Chemistry I with Lab

This chemistry course is designed to provide students with an opportunity to develop and evaluate basic ideas and theories related to chemistry. Students are required to apply skills and knowledge to chemistry principles in order to explain various concepts, solve problems, and complete labs. In order to accomplish these, students must take ownership in his/her education, by completing assignments and studying for exams.

This introductory course investigates the fundamental concepts of chemistry. Topics include scientific measurement, properties of matter, atomic structure, and the periodic table, ionic and covalent bonding, chemical nomenclature, chemical reactions, thermochemistry, gas laws, solutions and acids and bases. Laboratory work is an integral part of the course and includes experiments that reinforce the concepts presented in lectures. A practical application of chemistry to the student's daily life is emphasized throughout the course.

Course Information:

Frequency & Duration: Daily for 42 minutes; 6 periods per week (includes 1 lab period)
Text: Raymond E. Davis, Mickey Sarquis, Regina Frey and Jerry L. Sarquis. *Modern Chemistry*. Austin: Holt, Rinehart and Winston, 2006. Print.

Content: Nature of Science **Duration:** Aug./ Sept. (5 weeks)

Essential Question:	What is the nature of science?
Skills:	• Identify properties of matter that depend on sample size (mass, volume, weight, etc…). • Utilize significant figures to communicate the uncertainty in a quantitative observation. • Classify observations as qualitative or quantitative. • Demonstrate an understanding of quantitative measurement and analysis of data. • Express measurements in different English and SI units. • Express numbers in both standard and scientific notation and be able to easily go from one to the other.
Instructional/Engagement Activities	
Assessment:	• For given samples of matter, students will be able to identify the properties depending on each samples size. • Students will be able to utilize significant figures to communicate the uncertainty in a quantitative observation. • Students will be able to classify observations as qualitative or quantitative.
Resources / Activities:	Modern Chemistry (p. 6-7 and 28-58) Introduction to Equipment Lab (Safety) Measurement Lab Scientific Method Lab Density Lab
Standards:	3.2.10. A1. Identify properties of matter that depend on sample size. CHEM.A.1.1.3 Utilize significant figures to communicate the uncertainty in a quantitative observation. CHEM.A.1.1.2 Classify observations as qualitative or quantitative.
Vocabulary:	**Dimensional Analysis (Factor Label)- dimensional analysis** is the analysis of the relationships between different physical quantities by identifying their fundamental dimensions (such as length, mass, and time) and units of measure (such as miles vs. kilometers, or pounds vs. kilograms vs. grams) and tracking these dimensions as calculations or comparisons are performed; **Qualitative Observations** - use your senses to observe the results. (Sight, smell, touch, taste and hear); **Quantitative Observations**- made with instruments such as rulers, balances, graduated cylinders, beakers, and thermometers. These results are measurable; **Scientific Notation**- A method for expressing a given quantity as a number having significant digits

necessary for a specified degree of accuracy, multiplied by 10 to the appropriate power, as 1385.62 written as 1.386×10^3 ; **Significant Figures**- A prescribed decimal place that determines the amount of rounding off to be done based on the precision of the measurement; **SI System (or Metric System) -** the decimal measuring system based on the meter, liter, and gram as units of length, capacity, and weight or mass; **Scientific Method** – logical approach to solving problems by observing and collecting data, formulating hypotheses, and testing hypotheses and formulating theories that are supported by data.

Comments: An explanation of calculator usage to operate with numbers in the form of scientific notation is crucial.

Content: Matter and Energy **Duration:** October (2 weeks)

Essential Question:

How is matter characterized and quantified?

Skills:

- Describe the three normal states of matter (energy, particles in motion, phase transitions) according to the kinetic molecular theory.
- Differentiate between pure substances and mixtures, and between heterogeneous and homogeneous mixtures.
- Differentiate between physical and chemical properties and predict how combinations of substances can result in physical and/or chemical changes.
- Explain the difference between endothermic and exothermic reactions and processes.
- Describe the relationship between average kinetic molecular energy, temperature, and phase changes.

