

CARLISLE AREA SCHOOL DISTRICT

Carlisle, PA 17013

Chemistry

GRADE 11

Date of Board Approval: June 14, 2014

CARLISLE AREA SCHOOL DISTRICT

PLANNED INSTRUCTION COVER PAGE

TITLE OF COURSE: Chemistry **SUBJECT:** Science **GRADE LEVEL:** 11

COURSE LENGTH: Year **DURATION:** 50 minutes/class **FREQUENCY:** 5 days/week

PREREQUISITES: Biology I-II, Algebra I and Geometry* **CREDIT:** 1 credit **LEVEL:** Option II
(Geometry can be taken concurrently if student received at least a “B” average in algebra)

Course Description/Objectives:

Chemistry covers basic chemistry concepts using both descriptive and mathematical skills. Laboratory experimentation is an integral part of the learning process. This course includes many equations and formulas that require a mastery of basic Algebra I skills. Algebra and equation problem solving using algebraic techniques are found in every unit throughout the course. This course is designed for the academic student whose career plans do not include engineering, science or medicine.

Text: *Chemistry I* (Holt/Rinehart/Winston)

Curriculum Writing Committee: Chantal Savage and Shani Schalles

COURSE TIME LINE

Unit 1: Safety and Laboratory Basics	4 days
Unit 2: Matter, Change, Measurements, & Calculations	18 days
Unit 3: Atomic Theory	27 days
Unit 4: Periodicity	10 days
Unit 5: Chemical Bonding, Formulas, and Compounds	22 days
Unit 6: Chemical Reactions and Reaction Equations & Stoichiometry	23 days
Unit 7: Oxidation & reduction Reactions	3 days
Unit 8: Types of Mixtures and Solutions	15 days
Unit 9: Acids and Bases	8 days
Unit 10: Thermochemistry & Kinetics	3 days
Unit 11: Equilibrium	3 days
Unit 12: Nuclear Chemistry	4 days
Review and Midterm Exam	3 days
Review and Final Exam	5 days
	TOTAL: 148 days

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 4 days

UNIT # 1: Safety and Laboratory Basics (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure, when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions.

Writing:

- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

PA Academic Standards:

- 3.2.C.A6 • Evaluate experimental information for relevance and adherence to science processes.

College, Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

- CCSS.ELA-Literacy.CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCSS.ELA-Literacy.CCRA.R.2

2

College, Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

10

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 4 days

UNIT # 1: Safety and Laboratory Basics (Essential)

GRADE: 11

UNDERSTANDINGS

Students will understand how to work and conduct basic laboratory experiments safely in the chemistry lab.

Common Misconceptions within the Unit:

Nothing bad can happen to them while they are in the chemistry lab. Safety measures will be stressed.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Common Assessment:

Take and pass the safety quiz – Students must achieve a 100% on the quiz in order to work in the chemistry lab. Students will match the location of safety equipment to the location on a map of the chemistry lab and answer open ended questions about safety and proper laboratory equipment
Students will complete the “Getting to Know the Lab” experiment

**Each part has questions that go with it that they are to measure to further show the students understanding and knowledge of laboratory techniques and safety training.

KNOW

Define the following vocabulary:

- Fume Hood – a place to use volatile chemicals and ventilation
- Erlenmeyer flask – has a narrow neck, used for mixing liquids
- Evaporating dish – used to heat liquids
- Safety shower –
- Test tube holder – used to hold a test tube in the fire
- Eye wash – used if chemicals get into the eyes
- Weighing boat – used to measure solids on a balance
- Identify where the following items are in the classroom: broken glass container, fire extinguishers, emergency start/stop, eye wash, safety shower, goggles, hood.
- Describe that the hood is used for ventilation and volatile chemicals.
- Demonstrate basic laboratory safety behavior in the lab.
- Compare when to use the fire blanket, water, fire extinguisher, and watch glass to put out different types of fires.

