Boonton School District

Course Title:	Honors Chemistry	**Grade Level(s):**	**11**		
Curriculum Area / Level:	Science	**Credits:**	**5**		
Course prerequisites and/or co-requisites:	CP Biology, AP Biology				
Course Description:	The goal of this Chemistry course is to introduce students to the properties and structure of matter, the change matter undergoes and its close relationship to their everyday lives. Students will be exposed to various chemical concepts and theories in which will require abstract thinking, critical thinking, mathematical solutions and hands on experimentation of these theories.				
Created by:	Heba Obeidallah	**Date:**	08/2016	**BOE Approval:**	9/26/16
District Equity Statement:	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.				

Division of Umbrella & Mini Units	
Umbrella Unit 1 Topic / Name: Introduction to Chemistry	**Mini Unit(s)** **1A. Matter and Change (ch. 1)** **1B. Measurements and Calculations (ch. 2)**
Umbrella Unit 2 Topic / Name: Atomic Structure	**Mini Unit(s)** **2A. Atoms: The Building Blocks of Matter (ch. 3)** **2B. Arrangement of Electrons in Atoms (ch. 4)** **2C. The Periodic Law (ch. 5)**
Umbrella Unit 3 Topic / Name: Molecular structure	**Mini Unit(s)** **3A. Chemical Bonding (ch. 6)** **3B. Chemical Formulas and Chemical Compounds (ch. 7)**
Umbrella Unit 4 Topic / Name: Chemical Reactions	**Mini Unit(s)** **4A. Chemical Equations and Reactions (ch. 8)** **4B. Stoichiometry (ch. 9)**
Umbrella Unit 5 Topic/ Name: Physical Chemistry	**Mini Unit(s)** **5A. The Kinetic Molecular Theory (ch. 10)** **5B. Gases (ch. 11)** **5C. Solutions (ch. 12)** **5D. Thermochemistry (ch. 16)**

UMBRELLA UNIT 1	
Title:	Introduction to Chemistry
Duration:	5 Weeks
Essential Questions:	● What makes chemistry an important science to study? ● Why is it important to know how to classify matter? ● What is the periodic table and why is it a vital part of chemistry? ● Why do some elements' name and symbol not match? ● Why is the scientific method important in all sciences? ● Why must we use the SI units in science? ● Why do scientists use significant figures? ● How are conversion factors derived and used? ● Why are some relationships considered directly proportional while others are inversely proportional? Explain and provide real life examples.
Summative Assessments: **(Assessment at the end the learning period)**	End of Chapter Tests Lab technique and Equipment lab
Formative Assessments: **(Ongoing assessments during the learning period)**	Observations Questioning Do now and exit ticket In-class practice problem set Cooperative learning Section quizzes Section worksheets Labs
Differentiation:	Characterizing problem set into easy, intermediate and hard Online simulations Labs

	Demos Cooperative learning Peer teaching Class discussions
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21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.3.12.AG-FD.2	Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.
9.3.12.ED.1	Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

9.3.12.ED.2	Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.
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MINI UNIT 1A	
Title:	**Matter and Change**
Duration:	**2 Weeks**
Overview:	**Students will be able to define chemistry and its roles in our daily lives. They will also be able to characterize matter, identify their properties and the changes they undergo.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Chemistry is the study of the composition of matter and the changes that matter undergoes.	HS-PS1-1, HS-PS1-2, HS-PS 1-3,HS-PS 1-4, HS-PS 1-5, HS-PS 1-6, HS-PS 1-7, HS-PS 1-8
The three states of matter are classified by the distance of their particles	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Matter has various classifications which include pure, mixture, element and compound	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Mixtures can be classified as homogeneous or heterogeneous.	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Understand why chemistry is the central science and how it is present in their daily lives	HS-PS1-1, HS-PS1-2, HS-PS 1-3,HS-PS 1-4, HS-PS 1-5, HS-PS 1-6, HS-PS 1-7, HS-PS 1-8
Define the states of matter by describing them on a molecular level and by using models	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Identify a substance as pure, mixture, element, compound or molecule	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Classify a mixture as homogeneous or heterogeneous	HS-PS1-1, HS-PS1-2, HS-PS1-3

Essential Outcomes - Upon completion of this course students will understand (conceptual):	Alignment to Standards
Chemistry is used on a daily life and is essential for survival	HS-PS1-1, HS-PS1-2, HS-PS 1-3,HS-PS 1-4, HS-PS 1-5, HS-PS 1-6, HS-PS 1-7, HS-PS 1-8
States of matter have their properties due to their molecular structure	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Matter is characterized by its composition in order to better understand its properties	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-5, HS-PS 1-6
Mixtures are classified by their uniformity which can greatly affect its properties	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 1A:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002.

