

Virginia

Standards of Learning Assessments

Test Blueprint

Earth Science

**2010 Science
Standards of Learning**

This revised test blueprint will be effective with the administration of the 2012-2013 Science Standards of Learning (SOL) tests.

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Earth Science Standards of Learning

Test Blueprint

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General Test Information

Test Blueprint

Much like the blueprint for a building, a test blueprint serves as a guide for test construction. The blueprint indicates the content areas that will be addressed by the test and the number of items that will be included by content area and for the test as a whole. There is a blueprint for each test (e.g., grade 3 reading, grade 5 mathematics, grade 8 science, Virginia and United States History).

Reporting Categories

Each test covers a number of Standards of Learning (SOL). In the test blueprint, the SOL are grouped into categories that address related content and skills. These categories are labeled as reporting categories. For example, a reporting category for the Earth Science Standards of Learning test is *Earth and Space Systems*. Each of the SOL in this reporting category addresses a skill involved in investigating or understanding the concepts of force, motion, energy, or matter. When the results of the SOL tests are reported, the scores will be presented for each reporting category and as a total test score.

Assignment of Standards of Learning to Reporting Category

Different parts of a Standard of Learning may be assigned to different reporting categories. For example, Earth Science SOL ES.8a, which covers processes of soil development, is assigned to the reporting category *Earth and Materials and Processes* in the Earth Science SOL test. However, ES.8c, which involves relationships between groundwater zones, is assigned to the reporting category *Earth and Space Systems*.

Standards of Learning Excluded from Testing

In some content areas, there are SOL that do not lend themselves to assessment within the current format of the SOL tests. The SOL not tested are listed as “Excluded from Testing” at the end of the blueprint for each test. In Earth Science there are no SOL that are excluded within the current format of the SOL tests.

Coverage of Standards of Learning

Due to the large number of SOL in each grade level content area, *every* Standard of Learning will not be assessed on every version (form) of an SOL test. By necessity, to keep the length of a test reasonable, each version will sample from the SOL within a reporting category. All SOL in the blueprint will be tested within a three year period, and *all of these* SOL are eligible for inclusion on each version of an SOL test.

Use of the Curriculum Framework

The Earth Science Standards of Learning, amplified by the Curriculum Framework, define the essential understandings, knowledge, and skills that are measured by the Standards of Learning tests. The Curriculum Framework identifies essential understandings, defines essential content knowledge, and describes essential skills students need to master.

Earth Science Test Blueprint Summary Table

Reporting Category	Earth Science Standards of Learning	Number of Items
Assessed with Other SOL	ES.1f	
Scientific Investigation and the Nature of Science	ES.1a-e ES.2a-d	10
Earth and Space Systems	ES.3a-c ES.8c-d ES.10a, c-d ES.12a-d	10
Earth Materials and Processes	ES.4a ES.5a-c ES.7a-b ES.8a-b	10
Cosmology, Origins, and Time	ES.9a-d ES.11a-c ES.13a-b	10
Earth Resources and Human Interactions	ES. 3d ES.4b ES.6a-d ES.8e-f ES.10b, e ES.11d	10
Excluded from Testing	None	
Number of Operational Items		50
Number of Field Test Items*		10
Total Number of Items on Test		60

*Field test items are being tried out with students for potential use on subsequent tests and will not be used to compute students' scores on the test.

Earth Science Expanded Test Blueprint

Assessed with Other Science Standards of Learning

The following skill-based standards will be assessed through the reporting categories by applying them to other Standards of Learning content:

- ES.1 The student will plan and conduct investigations in which
- f) current applications are used to reinforce Earth science concepts.

