

## Boonton School District

<b>Course Title:</b>	Chemistry Concepts	<b>Grade Level(s):</b>	10		
<b>Curriculum Area / Level:</b>	Science/ cp	<b>Credits:</b>	5		
<b>Course prerequisites and/or co-requisites:</b>	Biology				
<b>Course Description:</b>	<p>This course teaches the fundamentals of chemistry with a strong emphasis on atomic structure, periodic properties, chemical names and formulas, and chemical reactions, while minimizing mathematical applications and associated problems. Basic laboratory skills and techniques will be demonstrated and practiced in formal labs and hands-on activities. Analytical thinking is encouraged in individual as well as group investigations. Students will gain basic chemistry knowledge along with background laboratory and measurement skills.</p>				
<b>Created by:</b>	Alex Rovinsky	<b>Date:</b>	8/1/2016	<b>BOE Approval:</b>	9/26/16
<b>District Equity Statement:</b>	<p>As required by state law, it is the policy of Boonton School District not to discriminate on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap in its educational programs or activities and to maintain a learning environment that is free from sexual harassment. Courses of study and instructional materials shall be designed and selected in order to eliminate discrimination and promote understanding, sex equity, and mutual respect among people. No course offering, including but not limited to physical education, health, technology education, vocational, home economics, music and adult education, shall be limited on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap. Furthermore, there shall be no discrimination against students as to any educational activity or program because of pregnancy, childbirth, pregnancy-related disabilities, actual or potential parenthood, or family or marital status. If a student requests to be excluded or a physician certifies that such is necessary for her physical, mental, or emotional well-being, she must be provided with adequate and timely opportunity for instruction to continue or make up her schoolwork without prejudice or penalty.</p>				

**Division of Umbrella & Mini Units**

**Umbrella Unit 1 Topic / Name:**

**Matter and Its Changes**

**Mini Unit(s) *(Add to the list of mini units as necessary)***

**1A. Measurement and the Scientific Method**

**1B. Properties of Matter**

**1C. Elements and Compounds**

**Umbrella Unit 2 Topic / Name:**

**Atomic Structure**

**Mini Unit(s) *(Add to the list of mini units as necessary)***

**2A. Structure of the Atom**

**2B. Periodic Table**

**2C. Naming Chemical Compounds**

**Umbrella Unit 3 Topic / Name:**

**Chemical Quantities and Reactions**

**Mini Unit(s) *(Add to the list of mini units as necessary)***

**3A. Chemical Quantities**

**3B. Chemical Equations and Reactions**

**3C. States of Matter**

**Umbrella Unit 4 Topic / Name:**

**Behavior of Gases and Solutions**

**Mini Unit(s) *(Add to the list of mini units as necessary)***

**4A. The Gas Laws**

**4B. Water and Solutions**

**4C. Acids and Bases**

<b>UMBRELLA UNIT 1</b>	
<b>Title:</b>	Matter and Its Changes
<b>Duration:</b>	10 weeks/ First Marking Period
<b>Essential Questions:</b>	<p>Why are measurements important?</p> <p>What is the difference between accuracy and precision?</p> <p>Name the phases of matter and describe how particles of matter behave in each one.</p> <p>What is the difference between physical and chemical changes?</p> <p>Explain the difference between an element and a compound.</p>
<b>Summative Assessments:</b> (Assessment at the end the learning period)	Unit test
<b>Formative Assessments:</b> (Ongoing assessments during the learning period)	Tests, Quizzes, Graded Labs and Homework assignments
<b>Differentiation:</b>	Individual ways of project completion
<b>TECHNOLOGY STANDARD (STANDARD 8)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
<b>8.1.12.B2</b>	<b>Multiple Means of Engagement: Students have choices of planning and expressing their results in various formats.</b>

	The method used to achieve the end result will vary for each participant.
<b>21ST CENTURY LIFE AND CAREER (STANDARD 9)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.

