

Content Area: Science
Grade/Course: Earth Space Science

Strand	The Scientific Process
Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process	

Topic	Scientific Inquiry		
Benchmark SC.ES.1.1	Describe how a testable hypothesis may need to be revised to guide a scientific investigation		
Sample Performance Assessment (SPA)	The student: Describes a testable hypothesis and revises it based on data from earth and space science investigations and primary sources (e.g., results, class data, information from a reputable source).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Revise a testable hypothesis based on new data to guide a scientific investigation	Describe how a testable hypothesis may need to be revised to guide a scientific investigation	Give an example of one way to revise a testable hypothesis	Recognize that a hypothesis may need revision

Topic	Scientific Inquiry		
Benchmark SC.ES.1.2	Design and safely implement an experiment, including the appropriate use of tools and techniques to organize, analyze, and validate data		
Sample Performance Assessment (SPA)	The student: Prepares an earth and space science lab report documenting the procedure(s) and the safe and appropriate use of tools (e.g., computer probes, meters, timers) and techniques (e.g., repeated trials, statistics, significant figures, spreadsheets, databases) to organize, analyze, and validate data.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Report thoroughly the significant and other relevant details related to the design selected for an experiment, including the safe and appropriate use of tools and techniques to organize, analyze, and validate data	Report the significant details related to the design selected for an experiment, including the safe and appropriate use of tools and techniques to organize, analyze, and validate data	Report some details related to the design selected for an experiment, including the safe and appropriate use of tools and techniques to organize, analyze, and validate data	Report very few details related to the design selected for an experiment, including the safe and appropriate use of tools and techniques to organize, analyze, and validate data

Topic	Scientific Inquiry		
Benchmark SC.ES.1.3	Defend and support conclusions, explanations, and arguments based on logic, scientific knowledge, and evidence from data		
Sample Performance Assessment (SPA)	The student: Prepares an earth and space science lab report that draws logical conclusions and formulates explanations and arguments from the results of investigations.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Defend conclusions, explanations, and arguments that are supported by logic, scientific knowledge, and evidence from data, and suggest implications	Defend conclusions, explanations, and arguments that are supported by logic, scientific knowledge, and evidence from data	Present conclusions, explanations, and arguments that are partially supported by logic, scientific knowledge, or evidence from data	Present unsupported conclusions, explanations, and arguments

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Topic	Scientific Inquiry		
Benchmark SC.ES.1.4	Determine the connection(s) among hypotheses, scientific evidence, and conclusions		
Sample Performance Assessment (SPA)	The student: Prepares an earth and space science lab report that supports or refutes a hypothesis based on an analysis of experimental data.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Determine and justify logical connection(s) and implications among hypotheses, scientific evidence, and conclusions	Determine logical connection(s) among hypotheses, scientific evidence, and conclusions	Identify some connections between hypotheses, scientific evidence, or conclusions	Make unsubstantiated connection(s) among hypotheses, scientific evidence, and conclusions

Topic	Scientific Inquiry		
Benchmark SC.ES.1.5	Communicate the components of a scientific investigation, using appropriate techniques		
Sample Performance Assessment (SPA)	The student: Presents the question, testable hypothesis, experimental design, analysis of data, and conclusions to the earth and space science class, using appropriate methods of communication (e.g., PowerPoint, essay, oral presentation, poster board, lab report, research paper).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Consistently present, in detail, all components of a scientific investigation, using appropriate techniques	Usually present all components of a scientific investigation, using appropriate techniques	Sometimes present the components of a scientific investigation, using appropriate techniques	Rarely present the components of a scientific investigation

Topic	Scientific Inquiry		
Benchmark SC.ES.1.6	Engage in and explain the importance of peer review in science		
Sample Performance Assessment (SPA)	The student: Examines a peer's earth and space science investigation for logic and validity based on evidence. Explains the importance of peer review to the process of scientific inquiry.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Effectively participate in peer review. Explain the principal and other relevant reasons for peer review in science	Engage actively in peer review. Explain the principal reasons for peer review in science.	Participate in peer review. Explain some reasons for peer review in science	Participate in peer review. Not able to explain the reasons for peer review in science

Topic	Scientific Knowledge		
Benchmark SC.ES.1.7	Revise, as needed, conclusions and explanations based on new evidence		
Sample Performance Assessment (SPA)	The student: Reflects on new earth and space science evidence from other valid sources and revises conclusion and explanations as needed. Includes recommendations for improving the investigation.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Revise and justify conclusions and explanations based on new evidence	Revise conclusions and explanations logically based on new evidence	Make few revisions to conclusions and explanations partially based on new evidence	Make very few revisions to conclusions and explanations

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Topic	Scientific Knowledge		
Benchmark SC.ES.1.8	Describe the importance of ethics and integrity in scientific investigation		
Sample Performance Assessment (SPA)	The student: Identifies and describes earth and space science examples of ethical and unethical experimentation, citation, and conclusions (e.g., provides guidelines concerning the appropriate treatment of living things and the environment; credits sources; reduces bias; sometimes adds constraints).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give examples of the principal and other relevant reasons for ethics and integrity in scientific investigation	Describe the principal reasons for ethics and integrity in scientific investigation	Describe some reasons for ethics and integrity in scientific investigation	Describe very few reasons for ethics and integrity in scientific investigation

Topic	Scientific Knowledge		
Benchmark SC.ES.1.9	Explain how scientific explanations must meet a set of established criteria to be considered valid		
Sample Performance Assessment (SPA)	The student: Describes how a published or an original earth and space science study meets the criteria of scientific explanations (e.g., they must be consistent with experimental and observational evidence about nature, make accurate predictions about systems being studied, be logical, abide by the rules of evidence, be open to questions and modifications, be based on historical and current scientific knowledge, and make a commitment to making the knowledge public) in order to draw conclusions about the study's validity.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze a scientific explanation to determine if it meets a set of established criteria	Explain how a set of established criteria must be met for scientific explanations to be considered valid	Explain some of the criteria used to evaluate scientific explanations	Attempt to explain how scientific explanations must meet a set of established criteria to be considered valid

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Strand	The Scientific Process
Standard 2: The Scientific Process: NATURE OF SCIENCE: Understand that science, technology, and society are interrelated	

Topic	Science, Technology, and Society		
Benchmark SC.ES.2.1	Explain how scientific advancements and emerging technology have influenced society		
Sample Performance Assessment (SPA)	The student: Describes a current scientific advancement or emerging technology, lists its key features and uses, and possible influence on society (e.g., space explorations, weather prediction, the Doppler effect).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Evaluate a current scientific advancement or emerging technology and predict its influence on society	Explain how scientific advancements and emerging technology have influenced society	Provide examples of the ways scientific advancements and emerging technology have influenced society	Recognize that science and technology have influenced society

Topic	Science, Technology, and Society		
Benchmark SC.ES.2.2	Compare the risks and benefits of potential solutions to technological issues		
Sample Performance Assessment (SPA)	The student: Compares risks and benefits (e.g., in terms of the impact on populations, resources, health, disease, environment) of alternative solutions to a specific current technological issue (e.g., satellite communication, alternative energy).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze the risks and benefits of potential solutions to technological issues and support that perspective	Compare the risks and benefits of potential solutions to technological issues	Describe the risks and benefits of potential solutions to technological issues	List risks and benefits of potential solutions to technological issues

Topic	Science, Technology, and Society		
Benchmark SC.ES.2.3	Explain the impact of humans on the Earth system		
Sample Performance Assessment (SPA)	The student: Explains how humans have affected the Earth system (e.g., renewable vs. nonrenewable resources, water and air pollution).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze and propose solutions to reduce the human impact on the Earth system	Explain the impact of humans on the Earth system	Provide examples of how humans impact the Earth system	Recognize that humans impact the Earth system

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Topic	Science, Technology, and Society		
Benchmark SC.ES.2.4	Describe technologies used to collect information about the universe		
Sample Performance Assessment (SPA)	The student: Describes several different technologies used to study the universe (e.g., optical, radio, and X-ray telescopes, space probes, satellites, spectroscope) and the types of information gathered from each.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain how the evolution of technology is related to our understanding of the universe	Describe technologies used to collect information about the universe	Provide examples of technologies used to collect information about the universe	Recall that different technologies are used to collect information about the universe

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Strand	Life and Environmental Sciences
Standard 3: Life and Environmental Sciences: ORGANISMS AND THE ENVIRONMENT: Understand the unity, diversity, and interrelationships of organisms, including their relationship to cycles of matter and energy in the environment	

There are no benchmarks for this standard for this Grade/Course.

Strand	Life and Environmental Sciences
Standard 4: Life and Environmental Sciences: STRUCTURE AND FUNCTION IN ORGANISMS: Understand the structures and functions of living organisms and how organisms can be compared scientifically	

There are no benchmarks for this standard for this Grade/Course.

Strand	Life and Environmental Sciences
Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms	

There are no benchmarks for this standard for this Grade/Course.

Strand	Physical, Earth, and Space Sciences
Standard 6: Physical, Earth, and Space Sciences: NATURE OF MATTER AND ENERGY: Understand the nature of matter and energy, forms of energy (including waves) and energy transformations, and their significance in understanding the structure of the universe	

There are no benchmarks for this standard for this Grade/Course.

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Strand	Physical, Earth, and Space Sciences
Standard 7: Physical, Earth, and Space Sciences: FORCE AND MOTION: Understand the relationship between force, mass, and motion of objects; and know the major natural forces: gravitational, electric, and magnetic	

There are no benchmarks for this standard for this Grade/Course.

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Strand	Physical, Earth, and Space Sciences
Standard 8: Physical, Earth, and Space Sciences: EARTH AND SPACE SCIENCE: Understand the Earth and its processes, the solar system, and the universe and its contents	

Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.1	Describe how elements and water move through solid Earth, the oceans, atmosphere, and living things as part of geochemical cycles		
Sample Performance Assessment (SPA)	The student: Describes the flow of elements in their geochemical cycles (e.g., water cycle, carbon cycle) as they pass through the lithosphere, hydrosphere, and atmosphere.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain the impact of alterations to any of the geochemical cycles	Describe how elements and water move through solid Earth, the oceans, atmosphere and living things as part of geochemical cycles	Diagram how the elements and water move through solid Earth, the oceans, atmosphere and living things as part of geochemical cycles	Provide examples of how elements and water move through solid Earth, the oceans, atmosphere and living things as part of geochemical cycles

Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.2	Describe how to estimate geologic time		
Sample Performance Assessment (SPA)	The student: Describes how scientists use rock sequences, fossils, and radioactive dating to estimate the age of fossils and the age of Earth itself.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Compare the various methods used to estimate geologic time	Describe how different methods are used to estimate geologic time	Give examples of some methods used to estimate geologic time	Recognize that the Earth's history is divided into geologic time periods

Topic	Earth in the Solar System		
Benchmark SC.ES.8.3	Explain the possible origins and evolution of the solar system		
Sample Performance Assessment (SPA)	The student: Describes and diagrams the formation of the solar system.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Predict the impact of the aging solar system on the Earth	Explain the possible origins and evolution of the solar system	Name possible origins and evolution of the solar system	Recognize that everything in the solar system was formed from the same stellar material

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Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.4	Describe how heat and energy transfer into and out of the atmosphere and their involvement in global climate		
Sample Performance Assessment (SPA)	The student: Diagrams heat transfer into and out of the atmosphere, labels the type of energy transfer (e.g., radiation, conduction, convection/advection), and explains how it affects changes in global climate.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Predict how changes in heat and energy transfer into and out of the atmosphere would affect global climate	Describe how heat and energy transfer into and out of the atmosphere and their involvement in global climate	Provide examples of how heat and energy transfer into and out of the atmosphere and their involvement in global climate	Recognize that heat and energy transfer into and out of the atmosphere

Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.5	Explain the effects of movements of crustal plates		
Sample Performance Assessment (SPA)	The student: Explains the effects produced at each boundary (e.g., mountain building, earthquakes, tsunami), and the impact on society (e.g., natural disaster safety, building requirements).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Develop safety recommendations for living in tectonically active areas	Explain the effects of movements of crustal plates	Provide examples of the effects of movements of crustal plates	Recognize the effects of movements of crustal plates

Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.6	Describe how winds and ocean currents are produced on the Earth's surface		
Sample Performance Assessment (SPA)	The student: Labels and explains wind and ocean currents on weather maps and explains some of the factors that cause them (e.g., differential heating of the Earth's land masses, oceans, and air by the sun; gravitational forces acting on different temperatures and densities in the ocean and air; effects of the Earth's rotation).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze how winds and ocean currents affect the climatic and ocean conditions of Hawaii	Describe how winds and ocean currents are produced on the Earth's surface	Identify how winds or ocean currents are produced on the Earth's surface	Provide examples of winds and ocean currents in Hawaii

Topic	Forces that Shape the Earth		
Benchmark SC.ES.8.7	Describe climate and weather patterns associated with certain geographic locations and features		
Sample Performance Assessment (SPA)	The student: Describes the relationships between certain geographic locations (e.g., latitude, proximity to large bodies of water, mountain range) and specific weather patterns (e.g., tornado alley, hurricane, drought, orographic rainfall).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze how climate and weather patterns are associated with certain geographic locations and features	Describe climate and weather patterns associated with certain geographic locations and features	Provide examples of climate and weather patterns associated with certain geographic locations and features	Recognize that climate and weather patterns are associated with certain geographic locations and features

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Topic	Earth in the Solar System		
Benchmark SC.ES.8.8	Describe the major internal and external sources of energy on Earth		
Sample Performance Assessment (SPA)	The student: Explains that while the sun is the major source of energy on Earth, the Earth also contributes its own internal energy to the Earth System (e.g., radioactive isotopes and gravitational energy from the Earth's formation).		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain how the major internal and external sources of energy drive the Earth's systems	Describe the major internal and external sources of energy on Earth	Identify the major internal or the major external sources of energy on Earth	Recognize that the Earth has internal and external sources of energy

Topic	The Universe		
Benchmark SC.ES.8.9	Describe the physical and nuclear dynamics involved in the life cycle of a star		
Sample Performance Assessment (SPA)	The student: Illustrates the life cycle of a star, including the physical and nuclear processes involved in the formation, evolution, and death of a star, and notes that life cycles vary among stars.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Analyze the patterns of various stars (e.g., mass, temperature) to determine its specific life cycle	Describe the physical and nuclear dynamics involved in the life cycle of a star	Provides examples of the physical or nuclear processes involved in the life cycle of a star	Recognize that physical and nuclear processes are involved in the life cycle of a star

Topic	The Universe		
Benchmark SC.ES.8.10	Compare different theories concerning the formation of the universe		
Sample Performance Assessment (SPA)	The student: Compares the Big Bang Theory to another theory of the origin of the universe (includes supporting evidence for both theories and evidence that refutes the theories) and recommends which theory is more plausible.		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Compare different theories and recommend and justify which theory is more plausible	Compare different theories concerning the formation of the universe	Illustrate the Big Bang Theory	Recognize that there are different theories concerning the formation of the universe