Instructional/Engagement Activities

Assessment:

- Students will be able to describe the three normal states of matter (in terms of energy, particle motion, and phase transitions) according to the kinetic molecular theory.
- For given various samples of matter, students will be able to differentiate between pure substances and mixtures, as well as between heterogeneous and homogeneous in case of mixtures.
- For given various properties of matter, students will be able to differentiate between chemical and physical properties and predict how combinations of substances can result in physical and/or chemical changes.
- Students will be able to explain the difference between endothermic and exothermic reactions.
- Students will be able to describe the relationship between the average kinetic molecular energy, temperature, and phase changes.

Resources / Activities:

Holt Chemistry (p.7-14 and 342 – 346)
Entropy and Enthalpy Lab
Separation of Mixtures Lab

Standards:	3.2. C.A3. Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. 3.2.10. A3.Describe phases of matter according to the **kinetic molecular theory**. 3.2. C.A1. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. Differentiate between physical properties and chemical properties. 3.2. C.A4.Predict how combinations of substances can result in physical and/or chemical changes. CHEM.A.1.1.1 Classify physical or chemical changes within a system in terms of matter and/or energy 3.2.10. A4. Explain the difference between **endothermic** and **exothermic** reactions. Identify the factors that affect the rates of reactions. 3.2. C.B3. Explain the difference between an **endothermic** process and an **exothermic** process. Describe the law of conservation of energy 3.2.12. B3. Describe the relationship between the average kinetic **molecular** energy, temperature, and phase changes. 3.2.C.B2 Explore the natural tendency for systems to move in a direction of disorder or randomness (entropy).
Vocabulary:	**Matter**- Anything that has mass and takes up space and may be classified as either a pure substance or a mixture; **Pure Substance**-something that consists of one type of matter (an element or a compound; **Mixture** - a blend of two or more kinds of matter each of which retains its own identity and properties; **Heterogeneous Mixture** – a mixture that consists of visibly distinguishable parts; **Homogeneous Mixture** – a mixture that has uniform composition and no visibly distinguishable parts; **Chemical Property**- A property of matter that describes a substance's ability to participate in a chemical reaction; (can't be measured or observed without changing the identity of the substance); **Physical Property** – a characteristic that can be measured or observed without changing the identity of the substance; **Endothermic Reaction**- Describe a process in which heat is absorbed from the environment; **Exothermic Reaction**- Describe a process in which a system releases heat into the environment; **Kinetic Molecular Theory**- Explains the behavior of physical systems depends on the combined actions of the molecules constituting the system; **Phase transition (phase change)**- The transitions between the solid, liquid, and gaseous phases of a single component, due to the effects of temperature and/or pressure.
Comments:	

Content: Atoms **Duration:** Oct./ Nov. (4.5 weeks)

Essential Question:	Why does the atomic theory serve as the basis for the study of matter?
Skills:	• Describe the evolution of atomic theory of the atom and how it contributed to the modern model of the atom. • Differentiate between the mass number of an isotope and an average atomic mass of an element and distinguish among the isotopic forms of elements. • Recognize discoveries form Daltons atomic theory, Thomson's (the electron), Rutherford (the nucleus), and Bohr (the planetary model of atom). • Describe Rutherford's gold foil experiment that led to the discovery of the atomic nucleus. • Explain the law of definite proportions to classify elements and compounds as pure substances. • Interpret the law of conservation of energy, law of conservation of mass, the laws of definite proportions, and multiple proportions. • Explain why compounds are composed of integer ratios of elements. • Explain how light is absorbed or emitted by electron orbital transitions.
Instructional/Engagement Activities	
Assessment:	• Students will be able to describe how the discoveries of Dalton, Thomson, Rutherford, and Bohr lead to our current model of the atom. • Student will be able to explain the difference between an isotope's mass number and the average atomic mass of the same element. • Students will distinguish among the isotopic forms of elements. • Students will be able to explain how the law of definite proportions is used to classify elements and compounds as pure substances. • Students will be able to interpret the law of conservation of energy, law of conservation of mass, the laws of definite proportions and multiple proportions. • Students will be able to explain why compounds are composed of integer ratios of elements
Resources / Activities:	Modern Chemistry (p.66- 82) Isotope Lab Flame Test Lab TBD
Standards:	CHEM.A.2.1.1- Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr. CHEM.A.2.1.2- Differentiate between the mass number of an isotope and the average atomic mass of an element. 3.2.12.A2 Distinguish among the isotopic forms of elements. 3.2.10.A5.MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory. 3.2.C.A5.MODELS Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.

	Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, electrons) of the nuclear atom and explain how they interact. CHEM.B.1.2.2- Apply the Law of definite proportions to the classification of elements and compounds as pure substances. 3.2. C.A4. Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions. 3.2.12.A2 Explain why compounds are composed of integer ratios of elements.
Vocabulary:	**Dalton's Atomic Theory**-the first theory of structure of matter supported by experimentation; **Isotope**- An atom that has the same number of protons as other atoms of the same element do but that has different number of neutrons in the nucleus. **Average Atomic Mass**- the average mass of an atom of an element calculated using relative abundance of isotopes in naturally occurring element; **Law of Conservation of Mass**- Atoms cannot be created or destroyed in ordinary chemical and physical changes; **Law of Definite Proportions (Constant Composition)**- A chemical compound always contains the same elements in exactly the same proportions by weight and mass; **Rutherford's Atomic Model**- First modern concept of atomic structure; all of the positive charge and most of the mass of the atom are contained in a compact nucleus; a number of electrons (equal to the atomic number) occupy the rest of the volume of the atom and neutralize the positive charge); **Thomson's Atomic Model**-also known as the plum pudding model which describes the atom as a positively charged particle with electrons embedded into it like plums embedded into pudding. The plum pudding model was abandoned after discovery of the atomic nucleus; **Bohr Model**- The simplest modern picture of the structure of the atom, according to which electrons move in orbits around the nucleus; **Electromagnetic Radiation**- All of the frequencies or wavelengths of electromagnetic radiation; **Average Atomic Mass-** the weighted average of the masses of all the naturally occurring isotopes of an element; **Mass Number** – the total number of protons and neutrons in the nucleus of an isotope; **Atomic Number**- the number of protons in the nucleus of an element;

Comments: An average atomic mass is calculated the same way a weighted grade is determined.

Content: Quantum Mechanical Model of the Atom and Periodic Law

Duration: Nov./ Dec. (3 weeks)

Essential Question:	What is the behavior of the electrons in matter?
Skills:	• Explain how electrons behave in atoms. • Describe the significance of quantum numbers. • Draw the electron configurations for the elements of the periodic table, and relate the position of an element on the periodic table to its electron configuration and reactivity.
Instructional/Engagement Activities	
Assessment:	• Students will be able to compare the electron configurations of the elements of the periodic table and relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.
Resources / Activities:	Modern Chemistry (p.104-124) and (p.132-165) Quantum Leap Lab Periodic Trends and Properties of the Elements Lab Periodic Table Kit Lab
Standards:	3.2.C.A2 Compare the electron configurations for the first twenty elements of the periodic table. Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other element in the table. 3.2.12.A2 Explain how light is absorbed or emitted by electron orbital transitions. 3.2.10.A1 Predict properties of elements using trends of the periodic table.
Vocabulary:	**Heisenberg Uncertainty Principle-**It is impossible to know the position and momentum of an electron in an atom; **Aufbau Principle-** electrons occupies the lowest energy orbital with a vacant place; **Hund's Rule –** Orbitals of equal energy are occupied by one electron with the same spin before electrons are paired**; Pauli Exclusion Principle –** no one orbital can hold two electrons with the same spin**; Electron Configuration**- The arrangement of electrons in an atom; **Orbital Notation, Spectroscopic Notation, Nobel Gas Notation**- are ways of showing the electron configuration; **Quantum Numbers**- the number that specifies the properties of atomic orbitals and the properties of electrons in orbitals.