<b>MINI UNIT 1A</b>	
<b>Title:</b>	<b>Measurement and the Scientific Method</b>
<b>Duration:</b>	<b>3 weeks</b>
<b>Overview:</b>	<b>The history of measurements and their importance will be studied. Students will practice measuring distances, mass, and volumes.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Testing, revising, and sometimes rejecting new and old theories is a continuous process.</b>	<b>HS-ETS1-3</b>
<b>Measurement standards are important to society and are maintained and protected by our government.</b>	<b>HS-ETS1-3</b>
<b>List the SI units of measurement.</b>	<b>HS-ETS1-3</b>
<b>The steps in the Scientific Method include making observations, testing hypotheses, and developing theories.</b>	<b>HS-ETS1-3</b>
<b>The Significant figures in a measurement include all of the digits that are known, plus a last digit that is estimated.</b>	<b>HS-ETS1-3</b>

<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Choose appropriate measurement scales and use proper units when recording data.</b>	<b>HS-ETS1-3</b>
<b>Calculate percent error.</b>	<b>HS-ETS1-3</b>
<b>Convert measurements between different temperature scales.</b>	<b>HS-ETS1-3</b>
<b>Determine the density of matter.</b>	<b>HS-ETS1-3</b>
<b>Properly measure the volume of liquids.</b>	<b>HS-ETS1-3</b>
<b>Utilize laboratory equipment in a safe manner.</b>	<b>HS-ETS1-3</b>
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
<b>How to solve problems using the Scientific Method in a multistep approach.</b>	<b>HS-ETS1-3</b>
<b>The ultimate goal of science is to develop an understanding of our natural world.</b>	<b>HS-ETS1-3</b>
<b>That the mass and weight of an object are related but not the same.</b>	<b>HS-ETS1-3</b>
<b>Resources Mini Unit 1A:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>MINI UNIT 1B</b>	
<b>Title:</b>	<b>Properties of Matter</b>
<b>Duration:</b>	<b>3.5 weeks</b>
<b>Overview:</b>	<b>Students explore matter and how it is classified. They will name physical and chemical properties of matter. Students will learn the difference between elements, compounds, mixtures and pure substances.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>A physical change results in a rearrangement of existing particles in a substance, and a chemical change results in the formation of different substances with changed properties.</b>	<b>HS-PS1-1, HS-PS1-5</b>
<b>The three phases of matter have different properties.</b>	<b>HS-PS1-1, HS-PS1-5</b>
<b>Physical and chemical changes are exothermic or endothermic.</b>	<b>HS-PS1-1, HS-PS1-5</b>
<b>In all chemical reactions mass and energy are conserved.</b>	<b>HS-PS1-1, HS-PS1-5</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Separate the components of a mixture.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Model the motion of particles in the three states of matter.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Identify substances based on their properties.</b>	<b>HS-PS1-1, HS-PS1-2</b>

<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>		<b>Alignment to Standards</b>
Substances can be identified by their chemical and physical properties.		HS-PS1-1, HS-PS1-2
The known universe is composed of matter that must be classified as elements, compounds, or mixtures.		HS-PS1-1, HS-PS1-2
All elements have a solid, liquid, and gaseous form.		HS-PS1-1, HS-PS1-2
The behavior of molecules in the solid, liquid, or gaseous form governs their physical behavior.		HS-PS1-1, HS-PS1-2
<b>Resources Mini Unit 1B:</b>	Laboratory apparatus; Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts	

<b>MINI UNIT 1C</b>		
<b>Title:</b>	<b>Elements and Compounds</b>	
<b>Duration:</b>	<b>3.5 weeks</b>	
<b>Overview:</b>	<b>Students are introduced to the elements, the fundamental building blocks of compounds. Students will learn element symbols and their properties.</b>	
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>		<b>Alignment to Standards</b>
Elements are pure substances.		HS-PS1-1
An atom is the smallest part of an element.		HS-PS1-1

Elements come together in chemical reactions to form compounds.	HS-PS1-1
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
Identify the chemical symbols of elements, and name elements, given their symbols.	HS-PS1-1
Distinguish between a substance and a mixture.	HS-PS1-1
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
Explain the difference between elements and compounds.	HS-PS1-1
<b>Resources Mini Unit 1C:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts



**UMBRELLA UNIT 2**

<b>Title:</b>	Atomic Structure
<b>Duration:</b>	10 weeks/ Second Marking Period
<b>Essential Questions:</b>	Explain Dalton's atomic theory. Name the parts of an atom and identify their charges. Which part of an atom is responsible for its chemical properties? Explain what makes isotopes different from each other?
<b>Summative Assessments:</b> (Assessment at the end the learning period)	Unit Test
<b>Formative Assessments:</b> (Ongoing assessments during the learning period)	Tests, Quizzes, Graded Labs and Homework assignments
<b>Differentiation:</b>	Challenge problems
<b>TECHNOLOGY STANDARD (STANDARD 8)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
<b>8.1.12.B2</b>	<b>Interdisciplinary Learning: Content area curriculum is developed while using relevant technology applications and cultivating skills.</b>