DO

- Inquiry Activity on Safety.
- Take a safety quiz and pass with a 100% to work in the lab.
- Identify and analyze different laboratory equipment.
- By doing the working in the lab experiment students will: (thinking and writing skill)
 - Read volumes on beakers, flasks, and cylinders
 - Use the electronic balance to mass solids and liquids
 - Describe physical characteristics (skill of observation)
 - Use a metric ruler to take measurements in cm
 - Light the Bunsen burner
- MSDS activity – read/interpret.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 18 days

UNIT # 2: Matter, Change, Measurements and Calculations (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A1 • Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.
- 3.2.C.A3 • Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.
- 3.2.10.A4 • Explain the difference between **endothermic** and **exothermic** reactions.
- 3.2.10.A1 • Identify properties of matter that depend on sample size.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 18 days

UNIT # 2: Matter, Change, Measurements and Calculations (Essential)

GRADE: 11

College and Career Readiness Standards Reading:

CCSS.ELA-Literacy.

- Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCRA.R.1

CCSS.ELA-Literacy.

- Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCRA.R.2

College and Career Readiness Standards Writing:

CCSS.ELA-Literacy

- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

CCRA.W.10

UNDERSTANDINGS

Chemistry is the study of matter, its properties and the changes it undergoes. When taking measurements in science instruments must be read to their limits. This level of precision must be maintained through all calculations.

Common Misconceptions within the Unit:

Students often think of chemicals as artificial or unnatural. Point out many natural chemicals in their lives, such as water.

Students believe that accuracy and precision are the same thing. Define and compare the differences between the two.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Common Assessments:

Element quizzes

Density experiment

Classifying experiment

Topic quizzes (short answer questions)

Reactions and Observations lab

Unit 1 test:

Classify properties, changes, and types of matter

Define key vocabulary terms

Discuss scientific method

Using scientific measurements and calculation: metric prefixes, scientific notation, significant figures, precision and accuracy, dimensional analysis, and density

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 18 days

UNIT # 2: Matter, Change, Measurements and Calculations (Essential)

GRADE: 11

KNOW

Vocabulary: Chemistry, group, period, Metric Prefixes, Quantitative, Qualitative, Precision, Accuracy, Significant Figures, Scientific Notation, Percent Error, System Internationale, Conversion Factor, Factor Label.

Density = mass/volume

$$\text{Percent Error} = \frac{\text{Accepted Value} - \text{Experimental Value}}{\text{Accepted Value}} \times 100$$

DO

- Produce a basic lab report.
- Analyze various substances to determine their matter type (*thinking*).
- Compare and contrast physical and chemical changes and properties (*writing*).
- Inquiry Activity on Experimental Design and Data Organization.
- Perform a Scientific Method Lab.
- Calculate conversions in the metric system.
- Convert numbers into scientific notation.
- Inquiry Activity for significant Figures.
- Perform calculations using proper significant figure rules.
- Distinguish between accuracy and precision.
- Perform density calculations.
- Perform density lab.
- Demonstrate ability to calculate % error.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 27 days

UNIT # 3: Atomic Theory (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A2 • Compare the electron configurations for the first twenty elements of the **periodic table**. Relate the position of an element on the **periodic table** to its electron configuration and compare its reactivity to the reactivity of other elements in the table. Use the **mole** concept to determine number of particles and **molar mass** for elements and compounds.
- 3.2.C.A4. • Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 27 days

UNIT # 3: Atomic Theory (Essential)

GRADE: 11

3.2.C.A5

- MODELS Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory. Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.

3.2.10.A2

- Explain why **compounds** are composed of integer ratios of **elements**.

3.2.10.A5

- MODELS. MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory. SCALE Apply the **mole** concept to determine number of particles and **molar mass** for **elements** and **compounds**.

3.2.12.A2

- Distinguish among the isotopic forms of **elements**. Explain how light is absorbed or emitted by **electron orbital transitions**.

