

Virginia

Standards of Learning Assessments

Test Blueprint

Chemistry

**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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Chemistry 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 Chemistry Standards of Learning test is *Atomic Structure and Periodic Relationships*. Each of the SOL in this reporting category addresses understanding of the structure of atoms and the organization of the periodic table. 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, Chemistry SOL CH.6a, which covers the unique properties of carbon, is assigned to the reporting category *Atomic Structure and Periodic Relationships* in the Chemistry SOL test. However, CH.6b, which involves use of carbon compounds, is assigned to the reporting category *Chemical Formulas and Reactions*.

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 Chemistry 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 Chemistry 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.

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Test Blueprint Summary Table

Reporting Category	Chemistry Standards of Learning	Number of Items
Assessed with Other SOL	CH.1j	
Scientific Investigation	CH.1a-i	10
Atomic Structure and Periodic Relationships	CH. 2a-i CH.6a	8
Chemical Formulas and Reactions	CH.3a-f CH.6b	16
Molar Relationships	CH. 4a-d	8
Phases of Matter and Kinetic Molecular Theory	CH. 5a-g	8
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.

Chemistry

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:

- CH.1 The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include
- j) the use of current applications to reinforce chemistry concepts.

Reporting Category: Scientific Investigation

Number of Items: 10

Standards of Learning:

- CH.1 The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include
- a) designated laboratory techniques;
 - b) safe use of chemicals and equipment;
 - c) proper response to emergency situations;
 - d) manipulation of multiple variables, using repeated trials;
 - e) accurate recording, organization, and analysis of data through repeated trials;
 - f) mathematical and procedural error analysis;
 - g) mathematical manipulations including SI units, scientific notation, linear equations, graphing, ratio and proportion, significant digits, and dimensional analysis;
 - h) use of appropriate technology including computers, graphing calculators, and probeware, for gathering data, communicating results, and using simulations to model concepts; and
 - i) construction and defense of a scientific viewpoint.

Reporting Category: Atomic Structure and Periodic Relationships

Number of Items: 8

Standards of Learning:

- CH.2 The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of
- a) average atomic mass, mass number, and atomic number;
 - b) isotopes, half lives, and radioactive decay;
 - c) mass and charge characteristics of subatomic particles;
 - d) families or groups;

- e) periods;
- f) trends including atomic radii, electronegativity, shielding effect, and ionization energy;
- g) electron configurations, valence electrons, and oxidation numbers;
- h) chemical and physical properties; and
- i) historical and quantum models.

CH.6 The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include

- a) unique properties of carbon that allow multi-carbon compounds.

Reporting Category: Chemical Formulas and Reactions

Number of Items: 16

Standards of Learning:

CH.3 The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include

- a) nomenclature;
- b) balancing chemical equations;
- c) writing chemical formulas;
- d) bonding types;
- e) reaction types; and
- f) reaction rates, kinetics, and equilibrium.

CH.6 The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include

- b) uses in pharmaceuticals and genetics, petrochemicals, plastics, and food.

Reporting Category: Molar Relationships

Number of Items: 8

Standards of Learning:

CH.4 The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include

- a) Avogadro's principle and molar volume;
- b) stoichiometric relationships;
- c) solution concentrations; and
- d) acid/base theory; strong electrolytes, weak electrolytes, and nonelectrolytes; dissociation and ionization; pH and pOH; and the titration process.

Reporting Category: Phases of Matter and Kinetic Molecular Theory**Number of Items: 8****Standards of Learning:**

- CH.5 The student will investigate and understand that the phases of matter are explained by kinetic theory and forces of attraction between particles. Key concepts include
- a) pressure, temperature, and volume;
 - b) partial pressure and gas laws;
 - c) vapor pressure;
 - d) phase changes;
 - e) molar heats of fusion and vaporization;
 - f) specific heat capacity; and
 - g) colligative properties.