<b>21ST CENTURY LIFE AND CAREER (STANDARD 9)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
<b>9.3.ST.4</b>	<b>Understand the nature and scope of the Science, Technology, Engineering &amp; Mathematics Career Cluster and the role of STEM in society and the economy.</b>

<b>MINI UNIT 2A</b>	
<b>Title:</b>	<b>Structure of the Atom</b>
<b>Duration:</b>	<b>3 weeks</b>
<b>Overview:</b>	<b>Students will learn about the characteristics and behavior of subatomic particles in relation to chemical reactions. Students will learn about ionic, covalent, and metallic bonding, and will be able to draw electron bonding models for the elements.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>When an atom gains one or more electrons, it becomes a negative ion and its radius increases. When an atom loses one or more electrons, it becomes a positive ion and its radius decreases.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Electron dot diagrams represent the valence electron arrangement in elements, compounds, and ions.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Two major categories of compounds are ionic and covalent compounds. Ionic compounds form between metals and nonmetals while covalent compounds form between two or more nonmetals.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Electron configuration shows the arrangement of</b>	<b>HS-PS1-1, HS-PS1-2</b>

electrons in an element or ion.	
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Draw the electron dot diagram (Lewis Structure) for any element, compound, or ion.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Write the electron configuration for any element or ion.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Determine the noble gas configuration an atom will achieve when bonding.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Explain the difference between polar and nonpolar covalent bonds.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Discuss how intermolecular forces determine physical properties.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-8</b>
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
<b>Atoms attain a stable electron configuration by bonding with other atoms.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Noble gases have stable electron configurations and will not form bonds.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Physical properties of substances (melting point, boiling point, malleability, solubility) can be explained in terms of chemical bonds and intermolecular forces.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-8</b>

Chemical bonds are formed when valence electrons are either shared (covalent bond), or transferred (ionic bond).	HS-PS1-1, HS-PS1-2, HS-PS1-8
<b>Resources Mini Unit 2A:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

MINI UNIT 2B	
<b>Title:</b>	Periodic Table
<b>Duration:</b>	3.5 weeks
<b>Overview:</b>	In this unit students will be exposed to the periodic table and its history. They will discover the relationship it has to the chemical and physical characteristics of elements. Using this knowledge students will be able to predict how elements will react with one another to form compounds.
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
The location of an element on the Periodic Table gives an indication of both the physical and chemical properties of that element.	HS-PS1-1, HS-PS1-2
Elements can be classified by their properties and placed on the Periodic Table as metals, nonmetals, and metalloids.	HS-PS1-1, HS-PS1-2
The atomic number of an element corresponds to the number of protons in the nucleus of that element.	HS-PS1-1, HS-PS1-2
The elements on the Periodic Table are arranged in	HS-PS1-1, HS-PS1-2

order of increasing atomic number.	
Elements in groups have similar properties.	HS-PS1-1, HS-PS1-2
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
Use the Periodic Table to predict trends such as atomic radii, electronegativity, and ionization energy of elements.	HS-PS1-1, HS-PS1-2
Compare and contrast trends in the physical and chemical properties of elements and their placement on the Periodic Table.	HS-PS1-1, HS-PS1-2
Explain the placement of an unknown element on the Periodic Table based on its properties.	HS-PS1-1, HS-PS1-2
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
The placement or location of an element on the Periodic Table gives an indication of the chemical and physical properties of that element.	HS-PS1-1, HS-PS1-2
The Periodic Table is used to predict periodic trends such as atomic radii, electronegativity, and ionization energy which is useful to chemists working to produce new compounds.	HS-PS1-1, HS-PS1-2
<b>Resources Mini Unit 2B:</b>	Periodic Table; Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>MINI UNIT 2C</b>	
<b>Title:</b>	<b>Naming Compounds</b>
<b>Duration:</b>	<b>3.5 weeks</b>
<b>Overview:</b>	<b>Students will learn how to write chemical formulas given the name of a chemical compound. In addition, students will learn correct IUPAC nomenclature and write chemical names from formulas.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Students will learn correct nomenclature for naming and writing chemical formulas.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Students will know and recognize polyatomic ions.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Proper names and formulas for polyatomic ions will be learned.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Students will write formulas for any binary ionic compound.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Polyatomic ions will be named and correct formulas written.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Covalent compounds will be correctly named with the proper formulas.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Acid compounds will be recognized with names and formulas.</b>	<b>HS-PS1-1, HS-PS1-2</b>

