

Virginia

Standards of Learning Assessments

Blueprint

End-of-Course

Earth Science Test

for the

2003 Science Standards of Learning

This revised blueprint will be effective with the 2005-2006 administration of the Standards of Learning Tests.

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Earth Science Blueprint

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Standards of Learning (SOL) Test Blueprint

Introduction

What is a test blueprint?

A test blueprint is a guide for test construction and use. The Standards of Learning (SOL) test blueprints serve a number of purposes. They serve as a guide to test developers as they write test questions and construct the SOL tests. These blueprints also serve as a guide to educators, parents, and students in that they show:

- (a) the SOL covered by the test and which, if any, have been excluded;
- (b) which SOL are assigned to each reporting category;
- (b) the number of test items in each reporting category and on the total test;
- (c) general information about how the test questions were constructed; and
- (e) the materials that students are allowed to use while taking the test.

How is the test blueprint organized?

The blueprint contains the following information:

1. **Test Development Guidelines**: guidelines used by the testing contractor and the members of the Content Review Committees in developing the SOL tests. This section contains two parts:
 - A. **General Considerations** — lists general considerations that were used in developing the test as well as considerations specific to a particular content area.
 - B. **Ancillary Materials** — lists any materials that students are allowed to use while taking the test.
2. **Blueprint Summary Table**: a summary of the blueprint which displays the following information:
 - reporting categories for the test;
 - number of test items in each reporting category;
 - Standards of Learning (SOL) included in each reporting category. SOL are identified by numbers and letters that correspond to the original SOL document;
 - SOL which are excluded from the SOL test;
 - number of operational items on the test;
 - number of field-test items on the test; and
 - total number of items (operational and field-test items) on the test.
3. **Expanded Blueprint**: provides the same information as the **Blueprint Summary Table** except that the full text of each SOL is included.

What is a reporting category?

Each test assesses a number of SOL. In the test blueprint, SOL are grouped into categories that address related content or skills. These categories are labeled *Reporting Categories*. For example, a reporting category for the Earth Science test is “Geology.” Each of the SOL in this reporting category addresses knowledge or rocks and minerals and geologic processes. When the results of the SOL tests are reported, the scores will be presented in terms of scores for each reporting category and a total test score.

Are some SOL assigned to more than one reporting category?

Letters under a particular SOL are sometimes coded to different reporting categories. For example, SOL ES.9a, which deals with processes of soil development, is assigned to the reporting category “Geology.” However, SOL ES.9c, which deals with identification of groundwater zones, is assigned to the reporting category “Meteorology, Oceanography, and Groundwater.” Each lettered SOL is assigned to only one reporting category.

Will all SOL listed in the blueprint be assessed each time the SOL tests are given?

Each SOL will not be assessed on every SOL test form. To keep the length of a test reasonable, each test will measure a selection of SOL within a reporting category. However, every SOL that is not excluded in the blueprint is eligible for inclusion on each form of an SOL test. Over time all SOL in a reporting category will be assessed.

Earth Science Test Development Guidelines

A. General Considerations

1. All items included in this test will address the knowledge and skills specified in the 2003 Virginia Standards of Learning in Earth Science.
2. Items will be examined for any content or context that stereotypes, offends, or unfairly penalizes students based on age, gender, economic status, race, ethnicity, religion, or geographic region.
3. The test will be untimed.
4. There is no penalty for guessing. Students will be scored on the number of correct answers out of the total number of operational items on the test.
5. The questions will be appropriate in terms of understandings and experiences that accompany an active science program.
6. Information will be presented through written text or through visual materials such as graphs, tables, models, or other illustrations.
7. Questions will require students to apply previously acquired knowledge and/or to use information that is provided in a prompt.
8. Measurements will be given in SI (metric), or English units where appropriate.
9. Students will be permitted scratch paper at any time during the test.
10. Four-function, scientific, or graphing calculators may be used on the test.
11. Students will be permitted to use standard (e.g., inches) and metric rulers during the test.

B. Ancillary Materials

Refer to the current examiner's manual or the Department of Education's Web site for ancillary materials that may be used.

Earth Science Blueprint Summary Table

Reporting Categories	Number of Items	Earth Science SOL
Scientific Investigation	10	ES.1a-e ES.2a-e ES.3a-d
Geology	21	ES.5a, b ES.6a-c ES.7a-e ES.8a-c ES.9a, b ES.10a-d
Meteorology, Oceanography, and Groundwater	10	ES.9c-f ES.11a-e ES.12a-e ES.13a-d
Astronomy and Space Science	9	ES.4a-d ES.14a-e
SOL Excluded From This Test		None
Total Number of Operational Items	50	
Field-Test Items*	10	
Total Number of Items	60	

*These field-test items will *not* be used to compute students' scores on the test.