MINI UNIT 1B		
Title:	**Measurements and Calculations**	
Duration:	**3 Weeks**	
Overview:	**Students will learn how to set-up conversion problems, which will be a skill used for the remainder of the year. They will also learn how to scientifically represent numbers using units and significant figures.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
The scientific method is a logical, systematic approach for scientific enquiries		HS-ETS1-3
Significant figures are an important part of reporting scientific number and solving scientific math problems		HS-ETS1-3

Conversion factors are used to convert a number's unit but never changes its magnitude	HS-ETS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Use the scientific method to design, execute and analyze an experiment using lab equipment with proper technique	HS-ETS1-3
Count significant figures and use them in math problems	HS-ETS1-3
Derive conversion factors from equivalent statements and use them to convert numbers' units	HS-ETS1-3
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
Scientific method ensures experiments are logical, factual, accurate and organized	HS-ETS1-3
Significant figures are used in order to ensure the precision of the equipment used during an experiment is reflected in the number of digits in a number	HS-ETS1-3
A conversion factor is used to change the unit that represents the number but does not change the amount because it's a ratio equivalent to 1	HS-ETS1-3
Resources Mini Unit 1B:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

UMBRELLA UNIT 2	
Title:	Atomic Structure
Duration:	6 Weeks
Essential Questions:	● Why is studying the atom a vital part of studying chemistry? ● Why are the outdated atomic models important for the modern atomic theory? ● Why are subatomic particles essential in understanding atoms? ● How are atoms of different elements distinguished and why is it important to distinguish them? ● Why is light important to study when studying atomic structure? ● Why is the the quantum mechanical theory of an atom a more plausible model than previous models? ● Why is the periodic table a vital part of chemistry? ● Why are various trends found in the periodic table?
Summative Assessments: **(Assessment at the end the learning period)**	End of chapter test
Formative Assessments: **(Ongoing assessments during the learning period)**	Observations Questioning Do now and exit ticket In-class practice problem set Cooperative learning Section quizzes Section worksheets Labs
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9.3.ST.3	Use technology to acquire, manipulate, analyze and report data.
9.3.ST.4	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3.ST.5	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
9.3.ST-SM.1	Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
9.3.ST-SM.2	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
9.3.ST-SM.3	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
	Analyze the impact that science and mathematics has on society.

MINI UNIT 2A	
Title:	**Atoms: The Building Blocks of Matter**
Duration:	**2 Weeks**
Overview:	**Students will learn the history of the atomic theory by learning about various scientists who helped develop it. They will learn what subatomic particles are, how to calculate them and their role within an atom. They will also learn how to convert between grams of an element and moles of an atom using atomic mass.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Various scientists helped develop the atomic theory over a large period of time	HS-PS1-1, HS-PS1-2
Various experiments led to the discovery of the subatomic particles including the cathode ray experiment and the gold foil experiment	HS-PS1-1, HS-PS1-2
The atom is composed of subatomic particles, which includes neutrons, protons and electrons	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Subatomic particles can be calculated using mass number, charge and atomic number	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Atomic mass is used to convert between mass and moles of an element, the chemistry unit for amount of matter	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Identify the role various scientists played in the development of the atomic theory throughout history	HS-PS1-1, HS-PS1-2
Relate various scientific experiments to the role they played in the development of the atomic theory	HS-PS1-1, HS-PS1-2
Relate subatomic particles to properties of an atom	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Calculate the number of subatomic particles in an atom	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Convert between grams and moles of an element	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The atomic theory was developed over many years with	HS-PS1-1, HS-PS1-2

the contribution of various scientists	
Various experiments played a role in discovering subatomic particles	HS-PS1-1, HS-PS1-2
Subatomic particles determine the identity and properties of an atom	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Calculating the subatomic particles can help better understand the properties of an atom	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Converting between grams and moles is important because moles is the unit of amount of substance	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 2A:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 2B	
Title:	**Arrangement of Electrons in Atoms**
Duration:	**2 weeks**
Overview:	**Students will learn the quantum model of an atom. They will learn what quantum numbers are and how they are used to map the location of electrons within an atom**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Electrons have dual properties; they can behave as a particle or a wave	HS-PS-1, HS-PS1-2, HS-PS1-3
The modern atomic theory is the quantum model of the atom	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4

