PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Honors Chemistry

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Curriculum writing committee:
Victoria Bednar

Grade Level: 10-12

Date of Board Approval: _____2024_____

Course Weighting: Honors Chemistry

Major Assessments	**45%**
Skills Application	**30%**
Skills Practice	**20%**
Participation	**5%**
Total	**100%**

Curriculum Map

Overview:
This course is an in-depth investigation of topics that include measurement, matter, atomic structure, electronic structure, the periodic table, nomenclature, mole concept and stoichiometry, molecular geometry, intermolecular forces, properties of matter, gases and gas laws, solubility, types of chemical reactions, and molarity. Laboratory safety and techniques are emphasized within this course. Having completed Honors Biology and having a high level of understanding in mathematical problem solving will facilitate success. The accelerated pace requires students to complete work outside of the classroom. Technology is integrated whenever appropriate to support and challenge the learning of the students. Such technological instruction will be accomplished through the use of graphing calculators, internet-based learning sites, and software programs (Excel, Google Sheets, Vernier, etc.).

Time/Credit for the Course:

- Full Academic Year
- 180 days
- 1 credit
- 1 period per day

Goals:

Marking Period 1: 45 days

- **Unit 1: Measurement and Significant Figures (14 days)**
  - **Understanding of:**
    - Measurement
    - Units
    - Standard International (SI) Units
    - Density
    - Qualitative
    - Quantitative
    - Accuracy
    - Precision
    - Uncertainty
    - Significant Figures (i.e. Significant Digits)
    - Rounding
    - Error Analysis (Percent Error and/or Percent Difference)
- **Unit 2: States, Properties, Changes, and Types of Matter (8 days)**
  - **Understanding of:**
    - States of Matter
    - Energy of states of matter
    - Law of Conservation of Mass
    - Open vs Closed System
    - Chemical and Physical Properties
    - Extensive vs Intensive Properties
    - Chemical and Physical Changes
    - Classification of Matter
    - Pure Substances (Elements, Compounds, and Molecules)
    - Mixtures (Homogeneous and Heterogeneous)
    - Separation Techniques
- **Unit 3: Atomic Structure (7 days)**
  - **Understanding of:**
    - Protons
    - Neutrons
    - Electrons
    - Atoms
    - Ions
    - Hyphen Notation
    - Nuclear Notation
    - Atomic Number
    - Average Atomic Mass
    - Mass Number
    - Isotopes

        - Relative Abundance
        - Mass Spectroscopy
- **Unit 4: Electronic Structure (10 days)**
    - **Understanding of:**
        - Rutherford, Bohr, and Quantum Mechanical Model
        - Energy Levels vs Energy Sublevels
        - Aufbau Principle
        - Pauli Exclusion Principle
        - Hund's Rule
        - Electron Configurations
        - Noble Gas Notations
        - Orbital Diagrams
        - Isoelectronic species
        - Valance Electrons
        - Chemical Reactivity
        - Ionization Energy
        - Coulomb's Law
        - Effective Nuclear Charge
        - Photoelectron Spectroscopy
- **Unit 5: The Periodic Table (6 days)**
    - **Understanding of:**
        - Periodic Law
        - J. W. Dobereiner
        - John Newlands
        - Dmitri Mendeleev
        - Henry Mosely
        - Glenn Seaborg
        - First Periodic Table vs Modern Periodic Table
        - Metals, Nonmetals, and Metalloids
        - Elemental Groups/ Families Properties
            - Alkali Metals, Alkaline Earth Metals, Chalcogens, Halogens, Noble Gases, Transition Metals, Inner Transition Metals
        - Shielding Effect
        - Coulomb's Law
        - Effective Nuclear Charge

Marking Period 2: 45 days

- **Unit 5: The Periodic Table (6 days)**
    - **Understanding of:**
        - Trends in Atomic Radius
        - Trends in Ionic Radius
        - Trends in Ionization Energy

        - Trends in Electron Affinity
        - Trends in Electronegativity
- **Unit 6: Chemical Formulas and Chemical Nomenclature (15 days)**
    - **Understanding of:**
        - Coefficients
        - Subscripts
        - Counting Atoms
        - Law of Conservation of Mass
        - Balanced Chemical Equations
        - States of Matter
        - Reactants vs Products
        - Monatomic Atoms
        - Diatomic Molecules
        - Alkanes
        - Alcohols
        - Covalent Compounds
        - Polyatomic Ions
        - Ionic Compounds
        - Hydrates
        - Acids
        - Bases
- **Unit 7: The Mole (15 days)**
    - **Understanding of:**
        - Significant Figures (i.e. Significant Digits)
        - Mole
        - Amedeo Avogadro's Number
        - Molar Mass
        - Percent Composition
        - Empirical Formulas
        - Molecular Formulas
        - Molar Conversions Using Dimensional Analysis
- **Unit 8: Molecular Geometry (9 days)**
    - **Understanding of:**
        - Intermolecular Forces
        - Intramolecular Forces
        - Ionic Bonds
        - Covalent Bonds
        - Single, Double, and Triple Bonds
        - Potential Energy
        - Bond Order
        - Bond Length
        - Octet Rule

- Duet Rule
- Lewis Structures
- Resonance Structures
- Formal Charges

Marking Period 3: 45 days

- **Unit 8: Molecular Geometry (11 days)**
  - **Understanding of:**
    - Sigma Bonds
    - Pi Bonds
    - Hybrid Orbitals
    - Electron Domain Geometry
    - Molecular Geometry
    - VSEPR Theory
- **Unit 9: Polarity, Solubility, and Intermolecular Forces (13 days)**
  - **Understanding of:**
    - Intramolecular Forces
    - Ionic Bonding
    - Covalent Bonding
    - Electronegativity
    - Bond Polarity
    - Molecule/Ion Polarity
    - Solubility
    - Chromatography
    - Retention Factor Values
    - Intermolecular Forces
      - Ion-Dipole, Hydrogen Bonding, Dipole-Dipole, Ion-Induced Dipole, Induced Dipole-Dipole, Induced Dipole- Induced Dipole (London Dispersion)
- **Unit 10: Properties of Matter (7 days)**
  - **Understanding of:**
    - Solids, Liquids, Gases, and Plasma
    - Energy in States of Matter
    - Kinetic Energy in Matter
    - Intermolecular Forces
    - Heating and Cooling Curves
    - ΔH_{fusion}
    - $\Delta H_{vaporization}$
    - Covalent Network Solids
    - Ionic Solids
    - Metallic Solids
    - Molecular Solids