Expanded Blueprint

Reporting Category: Scientific Investigation Number of Items: 10

Earth Science SOL in This Reporting Category:

- ES.1 The student will plan and conduct investigations in which
- volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools;
 - technologies including computers, probeware, and global positioning systems (GPS), are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions;
 - scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted;
 - variables are manipulated with repeated trials; and
 - a scientific viewpoint is constructed and defended (the nature of science).
- ES.2 The student will demonstrate scientific reasoning and logic by
- analyzing how science explains and predicts the interactions and dynamics of complex Earth systems;
 - recognizing that evidence is required to evaluate hypotheses and explanations;
 - comparing different scientific explanations for a set of observations about the Earth;
 - explaining that observation and logic are essential for reaching a conclusion; and
 - evaluating evidence for scientific theories.
- ES.3 The student will investigate and understand how to read and interpret maps, globes, models, charts, and imagery. Key concepts include
- maps (bathymetric, geologic, topographic, and weather) and star charts;
 - imagery (aerial photography and satellite images);
 - direction and measurements of distance on any map or globe; and
 - location by latitude and longitude and topographic profiles.

Reporting Category: Geology

Number of Items: 21

Earth Science SOL in This Reporting Category :

- ES.5 The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties. Key concepts include
- hardness, color and streak, luster, cleavage, fracture, and unique properties; and
 - uses of minerals.
- ES.6 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
- igneous (intrusive and extrusive) rocks;
 - sedimentary (clastic and chemical) rocks; and
 - metamorphic (foliated and unfoliated) rocks.
- ES.7 The student will investigate and understand the differences between renewable and nonrenewable resources. Key concepts include
- fossil fuels, minerals, rocks, water, and vegetation;
 - advantages and disadvantages of various energy sources;
 - resources found in Virginia;
 - making informed judgments related to resource use and its effects on Earth systems; and
 - environmental costs and benefits.
- ES.8 The student will investigate and understand geologic processes including plate tectonics. Key concepts include
- how geologic processes are evidenced in the physiographic provinces of Virginia including the Coastal Plain, Piedmont, Blue Ridge, Valley and Ridge, and Appalachian Plateau;
 - processes (faulting, folding, volcanism, metamorphism, weathering, erosion, deposition, and sedimentation) and their resulting features; and
 - tectonic processes (subduction, rifting and sea floor spreading, and continental collision).
- ES.9 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;
 - development of karst topography;

- ES.10 The student will investigate and understand that many aspects of the history and evolution of the 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.

Reporting Category: Meteorology, Oceanography, and Groundwater

Number of Items: 10

Earth Science SOL in This Reporting Category:

- ES.9 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include
- identification of groundwater zones including the water table, zone of saturation, and zone of aeration;
 - identification of other sources of fresh water including rivers, springs, and aquifers, with reference to the hydrologic cycle;
 - dependence on freshwater resources and the effects of human usage on water quality; and
 - identification of the major watershed systems in Virginia including the Chesapeake Bay and its tributaries.
- ES.11 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
- physical and chemical changes (tides, waves, currents, sea level and ice cap variations, upwelling, and salinity variations);
 - importance of environmental and geologic implications;
 - systems interactions (density differences, energy transfer, weather, and climate);
 - features of the sea floor (continental margins, trenches, mid-ocean ridges, and abyssal plains) as reflections of tectonic processes; and
 - economic and public policy issues concerning the oceans and the coastal zone including the Chesapeake Bay.
- ES.12 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 changes over geologic time;
 - current theories related to the effects of early life on the chemical makeup of the atmosphere;
 - comparison of the Earth's atmosphere to that of other planets;

- d) atmospheric regulation mechanisms including the effects of density differences and energy transfer; and
- e) potential atmospheric compositional changes due to human, biologic, and geologic activity.

- ES.13 The student will investigate and understand that energy transfer between the sun and the 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 and convection.

Reporting Category: Astronomy and Space Science

Number of Items: 9

Earth Science SOL in This Reporting Category:

- ES.4 The student will investigate and understand the characteristics of the Earth and the solar system. Key concepts include
- a) position of the Earth in the solar system;
 - b) sun-Earth-moon relationships (seasons, tides, and eclipses);
 - c) characteristics of the sun, planets and their moons, comets, meteors, and asteroids; and
 - d) the history and contributions of the space program.
- ES.14 The student will investigate and understand scientific concepts related to the origin and evolution of the universe. Key concepts include
- a) nebulae;
 - b) the origin of stars and star systems;
 - c) stellar evolution;
 - d) galaxies; and
 - e) cosmology including the big bang theory.