Reporting Category: Scientific Investigation and the Nature of Science

Number of Items: 10

Standards of Learning:

- ES.1 The student will plan and conduct investigations in which
- a) volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools;
 - b) technologies, including computers, probeware, and geospatial technologies, are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions;
 - c) scales, diagrams, charts, graphs, tables, imagery, models, and profiles are constructed and interpreted;
 - d) maps and globes are read and interpreted, including location by latitude and longitude; and
 - e) variables are manipulated with repeated trials.
- ES.2 The student will demonstrate an understanding of the nature of science and scientific reasoning and logic. Key concepts include
- a) science explains and predicts the interactions and dynamics of complex Earth systems;
 - b) evidence is required to evaluate hypotheses and explanations;
 - c) observation and logic are essential for reaching a conclusion; and
 - d) evidence is evaluated for scientific theories.

Reporting Category: Earth and Space Systems

Number of Items: 10

Standards of Learning:

- ES.3 The student will investigate and understand the characteristics of Earth and the solar system. Key concepts include
- a) position of Earth in the solar system;
 - b) sun-Earth-moon relationships; (seasons, tides, and eclipses); and
 - c) characteristics of the sun, planets and their moons, comets, meteors, and asteroids.

- ES.8 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include
- c) relationships between groundwater zones, including saturated and unsaturated zones, and the water table; and
 - d) identification of sources of fresh water including rivers, springs, and aquifers, with reference to the hydrologic cycle.
- 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. Key concepts include
- a) physical and chemical changes related to tides, waves, currents, sea level and ice cap variations, upwelling, and salinity variations;
 - c) systems interactions; and
 - d) features of the sea floor as reflections of tectonic processes.
- 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. Key concepts include
- a) observation and collection of weather data;
 - b) prediction of weather patterns;
 - c) severe weather occurrences, such as tornadoes, hurricanes, and major storms; and
 - d) weather phenomena and the factors that affect climate including radiation, conduction, and convection.

Reporting Category: Earth Materials and Processes**Number of Items: 10****Standards of Learning:**

- ES.4 The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties. Key concepts include
- a) hardness, color and streak, luster, cleavage, fracture, and unique properties.
- 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. Key concepts include
- a) igneous rocks;
 - b) sedimentary rocks; and
 - c) metamorphic rocks.
- ES.7 The student will investigate and understand geologic processes including plate tectonics. Key concepts include
- a) geologic processes and their resulting features; and
 - b) tectonic processes.

- ES.8 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include
- processes of soil development; and
 - development of karst topography.

Reporting Category: Cosmology, Origins, and Time

Number of Items: 10

Standards of Learning:

- 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. Key concepts include
- traces and remains of ancient, often extinct, life are preserved by various means in many sedimentary rocks;
 - superposition, cross-cutting relationships, index fossils, and radioactive decay are methods of dating bodies of rock;
 - absolute and relative dating have different applications but can be used together to determine the age of rocks and structures; and
 - rocks and fossils from many different geologic periods and epochs are found in Virginia.
- 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. Key concepts include
- scientific evidence for atmospheric composition changes over geologic time;
 - current theories related to the effects of early life on the chemical makeup of the atmosphere; and
 - atmospheric regulation mechanisms including the effects of density differences and energy transfer.
- ES.13 The student will investigate and understand scientific concepts related to the origin and evolution of the universe. Key concepts include
- cosmology including the Big Bang theory; and
 - the origin and evolution of stars, star systems, and galaxies.

Reporting Category: Earth Resources and Human Interactions

Number of Items: 10

Standards of Learning:

- ES.3 The student will investigate and understand the characteristics of Earth and the solar system. Key concepts include
- the history and contributions of space exploration.

- ES.4 The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties. Key concepts include
- b) uses of minerals.
- ES.6 The student will investigate and understand the differences between renewable and nonrenewable resources. Key concepts include
- a) fossil fuels, minerals, rocks, water, and vegetation;
 - b) advantages and disadvantages of various energy sources;
 - c) resources found in Virginia; and
 - d) environmental costs and benefits.
- ES.8 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include
- e) dependence on freshwater resources and the effects of human usage on water quality; and
 - f) identification of the major watershed systems in Virginia, including the Chesapeake Bay and its tributaries.
- 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. Key concepts include
- b) importance of environmental and geologic implications; and
 - 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. Key concepts include
- d) potential changes to the atmosphere and climate due to human, biologic, and geologic activity.