated with Domain

S5P1

S5P2

S5P3

### Associated Concepts, Skills, and Abilities

- Demonstrate understanding that the mass of an object is equal to the sum of its parts by manipulating and measuring different objects made of various parts
- Determine that common items have parts that are too small to be seen without magnification
- Identify examples of physical change, such as:
  - separating mixtures
  - manipulating paper (cutting, tearing, and folding)
- Explain that temperature differences can cause a physical change/change of state in water, such as:
  - water vapor/steam
  - liquid
  - ice
- Evaluate the properties of a substance before, during, and after a chemical reaction to find evidence of change
- Describe static electricity
- Determine the necessary components for completing an electric circuit
- Classify common materials as insulators or conductors of electricity
- Compare a bar magnet to an electromagnet

## Science

Grade: 5

Domain: Life Science

### Domain Description

Life Science refers to classifying organisms into groups, comparing and contrasting learned and inherited traits, and explaining how genes transfer traits. This domain also refers to using diagrams to identify features of cells, comparing and contrasting single- and multi-celled organisms, and identifying beneficial and harmful microorganisms.

### Standards Associated with Domain

S5L1

S5L3

S5L2

S5L4

### Associated Concepts, Skills, and Abilities

- Categorize animals as either vertebrate or invertebrate
- Classify vertebrates into groups, such as:
  - fish
  - amphibian
  - reptile
  - bird
  - mammal
- Explain how plants are sorted into groups
- Compare and contrast the characteristics of learned behaviors and inherited traits
- Describe what a gene is and the role genes play in the transfer of traits
- Explain how magnifiers such as microscopes or hand lenses are used to observe cells and their structure
- Recognize and determine the function of the parts of a plant cell, such as:
  - membrane
  - wall
  - cytoplasm
  - nucleus
  - chloroplasts
- Recognize and determine the function of the parts of an animal cell, such as:
  - membrane
  - cytoplasm
  - nucleus

- Distinguish between the structure and function of cells in multi-celled organisms and single-celled organisms
- Identify beneficial microorganisms and explain why they are beneficial
- Identify harmful microorganisms and explain why they are harmful

## Science

### Grade: 5

#### 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 mathematics 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

S5CS1	S5CS4	S5CS7
S5CS2	S5CS5	S5CS8
S5CS3	S5CS6	

#### Associated Concepts, Skills, and Abilities

- Demonstrate understanding that records of investigations and observations should not be altered
- Distinguish observations from ideas and speculation about those observations
- Offer reasons for findings and consider reasons suggested by others
- Add, subtract, multiply, and divide whole numbers through different means, such as:
  - mentally
  - on paper
  - with a calculator
- Compute scientific calculations using decimals and commonly encountered fractions, such as:
  - halves
  - thirds
  - fourths
  - fifths
  - tenths
  - hundredths
- Evaluate measurements and computations of quantities and decide if they are reasonable answers to scientific problems by comparing them to typical values in dimensions, such as:
  - length
  - area
  - volume
  - weight
  - time

- Determine appropriate common materials for making simple mechanical constructions and repairing things
- Explain how to measure and mix dry and liquid materials in prescribed amounts while exercising reasonable safety precautions
- Explain when to use computers, cameras, and recording devices for capturing information
- Implement accepted safety procedures while manipulating science materials and equipment
- Observe and describe how parts influence one another in things with many parts
- Represent features of objects, events, and processes in the real world by constructing representations, such as:
  - geometric figures
  - number sequences
  - graphs
  - diagrams
  - sketches
  - number lines
  - maps
  - stories
- Describe patterns of change—such as steady, repetitive, or irregular change—using appropriate forms, such as:
  - records
  - tables
  - graphs of measurements
- Identify the largest and the smallest possible values of something
- Construct instructions that others can follow in carrying out a scientific procedure
- Evaluate sketches used to aid in explaining scientific procedures or ideas
- Use numerical data to describe and compare objects and events, and to explore scientific or technological matters
- Evaluate sources of scientific information, such as:
  - reference books
  - back issues of newspapers and magazines
  - CD-ROMs
  - computer databases

