

Virginia

Standards of Learning Assessments

Test Blueprint

Biology

**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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Biology 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 Biology Standards of Learning test is *Life at the Molecular and Cellular Level*. Each of the SOL in this reporting category addresses an understanding of biological concepts related to molecules and cells. 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, Biology SOL BIO.6a, which covers structural similarities among organisms, is assigned to the reporting category *Life at the Systems and Organisms Level* in the Biology SOL test. However, BIO.6b, which involves fossil record interpretation, is assigned to the reporting category *Interaction of Life Forms*.

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. For example, Biology SOL BIO.4d is excluded from testing.

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 Biology 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.

Biology
Test Blueprint Summary Table

Reporting Category	Biology Standards of Learning	Number of Items
Assessed with Other SOL	BIO.1m	
Scientific Investigation	BIO.1a-l	11
Life at the Molecular and Cellular Level	BIO.2a-d BIO.3a-e BIO.4e BIO.5a-c, e-h, j BIO.6d	16
Life at the Systems and Organisms Level	BIO.4a-c BIO.5d BIO.6a, c, e	12
Interaction of Life Forms	BIO.4f BIO.6b BIO.7a-e BIO.8a-e	11
Excluded from Testing	BIO.4d BIO.5i	
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.

Biology

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:

- BIO.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- m) current applications of biological concepts are used.

Reporting Category: Scientific Investigation

Number of Items: 11

Standards of Learning:

- BIO.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- a) observations of living organisms are recorded in the lab and in the field;
 - b) hypotheses are formulated based on direct observations and information from scientific literature;
 - c) variables are defined and investigations are designed to test hypotheses;
 - d) graphing and arithmetic calculations are used as tools in data analysis;
 - e) conclusions are formed based on recorded quantitative and qualitative data;
 - f) sources of error inherent in experimental design are identified and discussed;
 - g) validity of data is determined;
 - h) chemicals and equipment are used in a safe manner;
 - i) appropriate technology including computers, graphing calculators, and probeware, is used for gathering and analyzing data, communicating results, modeling concepts, and simulating experimental conditions;
 - j) research utilizes scientific literature;
 - k) differentiation is made between a scientific hypothesis, theory, and law; and
 - l) alternative scientific explanations and models are recognized and analyzed.

Reporting Category: Life at the Molecular and Cellular Level

Number of Items: 16

Standards of Learning:

- BIO.2 The student will investigate and understand the chemical and biochemical principles essential for life. Key concepts include
- a) water chemistry and its impact on life processes;
 - b) the structure and function of macromolecules;
 - c) the nature of enzymes; and

- d) the capture, storage, transformation, and flow of energy through the processes of photosynthesis and respiration.
- BIO.3 The student will investigate and understand relationships between cell structure and function. Key concepts include
- a) evidence supporting the cell theory;
 - b) characteristics of prokaryotic and eukaryotic cells;
 - c) similarities between the activities of the organelles in a single cell and a whole organism;
 - d) the cell membrane model; and
 - e) the impact of surface area to volume ratio on cell division, material transport, and other life processes.
- BIO.4 The student will investigate and understand life functions of Archaea, Bacteria and Eukarya. Key concepts include
- e) how viruses compare with organisms.
- BIO.5 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include
- a) cell growth and division;
 - b) gamete formation;
 - c) cell specialization;
 - e) historical development of the structural model of DNA;
 - f) genetic variation;
 - g) the structure, function, and replication of nucleic acids;
 - h) events involved in the construction of proteins; and
 - j) exploration of the impact of DNA technologies.
- BIO.6 The student will investigate and understand bases for modern classification systems. Key concepts include
- d) examination of biochemical similarities and differences among organisms.

Reporting Category: Life at the Systems and Organisms Level**Number of Items: 12****Standards of Learning:**

- BIO.4 The student will investigate and understand life functions of Archaea, Bacteria and Eukarya. Key concepts include
- a) comparison of their metabolic activities;
 - b) maintenance of homeostasis; and
 - c) how the structures and functions vary among and within the Eukarya kingdoms of protists, fungi, plants, and animals, including humans.

- BIO.5 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include
- d) prediction of inheritance of traits based on the Mendelian laws of heredity.
- BIO.6 The student will investigate and understand bases for modern classification systems. Key concepts include
- a) structural similarities among organisms;
 - c) comparison of developmental stages in different organisms; and
 - e) systems of classification that are adaptable to new scientific discoveries.

Reporting Category: Interaction of Life Forms**Number of Items: 11****Standards of Learning:**

- BIO.4 The student will investigate and understand life functions of Archaea, Bacteria and Eukarya. Key concepts include
- f) evidence supporting the germ theory of infectious disease.
- BIO.6 The student will investigate and understand bases for modern classification systems. Key concepts include
- b) fossil record interpretation.
- BIO.7 The student will investigate and understand how populations change through time. Key concepts include
- a) evidence found in fossil records;
 - b) how genetic variation, reproductive strategies, and environmental pressures impact the survival of populations;
 - c) how natural selection leads to adaptations;
 - d) emergence of new species; and
 - e) scientific evidence and explanations for biological evolution.
- BIO.8 The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include
- a) interactions within and among populations including carrying capacities, limiting factors, and growth curves;
 - b) nutrient cycling with energy flow through ecosystems;
 - c) succession patterns in ecosystems;
 - d) the effects of natural events and human activities on ecosystems; and
 - e) analysis of the flora, fauna, and microorganisms of Virginia ecosystems.

Standards of Learning Excluded from Testing:

- BIO.4 The student will investigate and understand life functions of Archaea, Bacteria and Eukarya. Key concepts include
- d) human health issues, human anatomy, and body systems.

- BIO.5 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include
- i) use, limitations, and misuse of genetic information.