

# Chemistry

## Course Syllabus



### Supervising Teacher

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### Course Description:

*Chemistry* 2 semesters 2 credits Grades 11 or 12  
*Pre-requisite: Successful completion of Algebra I.*

*This course meets the graduation requirement for a laboratory science course.*

*Students will study major areas of chemistry including but not limited to: chemical reactions, chemical bonding, nuclear reactions, properties of elements, compounds and mixtures, organic chemistry, stoichiometric calculations, acids and bases, and more.*

### Recommended Textbook Options:

*Harcourt Holt: Chemistry*  
*McGraw-Hill/Glencoe: Chemistry – Concepts and Applications*  
*Pearson/Prentice Hall: Chemistry*

### Recommended Supplemental Materials or Software:

*For use with select Anchor assignments – Kitchen Chemistry labs*  
*Simon & Schuster/McGee, Harold: On Food and Cooking - The Science and Lore of the Kitchen.*

### Course Evaluation:

#### **A. Semester Examination: 12% of semester grade**

*A comprehensive semester examination will be given during exam week each semester. Semester examinations will be given by a supervising instructor at a previously agreed upon location, most often a resource center.*

#### **B. Home Participation and Portfolio: 60% of grade**

*Home participation is to be determined by the home educator. The participation may include, but is not limited to, textbook activities, quizzes, unit tests, projects, oral reports, or research papers. Grades for home participation will be submitted to the contact teacher who will then forward a copy to the supervising instructor for semester grade tabulation. A portfolio of student work which may include copies of some of the laboratories will be presented to the contact teacher once per semester.*

#### **C. Laboratory Expectations: 28% of grade**

*Students are expected to complete a minimum of 4 labs per semester chosen from a selection that cover the objectives for that semester's content. All laboratories must be completed only by the student and a full experiment write-up/report will be submitted to the supervising instructor by each anchor due date listed in the school calendar. All write-ups must contain at least one picture of the student performing the experiment, unless it is performed under supervision of an IDEA instructor at a local resource center. In the case of performing a supervised experiment, the supervising instructor's signature can substitute for the photographic documentation of student participation.*

## End of Course Assessment:

*A comprehensive examination will be given each semester in addition to required laboratories and the student portfolio.*

## Pacing Guide

The topics and standards for this course have been divided between the two semesters.

Semester 1(Fall)	Semester 2 (Spring)
Scientific Investigation/Nature of Science	Gases
Atomic and Molecular Structures	Acids and Bases
Chemical Bonds and Reactions	Solutions
Conservation of Matter	Thermal Chemistry
Measurements and Calculations	Reaction Rates and Equilibrium
	Electrochemistry and Redox Reactions
	Organic and Biochemistry
	Nuclear Chemistry

In order to fulfill this pacing requirement, the recommended texts have been broken down by chapter. Covering the chapters in the order listed will insure that all topics on the final exam will be covered during the appropriate semester.

### *Harcourt/Holt: Chemistry*

Semester 1(Fall)	Semester 2 (Spring)
Chapters 1-2	Chapters 12-13
Chapters 3-4	Chapters 14-16
Chapters 5-8	Chapter 17
Chapter 9	Chapter 18
Chapter 11	Chapters 19-20

### *McGraw-Hill/Glencoe: Chemistry – Concepts and Applications*

Semester 1(Fall)	Semester 2 (Spring)
Chapter 1	Review Chapter 6-reaction rates & equilibrium Chapter 11
Chapters 2-3	Chapters 13-15
Chapters 7-8	Chapters 16-17
Chapters 4-6	Chapters 18-19
Chapter 9	Chapter 20
Chapters 10,12	Chapter 21

*Pearson/Prentice Hall: Chemistry*

<b>Semester 1(Fall)</b>	<b>Semester 2 (Spring)</b>
Chapters 1,3	Chapters 14-16
Chapters 2-6	Chapters 15-16
Chapters 7--11	Chapters 17-18
Chapters 3.3, 12-13	Chapters 19-21
	Chapters 22-24
	Chapter 25

**I-DEA Student Honor Code:**

With any form of valid proof of dishonesty with regard to student work or testing, the instructor may elect from a range of actions. Academic dishonesty could lead to a zero grade for the assignment or even failure for the entire course following consultation between the instructor, Secondary Supervisor, and Director.

All students must adhere to the **Honor Code:**

*“On my honor, I will maintain the highest possible standards of honesty, integrity and personal responsibility. This means I will not lie, cheat or steal, and as a member of this academic community, I am committed to creating an environment of respect and mutual trust.”*

## IDAHO CONTENT STANDARDS: CHEMISTRY

### Standard 1: Nature of Science

Goals	Objectives							
<p><b>GOAL 1.1</b> Understand unifying concepts and processes of science; systems, order, organization, evidence, models, explanations, and theory.</p>	<p>11-12.CH.1.1.1 Utilize components of the scientific method to design, conduct, and communicate the results of investigations.</p>	<p>11-12.CH.1.1.2 Develop models to explain concepts or systems. Investigate and describe how different models can be used to demonstrate the same thing.</p>	<p>11-12.CH.1.1.3 Define, explain, and differentiate the terms: law, hypothesis, and theory</p>	<p>11-12.CH.1.1.4 Recognize the cumulative nature of scientific evidence.</p>	<p>11-12.CH.1.1.5 Identify and communicate sources of unavoidable experimental error.</p>	<p>11-12.CH.1.1.6 Recognize the issues of statistical variability and the need for controlled tests.</p>	<p>11-12.CH.1.1.7 Differentiate between mass and weight, heat and temperature</p>	
<p><b>GOAL 1.2</b> Understand Science as Inquiry</p>	<p>11-12.CH.1.2.1 Demonstrate skills necessary to become independent inquirers about the natural world.</p>	<p>11-12.CH.1.2.2 Use observations and data as evidence on which to base scientific explanations.</p>	<p>11-12.CH.1.2.3 Use the skills, abilities, and attitudes associated with science.</p>	<p>11-12.CH.1.2.4 Formulate scientific explanations based on knowledge, logic, and analysis.</p>	<p>11-12.CH.1.2.5 Critically evaluate information to distinguish between fact and opinion when responding to information.</p>	<p>11-12.CH.1.2.6 Communicate and defend a scientific argument in a clear and understandable manner.</p>	<p>11-12.CH.1.2.7 Construct and interpret various representations of data, including data tables, graphs, and scientific visualizations.</p>	<p>11-12.CH.1.2.8 Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.</p>
<p><b>GOAL 1.3</b> Understand the inter-relationship between science, technology, engineering, and mathematics</p>	<p>11-12.CH.1.3.1 Use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display, interpret, and manipulate data.</p>	<p>11-12.CH.1.3.2 Use significant figures as indicators of precision of measurements and calculated values</p>	<p>11-12.CH.1.3.3 Use exponential notation</p>	<p>11-12.CH.1.3.4 Perform mathematical calculations involving significant figures</p>	<p>11-12.CH.1.3.5 Formulate scientific explanations and models using logic and evidence.</p>	<p>11-12.CH.1.3.6 Carry out scientific procedures, using appropriate measurements and careful observations.</p>	<p>11-12.CH.1.3.7 Perform unit conversions between the English system and the metric system for common units of length/distance, mass, volume, and temperature</p>	<p>11-12.CH.1.3.8 Perform calculations in both the English system and the metric system</p>

GOAL 1.4 Understand Science in Personal and Social Perspectives	11-12.CH.1.4.1 Explain that scientists may work in teams and some may work alone, but all communicate extensively with each other.	11-12.CH.1.4.2 Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings.	11-12.CH.1.4.3 Analyze how specific changes in science have affected society.	11-12.CH.1.4.4 Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.				
GOAL 1.5 Understand the History and nature of Science	11-12.CH.1.5.1 Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.	11-12.CH.1.5.2 Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.						

