

**IDAHO CONTENT STANDARDS
GRADE 11-12
CHEMISTRY**

Students are expected to know content and apply skills from previous grades.

Standard 1: Nature of Science

Students exercise the basic tenets of scientific investigation, make accurate observations, exercise critical thinking skills, apply proper scientific instruments of investigation and measurement tools, and communicate results in problem solving. Students evaluate the validity of information by utilizing the tools of scientific thinking and investigation. Students summarize their findings by creating lab reports using technical writing including graphs, charts, and diagrams to communicate the results of investigations.

Goal 1.1: Understand Systems, Order, and Organization

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.1.1 Use the periodic table to predict physical and chemical properties.

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanation

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.2.1 Describe the historical development of the periodic table.
- 11-12.C.1.2.2 Create and interpret graphs of data.
- 11-12.C.1.2.3 Explain and interpret the key concepts of the kinetic molecular theory.
- 11-12.C.1.2.4 Distinguish the common theories defining acids and bases.

Goal 1.3: Understand Constancy, Change, and Measurement

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.3.1 Identify, compare and contrast physical and chemical properties and changes and appropriate computations.
- 11-12.C.1.3.2 Perform computations using scientific notation, the metric system and dimensional analysis.
- 11-12.C.1.3.3 Compute measurement uncertainty to include precision, accuracy and the rules for significant digits.
- 11-12.C.1.3.4 Perform calculations related to the conversion of grams to moles to particles, atoms, molecules and volume.
- 11-12.C.1.3.5 Analyze and solve reaction stoichiometry problems.
- 11-12.C.1.3.6 Express concentrations of solutions in various ways including molarity.
- 11-12.C.1.3.7 Interpret how the presence of solute particles affect the properties of a solution and be able to do calculations involving colligative properties.
- 11-12.C.1.3.8 Analyze quantitative relationships involved in acid/base chemistry including pH.

Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State

No objectives in Chemistry.

Goal 1.5: Understand Concepts of Form and Function

No objectives in Chemistry.

Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.6.1 Demonstrate an understanding of the scientific method.
- 11-12.C.1.6.2 Select and use appropriate scientific equipment, materials and techniques.

Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.7.1 Explain how a series of historically related and documented experiments led to the current model and structure of the atom.

Goal 1.8: Understand Technical Communication

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.1.8.1 Correctly write symbols, formulas and names for common elements, ions and compounds.
- 11-12.C.1.8.2 Communicate scientific investigations and information clearly.

Standard 2: Physical Science

Students explain the structure and properties of atoms, including isotopes. Students explain how chemical reactions, while requiring or releasing energy, can neither destroy nor create energy or matter. Students explain the differences between fission and fusion. Students explain the interactions of force and mass in describing motion using Newton's Laws. Students explain how energy can be transformed from one form to another while the total amount of energy remains constant. Students classify energy as potential and/or kinetic, and as energy contained in a field.

Goal 2.1: Understand the Structure and Function of Matter and Molecules and Their Interactions

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.2.1.1 Explain and understand how electrons are involved in the formation of chemical bonds using the octet rule and Lewis dot diagrams.
- 11-12.C.2.1.2 Predict the polarity of chemical bonds using electronegativity.
- 11-12.C.2.1.3 Predict physical properties of compounds based upon the attractive forces between atoms and molecules.
- 11-12.C.2.1.4 Distinguish and classify all matter into appropriate categories.
- 11-12.C.2.1.5 Explain the relationship and reactions of acids, bases, and salts.
- 11-12.C.2.1.6 Explain the role of dissociation and ionization in producing strong, weak, and nonelectrolytes.

As approved by the State Board of Education 8/21/08 incorporated by reference in temporary rule

Goal 2.2: Understand Concepts of Motion and Forces

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.2.2.1 Describe the Kinetic Molecular Theory as it applies to phases of matter.

Goal 2.3: Understand the Total Energy in the Universe is Constant

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.2.3.1 Explain and calculate the changes in heat energy that occur during chemical reactions and phase changes.
- 11-12.C.2.3.2 Demonstrate the conservation of matter by balancing chemical equations.
- 11-12.C.2.3.3 Differentiate between exothermic and endothermic chemical reactions during chemical or physical changes.

Goal 2.4: Understand the Structure of Atoms

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.2.4.1 Interpret the classic historical experiments that were used to identify the components of an atom and its structure.
- 11-12.C.2.4.2 Deduce the number of protons, neutrons and electrons for an atom or ion.
- 11-12.C.2.4.3 Describe the relationship between the structure of atoms and light absorption and emission.
- 11-12.C.2.4.4 Determine and illustrate electron arrangements of elements using electron configurations and orbital energy diagrams.

Goal 2.5: Understand Chemical Reactions

Objective(s): By the end of Chemistry, the student will be able to:

- 11-12.C.2.5.1 Illustrate the Law of Conservation of Mass and the Law of Definite Proportions.
- 11-12.C.2.5.2 Classify, write and balance chemical equations for common types of chemical reactions and predict the products.
- 11-12.C.2.5.3 Describe the factors that influence the rates of chemical reactions.

Standard 3: Biology

No goals or objectives in Chemistry.

Standard 4: Earth and Space Systems

No goals or objectives in Chemistry.

Standard 5: Personal and Social Perspectives; Technology

Students understand that science and technology interact and impact both society and the environment.

As approved by the State Board of Education 8/21/08 incorporated by reference in temporary rule

Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.5.1.1 Demonstrate the ability to work safely and effectively in a chemistry laboratory.

Goal 5.2: Understand the Relationship between Science and Technology

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.5.2.1 Assess the role of chemistry in enabling technological advances.

Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them

Objective(s): By the end of Chemistry, the student will be able to:

11-12.C.5.3.1 Evaluate the role of chemistry in energy and environmental issues.