

## Earth Science

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
0	Scientific Inquiry		
ES-1	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.		
ES-1.1	Apply established rules for significant digits, both in reading scientific instruments and in calculating derived quantities from measurement.		
ES-1.2	Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.		
ES-1.3	Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.		
ES-1.4	Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.		
ES-1.5	Organize and interpret the data from a controlled scientific investigation by using mathematics (including calculations in scientific notation, formulas, and dimensional analysis), graphs, tables, models, diagrams, and/or technology.		
ES-1.6	Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.		
ES-1.7	Evaluate conclusions based on qualitative and quantitative data (including the impact of parallax, instrument malfunction, or human		

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	error) on experimental results.		
ES-1.8	Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).		
ES-1.9	Communicate and defend a scientific argument or conclusion.		
ES-1.10	Use appropriate safety procedures when conducting investigations.		
0	Astronomy		
ES-2	Students will demonstrate an understanding of the structure and properties of the universe.	Astronomy	Section 2, Parts B-C
ES-2.1	Summarize the properties of the solar system that support the theory of its formation along with the planets.	Astronomy	Section 2, Parts C and F-N
ES-2.2	Identify properties and features of the Moon that make it unique among other moons in the solar system.	Astronomy	Section 1, Parts E-F (including discussion board questions)

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ES-2.3	Summarize the evidence that supports the big bang theory and the expansion of the universe (including the red shift of light from distant galaxies and the cosmic background radiation).		
ES-2.4	Explain the formation of elements that results from nuclear fusion occurring within stars or supernova explosions.		
ES-2.5	Classify stars by using the Hertzsprung-Russell diagram.		
ES-2.6	Compare the information obtained through the use of x-ray, radio, and visual (reflecting and refracting) telescopes.	Astronomy	Section 3, Parts J-N
ES-2.7	Summarize the life cycles of stars.	Astronomy	Section 2, Q-R
ES-2.8	Explain how gravity and motion affect the formation and shapes of galaxies (including the Milky Way).		
ES-2.9	Explain how technology and computer modeling have increased our understanding of the universe.		
0	Solid Earth		

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ES-3	Students will demonstrate an understanding of the internal and external dynamics of solid Earth.		
ES-3.1	Summarize theories and evidence of the origin and formation of Earth's systems by using the concepts of gravitational force and heat production.		
ES-3.2	Explain the differentiation of the structure of Earth's layers into a core, mantle, and crust based on the production of internal heat from the decay of isotopes and the role of gravitational energy.		
ES-3.3	Summarize theory of plate tectonics (including the role of convection currents, the action at plate boundaries, and the scientific evidence for the theory).	Interior of the Earth	Section 1, Parts D-I
ES-3.4	Explain how forces due to plate tectonics cause crustal changes as evidenced in earthquake activity, volcanic eruptions, and mountain building.	Interior of the Earth	Section 1, Parts J-Q
ES-3.5	Analyze surface features of Earth in order to identify geologic processes (including weathering, erosion, deposition, and glaciation) that are likely to have been responsible for their formation.		
ES-3.6	Explain how the dynamic nature of the rock cycle accounts for the interrelationships among igneous, sedimentary, and metamorphic rocks.	Earth's Materials	Section 3, C-N
ES-3.7	Classify minerals and rocks on the basis of their physical and chemical properties and the environment in which they were formed.	Earth's Materials	All of Sections 2 and 3

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ES-3.8	Summarize the formation of ores and fossil fuels and the impact on the environment that the use of these fuels has had.		
0	Earth's Atmosphere		
ES-4	The student will demonstrate an understanding of the dynamics of Earth's atmosphere.		
ES-4.1	Summarize the thermal structures, the gaseous composition, and the location of the layers of Earth's atmosphere.	Atmosphere and Climate	Section 1, Part V
ES-4.2	Summarize the changes in Earth's atmosphere over geologic time (including the importance of photosynthesizing organisms to the atmosphere).	Atmosphere and Climate	Section 1, Parts B-I
ES-4.3	Summarize the cause and effects of convection within Earth's atmosphere.	Atmosphere and Climate	Section 1, Section F
ES-4.4	Attribute global climate patterns to geographic influences (including latitude, topography, elevation, and proximity to water).		
ES-4.5	Explain the relationship between the rotation of Earth and the pattern of wind belts.		

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ES-4.6	Summarize possible causes of and evidence for past and present global climate changes.		
ES-4.7	Summarize the evidence for the likely impact of human activities on the atmosphere (including ozone holes, greenhouse gases, acid rain, and photochemical smog).	Atmosphere and Weather	Section 3, Parts J-M
ES-4.8	Predict weather conditions and storms (including thunderstorms, hurricanes, and tornados) on the basis of the relationship among the movement of air masses, high and low pressure systems, and frontal boundaries.	World of Weather	Section I, Parts D-I
0	Earth's Hydrosphere		
ES-5	The student will demonstrate an understanding of Earth's freshwater and ocean systems.		
ES-5.1	Summarize the location, movement, and energy transfers involved in the movement of water on Earth's surface (including lakes, surface-water drainage basins [watersheds], freshwater wetlands, and groundwater zones).		
ES-5.2	Illustrate the characteristics of the succession of river systems.		
ES-5.3	Explain how karst topography develops as a result of groundwater processes.		

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ES-5.4	Compare the physical and chemical properties of seawater and freshwater.		
ES-5.5	Explain the results of the interaction of the shore with waves and currents.		
ES-5.6	Summarize the advantages and disadvantages of devices used to control and prevent coastal erosion and flooding.		
ES-5.7	Explain the effects of the transfer of solar energy and geothermal energy on the oceans of Earth (including the circulation of ocean currents and chemosynthesis).	Atmosphere and Weather	Section 1, Part O
ES-5.8	Analyze environments to determine possible sources of water pollution (including industrial waste, agriculture, domestic waste, and transportation devices).	World's Water	Section 3, Parts N-R (including project)
0	The Paleobiosphere		
ES-6	Students will demonstrate an understanding of the dynamic relationship between Earth's conditions over geologic time and the diversity of its organisms.		
ES-6.1	Summarize the conditions of Earth that enable the planet to support life.	Astronomy	Section 2, Part I

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ES-6.2	Recall the divisions of the geologic time scale and illustrate the changes (in complexity and/or diversity) of organisms that have existed across these time units.	Geologic Time	Section 1, Parts C-F
ES-6.3	Summarize how fossil evidence reflects the changes in environmental conditions on Earth over time.		
ES-6.4	Match dating methods (including index fossils, ordering of rock layers, and radiometric dating) with the most appropriate application for estimating geologic time.	Geologic Time	All of Sections 2 and 3
ES-6.5	Infer explanations concerning the age of the universe and the age of Earth on the basis of scientific evidence.		