

Earth Science

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
ES.1	The student will plan and conduct investigations in which		
ES.1.a	volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools;	The Study of Earth Science	Tools for the Study of Earth Science
ES.1.b	technologies, including computers, probeware, and geospatial technologies, are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions;		
ES.1.c	scales, diagrams, charts, graphs, tables, imagery, models, and profiles are constructed and interpreted;	The Study of Earth Science	Applying Scale to Investigations Map Scales Organizing Data
ES.1.d	maps and globes are read and interpreted, including location by latitude and longitude;		
ES.1.e	variables are manipulated with repeated trials; and	The Study of Earth Science	Conducting a Scientific Investigation
ES.1.f	current applications are used to reinforce Earth science concepts.	The Study of Earth Science	Planet Earth
ES.2	The student will demonstrate an understanding of the nature of science and scientific reasoning and logic.		
ES.2.a	science explains and predicts the interactions and dynamics of complex Earth systems;	The Study of Earth Science	The Nature of Science
ES.2.b	evidence is required to evaluate hypotheses and explanations;	The Study of Earth Science	Conducting a Scientific Investigation

Earth Science

ES.2.c	observation and logic are essential for reaching a conclusion; and	The Study of Earth Science	Conducting a Scientific Investigation
ES.2.d	evidence is evaluated for scientific theories.	The Study of Earth Science	Scientific Beliefs, Laws, Theories, and Misconceptions
ES.3	The student will investigate and understand the characteristics of Earth and the solar system.		
ES.3.a	position of Earth in the solar system;	The Study of Earth Science	Tutorial: Earth's Dynamic Systems
ES.3.b	sun-Earth-moon relationships; (seasons, tides, and eclipses);		
ES.3.c	characteristics of the sun, planets and their moons, comets, meteors, and asteroids; and	The Solar System	The Sun, Moon and Inner Solar System The Outer Solar System and Space Exploration
ES.3.d	the history and contributions of space exploration.	The Solar System	The Outer Solar System and Space Exploration

Earth Science

ES.4	The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties.		
ES.4.a	hardness, color and streak, luster, cleavage, fracture, and unique properties; and	Rocks and Minerals	Avatar: The Properties of Minerals: Color The Properties of Minerals: Hardness The Properties of Minerals: Luster The Properties of Minerals: Cleavage The Properties of Minerals: Streak, Effervescence, Magnetism, and Fluorescence
ES.4.b	uses of minerals.	Rocks and Minerals	Economic Minerals
ES.5	The student will investigate and understand the rock cycle as it relates to the origin and transformation of rock types and how to identify common rock types based on mineral composition and textures.		
ES.5.a	igneous rocks;	Rocks and Minerals	Igneous Rocks
ES.5.b	sedimentary rocks; and	Rocks and Minerals	Sedimentary Rocks

Earth Science

ES.5.c	metamorphic rocks.	Rocks and Minerals	Metamorphic Rocks
ES.6	The student will investigate and understand the differences between renewable and nonrenewable resources.		
ES.6.a	fossil fuels, minerals, rocks, water, and vegetation;		
ES.6.b	advantages and disadvantages of various energy sources;	Earth's Natural Resources	Fossil Fuels Nuclear Energy Renewable Energy
ES.6.c	resources found in Virginia; and		
ES.6.d	environmental costs and benefits.	Earth's Natural Resources	Fossil Fuels Nuclear Energy Renewable Energy
ES.7	The student will investigate and understand geologic processes including plate tectonics.		
ES.7.a	geologic processes and their resulting features; and	Plate Tectonics	Plate Tectonics and the Landscape