Comments:

Content: Periodicity **Duration:** Dec./ Jan. (2 weeks)

Essential Question:	How is the periodic table a template of organization for the material world?
Skills:	• Describe chemical reactions in terms of atomic rearrangement and /or electron configuration. • Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. • Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends. • Predict characteristics of an atom or ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity).
Instructional/Engagement Activities	
Assessment:	• Students will be able to explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. • Students will be able to compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends. • Students will be able to predict characteristics of an atom or ion based on its location Students will be able to compare the element's reactivity to that of other elements. • Students will be able to compare the element's reactivity to that of other elements. • Students will be able to describe chemical reactions in terms of atomic rearrangement and /or electron transfer.
Resources / Activities:	Modern Chemistry (p.132-169) Periodic Trends and the Properties of Elements Lab Density is a Periodic Property Lab Analyzing the Solubility of Group II Metals.
Standards:	CHEM.A.2.3.1 Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. CHEM. A.2.3.2 Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends. 3.2.10.A1 Predict the properties of elements using the trends of the periodic table. CHEM.A.2.2.2 Predict characteristics of an atom or ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity).

Vocabulary: **Atomic Radius**- a measure of the size of atoms; **Electronegativity**- a measure of the ability of an atom in a chemical compound to attract electrons; **Ionization Energy**- describes the amount of energy required to remove an electron from the atom or molecule in the gaseous state; **Periodicity**- the variations in properties of chemical elements depending on their position in the periodic table; **Ionic Radius** – a measure of the size of the ions (**cations** and **anions**); **Electron Affinity** – an energy change that occurs when an electron is acquired by a neutral atom.

Comments: During the month of December several "Holiday" Labs may be inserted.

Content: Chemical Bonding **Duration:** Jan./ Feb. (4.5 weeks)

Essential Question: How does the study of valence electrons help to explain most chemical phenomena?

Skills:

- Use electronegativity to explain the difference between polar and non-polar covalent bonds.
- Use electronegativities and molecular geometry to predict the polarity of a molecule.
- Utilize Lewis dot Structures to predict the structure and bonding in simple compounds and draw the Lewis dot structure for simple molecules and ionic compounds.
- Compare and contrast different bond types that result in the formation of molecules and compounds and explain how atoms combine to form compounds through both ionic and covalent bonding.
- Predict chemical formulas based on the number of valence electrons.
- Use VSEPR theory to predict the molecular geometry of simple molecules.
- Explain the unique properties of water (polarity, high boiling point, forms of hydrogen bonds, high specific heat) that support life on Earth.

Instructional/Engagement Activities

Assessment:

- Students will be able to use electronegativity to explain the difference between polar and non-polar covalent bonds.
- Students will be able to use electronegativities and molecular gemetry to predict the polarity of a molecule
- Students will be able to utilize Lewis dot Structures to predict the structure and bonding in simple molecules and ionic compounds.
- Students will be able to compare and contrast different bond types that result in the formation of molecules and compounds and explain how atoms combine to form compounds through both ionic and covalent bonding.
- Students will be able to predict chemical formulas based on the number of valence electrons.
- Students will be able to use VSEPR theory to predict the molecular geometry of simple molecules.
- Students will be able to explain the unique properties of water (polarity, high boiling point, forms of hydrogen bonds, high specific heat) that support life on Earth.

