

Curriculum: Chemistry

Curricular Unit: Atomic Models

Instructional Unit: A. **The atomic model describes the electrically neutral atom**

Standard Alignments (Section 2)

SCCLE: SC1.1.Ea-c; SC1.1.F; SC7.1.A; SC7.1.Be; SC7.1.Cd; SC8.2.A,B
Knowledge: (SC) 1,7,8
CCSS: 11-12.RST.3; 11-12.RST.4; S-ID.2
NETS: 3b
Performance: 1.4, 1.6, 1.10

Unit (Section 3)

Learning Targets:

- Describe the contributions scientists made to the discovery of the atom and distinguish between the subatomic particles of an atom
 - Distinguish between a pure and applied science
 - Define an atom and give the name of the scientist who first named the atom.
 - Summarize Dalton's atomic theory
 - Distinguish between protons, electrons, and neutrons in terms of their symbols, relative masses, charges, and scientific discoverer
 - Discuss Rutherford's experiment and contributions in the development of the structure of the atom
 - Distinguish between a direct observation and an inference
- Use the periodic table to find the atomic number, mass number and atomic mass and use these numbers to calculate protons, electrons, and neutrons and to draw a simple atom
 - Locate the atomic number, mass number, and atomic mass on a periodic table
 - Use the atomic number and mass number of an element to find the number of protons, electrons, and neutrons
 - Draw simple atoms, including the location of protons, electrons, and neutrons with respect to the nucleus
- Explain what an isotope is, identify the symbols of an isotope, differentiate between the three isotopes of hydrogen, and use isotope data to calculate average atomic mass
 - Define an atomic mass unit
 - State how isotopes of an atom differ and interpret the symbols of isotopes
 - Differentiate between the three major isotopes of hydrogen
 - Use the concept of isotopes to explain why the atomic masses of the elements are not whole numbers
 - Calculate the average atomic mass of an element from isotope data
- Estimate the size of a molecule using data collected from experimental methods

Board Approved 8-3-15

<p>Instructional Strategies:</p> <ul style="list-style-type: none"> The teacher will: <ul style="list-style-type: none"> lecture over isotopes and the calculation of atomic mass using isotope data provide laboratory activities in which students calculate the size of molecules provide students with white board activities requiring students to diagram atomic structures and to calculate atomic masses facilitate in-class discussions over using data and observations to make inferences
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common: <ul style="list-style-type: none"> learning target quizzes unit tests Lab reports Practice/homework problems Exit slips White board practice/reviews In-class guided practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> Draw an atom of chlorine. Demonstrate that you know the location, number and symbol of protons, neutrons and electrons. How did Dalton's atomic theory have to be modified or changed over the years? Explain why these changes needed to be made. What is the atomic mass of silicon if 92.21% of its atoms have a mass of 27.977 amu, 4.70% have a mass of 28.976 amu, and 3.09% have a mass of 29.974 amu?
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> iPads – for research and simulations Lab equipment and chemicals Cathode ray tubes White boards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab writings) Math – Calculations: <ul style="list-style-type: none"> area volume averages

Depth of Knowledge (Section 5)

DOK: 2

Curriculum: Chemistry

Curricular Unit: Electron Arrangement

Instructional Unit: B. Electromagnetic energy is transferred as electromagnetic waves of varying frequency and wavelength

Standard Alignments (Section 2)

SCCLE: SC1.1.Ea; SC1.2.Ab-d; SC1.2.C; SC7.1.A,B; SC7.1.Ca; SC8.2.A,B; SC8.3.B

Knowledge: (SC) 1,7,8

CCSS: 11-12.RST.3; 11-12.RST.4

NETS: 3d

Performance: 1.6, 1.10

Unit (Section 3)

Learning Targets:

- Describe the early theories of the atomic model and explain the current quantum mechanical model of an atom
 - Explain the contributions that Thomson, Rutherford, and Bohr made to the development of the atomic theory
 - Describe the quantum mechanical model of the atom
 - Explain what is meant by the four quantum numbers
 - Describe the general shape of s, p, and d orbitals
 - Distinguish between energy level, sublevel, and orbital
 - Use the $2n^2$ formula to predict the maximum number of electrons that may fit in a particular energy level
- Distinguish between an excited and ground state atom and use this to explain flame tests, quantized energies of electrons, and chemiluminescence
 - Distinguish between excited and ground state atoms
 - Explain the significance of quantized energies of electrons
 - Explain how to perform a flame test and its purpose
 - Distinguish between chemiluminescence, incandescence, and bioluminescence
- Use the Aufbau Principle, Pauli Exclusion Principle, and Hunds Rule to write electron configurations and orbital notations, and explain why some electron configurations differ from the Aufbau Principle
- Give examples of electromagnetic radiation and explain how atomic emission spectra are used to identify elements
 - Define electromagnetic radiation, and in particular, the visible light spectrum
 - Use atomic emission spectrum to identify elements

Instructional Strategies:

- The teacher will:
 - provide materials for students to:
 - conduct a flame test to identify metallic ions
 - observe the atomic emission spectrum of various elements
 - lecture over the quantum mechanical model of the atom and electron configurations
 - facilitate a discussion of chemiluminescence after providing the students with selected readings
 - provide student with white board activities to practice writing electron configurations and orbital notations

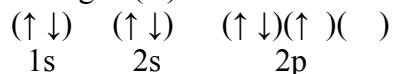
Assessments/Evaluations:

- Assessed using a common scoring guide:
 - Common:
 - Learning target quiz
 - Unit assessment
 - Lab reports
 - Homework/practice
 - In-class guided practice

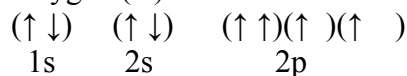
Sample Assessment Questions:

- Draw the Aufbau Diagonal Diagram in the space below. Label the number of electrons each sublevel can hold and draw the diagonal lines.
- Use the Aufbau Principle, Pauli Exclusion Principle, or Hund's Rule to explain why the following orbital notations are incorrect (**state which rule you used**). After your explanation write the notation the correct way.

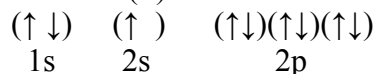
Nitrogen (N):



Oxygen (O):



Fluorine (F):



- In the lab, you viewed the atomic emission spectra of five gaseous elements. What is the significance of atomic emission spectra? Give an example of how it might be used in real life.

<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> • Lab equipment and chemicals • White boards • <i>ChemMatters</i> readings
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> • ELA – Literacy: <ul style="list-style-type: none"> • Technical: <ul style="list-style-type: none"> • reading (lab procedures) • writing (lab writings) • Physics: <ul style="list-style-type: none"> • Wavelength • Frequency • Radiation

Depth of Knowledge (Section 5)

DOK: 3

Curriculum: Chemistry

Curricular Unit: The Periodic Table and Periodic Trends

Instructional Unit: C. **The periodic table organizes the elements according to their atomic structure and chemical reactivity**

Standard Alignments (Section 2)

SCCLE: SC1.1.Ab,d; SC1.1.Fa-c; SC8.2.A; SC8.2.B

Knowledge: (SC) 1,8

CCSS: 11-12.RST.3; 11-12.RST.9

NETS: 3c

Performance: 1.6, 3.5

Unit (Section 3)

Learning Targets:

- Describe the origin of the Periodic Table and use it to identify the position and properties of various groups
 - List the uses of the periodic table
 - Explain the origin of the periodic table
 - Distinguish between periods/rows and groups/families on the periodic table
 - Determine the number of outer valence electrons in Groups IA- VIIIA
 - Recognize the demarcation of the periodic table into an s block, p block, d block, and f block
 - Identify an element as an alkali metal, alkaline earth metal, halogen, noble gas, transition metal, inner transition metal, or a representative element
 - Distinguish between the Lanthanide and Actinide Series in the f block
 - Identify an element on the periodic table as being a solid, liquid, or gas
 - Distinguish between the metals, nonmetals, and metalloids on the periodic table
 - Write long or short-hand electron configurations of elements using the periodic table as a guide
- Use the periodic table to predict and explain trends in atomic radius, ionization energy, ionic size, electronegativity, and shielding effect
- Identify uses and characteristics of the elements in a group or block on the periodic table

Instructional Strategies:

- The teacher will:
 - lecture over the history and arrangement of the periodic table, the characteristics of elements, and short-hand electron configurations
 - provide materials for students to explore the characteristics of elements (metals/nonmetals lab and chlorine compounds lab)
 - facilitate a web-quest allowing students to explore the trends exhibited in the periodic table (atomic radii, ionic radii, electronegativity, and ionization energy)
 - provide students with white board activities to practice short-hand electron configurations and periodic trends

Assessments/Evaluations:

- Assessed using a common scoring guide:
 - Common:
 - Learning target quiz
 - Unit assessment
 - Lab reports
- Homework/practice
- In-class guided practice
- Periodic Trends Web-Quest
- Exit slips

Sample Assessment Questions:

- Write the shorthand electron configuration and number of valence electrons for the following elements:

Element	Shorthand Notation	Valence Electrons
a. Mn		
b. Si		

- As the atomic number increases down a group, ionization energy increases or decreases?
- Using your knowledge of the unit and the “Exploring Chlorine Compounds” lab, pair the compounds below based on which might have more similar physical and chemical properties. Explain your reasoning.

Cadmium fluoride (CdF_2)
Potassium fluoride (KF)
Zinc fluoride (ZnF_2)
Sodium fluoride (NaF)

Instructional Resources/Tools:

- Computers/iPads for research
- Lab equipment and chemicals
- White boards

Cross Curricular Connections:

- ELA – Literacy:
 - Technical:
 - reading (lab procedures)
 - writing (lab writings)

Depth of Knowledge (Section 5)

DOK: 2

Curriculum: Chemistry

Curricular Unit: Ionic Bonding

Instructional Unit: D. Chemical bonding is the result of combining different pure substances to form new substances with different properties

Standard Alignments (Section 2)

SCCLE: SC1.1.Ac; SC1.1.Ec; SC1.1.Fa,c; SC1.1.Fc; SC1.1.Ha,c; SC8.2.Aa

Knowledge: (SC) 1

CCSS: 11-12.RST.4

NETS: 1c

Performance: 1.6, 3.5

Unit (Section 3)

Learning Targets:

- Name and write the symbols and charges of common elements, ions and polyatomic ions
 - Recognize the symbols and/or names of common elements
 - Distinguish between elements and compounds
 - Use the periodic table to determine the charge on ions of the representative groups
 - Distinguish between a monoatomic and polyatomic ion
- Draw electron dot diagrams for representative elements and ionic compounds
- Identify and explain the properties of ionic compounds
 - Recognize a compound as having ionic bonds
 - Identify the characteristics of ionic compounds
 - Explain the conductivity of melted and of aqueous solutions of ionic compounds
- Use the octet rule to explain the importance of noble-gas and pseudo-noble gas electron configurations and to describe the formation of cations and anions
 - Use the periodic table to find the number of valence electrons in an atom
 - Draw electron dot formulas of the representative elements
 - State the importance of the noble-gas and pseudo-noble gas electron configuration in the formation of ions
 - Describe the formation of a cation from a metallic element
 - Describe the formation of an anion from a nonmetallic element

<ul style="list-style-type: none"> Name and write formulas for ionic compounds and acids <ul style="list-style-type: none"> Write the chemical formula of an ionic compound, either binary, or ternary, when given the name of the compound Explain why a systematic method of naming chemical compounds is necessary Name an ionic compound, either binary, or ternary, when given the formula of the compound Name and write the formulas of acids
<p>Instructional Strategies:</p> <ul style="list-style-type: none"> The teacher will: <ul style="list-style-type: none"> lecture over the properties of ionic compounds, Lewis dot diagrams, and ionic nomenclature facilitate white board activities requiring students to create Lewis diagrams for ionic compounds, and to name and write formulas for ionic compounds pair students to practice ionic nomenclature using <i>Quizlet</i>
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common: <ul style="list-style-type: none"> Quizzes Unit assessment <i>Quizlet</i> nomenclature activity White boarding activities Homework/practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> Draw an electron dot diagram for the ionic compound barium phosphide. Write the electron configurations for the following ions and explain why they are isoelectronic to one another. Why did each ion gain or lose electrons? $[K^+]$ $[Ca^{2+}]$ $[Cl^-]$ Write the names for the following binary or ternary ionic substances: (2 points each) <ul style="list-style-type: none"> CaF_2 $LiC_2H_3O_2$ NH_4Br
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> iPads – for <i>Quizlet</i> activity White boards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: Reading Biology: Ions and equilibrium

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Depth of Knowledge (Section 5)

DOK: 2

Curriculum: Chemistry

Curricular Unit: Covalent Bonding

Instructional Unit: E. **Objects and the materials they are made of, have properties that can be used to classify them**

Standard Alignments (Section 2)

SCCLE: SC1.1.Ac,d; SC1.1.B; SC1.1.Hc; SC1.1.Fc; SC1.2.Ac

Knowledge: (SC) 1

CCSS: 11-12.RST.4

NETS: N/A

Performance: 1.6, 1.8, 3.5

Unit (Section 3)

Learning Targets:

- Describe the formation of a covalent bond and use electron dot formulas and structural formulas to draw covalent molecules
 - Describe the formation of a covalent bond between two nonmetallic elements
 - Describe single, double, and triple bonds
 - Draw electron dot formulas for simple covalent molecules containing single, double, or triple bonds and identify lone pairs of electrons
 - Define resonance and draw resonant structures
- Analyze covalent molecules to determine the shape, bond polarity, molecular polarity, dipole charges and bond dissociation energy
 - Use the VSEPR theory to describe the shapes of simple covalently bonded molecules
 - Use electronegativity values to determine whether a bond is nonpolar covalent, polar covalent, or ionic
 - Use the symmetry of polar molecules to determine the overall polarity of the molecule
 - Assign dipole charges to dipolar molecules
 - Calculate bond dissociation energy
- Identify characteristics of molecular and metallic substances and name and describe the weak attractive forces holding molecules together
 - Name and describe the weak attractive forces that hold molecules together
 - Identify the characteristics of molecular substances
 - List the properties of metals, nonmetals, and metalloids
 - Use the theory of metallic bonds to explain the physical properties of metals
- Name and write formulas for binary molecular compounds

Instructional Strategies:

- The teacher will:
 - lecture over the octet rule, types of covalent bonds (single, double, triple, coordinate), resonance, covalent nomenclature, intermolecular attractions, and alloys
 - facilitate:
 - a covalent bonding activity that requires students to use the octet rule while creating Lewis structures of covalent molecules
 - the use of molecular models enabling students to explore the VSEPR theory
 - white board activities requiring students to draw Lewis diagrams (including resonant structures) for covalent compounds
 - pair students to create a bonding diagram comparing the three types of bonds (ionic, covalent, metallic)

Assessments/Evaluations:

- Assessed using a common scoring guide:
 - Common:
 - learning target quiz
 - unit assessment
 - Bonding diagram
- White boarding.
- Homework/practice
- Covalent bonding activities (Fruit loop and VSEPR lab)

Sample Assessment Questions:

- NO_3^{-1} is a polyatomic ion. Show resonance by drawing 2 dot diagrams and 2 structural formulas that match the dot diagrams
- Draw a Lewis Dot Diagram. Determine the shape using VSEPR. Draw a structural formula reflecting the shape predicted and **assign $\delta+$ and $\delta-$** if needed. Determine Bond Dissociation Energy and overall molecular polarity

	Lewis Dot Diagram	Shape (VSEPR)	Structural Formula	Bond Dissociation Energy	Overall Molecular Polarity
CO_2					
CH_4					

- Write the formulas for the following molecular covalent compounds. (2 points each)
 - a. Dichlorine octoxide _____
 - b. Diarsenic trisulfide _____
 - c. Tetraphosphorus decoxide _____

Instructional Resources/Tools:

- Molecular model kits
- Butcher paper
- White boards

Cross Curricular Connections:

- ELA – Literacy: Reading
- Biology: Protein shape and function

Depth of Knowledge (Section 5)

DOK: 3

Curriculum: Chemistry

Curricular Unit: Chemical Equations and Reaction Rates

Instructional Unit: F. **Chemical reactions involve changes in the bonding of atoms with the release or absorption of energy**

Standard Alignments (Section 2)

SCCLE: SC1.1.Ga; SC1.1.Hd; SC1.1.Ib; SC1.2.Da

Knowledge: (SC) 1

CCSS: 11-12.RST.3; 11-12.RST.4

NETS: 1c

Performance: 1.6, 3.5

Unit (Section 3)

Learning Targets:

- Identify the different types of and the indicators of chemical reactions and use appropriate symbols to write the balanced chemical equations
 - Classify changes in matter as physical or chemical
 - Identify the reactants and products in a chemical reaction
 - Use appropriate symbols when writing an equation to accurately describe the chemical reaction
 - Write a balanced chemical reaction when given the names or formulas of all the reactants and products in a chemical reaction
 - Identify the indicators of a chemical reaction
 - Classify a reaction as a combination, decomposition, single-replacement, double-replacement, or combustion
- Predict the products and write a balanced chemical equation for combination, decomposition, single-replacement, double replacement, or combustion reactions
 - Predict the products of simple combination and decomposition reactions
 - Use the activity series of metals to predict the products of single-replacement reactions
 - Write the products of the double-replacement reaction between two ionic compounds
 - Write the products for complete and incomplete combustion reactions
- Use collision theory to explain how the rate of a chemical reaction is influenced by the nature of the reactant, temperature, concentration, particle size and catalysts and create a potential energy diagram and discuss the reaction mechanism
 - Relate the ideas of activation energy and activated complex to the rate of a reaction
 - Use collision theory to explain how the rate of a chemical reaction is influenced by the nature of the reactant, the temperature, concentration, particle size of the reactants, and catalysts

<ul style="list-style-type: none"> Given a potential energy diagram for a reaction, discuss the reaction mechanism for the reaction
<p>Instructional Strategies:</p> <ul style="list-style-type: none"> The teacher will: <ul style="list-style-type: none"> provide a graphic organizer for students to distinguish between ionic and covalent nomenclature pair students to practice ionic and covalent nomenclature using <i>Quizlet</i> lecture over writing balanced chemical equations and reaction rates provide students with the materials to construct an activity series of metallic elements from laboratory observations facilitate a white board review requiring students to predict the products of a chemical reaction and to write balanced chemical equations
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Nomenclature quiz Common learning target quiz Common unit assessments Lab reports White board review Homework/practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> Write and balance the following word equation using all appropriate symbols. Solid calcium oxide breaks down with the addition of heat and the catalyst, platinum, to form solid calcium and oxygen gas Write, balance, and correctly predict the products in the following <u>single replacement</u> reactions: <ul style="list-style-type: none"> A. Magnesium reacts with lithium sulfide → B. Bromine reacts with potassium iodide →
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> Lab equipment and chemicals Computers/iPads- for <i>Quizlet</i> White boards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab reports)

- Biology:
 - Photosynthesis
 - Cell respiration

Depth of Knowledge (Section 5)

DOK: 2

Curriculum: Chemistry

Curricular Unit: Measurement and The Mole

Instructional Unit: G. Calculation of chemical quantities using mass, volume, and representative particles

Standard Alignments (Section 2)

SCCLE: SC1.1.Aa; SC7.1B,C

Knowledge: (SC) 1,7

CCSS: 11-12.RST.3; 11-12.RST.4; A-CED.4

NETS: 4b

Performance: 1.6, 3.5

Unit (Section 3)

Learning Targets:

- Make measurements in the metric system and perform calculations and conversions using significant figures
 - Differentiate between qualitative and quantitative measurements
 - Differentiate between accuracy and precision and calculate percent error
 - Determine the number of significant figures in a measurement
 - Express answers to mathematical problems to the correct number of significant figures
 - Correctly read balances, thermometers, rulers, and graduated cylinders to their maximum precision
 - Correctly identify metric prefixes (kilo-, deci-, centi-, milli-, and micro-) and their appropriate of 10 and convert from one unit to another
 - Solve problems involving density
- Use the periodic table to determine the molar mass of a substance when given its chemical formula and distinguish between representative particles
 - Name the basic SI unit for measuring the amount of a substance
 - Identify the representative particle of elements and compounds
 - Calculate the molar mass of one mole of any substance
- Use the factor-label method to perform mole conversions
 - Describe how Avogadro's number is related to a mole of any substance
 - Use the factor-label method to make mole-volume, mole-representative particle, and mole-mass conversions
 - Use the factor-label method to convert among measurements of mass, volume, and number of particles
 - Calculate the molar mass of a gas from density measurements of gases at STP

<ul style="list-style-type: none"> Determine the percent composition and use that data to calculate empirical and molecular formulas <ul style="list-style-type: none"> Calculate the percentage composition of a substance from its chemical formula or experimental data Derive empirical and molecular formulas from appropriate experimental data
<p>Instructional Strategies:</p> <ul style="list-style-type: none"> The teacher will: <ul style="list-style-type: none"> lecture over significant figures, the factor label method of solving problems, and empirical and molecular formulas provide materials for the students to identify elements based on molar mass, to calculate the percentage composition, and to calculate empirical formulas facilitate white board practice over solving problems using the factor label
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common learning target quiz Common unit assessment Lab reports White board practice Homework/practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> A sample of C_8H_{18} contains 5.90 moles. <i>Start with 5.90 moles as the given each time.</i> <ul style="list-style-type: none"> a) How many grams are in this sample? b) How many molecules are in this sample? Calculate the mass of Copper in 53.2 g of $CuSO_4$. Put your final answer in Sig. Figs. Determine the empirical formula of a compound that is 69.5% oxygen and 30.5% nitrogen
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> Lab equipment and chemicals Whiteboards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab reports) Math: Calculations of quantities

Depth of Knowledge (Section 5)

DOK: 3

Curriculum: Chemistry

Curricular Unit: Stoichiometry and Heat Transfer

Instructional Unit: H.

- **Mass is conserved during any physical or chemical change**
- **Energy can be transferred within a system as the total amount of energy remains constant**

Standard Alignments (Section 2)

SCCLE: SC1.1.1a; SC1.1.2.Aa; SC1.2.D; SC7.1.B
Knowledge: (SC) 1,7
CCSS: 11-12.RST.3; 11-12.RST.4; A-CED.1; A-CED.4
NETS: 3d
Performance: 1.4

Unit (Section 3)

Learning Targets:

- Use balanced chemical equations to perform stoichiometric calculations
 - Perform stoichiometric calculations with balanced equations using moles, mass, representative particles, and volumes of gases at STP
- Perform limiting reactant calculations and calculate the percent yield of a reaction
 - Identify the limiting reactant in a reaction
 - Knowing the limiting reactant in a reaction, calculate the maximum amount of product(s) produced and the amount of any unreacted excess reactant
 - Given the information from which any of the two following may be determined, calculate the third: theoretical yield, actual yield, and percentage yield
- Solve heat transfer problems
 - Differentiate among heat and temperature
 - Convert temperature measurements between the Celsius and Kelvin scales
 - Solve problems involving heat transfer
- Identify the characteristics of endothermic and exothermic reactions

Instructional Strategies:

- The teacher will:
 - lecture over stoichiometric calculations involving:
 - limiting reactants
 - percent yield
 - heat transfer
 - provide students with materials to calculate the percent yield of a chemical reaction and to explore heat transfer between different materials
- White board practice over stoichiometric calculations

<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common learning target quizzes Common unit test Lab reports Homework/practice White board practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> Solve the following stoichiometric problems using the equation below: $2\text{Al}_{(s)} + 3\text{FeO}_{(s)} \rightarrow 3\text{Fe}_{(s)} + \text{Al}_2\text{O}_{3(s)}$ <p>How many moles of aluminum are required to produce 3.50 moles of aluminum oxide (Al_2O_3)? (3 points)</p> Calculate the following using the information provided: (2.70 moles) (4.00 moles) $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$ <p>A. What is the limiting reactant in the above equation?</p> <p>B. How many moles of product will be produced?</p> <p>C. How many moles of excess reactant are left over after the reaction occurs?</p> How much energy (in joules) is required to raise the temperature of 562 g of water from 15.6°C to 65.3°C? (The specific heat of water is 4.18J/g°C)
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> Lab equipment and chemicals White boards Vernier LabQuests
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab reports) Math: <ul style="list-style-type: none"> Calculations Solving for variables

Depth of Knowledge (Section 5)

DOK: 3

Curriculum: Chemistry

Curricular Unit: States of Matter and Gas Laws

Instructional Unit: I. **Physical changes in states of matter due to thermal changes in materials can be explained by the Kinetic Molecular Theory**

Standard Alignments (Section 2)

SCCLE: SC1.1.Da-c; SC1.2.Aa; SC7.1.B

Knowledge: (SC) 1,7

CCSS: 11-12.RST.3; 11-12.RST.4; 11-12.RST.9; F-IF.7; A-CED.2

NETS: 3d

Performance: 1.4, 1.8, 1.10

Unit (Section 3)

Learning Targets:

- Use kinetic theory to explain the differences in the three states of matter.
 - Name and characterize the three states of matter
 - List the three basic assumptions of the kinetic theory of gases
 - Relate temperature to average kinetic energy of the particles in a substance
 - Use kinetic theory of gases to explain gas pressure and atmospheric pressure
 - Convert between units of pressure of atm and mm. Hg
 - State the values of standard temperature and pressure
 - Explain why a liquid has a vapor pressure, and why a change in temperature causes a change in vapor pressure
 - Describe what happens at the boiling point of a liquid and the effects of pressure and temperature on boiling point
 - Distinguish between crystalline and amorphous solids
 - Identify energy changes and phase changes that matter can undergo by using a phase diagram
- Put data in appropriate graphical form and determine both the generic and specific equation of a graph
- Use the gas laws to account for changes in pressure, volume, temperature, amount, and rate of effusion of a confined gas
 - Distinguish between real and ideal gases
 - Use Dalton's Law of partial pressures to calculate total pressure of gases in a container
 - Use Boyle's law to account for pressure-volume changes in a gas
 - Use Charles's law to account for temperature-volume changes in a gas
 - Use Gay-Lussac's law to account for temperature pressure changes in a gas

<ul style="list-style-type: none"> • Perform calculations involving theL <ul style="list-style-type: none"> • combined gas law • ideal gas law • Use Graham's law of diffusion
<p>Instructional Strategies:</p> <ul style="list-style-type: none"> • The teacher will: <ul style="list-style-type: none"> • facilitate a States of Matter web-quest to allow students to explore kinetic molecular theory • pair students in groups to create a Venn diagram comparing the properties of the states of matter • lecture over graphing techniques and gas laws • provide students with materials to explore the relationship between pressure and volume, and temperature and volume of a confined gas • White board practice over gas law calculations
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> • Assessed using a common scoring guide: <ul style="list-style-type: none"> • Common Learning Target quizzes • Common unit test • Lab reports • Homework/practice • White board practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> • How many grams of nitrogen gas are in a flask with a volume of 250mL at a pressure of 2280mm Hg and a temperature of 27°C? • Explain why the temperature of a boiling liquid never rises above its boiling point. Also, discuss how a pressure cooker helps to cook food faster.
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> • Computers/iPads for research • Lab equipment • Vernier LabQuests • Gas pressure sensors • Temperature sensors • White boards • Butcher paper
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> • ELA – Literacy: <ul style="list-style-type: none"> • Technical: <ul style="list-style-type: none"> • reading (lab procedures) • writing (lab reports)

- Math:
 - Calculations
 - Graphing

Depth of Knowledge (Section 5)

DOK: 3

Curriculum: Chemistry

Curricular Unit: Water and Aqueous Solutions

Instructional Unit: J. **Properties of mixtures depend upon the concentrations, properties, and interactions of the particles**

Standard Alignments (Section 2)

SCCLE: SC1.1.Ab; SC1.1.Bc; SC1.1.Hb; SC7.1.B
Knowledge: (SC) 1,7
CCSS: 11-12.RST.3; 11-12.RST.4; F-IF.6; F-IF.7; A-CED.2
NETS: 3d
Performance: 1.6, 1.8, 1.10, 3.5

Unit (Section 3)

Learning Targets:

- Explain how hydrogen bonding is responsible for the properties of water
 - Describe the hydrogen-bonding that occurs in water on the basis of the structure of the polar water molecule
 - Use the concept of hydrogen bonding to explain the following properties of water: high surface tension, low vapor pressure, high specific heat, high heat of vaporization, and high boiling point
 - Explain the low density and high heat of fusion of ice
- Explain how a solution forms
 - Define the terms solution, aqueous solution, solute, and solvent and give examples of each
 - Use the rule that “like dissolves like” to predict the solubility of one substance in another
 - Describe the role of solvation in the dissolving process
- Explain the difference between a hydrated and anhydrous compound
- Explain why some substances are classified as electrolytes when in solution and others are classified as non-electrolytes
 - Distinguish among strong electrolytes, weak electrolytes, and nonelectrolytes. Give examples
 - Describe the relationship between concentration of an aqueous electrolyte and its conductivity
 - Write equations to show how substances ionize or dissociate in water
- Describe the properties of different types of mixtures
 - Give the characteristics of colloids and suspensions that distinguish them from solutions
 - Explain the role of emulsifying agents

<p>Instructional Strategies:</p> <ul style="list-style-type: none"> The teacher will: <ul style="list-style-type: none"> provide the students with materials to explore the: <ul style="list-style-type: none"> properties of water (high surface tension, high specific heat capacity, high boiling point, low vapor pressure, high heat of vaporization) conductivity of electrolytes in aqueous solutions lecture over hydrated compounds and mixtures White board activities
<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common Learning Target quizzes Common unit test Lab reports Homework/practice White board practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> How many joules are required to vaporize 27.0 mg of water at its boiling point? (The heat of vaporization of water is 2.26 kJ/g.) Show your work to receive credit. Explain why methanol (CH₃OH) will dissolve in both gasoline and water. Calculate the percent water in MgSO₄·7H₂O. Show your work to receive credit.
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> Lab equipment and chemicals Vernier LabQuests and conductivity sensors White boards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab reports) Math: <ul style="list-style-type: none"> Calculations Graphing Biology: Water’s importance to life

Depth of Knowledge (Section 5)

DOK: 4

Curriculum: Chemistry

Curricular Unit: Solutions

Instructional Unit: K. Properties and classifications of solutions

Standard Alignments (Section 2)

SCCLE: SC1.1.Ba,c; SC7.1.B

Knowledge: (SC) 1,7

CCSS: 11-12.RST.3; 11-12.RST.4; A-CED.1

NETS: 3d

Performance: 1.6, 1.8, 1.10, 3.5

Unit (Section 3)

Learning Targets:

- Identify the factors that affect solubility
 - List three factors that determine how fast a soluble substance dissolves
 - Define solubility and interpret a solubility curve or table
 - Explain the difference between saturated, unsaturated, and supersaturated solutions
- Calculate the concentration of a solution
 - Calculate the molarity of a solution
 - Describe how to prepare dilute solutions from concentrated solutions of known molarity
 - Calculate the molality of a solution
- Determine how the concentration of a solution affects the solution's properties
 - Calculate the freezing point depressions and boiling point elevations of aqueous solutions
 - Determine the molar mass of an unknown experimental freezing point depression or boiling point elevation measurement

Instructional Strategies:

- The teacher will:
 - lecture over solubility, solution concentration, and colligative properties of solutions
 - provide students with materials to make solutions of known concentrations, and test concentration using Beer's Law
 - facilitate discussion on separating mixtures using chromatography
- White boarding practice

<p>Assessments/Evaluations:</p> <ul style="list-style-type: none"> Assessed using a common scoring guide: <ul style="list-style-type: none"> Common Learning Target quizzes Common unit test Lab reports Homework/practice White board practice
<p>Sample Assessment Questions:</p> <ul style="list-style-type: none"> How many grams of NaCl are in 750.mL of a 0.400M solution? How would you prepare 90.0mL of 2.0M H₂SO₄ from 18M stock solution? <p>Statement:</p> <ul style="list-style-type: none"> What is the freezing point of a solution that has 5 moles of NaI in 1250g of water? (K_f = 1.86°C/m)
<p>Instructional Resources/Tools:</p> <ul style="list-style-type: none"> Lab equipment and chemicals Vernier LabQuests and Spectrovis Plus sensor White boards
<p>Cross Curricular Connections:</p> <ul style="list-style-type: none"> ELA – Literacy: <ul style="list-style-type: none"> Technical: <ul style="list-style-type: none"> reading (lab procedures) writing (lab reports) Math: Calculations

Depth of Knowledge (Section 5)

DOK: 4