- Recognize when comparisons might not be fair because some conditions are different
- Explain that similar scientific investigations seldom produce exactly the same results due to circumstances, such as:
  - unexpected differences in what is being investigated
  - unrecognized differences in the methods or circumstances of the investigation
  - observational uncertainties
- Demonstrate understanding that although some scientific knowledge is very old, it is still applicable today
- Determine that scientific investigations may take many different forms, such as:
  - surveying what things are like
  - observing what is happening
  - collecting specimens for analysis
  - doing experiments
- Justify the reasons why clear and active communication is an essential part of doing science, such as:
  - enabling scientists to inform others about their work
  - allowing scientists to expose their ideas to criticism by other scientists
  - helping scientists stay informed about scientific discoveries around the world
- Describe ways scientists use technology to increase their acuity in such activities as:
  - observing
  - measuring
  - comparing
- Demonstrate understanding that science involves many different kinds of work and engages men and women of all ages and backgrounds

## 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
- Differentiate between the characteristics of various sources of water on the surface of Earth.
- 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 how the distribution of land and oceans affect climate and weather.
- 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 mathematics 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	S6CS4	S6CS7
S6CS2	S6CS5	S6CS8
S6CS3	S6CS6	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 in other parts of the system
- Identify several different models (such as physical replicas, pictures, and analogies) that could be used to represent the same thing, and evaluate their usefulness, taking into account such things as the model's purpose and complexity.
- 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
  - observing the effects of one variable on another, keeping all other variables constant
- Demonstrate understanding that scientists often collaborate to design research. To prevent bias, scientists conduct independent studies to answer the same questions.
- 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 tissues
  - tissues are organized into organs
  - organs are organized into systems
  - systems are organized into organisms
- Explain that tissues, organs, and organ systems serve the needs cells have for oxygen, food, and waste removal
- Demonstrate understanding of the purpose of the major organ systems in the human body, 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
- Compare and contrast the characteristics of Earth's major terrestrial and aquatic biomes, such as:
  - tropical rain forest
  - savannah (also spelled savanna)
  - 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, such as:
  - Darwin's finches
  - peppered moths
- Demonstrate understanding of the processes of natural selection
- Describe ways in which species on Earth have evolved due to natural selection
- Demonstrate understanding that the fossil record found in sedimentary rock provides evidence for evolution

## Science

Grade: 7

### 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 mathematics 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

S7CS1	S7CS4	S7CS7
S7CS2	S7CS5	S7CS8
S7CS3	S7CS6	S7CS9

### 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
- Understand that different models (such as physical replicas, pictures, and analogies) can be used to represent the same thing.
- 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
  - observing the effects of one variable on another, keeping all other variables constant
- Demonstrate understanding that scientists often collaborate to design research. To prevent bias, scientists conduct independent studies to answer the same questions.
- 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<sup>8</sup>

- 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

Characteristics of Science items are integrated into 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 mathematics 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

S8CS1	S8CS4	S8CS7
S8CS2	S8CS5	S8CS8
S8CS3	S8CS6	S8CS9

### 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
  - 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
- Understand that different models (such as physical replicas, pictures, and analogies) can be used to represent the same thing
- 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:
  - facts intermingled with opinion
  - conclusions based on insufficient evidence
  - small sample sizes
  - 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
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- 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:
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  - confirming previous results
  - testing how well a theory predicts
  - comparing different theories

- Demonstrate understanding that scientific investigations usually involve similar steps, such as:
  - collecting evidence
  - reasoning
  - devising hypotheses
  - formulating explanations
  - observing the effects of one variable on another, keeping all other variables constant
- Demonstrate understanding that scientists often collaborate to design research. To prevent bias, scientists conduct independent studies to answer the same questions.
- 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