Resources / Activities:	Modern Chemistry (p175-179) Intermolecular Forces Lab Lewis Structures and Molecular Geometry Lab
Standards:	3.2.C.A1 Use electronegativity to explain the difference between polar and non-polar covalent bonds. CHEM.B.1.3.3 Use illustrations to predict the polarity of a molecule. CHEM.B.1.4.2 Utilize Lewis dot Structures to predict the structure and bonding in simple compounds. 3.2.10.A.2 Compare and contrast different bond types that result in the formation of molecules and compounds. 3.2.C.A2 Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Draw Lewis dot Structures for simple molecules and ionic compounds. CHEM.B.1.3.1 Explain how atoms combine to form compounds through ionic and covalent bonding. CHEM.B.1.4.2 Utilize Lewis dot structures to predict the structure and bonding in simple compounds. 3.2.12.A5 MODELS/ PATTERNS USE VSEPR theory to predict the molecular geometry of simple molecules. 3.2.10.A1 Explain the unique properties of water (polarity, high boiling point, forms of hydrogen bonds, high specific heat) that support life on Earth.
Vocabulary:	**Covalent Bonds**- A bond formed when atoms share one or more pairs of electrons; **Intermolecular Forces**- The forces of attraction between molecules; **Ionic Bonds**- A chemical bond formed between two ions with opposite charges; **Ions**- An atom or molecule that has gained or lost one or more electrons and has a negative or positive charge; **Lewis Structure**- structural representation of a molecule where dots are used to show valence electron position around the atoms and lines or dot pairs represent covalent bonds between atoms; **Octet Rule**- A concept of chemical bonding theory that is based on the assumption that atoms tend to have either empty valence shells or full valance shells of eight electrons; **Polyatomic Ions**- An ion made of two or more atoms; **VSEPR Theory (Molecular Geometry)**- Theory that predicts some molecular shapes based on the idea that pairs of valence electrons surrounding an atom repel each other

Comments:

Content: Naming Chemical Compounds **Duration:** March (2 weeks)

Essential Question:	How does chemical naming exhibit organizational patterns?

Skills:

- Predict chemical formulas for simple ionic and molecular compounds.
- Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, and ionic compounds containing polyatomic ions including fixed charge and variable charged ions).

Instructional/Engagement Activities

Assessment:

- Students will be able to predict chemical formulas for simple ionic and molecular compounds.
- Students will be able to apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, and ionic compounds containing polyatomic ions).

Resources / Activities:

Modern Chemistry (p.218-221)
Writing Ionic Formulas Activity
Let's Make An Element Activity

Standards:

3.2.C.A2 Predict the chemical formulas for simple ionic and molecular compounds.
CHEM.A.1.1.5 Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds, containing polyatomic ions).

Vocabulary:

Binary Covalent- A binary compound is composed of two different nonmetal elements; **Binary Ionic**- a compound consisting of two types of ions: ions of a metal (positively charges) and ions of a nonmetal (negatively charged); **Ionic Compounds**- a chemical compound of cations and anions which are held together by ionic bonds in a lattice structure; **IUPAC**- An acronym for International Union of Pure and Applied Chemistry. The IUPAC is the recognized authority for chemical standards of nomenclature, measurements and atomic mass values

Comments:

Content: Mole Concept **Duration:** January (2.5 weeks)

Essential Question:

What makes the mole the fundamental unit of chemistry?

Skills:

- Use the mole concept to determine number of particles and molar mass for elements and compounds and apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, and molecules, and/or formula units).

Instructional/Engagement Activities

Assessment:

- Students will be able to use the mole concept to determine number of particles and molar mass for elements and compounds and apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, and molecules, and/or formula units).

Resources / Activities:

Modern Chemistry (p.82-87 and 238-244)
Mole Lab
Atomic Coatings Lab
Counting by Weighing Lab

Standards:

3.2.C.A2 Use the mole concept to determine number of particles and molar mass for elements and compounds.
CHEM.B.1.1.1 Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, and molecules, and/or formula units).
SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds.

Vocabulary:

Atomic Weight (or Atomic Mass)- the average mass of atoms of an element , calculated using the relative abundance of isotopes in a naturally-occurring element; **Molar Mass**- The mass in grams of 1 mole of a substance; **Mole**- a counting unit for atoms equal to the number of atoms of carbon in exactly 12 grams of carbon-12; (Avogadro's Number – numerically equal to 6.022×10^{23})

Comments: Please note that a mole is a counting unit for atoms just as a dozen is used for eggs and bakery items.