Earth Science

ES.7.b	tectonic processes.	Plate Tectonics	The Theory of Plate Tectonics
ES.8	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.		
ES.8.a	processes of soil development;	Weathering and Soils	The Nature and Properties of Soils
ES.8.b	development of karst topography;	Landscape Features	Karst Topography
ES.8.c	relationships between groundwater zones, including saturated and unsaturated zones, and the water table;		
ES.8.d	identification of sources of fresh water including rivers, springs, and aquifers, with reference to the hydrologic cycle;	Rivers and Groundwater Systems	Tutorial: Earth's Water Cycle Rivers Aquifers Springs and Geysers
ES.8.e	dependence on freshwater resources and the effects of human usage on water quality; and	Rivers and Groundwater Systems	Human Impacts on Watersheds Rivers and Human Settlements
ES.8.f	identification of the major watershed systems in Virginia, including the Chesapeake Bay and its tributaries.	Rivers and Groundwater Systems	Research Assignment: Your Local Watershed

Earth Science

ES.9	The student will investigate and understand that many aspects of the history and evolution of Earth and life can be inferred by studying rocks and fossils.		
ES.9.a	traces and remains of ancient, often extinct, life are preserved by various means in many sedimentary rocks;	Geologic History	Relative Dating and Sedimentary Environments
ES.9.b	superposition, cross-cutting relationships, index fossils, and radioactive decay are methods of dating bodies of rock;	Geologic History	Avatar: Laws of Stratigraphy Applying Superposition Fossils and Relative Dating Radioactive Decay
ES.9.c	absolute and relative dating have different applications but can be used together to determine the age of rocks and structures; and	Geologic History	Relative Dating Absolute Dating
ES.9.d	rocks and fossils from many different geologic periods and epochs are found in Virginia.		
ES.10	The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long- and short-term variations.		
ES.10.a	physical and chemical changes related to tides, waves, currents, sea level and ice cap variations, upwelling, and salinity variations;		
ES.10.b	importance of environmental and geologic implications;	Plate Tectonics The Atmosphere-Ocean System	The Mid-Ocean Ridges Global Warming and Thermohaline Circulation

Earth Science

ES.10.c	systems interactions;	The Atmosphere-Ocean System	Global Warming and Thermohaline Circulation
ES.10.d	features of the sea floor as reflections of tectonic processes; and	Plate Tectonics	The Mid-Ocean Ridges
ES.10.e	economic and public policy issues concerning the oceans and the coastal zone including the Chesapeake Bay.		
ES.11	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.		
ES.11.a	scientific evidence for atmospheric composition changes over geologic time;	Geologic History	Tour of Geologic Time
ES.11.b	current theories related to the effects of early life on the chemical makeup of the atmosphere;	The Atmosphere-Ocean System	Timeline: The Evolution of Earth's Atmosphere
ES.11.c	atmospheric regulation mechanisms including the effects of density differences and energy transfer; and	The Atmosphere-Ocean System	Motion and Energy in the Atmosphere
ES.11.d	potential changes to the atmosphere and climate due to human, biologic, and geologic activity.	The Atmosphere-Ocean System Plate Tectonics	The Atmosphere and Human Activity The Effects of Volcanoes

Earth Science

ES.12	The student will investigate and understand that energy transfer between the sun and Earth and its atmosphere drives weather and climate on Earth.		
ES.12.a	observation and collection of weather data;	The Atmosphere-Ocean System	Journal: Hometown Climate
ES.12.b	prediction of weather patterns;	The Atmosphere-Ocean System	Self-Check: Interpreting Weather Maps
ES.12.c	severe weather occurrences, such as tornadoes, hurricanes, and major storms; and	The Atmosphere-Ocean System	The Formation of Storms
ES.12.d	weather phenomena and the factors that affect climate including radiation, conduction, and convection.	The Atmosphere-Ocean System	Tutorial: Earth's Radiation Balance
ES.13	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.		
ES.13.a	cosmology including the Big Bang theory; and	The Solar System	Origin of the Universe
ES.13.b	the origin and evolution of stars, star systems, and galaxies.	The Solar System	Origin of the Universe The Life Cycle of Stars