Essential Outcomes - Upon completion of this course students will understand (conceptual):	Alignment to Standards
Chemical names are unique and precise, representing exact chemical formulas.	HS-PS1-1, HS-PS1-2
A polyatomic ion is a group of atoms held together by covalent bonds that has an electric charge.	HS-PS1-1, HS-PS1-2
Some chemicals have common names that can be used in place of their chemical names.	HS-PS1-1, HS-PS1-2
<b>Resources Mini Unit 2C:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>UMBRELLA UNIT 3</b>	
<b>Title:</b>	Chemical Quantities and Chemical Reactions
<b>Duration:</b>	10 weeks/ Third Marking Period
<b>Essential Questions:</b>	<p>How is matter quantified?</p> <p>Why must chemical equations be balanced?</p> <p>What is conserved during chemical reactions?</p> <p>How does the state of a substance relate to how it will react?</p>
<b>Summative Assessments:</b> (Assessment at the end the learning period)	Project
<b>Formative Assessments:</b> (Ongoing assessments during the learning period)	Quizzes, Tests, Graded Homework, and projects
<b>Differentiation:</b>	Individualized Project work to be completed.
<b>TECHNOLOGY STANDARD (STANDARD 8)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>



<b>8.1.12.B2</b>	<b>Interdisciplinary Learning: Content area curriculum is developed while using relevant technology applications and cultivating skills.</b>
<b>21ST CENTURY LIFE AND CAREER (STANDARD 9)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
<b>9.3.ST.2</b>	<b>Use technology to acquire, manipulate, analyze and report data.</b>

<b>MINI UNIT 3A</b>	
<b>Title:</b>	<b>Chemical Quantities</b>
<b>Duration:</b>	<b>3.5 weeks</b>
<b>Overview:</b>	<b>Students will learn about the SI unit for the amount of a substance-the mole. They will be able to relate moles to balanced chemical equations, involving solids, liquids, and gases. Finally, students will be able to calculate amounts of reactants used and products formed.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Avogadro's number and how it relates to the mole.</b>	<b>HS-PS1-1, HS-PS1-5, HS-PS1-6</b>
<b>Describe methods for measuring the amount of a substance.</b>	<b>HS-PS1-1, HS-PS1-5, HS-PS1-6</b>
<b>Students will learn the definition of a mole.</b>	<b>HS-PS1-1, HS-PS1-5, HS-PS1-6</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Calculate the mass of a mole of an element or a</b>	<b>HS-PS1-1, HS-PS1-5, HS-PS1-6</b>

compound.	
Measure in grams any molar mass of an element or compound.	HS-PS1-1, HS-PS1-5, HS-PS1-6
Correctly determine the molar volume of a substance.	HS-PS1-1, HS-PS1-5, HS-PS1-6
Convert moles to mass, volumes, and particles, and perform reverse calculations.	HS-PS1-1, HS-PS1-5, HS-PS1-6
Use molar mass to calculate the number of moles in a sample.	HS-PS1-1, HS-PS1-5, HS-PS1-6
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
The mole is a real measure that relates the number of molecules, their masses, and volumes.	HS-PS1-1, HS-PS1-5, HS-PS1-6
The molar volume of any gas is 22.4 liters at STP.	HS-PS1-1, HS-PS1-5, HS-PS1-6
The mole is the key to connecting elements and equations with the real world reactions that are observed by students.	HS-PS1-1, HS-PS1-5, HS-PS1-6
<b>Resources Mini Unit 3A:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>MINI UNIT 3B</b>	
<b>Title:</b>	<b>Chemical Equations and Reactions</b>
<b>Duration:</b>	<b>3.5 weeks</b>
<b>Overview:</b>	<b>Students will be introduced to five general types of chemical reactions: combination, decomposition, single replacement, double replacement, and combustion.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Describe the five general types of chemical reactions.</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>What can affect the speed of a chemical reaction?</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>What are exothermic and endothermic chemical reactions?</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>What constitutes a chemical equation?</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Create and use models to demonstrate chemical reactions.</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>Identify reactants and products common to the unique type of chemical reaction.</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>Write and balance chemical equations.</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5</b>
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
<b>In all chemical reactions there is conservation of mass, energy, and electric charge.</b>	<b>HS-PS1-2, HS-PS1-4, HS-PS1-5, HS-PS1-7</b>