- Interstitial and Substitutional Alloys
- Vaporization/Boiling Points
- Melting Points

- **Unit 11: Gases (14 days)**
  - **Understanding of:**
    - Kinetic Energy
    - Intermolecular Forces
    - Particle Arrangement
    - Compressibility
    - Diffusion
    - Effusion
    - Real Gases
    - Ideal Gases
    - Deviation from Ideal Behavior
    - Kinetic Molecular Theory
    - Maxwell-Boltzmann Distribution
    - Gas Laws
      - Graham's Law, Dalton's Law of Partial Pressures, Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law, Avogadro's Law, Ideal Gas Law
    - Gas Collection Over Water
    - Determining Molar Mass Using the Ideal Gas Law

Marking Period 4: 45 days

- **Unit 12: Molarity, Solubility, and Particle Diagrams (12 days)**
  - **Understanding of:**
    - Concentration
    - Solute
    - Solvent
    - Solubility
    - Soluble
    - Insoluble
    - Intermolecular Forces
    - Intramolecular Forces
    - Ions
    - Solvation Shell
    - Molarity
    - Dilution
    - Evaporation
    - Types of Matter
      - Elements, Compounds, Molecules, Homogenous Mixtures, Heterogeneous Mixtures

        - Particle Diagrams
- **Unit 13: Chemical Reactions (12 days)**
    - **Understanding of:**
        - Law of Conservation of Mass
        - Chemical Changes
        - Physical Changes
        - Chemical Equations
        - Reactant
        - Product
        - Balanced Equations
        - Oxidation
        - Reduction
        - Synthesis Reactions
        - Decomposition Reactions
        - Single Replacement (Displacement) Reactions
        - Double Replacement (Displacement) Reactions
        - Combustion Reactions
        - Oxidation – Reduction (Redox) Reactions
        - Precipitation Reactions
        - Acid – Base (Neutralization) Reactions
- **Unit 14: Stoichiometry, Limiting and Excess Reactant, and Ionic and Net Ionic Equations (12 days)**
    - **Understanding of:**
        - Stoichiometry
        - Limiting Reactant
        - Excess Reactant
        - Percent Yield
        - Molecular Equation
        - Ionic Equation
        - Net Ionic Equation
        - Spectator Ions
- **Unit 15: Academic Enrichment: Passion Project (9 days)**
    - **Understanding of:**
        - All Previous Content

Big Ideas:

- **BIG IDEA 1: SCALE, PROPORTION, AND QUANTITY**
    - Quantities in chemistry are expressed at both the macroscopic and atomic scale. Explanations, predictions, and other forms of argumentation in chemistry require understanding the meaning of these quantities, and the relationship between quantities at the same scale and across scales.
- **BIG IDEA 2: STRUCTURE AND PROPERTIES**
    - Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them. Chemical reasoning moves in both directions across these scales. Properties are predicted from known aspects of the structures and interactions at the atomic scale. Observed properties are used to infer aspects of the structures and interactions.
- **BIG IDEA 3: TRANSFORMATIONS**
    - At its heart, chemistry is about the rearrangement of matter. Understanding the details of these transformations requires reasoning at many levels as one must quantify what is occurring both macroscopically and at the atomic level during the process. This reasoning can be as simple as monitoring amounts of products made or as complex as visualizing the intermolecular forces among the species in a mixture. The rate of a transformation is also of interest, as particles must move and collide to initiate reaction events.
- **BIG IDEA 4: ENERGY**
    - Energy has two important roles in characterizing and controlling chemical systems. The first is accounting for the distribution of energy among the components of a system and the ways that heat exchanges, chemical reactions, and phase transitions redistribute this energy. The second is in considering the enthalpic and entropic driving forces for a chemical process. These are closely related to the dynamic equilibrium present in many chemical systems and the ways in which changes in experimental conditions alter the positions of these equilibria.

Textbook and Supplemental Resources:

- **Name of Textbook:** Chemistry, The Central Science
- **Textbook ISBN-13 number:** 978-0-13-760680-1
- **Textbook Publisher and Year of Publication:** Pearson, 2023
- **Supplemental Resources:**
    - OpenSciEd: https://www.openscied.org/curriculum/high-school/
    - The Wonder of Science: https://thewonderofscience.com/phenomenal
    - Phenomena for NGSS: https://www.ngssphenomena.com/
    - ScienceNewsExplores: https://www.snexplores.org/
    - Model Based Inquiry: https://sites.google.com/view/modelbasedinquiry/phenomena-ideas/physical-sciences

Curriculum Plan

Unit 1: Measurement and Significant Figures **Time/Days:** 14 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.G
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.1
- **Eligible Content:**
  - CHEM.A.1.1.2, CHEM.A.1.1.3

Objectives:

- DOK Level 1 –
  - Identify the difference between accuracy and precision in measurements.
  - Define significant figures in a measurement.
  - State how many significant figures are in various measurements.
  - Identify standard international units of measurement.
  - Identify various types of laboratory equipment and scientific measurement instruments.
  - Identify sources of uncertainty.
  - Identify sources of qualitative and/or quantitative data.
  - Calculate the density, mass, and/or volume of a substance using the density equation.
  - Identify the scenarios to utilize percent error/percent difference.
- DOK Level 2 -
  - Categorize the metric system with the Imperial system of measurement.
  - Explain potential sources of uncertainty.
  - Utilize SI units of measurement.
  - Classify a group of measurements as either precise or not precise.
  - Classify a group of measurements as either accurate or not accurate.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.

        - Interpret and/or employ various lab scientific measurement instruments.
        - Apply significant digits to measurements and calculations.
    - DOK Level 3 -
        - Investigate and explain the significance of significant figures in experimental data.
        - Assess the validity of data utilizing percent error and/or percent difference.
        - Formulate and draw conclusions from dimensional analysis calculations.
        - Formulate and draw conclusions from a procedure to determine the density of an irregularly shaped object and/or liquid.
        - Formulate and draw conclusions from a method to determine the density, mass, and/or volume of a substance using the density equation.
        - Assess the impact of rounding errors in measurements on the final result of a scientific experiment.
        - Draw conclusions about the precision of a measuring instrument based on the recorded values and uncertainties in measurements.
        - Determine the density of various objects and substances.
    - DOK Level 4 –
        - Analyze the errors associated with the use of an inappropriate measuring instrument for a specific measurement task.
        - Critique a scientific study's methodology in terms of the precision and accuracy of measurements reported.
        - Critique a scenario where understanding significant figures is critical in a laboratory setting.
        - Apply the concept of significant figures to a real-world problem involving calculations in a chemistry experiment.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Accuracy and Precision Lab (See Appendix)
- Rainbow Lab (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning

        - Teacher observation
        - Homework assignments
        - Classwork assignments
        - Exit tickets
        - Practice quizzes
        - In-class assignments
        - Quizzes
    - **Summative:**
        - Density Laboratory Activity (See Appendix)
            - Using Excel/Google Sheets for Data Analysis
        - Unit #1 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 2: States, Properties, Changes, and Types of Matter **Time/Days:** 8 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.C.A1., 3.2.10.A3, 3.2.C.A3., 3.2.C.A4, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.G
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.1, CHEM.A.1.2
- **Eligible Content:**
  - CHEM.A.1.1.1, CHEM.A.1.1.4, CHEM.A.1.2.2

Objectives:

- DOK Level 1 –
  - Identify the states of matter.
  - Define a physical and/or chemical change in matter.
  - List properties of solids, liquids, gases, and plasma.
  - Define physical and/or chemical properties in matter.
  - Define intensive and/or extensive properties in matter.
  - List various separation techniques.
  - State the Law of Conservation of Matter (Mass).
- DOK Level 2 –
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Categorize physical and chemical changes in matter.
  - Categorize physical and chemical properties in matter.
  - Categorize intensive and extensive properties in matter.
  - Categorize pure substances and mixtures.
  - Classify various substances as elements, compounds, molecules, or mixtures.
  - Interpret the relationship between temperature and the state of matter for various substances.

- DOK Level 3 –
    - Draw conclusions about the relationship between particle arrangement and density in different states of matter.
    - Compare and contrast pure substances (elements, compounds, and molecules) and mixtures (homogenous and heterogeneous).
    - Investigate various techniques for separating various heterogeneous and homogeneous mixtures.
    - Apply the Law of Conservation of Mass to experimental data.
    - Investigate how temperature impacts changes in physical states of matter.
- DOK Level 4 –
    - Create a hypothesis for why some substances float in water while others do not.
    - Draw conclusions about the relationship between particle arrangement and density in different states of matter.
    - Analyze the role of molecular structure in determining the properties of matter.
    - Analyze how different errors may affect experimental data.
    - Critique the effectiveness of separation techniques in real-world scenarios.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Law of Conservation of Mass Lab (See Appendix)
- Chemical and Physical Changes Lab (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes

- **Summative:**
    - Separation of Mixtures Laboratory Activity (See Appendix)
        - Using Excel/Google Sheets for Data Analysis
    - Unit #2 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 3: Atomic Structure **Time/Days:** 7 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.3.12.A2, 3.2.C.A5, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.A
- **Anchors:**
  - CHEM.A.2, CHEM.A.2.1
- **Eligible Content:**
  - CHEM.A.2.1.1, CHEM.A.2.1.2

Objectives:

- DOK Level 1 –
  - List the components of an atom or ion.
  - Identify atoms, isotopes, and ions.
  - Identify subatomic particles.
  - Identify the charges on subatomic particles.
  - Define atomic number, mass number, and average atomic mass.
  - Identify the hyphen notation and nuclear notation for various atoms and/or ions.
  - Calculate the number of protons, neutrons, and electrons in atoms, ions, and isotopes.
- DOK Level 2 -
  - Categorize atoms, isotopes, and ions.
  - Determine the cause of electrical charge of various ions.
  - Summarize the differences between hyphen notation and nuclear notation.
  - Compare relative masses of isotopes and explain the effect on average atomic mass of elements.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.

- DOK Level 3 –
    - Investigate how mass spectrometry is used to determine relative abundances of isotopes of an element.
    - Assess the impact of isotopes on the average atomic mass of an element.
    - Formulate a hypothesis on how changing the number of electrons in an atom affects its chemical properties.
    - Draw conclusions about the relationship between mass number and isotopes.
    - Formulate and draw conclusions from a method to determine the average atomic mass of elements using relative abundance of isotopes.
- DOK Level 4 –
    - Analyze the role of mass spectrometry in determining the mass of isotopes.
    - Critique the use of average atomic mass as a representation of an element's mass.
    - Synthesize how isotopes of an element differ in their atomic structure.
    - Apply the concept of nuclear notation to explain how isotopes are represented.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Simulation of Rutherford's Gold Foil Experiment (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes
- **Summative:**
    - Isotope Activity (See Appendix)
    - Unit #3 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 4: Electronic Structure **Time/Days:** 10 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.3.C.A2, 3.2.10.A5, 3.2.C.A5, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.A
- **Anchors:**
  - CHEM.A.2, CHEM.A.2.2
- **Eligible Content:**
  - CHEM.A.2.2.1, CHEM.A.2.2.2, CHEM.A.2.2.3

Objectives:

- DOK Level 1 –
  - Define the Aufbau Principle, Pauli Exclusion Principle, and Hund's Rule.
  - List the sublevels in the energy levels of atoms, ions, and isotopes.
  - Identify the number of valance electrons in various atoms, ions, and isotopes.
  - Define ionization energy.
  - Define Coulomb's Law and Effective Nuclear Charge.
  - Define isoelectronic species.
  - Define valence electrons.
  - Identify the shape of the s, p, d, and f orbitals.
  - Identify the s, p, d, and f orbital locations on the periodic table.
  - Identify the number of valance electrons in various atoms, ions, and isotopes.
  - List the maximum number electrons that occupy the s, p, d, and f subshells.
- DOK Level 2 –
  - Compare and contrast the Aufbau Principle, Pauli Exclusion Principle, and Hund's Rule.
  - Summarize the differences between energy levels and energy sublevels.
  - Construct electron configurations using the principles of orbital energy (Aufbau Principle), electron spin (Pauli Exclusion Principle), & orbital capacity (Hund's Rule) for atoms, ions, and/or isotopes.

    - Construct noble gas notations using the principles of orbital energy (Aufbau Principle), electron spin (Pauli Exclusion Principle), & orbital capacity (Hund's Rule) for atoms, ions, and/or isotopes.
    - Construct orbital diagrams using the principles of orbital energy (Aufbau Principle), electron spin (Pauli Exclusion Principle), & orbital capacity (Hund's Rule) for atoms, ions, and/or isotopes.
    - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
    - Interpret and/or employ various lab scientific measurement instruments.
    - Compare and contrast the characteristics of an atom's nucleus and electron cloud.
    - Classify the elements based on electron configuration.
    - Predict which elements will be more/less stable based on their electron configurations.
- DOK Level 3 –
    - Investigate and explain how the Pauli Exclusion Principle, Aufbau Principle, and Hund's Rule influences electron configurations of atoms, ions, and/or isotopes.
    - Formulate a hypothesis on how the chemical reactivity of atoms is related to the number of valence electrons they possess.
    - Draw conclusions on the relationship between ionization energy and atomic size based on Coulomb's Law.
    - Formulate an explanation for why elements in the same group of the periodic table have similar chemical properties.
    - Draw conclusions of electron configurations to predict elemental behavior.
    - Assess the relationship between electron arrangement and the chemical reactivity of an element.
    - Compare electron configurations for elements with their location on the periodic table.
    - Summarize the relationship between electron configurations and the properties of elements.
- DOK Level 4 –
    - Critique the validity of the Bohr model of the atom in explaining the behavior of electrons.
    - Analyze the relationship between electronic structure and an element's placement on the periodic table.
    - Critique the effectiveness of using noble gas notations to represent electron configurations.
    - Apply the principles of quantum mechanics to design an experiment using photoelectron spectroscopy to determine the electron configurations of unknown elements.
    - Create a prediction of the change in chemical behavior of an element in a scenario where its electron configuration is altered.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
  - Informal discussion
  - Introductory questions
  - Warm up questioning
- **Formative:**
  - Daily warm-ups
  - Informal questioning
  - Teacher observation
  - Homework assignments
  - Classwork assignments
  - Exit tickets
  - Practice quizzes
  - In-class assignments
  - Quizzes
- **Summative:**
  - Electron Activity (See Appendix)
  - Unit #4 Quiz: Electron Configurations, Orbital Diagrams, and Noble Gas Notation
  - Unit #4 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 5: The Periodic Table **Time/Days:** 12 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A1, 3.3.C.A1, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.A
- **Anchors:**
  - CHEM.A.2, CHEM.A.2.3
- **Eligible Content:**
  - CHEM.A.2.3.1, CHEM.A.2.3.2, CHEM.A.2.2.3

Objectives:

- DOK Level 1 –
  - Define Periodic Law.
  - Identify the discoveries of the notable scientists.
  - Identify the main groups/families on the periodic table (alkali metals, alkaline earth metals, transition metals, actinides, lanthanides, halogens, and noble gases).
  - Define Coulomb's Law.
  - Define Effective Nuclear Charge.
  - Define atomic radius, ionic radius, ionization energy, electron affinity, and electronegativity.
  - Identify properties of metals, nonmetals, and metalloids.
- DOK Level 2 –
  - Describe trends atomic radius, ionic radius, ionization energy, electron affinity, and electronegativity.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Distinguish between the periodic groups/families and their properties.
  - Classify elements as metals, nonmetals or metalloids based on their properties.
  - Classify elements into their respective groups/families.
- DOK Level 3 –
  - Investigate and explain the concept of effective nuclear charge and its impact on periodic trends.

        - Formulate a hypothesis on how the shielding effect influences the reactivity of alkali metals.
        - Draw conclusions on why elements in the same group have similar chemical properties.
        - Assess the relationship between electron affinity and electronegativity in predicting bonding behavior.
        - Draw a conclusion about the relationship between group number and the number of valence electrons.
    - DOK Level 4 –
        - Formulate a hypothesis on how the shielding effect influences the reactivity of alkali metals.
        - Draw conclusions on why elements in the same group have similar chemical properties.
        - Assess the relationship between electron affinity and electronegativity in predicting bonding behavior.
        - Connect the locations of elements on the table with the repeating pattern of properties.
        - Apply concepts of coulomb's law and effective nuclear charge to explain patterns of periodic trends.
        - Analyze the reasons behind the placement of Hydrogen in Group 1.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Mendeleev Lab (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes

- **Summative:**
    - Unit #5 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 6: Chemical Formulas and Chemical Nomenclature **Time/Days:** 15 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A2, 3.2.C.A2, 3.3.C.A4, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.B, 3.2.9-12.C
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.1, CHEM.B.1, CHEM.B.1.3
- **Eligible Content:**
  - CHEM.A.1.1.5, CHEM.B.1.3.1

Objectives:

- DOK Level 1 –
  - Define subscripts and coefficients.
  - Define the Law of Conservation of Mass.
  - Identify the number of atoms and molecules using subscripts and coefficients.
  - Calculate the total number of atoms in chemical formulas.
  - Memorize and use the seven diatomic molecules.
  - Memorize and use common polyatomic ions.
- DOK Level 2 –
  - Classify compounds/molecules as organic, diatomic, ionic, and/or covalent.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Summarize the main idea of the Law of Conservation of Mass.
- DOK Level 3 –
  - Summarize the main idea of the Law of Conservation of Mass.
  - Construct names and write formulas for organic compound (alkanes/alcohols)
  - Construct names and write formulas for ionic compounds.
  - Construct names and write formulas for covalent compounds.
  - Construct names and write formulas for acids and bases.
  - Construct names and write formulas for hydrates.

- DOK Level 4 –
    - Analyze the role of polyatomic ions in forming ionic compounds.
    - Critique a given balanced chemical equation to identify any errors and correct them.
    - Critique the naming conventions for ionic compounds and summarize the key rules.
    - Critique the naming conventions for binary covalent compounds and summarize the key rules.
    - Critique the naming conventions for acid compounds and summarize the key rules.
    - Critique the naming conventions for hydrate compounds and summarize the key rules.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes
- **Summative:**
    - Chemical Formula and Chemical Nomenclature Activity (See Appendix)
    - Unit #6 Quiz: Covalent Compounds, Diatomic Molecules, Organic Compounds, and Law of Conservation of Mass
    - Unit #6 Quiz: Polyatomic Ions
    - Unit #6 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources

- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 7: The Mole **Time/Days:** 15 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.C.A2, 3.2.10.A5, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.G
- **Anchors:**
  - CHEM.B.1, CHEM.B.1.1, CHEM.B.1.2
- **Eligible Content:**
  - CHEM.B.1.1.1, CHEM.B.1.2.1, CHEM.B.1.2.2, CHEM.B.1.2.3

Objectives:

- DOK Level 1 –
  - Define the mole in chemistry.
  - Define molar mass.
  - Define empirical formula.
  - Define molecular formula.
  - List the steps involved in finding the percent composition of a compound.
  - List the steps involved in finding the empirical formula of a compound.
  - List the steps involved in finding the molecular formula of a compound.
  - Identify units of molar mass and Avogadro's number.
  - Define Avogadro's Number.
- DOK Level 2 –
  - Compare empirical and molecular formulas.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Summarize the process of determining the empirical formula of a compound.
  - Classify different types of molar conversions that can be done using dimensional analysis.
- DOK Level 3 –
  - Formulate and draw conclusions from a method to determine the molar mass of compounds/molecules.

        - Formulate and draw conclusions from a method using molar conversions to determine the amount of mass, moles, and/or particles in a sample.
        - Formulate and draw conclusions from a method to determine the percent composition of compounds.
        - Formulate and draw conclusions from a method to determine the molecular formula of a compound given its empirical formula.
        - Investigate how Avogadro's number is related to the mole concept.
        - Draw conclusions about the relationship between molar mass and percent composition.
        - Assess the impact of rounding on significant figures in a calculation involving molar conversions.
    - DOK Level 4 –
        - Apply the concept of significant figures to explain the limitations of experimental data in determining molecular formulas.
        - Critique the relevance and significance of Avogadro's number in the field of chemistry, providing examples to support your argument.
        - Prove the relevance and significance of Avogadro's number in the field of chemistry.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Understanding the Mole Lab (See Appendix)
- Percent Composition of Hydrate Lab (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes
- **Summative:**
    - Unit #7 Quiz: Mole Conversions

    - Empirical and Molecular Formula Activity (See Appendix)
    - Unit #7 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 8: Molecular Geometry **Time/Days:** 20 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A2, 3.2.C.A2, 3.2.12.A5, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.A, 3.2.9-12.B
- **Anchors:**
  - CHEM.A.2, CHEM.A.2.2, CHEM.B.1, CHEM.B.1.3, CHEM.B.1.4
- **Eligible Content:**
  - CHEM.A.2.2.2, CHEM.B.1.3.1, CHEM.B.1.3.2, CHEM.B.1.4.1, CHEM.B.1.4.2

Objectives:

- DOK Level 1 –
  - Define intramolecular forces.
  - Define intermolecular forces.
  - Define resonance.
  - List the types of bonds commonly found in the intramolecular forces in molecules.
  - Identify the factors that determine bond length.
  - Calculate the formal charge of an atom in a given molecule's and/or ion's Lewis structure.
  - Identify the bond order of a bond in a molecule and/or ion based on its Lewis structure and/or molecular geometry.
  - Calculate the bond order of a bond in a molecule and/or ion based on its Lewis structure and/or molecular geometry.
  - List the various molecular geometry shapes (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral, etc.)
  - Identify bond angles in various molecular geometries.
- DOK Level 2 –
  - Compare ionic bonds and covalent bonds.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Classify the type of hybrid orbital(s) present in a molecule and/or ion based on its Lewis structure and/or molecular geometry.

        - Summarize the concept of resonance structures in chemical bonding.
        - Identify the bond order of a bond in a molecule and/or ion based on its Lewis structure and/or molecular geometry.
        - Predict the type of bonding that would occur.
        - Construct Lewis structures for molecules and/or ions.
        - Construct resonance structures for molecules and/or ions.
    - DOK Level 3 –
        - Investigate how the VSEPR theory helps predict the molecular geometry of a molecule/ion.
        - Formulate a hypothesis on the effect of bond order on bond energy.
        - Assess the impact of sigma and pi bonds on the overall stability of a molecule.
        - Formulate and draw conclusions using the Valence Shell Electron Pair Repulsion (VSEPR) Theory to predict geometry of molecules and/or ions.
    - DOK Level 4 –
        - Analyze when resonance structures are necessary for molecules and/or ions.
        - Analyze the role of hybrid orbitals in determining the shape of complex molecules.
        - Create a Lewis structure for a molecule and/or ion with a specific molecular geometry.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes

- **Summative:**
    - Unit #8 Quiz: Lewis Structures, Resonance, and Formal Charge
    - Unit #8 Quiz: Molecular Geometry
    - Molecular Geometry Activity
    - Unit #8 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 9: Polarity, Solubility, and Intermolecular Formulas **Time/Days:** 13 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A1, 3.2.C.A1, 3.2.12.A1, 3.2.10.A2, 3.2.C.A2, 3.2.12.A5, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.B
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.2, CHEM.B.1, CHEM.B.1.3
- **Eligible Content:**
  - CHEM.A.1.2.5, CHEM.B.1.3.3

Objectives:

- DOK Level 1 –
  - Define intramolecular forces.
  - Define intermolecular forces.
  - Define electronegativity.
  - List the types of bonds commonly found in the intramolecular forces in molecules.
  - Identify the factors that determine bond polarity.
  - Calculate the retention factors of various substances.
  - Identify how intermolecular forces affect physical properties.
- DOK Level 2 –
  - Summarize the concept of solubility and its relation to polarity.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Classify the types of intermolecular forces.
  - Classify molecules and/or ions as polar, nonpolar, or partially polar-partially nonpolar.
  - Summarize the importance of bond polarity in determining molecular polarity and properties.
  - Summarize the principles of chromatography.
  - Estimate the retention factor values for different substances.
  - Organize various molecules in order of increasing or decreasing physical properties based on the intermolecular forces of attraction present.

- DOK Level 3 –
    - Formulate a hypothesis on how retention factors values can be used in chromatography to separate substances.
    - Draw conclusions on the factors that influence intermolecular forces in different substances.
    - Draw conclusions about the relationship between London Dispersion forces and molecule size.
    - Differentiate how electronegativity values influence the type of bond formed between atoms.
    - Construct an argument for the significance of intermolecular forces in determining the physical properties of substances.
    - Formula a conclusion about the relationship between a molecule and/or ion polarity and its solubility in different solvents.
    - Investigate the relationship between the type of intermolecular forces and the boiling points and/or melting points of various substances.
- DOK Level 4 –
    - Assess how bond polarity and molecular geometry to determine polarity of a molecular structure.
    - Analyze the impact of different types of intermolecular forces on the physical properties of substances.
    - Critique the effectiveness of chromatography in separating mixtures base on retention factor values.
    - Critique the use of retention factor values in chromatography in analysis.
    - Analyze a molecule's structure to predict its solubility based on its polarity.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Intermolecular Forces Lab (See Appendix)
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments

        - Exit tickets
        - Practice quizzes
        - In-class assignments
        - Quizzes
- **Summative:**
        - Chromatography Lab (See Appendix)
        - Unit #9 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 10: Types and Properties of Matter **Time/Days:** 7 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A3, 3.2.C.A3, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.B, 3.2.9-12.N, 3.2.9-12.P
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.1
- **Eligible Content:**
  - CHEM.B.1.1.4

Objectives:

- DOK Level 1 –
  - List the four states of matter.
  - Identify the possible phase changes in matter.
  - Define kinetic energy.
  - Define melting point.
  - Define boiling point.
  - Define ΔH_{fusion} and $\Delta H_{vaporization}$.
  - List examples of covalent network solids, ionic solids, metallic solids, and molecular solids.
  - Define intramolecular forces.
  - Define intermolecular forces.
  - Identify the particle representation of various types of solids.
- DOK Level 2 –
  - Classify various substances as covalent network solids, ionic solids, metallic solids, or molecular solids.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Relate temperature to kinetic energy within a sample of matter.
  - Organize various substances in order of increasing or decreasing boiling points and/or melting points.
  - Summarize the key differences between ΔH_{fusion} and $\Delta H_{vaporization}$.

- DOK Level 3 –
    - Compare how heating curves for various substances differ during melting and vaporization.
    - Compare how cooling curves for various substances differ during freezing and condensation.
    - Compare the intermolecular forces present in solids, liquids, and gases.
    - Draw conclusions of the kinetic energy between particles in the different states of matter.
    - Assess the impact of the strength of intermolecular forces on the energy required for vaporization to occur.
    - Draw conclusions how heating and/or cooling affects the kinetic energy of particles in different substances.
    - Describe the heating and cooling curves of a substance.
    - Draw conclusions on how intramolecular forces influence the physical properties of a substance.
- DOK Level 4 –
    - Analyze the heating and cooling curve of a substance and explain the changes in kinetic energy at specific points.
    - Critique the effectiveness of using ΔH_{fusion} and $\Delta H_{vaporization}$ values to predict the behaviors of various substances.
    - Analyze how the structure of various solids affects its ability to conduct electricity.
    - Analyze the factors influencing the melting point and vaporization in different types of substances.
    - Analyze the factors influencing the freezing point and condensation in different types of substances.
    - Analyze heating and cooling curves for various substances and interpret the ΔH_{fusion} and $\Delta H_{vaporization}$ associated with each.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation

        - Homework assignments
        - Classwork assignments
        - Exit tickets
        - Practice quizzes
        - In-class assignments
        - Quizzes

- **Summative:**
    - Unit #10 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 11: Gases **Time/Days:** 14 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A3, 3.2.C.A3, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.B, 3.2.9-12.E
- **Anchors:**
  - CHEM.B.2, CHEM.B.2.2
- **Eligible Content:**
  - CHEM.B.2.2.1, CHEM.B.2.2.2

Objectives:

- DOK Level 1 –
  - Define kinetic energy.
  - Define boiling point.
  - Define $\Delta H_{vaporization}$.
  - Define intermolecular forces.
  - Identify the particle representation of gases.
  - State the formula for calculating the kinetic energy of a gas.
  - Define diffusion.
  - Define effusion.
- DOK Level 2 –
  - Summarize the relationship between particle arrangement and compressibility of gases.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Classify real gases vs ideal gases based of the behavior of various substances.
  - Construct a Maxwell-Boltzmann distribution curve for gases at different temperatures.
  - Construct a Maxwell-Boltzmann distribution curve for gases at different masses.
  - Estimate how the particle arrangement changes in a gas as it transitions from ideal behavior to real behavior.

- DOK Level 3 –
    - Compare real gases vs ideal gases.
    - Compare diffusion vs effusion.
    - Investigate the impact of intermolecular forces on the diffusion and effusion rates of gases.
    - Formulate a hypothesis on how temperature affects the kinetic energy of gas particles.
    - Assess the validity of the Ideal Gas Law in various experimental conditions.
    - Formulate and draw conclusions about the molar mass of a gas using the Ideal Gas Law and gas collection over water technique.
    - Formulate and draw conclusions about the molar mass of a gas using the Ideal Gas Law.
    - Investigate how deviations from ideal behavior in gases can be explained by the kinetic molecular theory.
    - Formulate a hypothesis on how gas collection over water can impact the accuracy of gas volume measurements.
    - Assess the impact of intermolecular forces on the diffusion rates of various gases.
    - Draw conclusions about the relationship between the pressure, volume, and/or temperature of gases using gas laws.
    - Formulate and draw conclusions from a method to determine the molar mass, pressure, volume, and/or temperature of various gases.
- DOK Level 4 –
    - Analyze the Maxwell-Boltzmann distribution to explain the behavior of gas particles at different temperatures.
    - Analyze the Maxwell-Boltzmann distribution to explain the behavior of gas particles with different masses.
    - Critique the limitations of the Ideal Gas Law when applied to real gases.
    - Analyze the factors contributing to the deviation from ideal behavior in gases and propose solutions to minimize these deviations.
    - Apply the concepts of Graham's Law and diffusion and/or effusion to explain how different gases behave in a mixture based on their molar masses.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion

        - Introductory questions
        - Warm up questioning
    - **Formative:**
        - Daily warm-ups
        - Informal questioning
        - Teacher observation
        - Homework assignments
        - Classwork assignments
        - Exit tickets
        - Practice quizzes
        - In-class assignments
        - Quizzes
    - **Summative:**
        - Molar Mass of Gas Lab (See Appendix)
        - Unit #10 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 12: Molarity, Solubility, and Particle Diagrams **Time/Days:** 12 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.C.A4, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.B, 3.2.9-12.P
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.2
- **Eligible Content:**
  - CHEM.A.1.2.1, CHEM.A.1.2.2, CHEM.A.1.2.3, CHEM.A.1.2.4, CHEM.A.1.2.5

Objectives:

- DOK Level 1 –
  - Define solute.
  - Define solvent.
  - Define soluble.
  - Define insoluble.
  - Identify the particles in a solution.
  - Identify the forces involved in solubility.
- DOK Level 2 –
  - Compare solute and solvent.
  - Summarize the process of dilution of solutions referring to the solute and solvent particle composition.
  - Summarize the process of evaporation of solutions referring to the solute and solvent particle composition.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Compare the strength of intermolecular forces vs intramolecular forces in the development of solutions.
  - Investigate the role of ion-dipole interactions in solubility.
- DOK Level 3 –
  - Formulate and draw conclusions from a method to determine the molarity, moles, and/or volume.
  - Compare the different factors that affect solubility.
  - Construct a solvation shell diagram for a given solution.

        - Construct a particle diagram for various chemical change, physical changes, and/or solutions.
    - DOK Level 4 –
        - Critique the use of particle diagrams to explain evaporation of solutions.
        - Critique the use of particle diagrams to explain dilution of solutions.
        - Apply the concept of molarity to create a solution with specific concertation requirements.
        - Analyze the solvation shells the dissolution process of solutions.
        - Critique the use of dilution as a method to manipulate the concentration of a solution.
        - Critique the use of evaporation as a method to manipulate the concentration of a solution.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes
- **Summative:**
    - Unit #12 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 13: Chemical Reactions **Time/Days:** 12 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A2, 3.2.C.A2, 3.2.10.A4, 3.2.C.A4, 3.2.12.A4, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.C, 3.2.9-12.G
- **Anchors:**
  - CHEM.B.2, CHEM.B.2.1
- **Eligible Content:**
  - CHEM.B.2.1.3, CHEM.B.2.1.4, CHEM.B.2.1.5

Objectives:

- DOK Level 1 –
  - Define the Law of Conservation of Mass.
  - Define chemical change.
  - Define physical change.
  - List examples of chemical changes.
  - List examples of physical changes.
  - Define reactant.
  - Define product.
  - Identify types of chemical reactions.
- DOK Level 2 –
  - Compare oxidation and reduction.
  - Classify given reactions as synthesis (combination), decomposition, single replacement (displacement), double replacement (displacement), combustion, oxidation – reduction, precipitation, and/or acid – base (neutralization) reactions.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Summarize the key characteristics of synthesis (combination), decomposition, single replacement (displacement), double replacement (displacement), combustion, oxidation – reduction, precipitation, and/or acid – base (neutralization) reactions.
  - Summarize the process of balancing a chemical equation.

- DOK Level 3 –
    - Assess the importance of balanced chemical equations n understanding chemical reactions.
    - Formulate and draw conclusions from a method to determine the product(s) of synthesis (combination), decomposition, single replacement (displacement), double replacement (displacement), combustion, oxidation – reduction, precipitation, and/or acid – base (neutralization) reactions.
    - Investigate the role of oxidation and reduction in redox reactions.
    - Formulate and draw conclusions from a method to determine balanced chemical reaction from unbalanced chemical equations.
- DOK Level 4 –
    - Assess chemical equations and explain the stoichiometry involved.
    - Critique a given chemical equation for potential errors or inconsistencies.
    - Analyze a given chemical equation and identify the type of reaction it represents, providing a detailed explanation.
    - Evaluate and justify the classification of various chemical reactions.
    - Analyze and interpret experimental data and observations to identify the type of chemical reaction occurring in a given scenario.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes
- **Summative:**
    - Chemical Reaction Lab (See Appendix)
    - Unit #13 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 14: Stoichiometry, Limiting and Excess Reactant, and Ionic and Net Ionic Equations
Time/Days: 12 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A2, 3.2.C.A2, 3.2.10.A4, 3.2.C.A4, 3.2.12.A4, 3.2.10.A6., 3.2.C.A6., 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.C, 3.2.9-12.G
- **Anchors:**
  - CHEM.B.2, CHEM.B.2.1
- **Eligible Content:**
  - CHEM.B.2.1.1, CHEM.B.2.1.2, CHEM.B.2.1.5

Objectives:

- DOK Level 1 –
  - Define stoichiometry.
  - Define limiting reactant.
  - Define excess reactant.
  - Define spectator ions.
  - List the steps involved in calculating percent yield.
  - Identify spectator ions in chemical reactions.
- DOK Level 2 –
  - Compare molecular equations, ionic equations, and net ionic equations.
  - Relate basic laboratory safety practices in carrying out laboratory procedures and/or reviewing laboratory reports.
  - Interpret and/or employ various lab scientific measurement instruments.
  - Summarize the steps involved in calculation the limiting reactant and excess reactant in a chemical reaction.
- DOK Level 3 –
  - Formulate and draw conclusions from a method to determine the limiting and excess reactant from chemical reactions.
  - Formulate and draw conclusions from a method to determine the amount of excess reactant remain after chemical reactions.
  - Formulate and draw conclusions from a method to determine percent yield from chemical reactions.

        - Draw conclusions about the efficiency of a reaction based on the calculated percent yield.
        - Construct and balance net ionic equations for chemical reactions, omitting spectator ions and representing only the species involved in chemical changes.
        - Construct and balance ionic equations for chemical reactions, representing dissociated ions as separate entities.
    - DOK Level 4 –
        - Analyze a chemical reaction and identify the limiting reactant, excess reactant, and percent yield.
        - Analyze and evaluate reaction scenarios involving excess reactants to determine the amount of excess reactant consumed and the resulting product yield.
        - Analyze and evaluate ionic equations to identify spectator ions and write net ionic equations for reactions, focusing on the species directly involved in chemical changes.
        - Analyze and evaluate net ionic equations to interpret reaction mechanisms, identify reactants and products, and quantify reaction stoichiometry.
        - Analyze and evaluate reaction scenarios to determine spectator ions and write net ionic equations, focusing on the essential chemical changes occurring in solution.

Core Activities and Corresponding Instructional Methods:

- Instructional texts
- Lecture of instructional content
- Phenomena investigation
- Collaborative learning

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily warm-ups
    - Informal questioning
    - Teacher observation
    - Homework assignments
    - Classwork assignments
    - Exit tickets
    - Practice quizzes
    - In-class assignments
    - Quizzes

- **Summative:**
    - Limiting Reactant Lab (See Appendix)
    - Unit #14 Common Unit Assessment

Extensions:

- Rigorous and/or challenging additional worksheets and activities
- Rigorous and challenging data sets/calculations
- In-depth online video resources
- Additional laboratory enrichment experiences using measurement apparatus

Correctives:

- Additional practice worksheets
- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Unit 15: Academic Enrichment: Passion Project **Time/Days:** 9 days

- **Standards (by number):**
  - PA Academic Standards
    - 3.2.10.A1, 3.2.C.A1, 3.2.12.A1, 3.2.10.A2, 3.2.C.A2, 3.2.12.A2, 3.2.10.A3, 3.2.C.A3, 3.2.12.A3, 3.2.10.A4, 3.2.C.A4, 3.2.12.A4, 3.2.10.A5, 3.2.C.A5, 3.2.12.A5, 3.2.10.A6, 3.2.C.A6, 3.2.12.A6
  - Academic Standards for Reading in Science and Technology
    - CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H, CC.3.5.9-10.I, CC.3.5.9-10.J, CC.3.5.11-12.A, CC.3.5. 11-12.B, CC.3.5. 11-12.C, CC.3.5. 11-120.D, CC.3.5. 11-12.E, CC.3.5. 11-12.F, CC.3.5. 11-12.G, CC.3.5. 11-12.H, CC.3.5. 11-12.I, CC.3.5. 11-12.J
  - Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards
    - 3.2.9-12.A, 3.2.9-12.B, 3.2.9-12.C, 3.2.9-12.D, 3.2.9-12.E, 3.2.9-12.F, 3.2.9-12.G, 3.2.9-12.H, 3.2.9-12.N, 3.2.9-12.O, 3.2.9-12.P, 3.2.9-12.T, 3.2.9-12.V
- **Anchors:**
  - CHEM.A.1, CHEM.A.1.1., CHEM.A.1.2, CHEM.A.2.1, CHEM.A.2.2, CHEM.A.2.3, CHEM.B.1, CHEM.B.1.1, CHEM.B.1.2, CHEM.B.1.3, CHEM.B.1.4, CHEM.B.2.1, CHEM.B.2.2
- **Eligible Content:**
  - CHEM.A.1.1.1, CHEM.A.1.1.2, CHEM.A.1.1.3, CHEM.A.1.1.4, CHEM.A.1.1.5, CHEM.A.1.2.1, CHEM.A.1.2.2, CHEM.A.1.2.3, CHEM.A.1.2.4, CHEM.A.1.2.5, CHEM.A.2.1.1, CHEM.A.2.1.2, CHEM.A.2.2.1, CHEM.A.2.2.2, CHEM.A.2.2.3, CHEM.A.2.2.4, CHEM.A.2.3.1, CHEM.A.2.3.2, CHEM.B.1.1.1, CHEM.B.1.2.1, CHEM.B.1.2.2, CHEM.B.1.2.3, CHEM.B.1.3.1, CHEM.B.1.3.2, CHEM.B.1.3.3, CHEM.B.1.4.1, CHEM.B.1.4.2, CHEM.B.2.1.1, CHEM.B.2.1.2, CHEM.B.2.1.3, CHEM.B.2.1.4, CHEM.B.2.1.5, CHEM.B.2.2.1, CHEM.B.2.2.2

Objectives:

- DOK Level 1 –
  - Identify a chemistry-related topic of personal interest.
  - Report information on the selected chemistry topic(s) from accessible sources such as books, articles, and websites using appropriate research methods and sources.
- DOK Level 2 –
  - Interpret the collected data using relevant analytical tools and techniques, such as statistical analysis, graphical representation, and qualitative analysis.
  - Relate potential applications or implications of the research findings for the broader field of chemistry or related disciplines.

        - Organize and present the findings of the passion project in a clear and coherent manner using appropriate presentation tools and formats.
    - DOK Level 3 –
        - Investigate various chemistry topics, evaluate their relevance and potential for exploration, and select a topic for an in-depth passion project.
        - Draw conclusions from the collected data, drawing conclusions and making connections between different pieces of information to address the research questions and objectives.
    - DOK Level 4 –
        - Critique the research findings effectively through written reports, presentations, posters, or multimedia formats.
        - Apply the topics in AP Chemistry to investigating, researching, and presenting a real-world chemistry topic.

Core Activities and Corresponding Instructional Methods:

- Phenomena Investigation/Passion Project
    - Examples:
        - Components of a Water Sample
        - Ocean Acidification
        - Nuclear Energy
        - Green Chemistry
        - Nanotechnology
        - Biochemistry
        - Environmental Chemistry
        - Materials Science
        - Food Chemistry

Assessments:

- **Diagnostic:**
    - Informal discussion
    - Introductory questions
    - Warm up questioning
- **Formative:**
    - Daily Warm-ups
    - Informal Questioning
    - Teacher Observation
- **Summative:**
    - Real World Project Presentation

Extensions:

- In-depth online video resources

Correctives:

- Textbook resources/chapter summaries
- Online video resources
- Textbook provided PowerPoints/Notes

Appendix

- Honors Chemistry Curriculum Core Activities Examples