Duration: March/ April (4 weeks)

Content: Chemical Reactions and Balancing

Essential Question: What is happening during a chemical reaction?

Skills:

- Relate the percent composition and mass of each element present in a compound.
- Balance chemical equations by applying the law of conservation of mass.
- Classify and predict products of chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement (replacement), and combustion.
- Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction using mole ratios
- Use stoichiometry to predict quantitative relationships in a chemical reaction and describe the roles of limiting and excess reactants in a chemical reaction.
- Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).
- Understand the natural tendency for systems to move in a direction of disorder or randomness (entropy) and identify the factors that affect the rates of reaction.

Instructional/Engagement Activities

Assessment:

- Students will be able to relate the percent composition and mass of each element present in a compound, as well as, the number of atoms of each element.
- Students will be able to balance chemical equations by applying the laws of conservation of mass.
- Students will be able to classify and predict chemical reactions as synthesis (Combination), decomposition, single displacement (replacement), double displacement (replacement), and combustion.
- Students will be able use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction using mole ratio.
- Students will be able to use stoichiometry to predict quantitative relationships in a chemical reaction and describe the roles of limiting and excess reactants in chemical reactions
- Students will be able to describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).
- Students will understand the natural tendency for systems to move in a direction of disorder or randomness (entropy) and identify the factors that affect the rates of reaction.

Resources / Activities:

Modern Chemistry (242-249 and 260-293 and 298-319)
Percent of Water in a Hydrate Lab
Empirical Formula of MgO Lab
What is a Chemical Reaction Lab
Activity Series of the Elements Lab
Leftover Aluminum Wire Lab

Standards:

CHEM.B.1.2.3 Relate the percent composition and mass of each element present in a compound.
CHEM.B.2.1.2 Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction.
3.2.C.A4 Balance chemical equations by applying the laws of conservation of mass.
Classify chemical reactions as synthesis (Combination), decomposition, single displacement (replacement), double displacement (replacement), and combustion.
Use stoichiometry to predict quantitative relationships in a chemical reaction.
CHEM.A.1.2.4D Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).
CHEM.B.1.2.3 Relate the percent composition and mass of each element present in a compound.
CHEM.B.2.1.1 Describe the roles of limiting and excess reactants in chemical reactions
CHEM.B.2.1.2 Use stoichiometric relationships to calculate the amount of reactants and products involved in a chemical reaction.
CHEM.B.2.1.4 Predict products of simple chemical reactions (e.g., synthesis,

	decomposition, single replacement, double replacement, combustion). 3.2.10.A4 Predict the amounts of products and reactants in a chemical reaction using mole relationships. 3.2.C.B2 Explore the natural tendency for systems to move in a direction of disorder or randomness (entropy). 3.2.10.A4 Identify the factors that affect the rates of reaction
Vocabulary:	**Combustion**- a type of chemical reaction where a fuel and oxygen are reacted to produce carbon dioxide and water; **Decomposition**- the process by which the atoms of a compound are rearranged to form two or more different compounds; **Synthesis**- the formation of a chemical compound through the combination of simpler compounds or elements **Single Displacement (Replacement)**- a type of oxidation-reduction chemical reaction when one element is replaced by another in a compound; **Double Displacement (Replacement)**- one component each of both the reacting molecules is exchanged to form the products. During this reaction, the cations and anions of two different compounds switch places, forming two entirely different compounds; **Empirical Formula**- A chemical formula that shows the composition of a compound in terms of the relative numbers and kinds of atoms in the simplest ratio; **Limiting Reactants**- The substance that controls the quantity of product that can form in a chemical reaction; **Molecular Formula**- A chemical formula that shows the number and kinds of atoms in a molecule, but not the arrangement of atoms; **Percent Composition**- The percentage by mass of each element in a compound.; **Percent Yield**- Refers to the efficiency of a chemical reaction; defined as the actual yield/theoretical yield x 100; **Precipitate**- an insoluble solid that emerges from a liquid solution;; **Stoichiometry**- The proportional relationships between two or more substances during a chemical reactions.