Quantum theory involves numbers known as quantum numbers, which are numbers describing the location of electrons within an atom	HS-PS1-3
Electrons follow specific rules when filling orbitals within an atom	HS-PS-1, HS-PS1-2, HS-PS1-3
Each atom or ion's electrons can be written in a series of numbers, letters and superscripts known as electron configuration	HS-PS1-1, HS-PS1-2, HS-PS 1-6
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Calculate the wavelength, frequency and energy of a wave and relate it to emission spectra of an atom	HS-PS-1, HS-PS1-2, HS-PS1-3
Explain why the Schrodinger, Heisenberg and Einstein played a role in the modern quantum theory, which is a more plausible model than Bohr's model	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4
Describe what each quantum number represents and how to calculate them	HS-PS1-3
Fill electrons in orbitals using the Aufbau Principle, Hund's Rule and Pauli Exclusion Principle	HS-PS-1, HS-PS1-2, HS-PS1-3
Write electron configuration for any given atom or ion	HS-PS1-1, HS-PS1-2, HS-PS 1-6
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
Electrons can behave as particles and as waves, which makes studying waves an important part of studying electrons	HS-PS-1, HS-PS1-2, HS-PS1-3
The modern atomic theory is far more complex than previous models due to the electrons' repulsion to one	HS-PS1-1, HS-PS1-2, HS-PS 1-3, HS-PS 1-4

another	
Quantum numbers describe the location of an electron by describing the size, shape and orientation of the orbital it occupies	HS-PS1-3
Electrons follow rules when filling the orbital of an atom in order to minimize the energy of an atom, which will in turn stabilize it	HS-PS-1, HS-PS1-2, HS-PS1-3
Electron configuration is a simplified way of describing the electrons within the atom by stating its energy level and orbital shape	HS-PS1-1, HS-PS1-2, HS-PS 1-6
Resources Mini Unit 2B:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 2C	
Title:	**The Periodic Law**
Duration:	**2 Weeks**
Overview:	**Students will learn the significance of the periodic table of elements. They will understand that the location of the elements on the periodic table determines its physical and chemical properties which includes their appearance, ionization energy, atomic radii and electronegativity.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Mendeleev developed the periodic table by organizing elements by their properties	HS-P1-1, HS-P1-2
The periodic table can be used to determine the properties of elements	HS-P1-1, HS-P1-2
The periodic table is divided into groups or families	HS-P1-1, HS-P1-2

because of their similar properties	
The periodic table has various trends including atomic and ionic radii, ionization energy, electron affinity and electronegativity.	HS-PS1, HS-PS1-2
An atom's effective nuclear charge and electron shielding cause the various trends within the periodic table	HS-P1-1, HS-P1-2
Valence electrons and the number of valence electrons within each family play a vital role in an element's chemical properties	HS-P1-1, HS-P1-2
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Describe how Mendeleev was able to develop the periodic table using the properties of elements	HS-P1-1, HS-P1-2
Describe the physical and chemical properties of elements by using their location on the periodic table	HS-P1-1, HS-P1-2
Identify the various families in the periodic table and describe their properties	HS-P1-1, HS-P1-2
Describe the various trends in the periodic table and use them to identify the properties of main group elements	HS-PS1, HS-PS1-2
Relate the trends to effective nuclear charge and electron shielding	HS-P1-1, HS-P1-2
Relate the number of valence electrons to the properties of each group within the periodic table	HS-P1-1, HS-P1-2
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
Mendeleev was able to develop the periodic table by	HS-P1-1, HS-P1-2

using their physical properties because the elements follow trends	
Elements within the same family have the same number of valence electrons which gives them very similar properties	HS-P1-1, HS-P1-2
Due to the same number of valence electrons, elements in the same group or family have very similar properties	HS-P1-1, HS-P1-2
Main group elements follow trends that affect their properties	HS-PS1, HS-PS1-2
Some properties of an atom are directly affected by the attractive and repulsive forces within the atom	HS-P1-1, HS-P1-2
Valence electrons affect the properties of an element because they are the electrons involved in reactions	HS-P1-1, HS-P1-2
Resources Mini Unit 2C:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

UMBRELLA UNIT 3	
Title:	Molecular Structure
Duration:	6 Weeks
Essential Questions:	● Why is it important to classify bonds as either covalent or ioinc? ● Why is electronegativity important to study when studying bonds? ● Why is it important to study potential energy when studying bond energy? ● Why is the octet rule an essential part of molecular structure? ● Why is studying molecular structure essential in studying chemistry? ● What is the relationship between VSEPR theory and your daily lives? ● Why are intermolecular forces essential for living?
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MINI UNIT 3A	
Title:	**Chemical Bonding**
Duration:	**3 Weeks**
Overview:	**Students will learn what a bond is and the different classifications of them. They will learn how to draw bonds and how to determine the geometry of the molecules. Knowing the geometry of the molecules will help them classify the intermolecular forces that the molecules have which will inturn**

	help them determine its physical properties.

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Bonds are classified as ionic or covalent	HS-PS1-1, HS-PS1-2
Electronegativity plays a vital role in the type of bonds that two atoms will form	HS-PS1-1, HS-PS1-2
Valence electrons are used to draw molecules which are known as Lewis dot structures	HS-PS1-1, HS-PS1-2
Using the number of lone pair electrons and bonds in a molecule, the geometry of a molecule can be determined by using the VSEPR theory	HS-PS1-1, HS-PS1-2
The geometry of a molecule can be used to determine the intermolecular forces that a molecule has, which can then determine its physical properties	HS-PS1-1, HS-PS1-2
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standard**
Classify bonds as ionic or covalent	HS-PS1-1, HS-PS1-2
Use electronegativity to determine the bond type between two atoms	HS-PS1-1, HS-PS1-2
Draw Lewis dot structures of molecules	HS-PS1-1, HS-PS1-2
Determine the geometry of a molecule using the VSEPR theory	HS-PS1-1, HS-PS1-2
Determine the physical properties of a molecule by determining its intermolecular forces	HS-PS1-1, HS-PS1-2
Essential Outcomes - Upon completion of this course	**Alignment to Standards**

students will understand (conceptual):	
Bond are classified as ionic or covalent depending on whether the electrons were transferred or shared	HS-PS1-1, HS-PS1-2
Electronegativity is the pull an atom has on electrons, therefore it will determine whether electrons are shared or transferred	HS-PS1-1, HS-PS1-2
Drawing Lewis dot structure shows the distribution of valence electrons within a molecule	HS-PS1-1, HS-PS1-2
The geometry of a molecule is determined by the repulsion forces between the electrons in a molecule	HS-PS1-1, HS-PS1-2
The geometry of a molecule determines the intermolecular forces which determine the physical properties of a molecule	HS-PS1-1, HS-PS1-2
Resources Mini Unit 3A:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 3B	
Title:	**Chemical Formulas and Chemical Compounds**
Duration:	**3 Weeks**
Overview:	**The systematic way of naming compounds allows one to go between formula and written name of a compound with ease. The formula is essential because it allows one to calculate moles, oxidation numbers, percent composition and empirical formula.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
There is a systematic way of naming compounds which allows one to derive the formula of that compound	HS-PS1-1, HS-PS1-2, HS-PS1-3
Oxidation numbers are a way to assign charges to each atom within an compound	HS-PS1-1, HS-PS1-2, HS-PS1-3
Molar mass is calculated from the periodic table in order to be used as a conversion factor between grams and moles of a molecule	HS-PS1-1, HS-PS1-2, HS-PS1-3
Percent composition of a compound shows the percent by mass of each element within the compound	HS-PS1-1, HS-PS1-2, HS-PS1-3
Percent composition can be used to calculate empirical formula, which is the smallest whole number ratio of elements as well as molecular formula	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Name compounds when formula is given and write formula when name is given	HS-PS1-1, HS-PS1-2, HS-PS1-3
Assign oxidation number to each element in a compound	HS-PS1-1, HS-PS1-2, HS-PS1-3
Calculate molar mass using the periodic table and use it to convert between grams and moles of a molecule	HS-PS1-1, HS-PS1-2, HS-PS1-3
Calculate percent composition of a molecule using the masses from the periodic table	HS-PS1-1, HS-PS1-2, HS-PS1-3
Calculate empirical formula from percent composition of a molecule	HS-PS1-1, HS-PS1-2, HS-PS1-3

Essential Outcomes - Upon completion of this course students will understand (conceptual):	Alignment to Standards
Naming compounds have a specific rules that allow an easy conversion between name and formula	HS-PS1-1, HS-PS1-2, HS-PS1-3
Oxidation numbers are assigned to each atom within a compound in order to track electron transfer	HS-PS1-1, HS-PS1-2, HS-PS1-3
Molar mass of a compound can be used as a conversion factor between grams and moles because it is the weight of 1 mole of a compound	HS-PS1-1, HS-PS1-2, HS-PS1-3
Percent composition describes the mass distribution of elements in a compound due to the varying weights of atoms	HS-PS1-1, HS-PS1-2, HS-PS1-3
Empirical formula can be calculated using percent composition because the percent composition of any given compound is constant	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 3B:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

UMBRELLA UNIT 4	
Title:	Chemical Reactions
Duration:	6 weeks
Essential Questions:	● Why are chemical reactions a vital part of our lives? ● What are some daily examples of the law of conservation of mass? ● Why is 100% percent yield nearly impossible? ● How can the law of conservation of matter be proven?
Summative Assessments: **(Assessment at the end the learning period)**	End of Chapter Tests
Formative Assessments: **(Ongoing assessments during the learning period)**	Observations Questioning Do now and exit ticket In-class practice problem set Cooperative learning Section quizzes Section worksheets Labs
Differentiation:	Characterizing problem set into easy, intermediate and hard Online simulations Labs Demos Cooperative learning Peer teaching Class discussions

TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results
8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.3.12.AG-FD.2	Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.
9.3.12.ED.1 9.3.12.ED.2	Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.
9.3.12.ED.3	Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.
9.3.12.ED.4	Use critical thinking to process educational communications, perspectives, policies and/or procedures.

9.3.12.ED.5	Evaluate and manage risks to safety, health and the environment in education and training settings.
9.3.MN-HSE.2	Demonstrate group collaboration skills to enhance professional education and training practice.
9.3.ST.2	Develop safety plans for production processes that meet health, safety and environmental standards.
9.3.ST.3	Use technology to acquire, manipulate, analyze and report data.
9.3.ST.4	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3.ST.5	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
9.3.ST-SM.1	Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
9.3.ST-SM.2	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
9.3.ST-SM.3	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
	Analyze the impact that science and mathematics has on society.

MINI UNIT 4A	
Title:	**Chemical Equations and Reactions**
Duration:	**3 Weeks**
Overview:	**This chapter covers how chemical reactions are properly written using reactant, products and various symbols. Reactions types will be presented and students will be able to use that information to complete reactions when only the reactants are given.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Chemical reaction are represented with chemical formulas, symbols and coefficients	HS-PS1-1, HS-PS1-2, HS-PS1-3
Chemical reactions must be balanced in order to follow the law of conservation of mass	HS-PS1-1, HS-PS1-2, HS-PS1-3
Given the reactants, one can complete a chemical reaction	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Write a chemical reaction with proper formulas and symbols	HS-PS1-1, HS-PS1-2, HS-PS1-3
Balance chemical reactions	HS-PS1-1, HS-PS1-2, HS-PS1-3
Complete a chemical reaction	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
A chemical equation is written and balanced in order to	HS-PS1-1, HS-PS1-2, HS-PS1-3

demonstrate that no atom is created nor destroyed but rather rearranged in a chemical reaction	
Balancing a chemical reaction is done by adding coefficients to the reaction to demonstrate the law of conservation of mass without changing the identity of the substances	HS-PS1-1, HS-PS1-2, HS-PS1-3
Molecules follow certain rules when they react and when studied, one can complete a chemical reaction when only reactants are presented	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 4A:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 4B		
Title:	**Stoichiometry**	
Duration:	**3 Weeks**	
Overview:	**Stoichiometry is a mathematical method used to relate the masses of the reactants and products within a reaction. This is possible due to the law of conservation of mass.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
The coefficients used to balance a chemical reaction can be used to solve stoichiometry problems		HS-PS1-1, HS-PS1-2, HS-PS1-3
Most chemical reactions have a limiting reagent		HS-PS1-1, HS-PS1-2, HS-PS1-3
Percent yield is often calculated to compare the theoretical yield of a reaction to the actual yield within a laboratory setting		HS-PS1-1, HS-PS1-2, HS-PS1-3

Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Solve stoichiometry problems by using the coefficients as mole fractions	HS-PS1-1, HS-PS1-2, HS-PS1-3
Solve stoichiometry problems when a limiting reagent is given	HS-PS1-1, HS-PS1-2, HS-PS1-3
Solve a percent yield problem when laboratory data is given or derived in lab	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
Stoichiometry mathematically relates the the masses of reactants and products within a reaction	HS-PS1-1, HS-PS1-2, HS-PS1-3
Calculating using limiting reagent is important because once one reactant is consumed, the reaction stops and products will no longer form	HS-PS1-1, HS-PS1-2, HS-PS1-3
Percent yield is used to compare the theoretical yield of a reaction with the actual yield with a flawed, human error filled laboratory	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 4B:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

UMBRELLA UNIT 5	
Title:	Physical Chemistry
Duration:	12 weeks
Essential Questions:	● Relate molecules to states of matter. ● How are the differing properties of the states of matter essential for life? ● Why do we have solid, liquid and gas at the same temperature? ● What makes gases so unique? ● How does the concentration of a solution affect it? ● Where does energy go in a chemical reaction? ● Why does matter want to be low in energy?
Summative Assessments: **(Assessment at the end the learning period)**	End of chapter test
Formative Assessments: **(Ongoing assessments during the learning period)**	Observations Questioning Do now and exit ticket In-class practice problem set Cooperative learning Section quizzes Section worksheets Labs
Differentiation	Characterizing problem set into easy, intermediate and hard Online simulations Labs Demos Cooperative learning Peer teaching Class discussions

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8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results
8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
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9.3.MN-HSE.2	Develop safety plans for production processes that meet health, safety and environmental standards.
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
9.3.ST.3	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3.ST.4	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
9.3.ST.5	Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
9.3.ST-SM.1	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
9.3.ST-SM.2	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.

MINI UNIT 5A	
Title:	**Kinetic Molecular Theory**
Duration:	**3 Weeks**
Overview:	**The states of matter are determined by the interaction between its particles. A substance can easily change between states of matter when its pressure and temperature is manipulated and intermolecular forces are formed or broken.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
The kinetic Molecular theory has five assumptions made about gas behavior	HS-PS1-1, HS-PS1-2, HS-PS1-3
How the particles of matter determines its state of matter and properties	HS-PS1-1, HS-PS1-2, HS-PS1-3
Gas has characteristic properties such as expansion, density, fluidity, compressibility, diffusion, and effusion	HS-PS1-1, HS-PS1-2, HS-PS1-3
Matter can change states when temperature and pressure is manipulated	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Relate the five points of the Kinetic Molecular Theory to gas behavior	HS-PS1-1, HS-PS1-2, HS-PS1-3
Relate particles to state of matter and properties of a substance	HS-PS1-1, HS-PS1-2, HS-PS1-3
Relate a gas' particles to expansion, density, fluidity, compressibility, diffusion, and effusion	HS-PS1-1, HS-PS1-2, HS-PS1-3
Relate pressure and temperature to change in states	HS-PS1-1, HS-PS1-2, HS-PS1-3

of matter	
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The Kinetic Molecular Theory's five points are assumptions made when a gas behaves ideally in order to simplify mathematical calculations of a gas because real gases' behavior is too complex	HS-PS1-1, HS-PS1-2, HS-PS1-3
The distance between particles and temperature determined the state of matter of a substance	HS-PS1-1, HS-PS1-2, HS-PS1-3
Gases have special properties due to the large distance between its particles	HS-PS1-1, HS-PS1-2, HS-PS1-3
Temperature and pressure together determine the state of matter because they allow for the particles to be close enough to establish intermolecular forces	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 4A:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 5B		
Title:	**Gases**	
Duration:	**3 Weeks**	
Overview:	**Gases have various variables that describe them such as volume, pressure, moles and temperature. The relationship between these variables are described in gas laws such as Boyle, Charles, Gay-Lussac, Avogadro, combined and Ideal gas laws.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**

Pressure is a property of gas and is represented with various units	HS-PS1-1, HS-PS1-2, HS-PS1-3
There are many gas laws that are used to calculate the gas variables	HS-PS1-1, HS-PS1-2, HS-PS1-3
The difference between real and ideal gases	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Convert between the different units of pressure	HS-PS1-1, HS-PS1-2, HS-PS1-3
Use the gas laws to carry out various math problems related to gases	HS-PS1-1, HS-PS1-2, HS-PS1-3
Identify which conditions cause gases to behave idealy	HS-PS1-1, HS-PS1-2, HS-PS1-3
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The pressure of a gas is caused by the collision of gas particles with the walls of a container and can be represented by various units	HS-PS1-1, HS-PS1-2, HS-PS1-3
The variables of a gas have either a direct or inverse mathematical relationship which allows for the use of various equations	HS-PS1-1, HS-PS1-2, HS-PS1-3
Gases only behave ideally when the volume and attraction of the particles can be ignored	HS-PS1-1, HS-PS1-2, HS-PS1-3
Resources Mini Unit 5B:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 5C	
Title:	**Solutions**
Duration:	**3 Weeks**
Overview:	**Solutions are homogeneous mixtures that we encounter on a daily basis. Students will be able to determine the concentration of these solutions using different equations.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
Solutions are homogeneous mixtures composed of a solvent and a solute	HS-P1-3
Solutions have various equations that represent their concentration	HS-P1-3
Solutions can be diluted using solvent, which will cause it to have a new concentration	HS-P1-3
There are various factors that affect the solubility of a solute in a solvent	HS-P1-3
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Identify the solute and solvent within a solution	HS-P1-3
Calculate the molarity, molality, mole fraction and mass percent of a solution	HS-P1-3
Calculate new concentration of a solution when it is diluted	HS-P1-3
Describe the factors that affect the solubility of a solute in a solvent	HS-P1-3

Essential Outcomes - Upon completion of this course students will understand (conceptual):	Alignment to Standards
A solution is composed of a solute and a solvent that must be molecularly compatible	HS-P1-3
There are different ways the concentration of a solution can be represented, each of which have their own significance in chemistry	HS-P1-3
Adding solvent to a solution causes an increase in solvent while keeping the solute particle constant which in turn decreases the concentration	HS-P1-3
Solubility occurs when solvent and solute are compatible and are able to collide making increase in temperature, surface area and agitation desirable for dissolution	HS-P1-3
Resources Mini Unit 5C:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

MINI UNIT 5D		
Title:	**Thermochemistry**	
Duration:	**3 Weeks**	
Overview:	**Energy is always involved in chemical changes, whether the change is physical or chemical. Energy plays a very important role in the world around us and is a key component in chemistry. This chapter describes the close relationship between energy and change in matter.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
There are three laws of thermodynamics		HS-PS1-3, HS-PS1-5

Different substances have different specific heats	HS-PS1-3, HS-PS1-5
Enthalpy and entropy are variables that determines whether a reaction will occur	HS-PS1-3, HS-PS1-5
The calculation of Gibbs Free Energy determines the spontaneity of a reaction	HS-PS1-3, HS-PS1-5
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Define the three laws of thermodynamics and relate it to daily lives	HS-PS1-3, HS-PS1-5
Solve mathematical problems related to specific heat	HS-PS1-3, HS-PS1-5
Define and calculate enthalpy and entropy	HS-PS1-3, HS-PS1-5
Calculate Gibbs Free Energy and determine the spontaneity of a reaction	HS-PS1-3, HS-PS1-5
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
Energy is not created nor destroyed whereas entropy of the universe is increasing	HS-PS1-3, HS-PS1-5
Different substances have different specific heats, which causes them to require different amount of energy to increase temperature	HS-PS1-3, HS-PS1-5
Enthalpy and entropy are used in an equation to determine the spontaneity of a reaction	HS-PS1-3, HS-PS1-5
Gibbs free energy determines whether a reaction is spontaneous, non spontaneous or in equilibrium	HS-PS1-3, HS-PS1-5
Resources Mini Unit 5D:	*Modern Chemistry*. Holt, Rinehart and Winston, 2002

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