## Standard 2: Atoms, Molecules, and Solutions

Goals	Objectives							
GOAL 2.1 Understand the periodic table and how physical and chemical properties are related to atomic structure	11-12.CH.2.1.1 Relate the position of an element in the periodic table to its atomic number and atomic mass.	11-12.CH.2.1.2 Associate elements with groups and periods	11-12.CH.2.1.3 Identify trends in periodic table	11-12.CH.2.1.4 Use the periodic table to identify metals, semimetals, nonmetals, and halogens.	11-12.CH.2.1.5 Use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.	11-12.CH.2.1.6 Use the periodic table to determine the number of electrons available for bonding.	11-12.CH.2.1.7 Identify atomic mass and atomic number of elements	
GOAL 2.2 Understand the structures and operations of atoms and molecules	11-12.CH.2.2.1 Describe the nucleus of an atom and its size and mass as they relate to the atom.	11-12.CH.2.2.2 Identify the valence number and reactivity of an atom or molecule	11-12.CH.2.2.3 Explain the quantum electron configuration and orbitals	11-12.CH.2.2.4 Describe the relationship between orbitals and energy levels	11-12.CH.2.2.5 Discuss historical discoveries and models of atoms	11-12.CH.2.2.6 Use Planck's equation in association with spectral lines		

GOAL 2.3 Understand the properties and identification of acids and bases	11-12.CH.2.3.1 Identify the observable properties of acids, bases, and salt solutions.	11-12.CH.2.3.2 Describe Arrhenius definition of acids and bases in terms of hydrogen ions.	11-12.CH.2.3.3 Describe Bronsted-Lowry definition of acids and bases in terms of proton-transfer	11-12.CH.2.3.4 Describe Lewis definition of acids and bases in terms of covalent bonds	11-12.CH.2.3.5 Identify strong acids and bases in terms of full and partial dissociation.	11-12.CH.2.3.6 Use the pH scale to characterize acid and base solutions.	11-12.CH.2.3.7 Perform pH calculations	11-12.CH.2.3.8 Perform and describe titration
GOAL 2.4 Understand properties and behaviors of solutions	11-12.CH.2.4.1 Explain solute and solvent.	11-12.CH.2.4.2 Describe random molecular motion as it pertains to the dissolving process.	11-12.CH.2.4.3 Explain how temperature, pressure, and surface area affect the dissolving process.	11-12.CH.2.4.4 Calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition.	11-12.CH.2.4.5 Describe factors that affect solvation	11-12.CH.2.4.6 Differentiate Molarity and Molality	11-12.CH.2.4.7 Identify colligative properties	

### Standard 3: Chemical Interactions

GOAL 3.1 Understand the classifications of chemical compounds	11-12.CH.3.1.1 Use compound nomenclature in the naming of chemical compounds							
GOAL 3.2 Understand the structuring of molecules and their bonds	11-12.CH.3.2.1 Explain the formation of molecules and classify them by type of bond : covalent, metallic, or ionic.	11-12.CH.3.2.2 Identify and calculate molar mass, percent composition, and empirical formulas	11-12.CH.3.2.3 Demonstrate knowledge of covalent chemical bonds between atoms in large biological molecules and molecules such as H <sub>2</sub> , CH <sub>4</sub> , NH <sub>3</sub> , H <sub>2</sub> CCH <sub>2</sub> , N <sub>2</sub> , Cl <sub>2</sub> .	11-12.CH.3.2.4 Describe the structure of salt crystals and electrostatic attraction.	11-12.CH.3.2.5 Indicate the molecular structures of various molecules.	11-12.CH.3.2.6 Differentiate the intermolecular forces of atoms and molecules in solids, liquids, and gases.	11-12.CH.3.2.7 Draw accurate Lewis dot structures.	

GOAL 3.3 Understand molar mass and chemical calculations	11-12.CH.3.3.1 Define a Mole as it relates to carbon 12 atoms.	11-12.CH.3.3.2 Identify and use Avogadro's Number ( $6.02 \times 10^{23}$ particles) as it relates to Molar mass	11-12.CH.3.3.3 Mathematically convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.	11-12.CH.3.3.4 Determine the molar mass of a molecule from its chemical formula and a table of atomic masses	11-12.CH.3.3.5 Calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.	11-12.CH.3.3.6 Calculate percent yield of a reaction	11-12.CH.3.3.7 Perform stoichiometric calculations	
GOAL 3.4 Understand reaction rates and their variables	11-12.CH.3.4.1 Measure and describe the rate of reaction	11-12.CH.3.4.2 Determine how reaction rates depend on such factors as concentration, temperature, and pressure.	11-12.CH.3.4.3 Measure and describe how a catalyst increases the reaction rate.	11-12.CH.3.4.4 Use and describe Rate law as it pertains to concentration of reactant (and catalyst)				
GOAL 3.5 Understand equilibrium in chemical reactions	11-12.CH.3.5.1 Use Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure.	11-12.CH.3.5.2 Explain how equilibrium is established when forward and reverse reaction rates are equal.	11-12.CH.3.5.3 Identify and use equilibrium constants in calculation	11-12.CH.3.5.4 Describe solubility as it pertains to equilibrium				
GOAL 3.6 Understand electrochemical reactions	11-12.CH.3.6.1 Explain the oxidation and reduction process in Redox reactions	11-12.CH.3.6.2 Perform Redox reactions and balance redox equations	11-12.CH.3.6.3 Discuss cell potentials					

#### Standard 4: Physical Chemistry

GOAL 4.1 Understand conservation, and balance of chemical equations	11-12.CH.4.1.1 Explain the Law of Conservation of Matter	11-12.CH.4.1.2 Describe chemical reactions by writing balanced equations.						
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GOAL 4.2 Understand molecular behaviors in gases	11-12.CH.4.2.1 Explain standard temperature and pressure (STP).	11-12.CH.4.2.2 Explain the kinetic-molecular theory of molecules as it relates to pressure (STP)	11-12.CH.4.2.3 Explain the kinetic-molecular theory of molecules as it relates to the diffusion of gases.					
GOAL 4.3 Understand the laws of gases, how they relate to volume, temperature, and pressure	11-12.CH.4.3.1 Identify and apply Dalton's law of partial pressures in calculating total pressure of a mixture	11-12.CH.4.3.2 Identify and apply Graham's law of effusion in calculating effusion rates of gases	11-12.CH.4.3.3 Identify and apply Boyle's law in calculating the volume of gases	11-12.CH.4.3.4 Identify and apply Charles's law in calculating the volume of gases.	11-12.CH.4.3.5 Identify and apply the Combined gas law in calculating the volume of gases.	11-12.CH.4.3.6 Identify and apply the Ideal gas law in calculating Pressure, volume, and temperature of gases		
GOAL 4.4 Understand units of temperature	11-12.CH.4.4.1 Describe and convert between the Fahrenheit, Celsius and Kelvin temperature scales.							
GOAL 4.5 Understand derivations and behaviors related to thermodynamics	11-12.CH.4.5.1 Describe temperature and heat flow in terms of the motion of molecules (or atoms) and specific heat.	11-12.CH.4.5.2 Differentiate exothermic and endothermic thermal energy.	11-12.CH.4.5.3 Describe and apply Hess's law in calculating the enthalpy of a reaction	11-12.CH.4.5.4 Describe and apply Gibbs free energy in calculating free energy change	11-12.CH.4.5.5 Measure how energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts.	11-12.CH.4.5.6 Solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.		
GOAL 4.6 Understand nuclear properties and energy	11-12.CH.4.6.1 Describe the properties of the nucleus as it pertains to protons and neutrons	11-12.CH.4.6.2 Calculate to change in mass, use the equation $E = mc^2$ , during nuclear fusion or fission reactions.	11-12.CH.4.6.3 Relate the energy release of nuclear fusion or fission reactions to that of chemical reactions					

GOAL 4.7 Understand radioactivity and radioactive isotopes	11-12.CH.4.7.1 Explain the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.	11-12.CH.4.7.2 Identify naturally occurring radioactive isotopes of elements	11-12.CH.4.7.3 Describe how isotopes in nuclear reactions become radioactive	11-12.CH.4.7.4 Explain how alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.				
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### Standard 5: Organic Chemistry and Biochemistry

Goals	Objectives							
GOAL 5.1 Understand chemical classifications in organic and biological systems	11-12.CH.5.1.1 Identify and properly use organic compound nomenclature	11-12.CH.5.1.2 Identify functional groups	11-12.CH.5.1.3 Identify types of biological molecules					
GOAL 5.2 Understand the structures and behaviors of organic and biological molecules	11-12.CH.5.2.1 Describe how large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.	11-12.CH.5.2.2 Describe the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.	11-12.CH.5.2.3 Discuss amino acids as the building blocks of proteins.					