

Virginia

Standards of Learning Assessments

Blueprint

End-of-Course

Biology 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.

©2005 by the Commonwealth of Virginia, Department of Education, P.O. Box 2120, Richmond, Virginia 23218-2120. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Commonwealth of Virginia public school educators may reproduce any portion of these Blueprints for noncommercial educational purposes without requesting permission. All others should direct their written requests to the Virginia Department of Education, Division of Assessment and Reporting at the above address or by e-mail to darfax@doe.virginia.gov.

Biology Blueprint

Table of Contents

Standards of Learning (SOL) Test Blueprint Introduction.....	1
Development Guidelines.....	3
Blueprint Summary Table.....	4
Expanded Blueprint	5

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;
- (c) the number of test items in each reporting category and on the total test;
- (d) 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 represent related content or skills. These categories are labeled *Reporting Categories*. For example, a reporting category for the Biology 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 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, the SOL BIO.2e which deals with the collaborative efforts of scientists is assigned to the reporting category “Scientific Investigation” in the test. However, SOL BIO.2d which deals with the development of the structural model of DNA is assigned to the reporting category “Life at the Molecular and Cellular Level.” Each lettered SOL is assigned to only one reporting category.

Are there some SOL not included in the test blueprint?

At the end of the blueprint and the expanded blueprint, the SOL not tested are listed in “SOL Excluded From This Test.”

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, the test will measure a selection of the 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.

Biology 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 Biology.
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.

Biology Test Blueprint Summary Table

Reporting Categories	Number of Items	Biology SOL
Scientific Investigation	11	BIO.1a-m BIO.2e BIO.7e
Life at the Molecular and Cellular Level	14	BIO.2a, d BIO.3a-d BIO.4a-d BIO.5f BIO.6a-c, e-g, I BIO.7d
Life at the Systems and Organisms Level	14	BIO.2b BIO.5a-d BIO.6d BIO.7a, c
Interaction of Life Forms	11	BIO.2c BIO.8a-e BIO.9a-e BIO.7b
SOL excluded from this test		BIO.5e BIO.6h
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: 11

Biology SOL in This Reporting Category:

BIO.1 The student will plan and conduct 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 and communicating results;
- j) research utilizes scientific literature;
- k) differentiation is made between a scientific hypothesis and theory;
- l) alternative scientific explanations and models are recognized and analyzed; and
- m) a scientific viewpoint is constructed and defended (the nature of science).

BIO.2 The student will investigate and understand the history of biological concepts. Key concepts include

- e) the collaborative efforts of scientists, past and present.

BIO.7 The student will investigate and understand bases for modern classification systems. Key concepts include

- e) systems of classification that are adaptable to new scientific discoveries.

Reporting Category: Life at the Molecular and Cellular Level Number of Items: 14

Biology SOL in This Reporting Category:

- BIO.2 The student will investigate and understand the history of biological concepts. Key concepts include
- evidence supporting the cell theory; and
 - development of the structural model of DNA.
- BIO.3 The student will investigate and understand the chemical and biochemical principles essential for life. Key concepts include
- water chemistry and its impact on life processes;
 - the structure and function of macromolecules;
 - the nature of enzymes; and
 - the capture, storage, transformation, and flow of energy through the processes of photosynthesis and respiration.
- BIO.4 The student will investigate and understand relationships between cell structure and function. Key concepts include
- characteristics of prokaryotic and eukaryotic cells;
 - exploring the diversity and variation of eukaryotes;
 - similarities between the activities of a single cell and a whole organism; and
 - the cell membrane model (diffusion, osmosis, and active transport).
- BIO.5 The student will investigate and understand life functions of archaebacteria, monerans (eubacteria), protists, fungi, plants, and animals including humans. Key concepts include
- how viruses compare with organisms.
- BIO.6 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include
- cell growth and division;
 - gamete formation;
 - cell specialization;
 - genetic variation (mutation, recombination, deletions, additions to DNA);
 - the structure, function, and replication of nucleic acids (DNA and RNA);
 - events involved in the construction of proteins; and
 - exploration of the impact of DNA technologies.
- BIO.7 The student will investigate and understand bases for modern classification systems. Key concepts include
- examination of biochemical similarities and differences among organisms.

Reporting Category: Life at the Systems and Organisms Level
Number of Items: 14

Biology SOL in This Reporting Category:

- BIO.2 The student will investigate and understand the history of biological concepts. Key concepts include
- b) scientific explanations of the development of organisms through time (biological evolution).
- BIO.5 The student will investigate and understand life functions of archaeobacteria, monerans (eubacteria), protists, fungi, plants, and animals including humans. Key concepts include
- a) how their structures and functions vary between and within the kingdoms;
 - b) comparison of their metabolic activities;
 - c) analyses of their responses to the environment; and
 - d) maintenance of homeostasis.
- BIO.6 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.7 The student will investigate and understand bases for modern classification systems. Key concepts include
- a) structural similarities among organisms; and
 - c) comparison of developmental stages in different organisms.

Reporting Category: Interaction of Life Forms
Number of Items: 11

Biology SOL in This Reporting Category:

- BIO.2 The student will investigate and understand the history of biological concepts. Key concepts include
- c) evidence supporting the germ theory of infectious disease.
- BIO.7 The student will investigate and understand bases for modern classification systems. Key concepts include
- b) fossil record interpretation.
- BIO.8 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 explanations for biological evolution.

BIO.9 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 including the Chesapeake Bay and its tributaries.

Biology SOL Excluded From This Test:

BIO.5e The student will investigate and understand life functions of archaeobacteria, monerans (eubacteria), protists, fungi, plants, and animals including humans. Key concepts include human health issues, human anatomy, body systems, and life functions.

BIO.6h The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include use, limitations, and misuse of genetic information.