Comments: Labs listed are a representation of those available to cover the concepts of the unit.

Duration: April (1.5 weeks)

Content: Gasses

Essential Question:	How are the gas laws useful in everyday life?
Skills:	• Utilize mathematical models to relate the volume, temperature, pressure and quantity of a gas (i.e., Boyle's Law, Charles's Law, Gay-Lussac's Law, Daltons Law of Partial Pressures, the Combined Gas Law, and the Ideal Gas Law). • Predict the amounts of reactants and products involved in a chemical reaction using molar mass volume of a gas at STP.
Instructional/Engagement Activities	
Assessment:	• Students will be able to utilize mathematical models to relate the volume, temperature, pressure and quantity of a gas (i.e., Boyle's Law, Charles Law, Gay-Lussac's Law Dalton's Law of Partial Pressures, the Combined Gas Law, and the Ideal Gas Law). • Students will be able to predict the amounts of reactants and products involved in a chemical reaction using molar mass volume of a gas at STP.

Resources / Activities:	Modern Chemistry (p.360-367) Determining the Molar Volume of a Gas Lab Preparing and Testing Hydrogen Lab
Standards:	CHEM.B.2.2.1 Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure and the volume in a gaseous system (i.e., Boyle's Law, Charles's Law, Dalton's Law of Partial Pressures, the Combined Gas Law, and the Ideal Gas Law). CHEM.B.2.2.2 Predict the amounts of reactants and products involved in a chemical reaction using molar mass volume of a gas at STP.
Vocabulary:	**Boyle's Law**- The law that states that for a fixed amount of gas at a constant temperature, the volume of the gas increases as the pressure of the gas decreases and vice versa; **Charles's Law**- The law that states that for a fixed amount of gas at a constant pressure, the volume of the gas increases as the temperature of the gas increases and vice versa; **Gay-Lussac's Law** – the law that states that for a fixed amount of gas at a constant volume, the pressure of the gas increases as the temperature of the gas increases and vice a versa; **Combined Gas Law**- a gas law that combines Charles's law, Boyle's law; and Gay-Lussac's Law; **Dalton's Law of Partial Pressure**- The law states that the total pressure of a mixture of gases is equal to the sum of the partial pressure of the component gases; **Ideal Gas Law**- The law that relates pressure, volume, temperature, the gas constant and the number of moles of a gas (or PV=nRT); **STP**- Standard temperature and pressure. Defined as zero degrees Celsius (0 ºC), which translates to 32 degrees Fahrenheit (32 ºF) or 273.15 degrees kelvin (273.15 K). This is essentially the freezing point of pure water at sea level, in air at standard pressure (1 atm).

Comments:

Duration: April/ May (3.5 weeks)

Content: Solutions, Acids, and Bases

Essential Question:	How do solutions, acids and bases influence people's lives?
Skills:	• Describe the interactions between acids and bases
Instructional/Engagement Activities	

Assessment:	• Students will be able to describe the interactions between acids and bases.
Resources / Activities:	Modern Chemistry (p.418-421 and 503-505 and 515-521) Exploring the Chemical Reaction in a Toy Lab Determining Acid Concentration of a Juice Lab
Standards:	3.2.CA4 Describe the interactions between acids and bases.
Vocabulary:	**Acid**- Proton donors that yield hydronium ion in a water solution; **Base**- an proton acceptor generates hydroxide ions in aqueous solutions; **Solute**- the substance that dissolves in the solvent; **Solvent**- the substance in which the solute dissolves; **Solution**- A mixture of two or more substances uniformly dispersed throughout a single phase; **Molarity** – a measure of concentration, equals the number of moles of solute per liter of solution; **Titration** – a process of determining the unknown concentration of an acid or base with a solution of base or acid of known concentration.

Comments: