

Novato Unified School District
Course Description

CHEMISTRY

A. Course goals and/or major student outcomes

B. Course Objectives

Objectives	Standards
<p><i>Students will understand:</i></p> <ol style="list-style-type: none"><i>1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept.</i><i>2. Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</i><i>3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.</i><i>4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases.</i><i>5. Acids, bases, and salts are three classes of compounds that form ions in water solutions.</i><i>6. Solutions are homogenous mixtures of two or more substances.</i><i>7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter</i><i>8. Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</i><i>9. Chemical equilibrium is a dynamic process at the molecular level.</i><i>10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical basis of life.</i><i>11. Nuclear processes are those which an atom nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion.</i>	<p>Chemistry Standard 1:a-e</p> <p>Chemistry Standard 2:a-e</p> <p>Chemistry Standard 3:a-e</p> <p>Chemistry Standard 4:a-f</p> <p>Chemistry Standard 5:a-d</p> <p>Chemistry Standard 6:a-d</p> <p>Chemistry Standard 7:a-d</p> <p>Chemistry Standard 8:a-c</p> <p>Chemistry Standard 9:a & b</p> <p>Chemistry Standard 10:a-c</p> <p>Chemistry Standard 11:a-e</p>

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C. Outlines	Topics/Units/Themes	Key Activities/Assignments
	<p>Introduction to Chemistry</p> <ul style="list-style-type: none">• <i>Classification and Properties of Matter</i>• <i>Measurement</i>• <i>Scientific Notation and Significant Figures</i> <p>Atoms, Molecules and Ions</p> <ul style="list-style-type: none">• <i>Atomic Theory</i>• <i>Structure of the Atom</i>• <i>Atomic Number, Mass, Isotopes</i>• <i>Molecules and Ions</i>• <i>Chemical Formulas</i>• <i>Naming Compounds</i> <p>Stoichiometry</p> <ul style="list-style-type: none">• <i>Atomic Mass</i>• <i>Molar Mass and Avogadro's Number</i>• <i>Molecular Mass</i>• <i>Percent Composition</i>• <i>Determination of Empirical Formulas</i>• <i>Amounts of Reactants and Products</i>• <i>Limiting Reagents and Yield of Reaction</i> <p>Reactions in Aqueous Solutions</p> <ul style="list-style-type: none">• <i>Properties of Aqueous Solutions</i>• <i>Precipitation Reactions</i>• <i>Acid-Base Reactions</i>• <i>Oxidation-Reduction Reactions</i>• <i>Concentration and Dilution of Solutions</i>• <i>Solution Stoichiometry</i> <p>Gases</p> <ul style="list-style-type: none">• <i>General Properties of Gases</i>• <i>The Gas Laws</i>• <i>The Ideal Gas Equation</i>• <i>Dalton's Law of Partial Pressures</i>• <i>Kinetic Molecular Theory of Gases</i> <p>Energy Relationships in Chemical Reactions</p> <ul style="list-style-type: none">• <i>Energy and Energy Changes in Chemical Reactions</i>• <i>Enthalpy</i>• <i>Calorimetry</i>• <i>Standard Enthalpy of Formation and Reaction</i>	

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Electronic Structure of Atoms

- *From Classical Physics to Quantum Theory*
- *The Photoelectric Effect*
- *Bohr's Theory of the Hydrogen Atom*
- *The Dual Nature of the Electron*
- *Quantum Mechanics*
- *Quantum Numbers*
- *Atomic Orbitals*
- *Electron Configurations*

The Periodic Table

- *Development of the Periodic Table*
- *Periodic Classification of the Elements*
- *Periodic Variation in Physical Properties*
- *Ionization Energy*
- *Electron Affinity*

Chemical Bonding

- *Covalent and Ionic Bonds*
- *Lewis Dot Symbols and Lewis Structures*
- *Electronegativity*
- *Resonance*
- *Molecular Geometry*
- *Molecular Dipoles*

Intermolecular Forces and Liquids and Solids

- *Kinetic Molecular Theory of Liquids and Solids*
- *Intermolecular Forces*
- *The Liquid State*
- *Crystal Structure*
- *Bonding in Solids*
- *Phase Changes*
- *Phase Diagrams*

Physical Properties of Solutions

- *Types of Solutions*
- *Molecular View of Solution Process*
- *Concentration Units*
- *Effect of Temperature on Solubility*
- *Effect of Pressure on Solubility of a Gas*
- *Colligative Properties*

Introduction to Organic and Biochemistry

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- *The Study of Organic Chemistry*
- *Hydrocarbons*
- *Functional Groups*
- *Properties of Polymers*
- *Proteins*
- *Nucleic Acids*
- *Carbohydrates*
- *Lipids*

Chemical Equilibrium

- *The Concept of Equilibrium*
- *Equilibrium Constant Expressions and Their Meaning*
- *Factors that Affect Chemical Equilibrium*

Acids and Bases

- *Bronsted Acids and Bases*
- *Acid-Base Properties of Water*
- *pH*
- *Strong Acids and Strong Bases*
- *Weak Acids and K_a*
- *Buffers*
- *Lewis Acids and Bases*

Solubility Equilibrium

- *Solubility Product Constant, K_{sp}*
- *Common Ion Effect*
- *Qualitative Analysis*

Redox Reactions and Electrochemistry

- *Redox Reactions*
- *Galvanic Cells*
- *Standard Electrode Potentials*
- *Spontaneity of Redox Reactions*
- *Electrolysis*

Chemical Kinetics

- *The Rate of a Reaction*
- *The Rate Laws*
- *Activation Energy*
- *Reaction Mechanisms*
- *Catalysis*

Nuclear Chemistry

- *The Nature of Nuclear Chemistry*
- *Natural Radioactivity*
- *Nuclear Transmutation*
- *Nuclear Fission*
- *Nuclear Fusion*

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D. Texts & supplemental instructional materials

Chemistry Connections to Changing the World, 2nd Edition, Prentice Hall, Lemay Beal

E. Instructional methods and/or strategies –

lecture	individual and/or group oral presentations
discussion	library/media center research
laboratory work	videotapes
computer tutorials/instruction	memorization
modeling	review games and contests
group work	

F. Assessment methods and/or tools –

Daily/weekly work (in-class activities, lab reports, quizzes, tests)
Projects
Comprehensive semester exam

G. Assessment criteria

Rubric scores on major assignments
Objective quizzes and tests
Teachers' professional judgment of quality based on assigned criteria

Accumulated points from the above assessments will be evaluated as follows:

90-100%	exceptional
80-89%	above average
70-79%	average
60-69%	below average
below 60%	unacceptable