Predict what products will form based on the type of chemical reaction.	HS-PS1-2, HS-PS1-4, HS-PS1-5
Chemical equations must be balanced to obey the Law of Conservation of mass and energy.	HS-PS1-2, HS-PS1-4, HS-PS1-5, HS-PS1-7
Some chemical reactions are reversible.	HS-PS1-1, HS-PS1-2, HS-PS1-7
Many real-world processes (both living and non-living) rely on chemical reactions.	HS-PS1-1, HS-PS1-2, HS-PS1-7
<b>Resources Mini Unit 3B:</b>	Lab Model Materials; Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>MINI UNIT 3C</b>	
<b>Title:</b>	<b>States of Matter</b>
<b>Duration:</b>	<b>3 weeks</b>
<b>Overview:</b>	<b>Students will become familiar with matter in its three most common phases; solid, liquid, and gas, as well as the energy changes involved with them.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Three phases of matter-solid, liquid, and gas have distinct physical properties</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>The arrangement and kinetic energy of particles are unique to each phase of matter.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>State the kinetic theory of gases.</b>	<b>HS-PS1-1, HS-PS1-2</b>

<b>Changes of state occur only with energy exchanges with the environment.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Analyze a phase diagram in terms of energy flow.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-5</b>
<b>Compare and contrast molecular motion in solids, liquids, and gases.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Describe how equilibrium conditions are represented in a phase diagram.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-5</b>
<b>Explain evaporation in terms of kinetic energy.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-5</b>
<b>Explain what happens when a liquid boils.</b>	<b>HS-PS1-1, HS-PS1-2, HS-PS1-5</b>
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
<b>Gas pressure is the result of simultaneous collisions of billions of rapidly moving gas particles with an object.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>The Kelvin temperature of a substance is directly proportional to the average kinetic energy of the particles of the substance.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>A liquid will boil when it is heated to a temperature at which particles throughout the liquid have enough kinetic energy to vaporize.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Changes of state begin at the atomic level and have</b>	<b>HS-PS1-1, HS-PS1-2</b>

<b>effects that occur on the visible level.</b>	
<b>A substance in a different state of matter may not have the same physical properties, but will have the same chemical properties.</b>	<b>HS-PS1-1, HS-PS1-2</b>
<b>Resources Mini Unit 3C:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>UMBRELLA UNIT 4</b>	
<b>Title:</b>	Behavior of Gases and Solutions
<b>Duration:</b>	10 weeks/ Fourth Marking Period
<b>Essential Questions:</b>	<p>What are the gas laws?            Why can gases be compressed and not solids or liquids?            How are the gas laws related?            Why is water called the universal solvent?            What is an acid and why can it burn us?            What is pH and what does it measure?</p>
<b>Summative Assessments:</b> (Assessment at the end the learning period)	Unit test
<b>Formative Assessments:</b> (Ongoing assessments during the learning period)	Graded labs and homework, Quizzes, Tests, and Research Projects
<b>Differentiation:</b>	Individual research on projects, class readings and analysis
<b>TECHNOLOGY STANDARD (STANDARD 8)</b>	
<b>CPI #</b>	<b>CUMULATIVE PROGRESS INDICATOR (CPI)</b>
<b>8.1.12.B2</b>	<b>Multiple Means of Engagement: Students have choices of planning and expressing their results in various formats. The method used to achieve the end result will vary for each participant.</b>

21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.

MINI UNIT 4A	
Title:	Behavior of Gases
Duration:	3.5 weeks
Overview:	In this unit students get to know the gas laws and their history. They will learn how the gas laws are related and how to use them to solve real world problems.
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
State the main gas laws.	HS-PS1-2
Name three factors that affect gas pressure.	HS-PS1-2
Describe the relationships among temperature, pressure, and volume of a gas.	HS-PS1-2
Essential Outcomes - Upon completion of this course students will be able to (procedural):	Alignment to Standards
Explain why gases can be compressed while liquids and solids cannot.	HS-PS1-2



Use the gas laws to solve problems.	HS-PS1-2
Compare and contrast ideal and real gases.	HS-PS1-2
Relate the total pressure of a mixture of gases to the partial pressures of the component gases.	HS-PS1-2
Use Models to demonstrate gas behavior.	HS-PS1-2
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
The ideal gas law can be used to solve variables in real world situations, such as scuba diving.	HS-PS1-2
Gas behavior (pressure, temperature, and volume) is a manifestation of the particles of the gas interacting with the environment.	HS-PS1-2
The gas laws exhibit effects that can be seen equally at both atomic and visible levels.	HS-PS1-2
<b>Resources Mini Unit 4A:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

<b>MINI UNIT 4B</b>	
<b>Title:</b>	<b>Water and Solutions</b>
<b>Duration:</b>	<b>3.5 weeks</b>
<b>Overview:</b>	<b>Students will learn ways to calculate concentration. They will explain on a molecular level how a substance dissolves. Also, students will learn how to create and interpret solubility curves.</b>
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>	<b>Alignment to Standards</b>
<b>Define solute and solubility.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>What are some ways to express concentration?</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Define surface tension and provide examples.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>What is an electrolyte?</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Explain the concept of polarity and how it affects solubility.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
<b>Interpret and create solubility curves.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Calculate molarity of different solutions.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Distinguish among solutions, suspensions, and colloids.</b>	<b>HS-PS1-2, HS-PS1-4</b>
<b>Model unsaturated, saturated, and supersaturated solutions.</b>	<b>HS-PS1-2, HS-PS1-4</b>

<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>		<b>Alignment to Standards</b>
The solution process works as individual ions break away from the parent solid crystal and become surrounded by solution molecules.		HS-PS1-2, HS-PS1-4
Particle size largely determines if a liquid mixture is a colloid, suspension, or solution.		HS-PS1-2, HS-PS1-4
What determines (at the atomic level) whether a solute will dissolve a substance.		HS-PS1-2, HS-PS1-4
<b>Resources Mini Unit 4B:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts	

<b>MINI UNIT 4C</b>		
<b>Title:</b>	<b>Acids and Bases</b>	
<b>Duration:</b>	<b>3 weeks</b>	
<b>Overview:</b>	In this unit students will learn the definition of acids and bases, and examples of each. They will learn what pH measures and students will use that knowledge to identify acids, bases, and neutral solutions.	
<b>Essential Outcomes - Upon completion of this course students will know (declarative):</b>		<b>Alignment to Standards</b>
Define acids and bases, according to Lewis, Arrhenius, and Bronsted-Lowry.		HS-PS1-2, HS-PS1-4
What makes an acid strong or weak?		HS-PS1-2, HS-PS1-4

Explain what pH is and how pH can distinguish acids, bases, and neutral solutions.	HS-PS1-2, HS-PS1-4
<b>Essential Outcomes - Upon completion of this course students will be able to (procedural):</b>	<b>Alignment to Standards</b>
Classify a solution as acidic, basic, or neutral given the hydrogen ion concentration.	HS-PS1-2, HS-PS1-4
Perform a neutralization reaction.	HS-PS1-2, HS-PS1-4
Convert hydrogen ion concentrations to pH values.	HS-PS1-2, HS-PS1-4
Carry out a titration experiment.	HS-PS1-2, HS-PS1-4
<b>Essential Outcomes - Upon completion of this course students will understand (conceptual):</b>	<b>Alignment to Standards</b>
Acidity or alkalinity is a function of hydrogen ion concentration.	HS-PS1-2, HS-PS1-4
The relative level of acidity or alkalinity of a solution can be determined through the use of indicators.	HS-PS1-2, HS-PS1-4
Common household acids and bases have the same behavior as laboratory solutions.	HS-PS1-2, HS-PS1-4
<b>Resources Mini Unit 4C:</b>	Wilbraham, Staley, Matta, Waterman (2005). Chemistry, Pearson Education, Boston, Massachusetts

Board of Education Adoption Date: 09/26/2016