College and Career Readiness Standards Reading:

CCSS.ELA-

Literacy.CCRA.R.1

- Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCSS.ELA-

Literacy.CCRA.R.2

- Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

CCSS.ELA-

Literacy.

CCRA.W.10

- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 27 days

UNIT # 3: Atomic Theory (Essential)

GRADE: 11

UNDERSTANDINGS

Matter cannot be created nor destroyed by ordinary chemical means.

The basic building blocks of matter are elements and they are comprised of subatomic particles: protons, electrons and neutrons.

The Atomic Theory evolution from Bohr's original model to the Quantum-Mechanical Theory with relation to electron location and energy levels.

Common Misconceptions within the Unit:

Students often confuse the atomic number and the atomic mass. Identify the procedure for determining both the atomic number and atomic mass.

Electrons are organized in 2-D orbits rather than 3-D orbitals. Bohr model and Quantum Mechanical Model will be shown to designate the difference.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Common Assessments:

- Flame Test lab
- Obscertainer lab
- Law of Conservation of Mass lab
- Homework on mathematical concepts
- Homework on structure of the atom and theories

Unit 2 Tests: The following topics are divided into two tests at the discretion of the teacher.

- Identify experiments which led to the development of atomic structure
- Distinguish between key vocabulary terms
- Label the structure of the atom
- Perform mole calculations
- Distinguish between the Law of Conservation, Law of Definite Proportion, Law of Multiple Proportion
- Explain Dalton's atomic theory
- Define and relate properties of EMR
- Analyze the different theories leading to the development of the Quantum-Mechanical Theory
- Determine electron configurations and Aufbau notations for elements

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 27 days

UNIT # 3: Atomic Theory (Essential)

GRADE: 11

KNOW

- Identify the following scientists: Democritus, Dalton, Rutherford, Thomson, Bohr, Heisenberg, DeBroglie, Planck, Einstein, Schrodinger.
- Define the following: Law of conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions, Cathode Ray Tube, Isotope, Atomic Number, Mass Number, Atomic Mass Unit, Average Atomic Mass, Mole, Molar Mass, Wavelength, Frequency, Photon, Quantum, Ground State, Excited State, Line Emission Spectrum, Orbitals, Highest Occupied Level, Valence Electron, Unpaired Electrons.
- Explain the following: Bohr Model, Heisenberg's Uncertainty Principle, DeBroglie's Hypothesis, Dual Wave-Particle Nature of Light and Electrons and Schrodinger's Wave Equation, Aufbau Principle, Pauli Exclusion Principle and Hund's Rule.
- Diagram: Electron configuration and Aufbau diagrams, Noble Gas Notation.

DO

- Evaluate the number of protons, neutrons, electrons, mass number and atomic number of a given element/isotope.
- Inquiry Activity on average atomic mass.
- Assess the Law of Conservation of mass through experimentation.
- Calculate mole problems to determine the number of particles and molar mass of elements.
- Analyze how the Atomic Theory has evolved over time (*thinking*).
- Identify contributions of the 3 main quantum mechanical scientists (*writing*).
- Relate the Quantum-Mechanical Theory to the orbital sublevels and distinguish between the sublevels.
- Create Aufbau diagrams for the elements.
- Inquiry Activity on electron configuration.
- Create electron configurations for all elements (emphasizing the comparison of elements 1-20).
- Perform the Flame Test Lab.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 10 days

UNIT # 4: Periodicity (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A1 • Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electronegativity, atomic size, and classification of elements.
- 3.2.C.A2 • Relate the position of an element on the **periodic table** to its electron configuration and compare its reactivity to the reactivity of other elements in the table.
- 3.2.10.A1 • Predict properties of **elements** using trends of the **periodic table**.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 10 days

UNIT # 4: Periodicity (Essential)

GRADE: 11

College and Career Readiness Standards Reading:

CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCSS.ELA-Literacy.CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

CCSS.ELA-Literacy.CCRA.W.10 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 10 days

UNIT # 4: Periodicity (Essential)

GRADE: 11

UNDERSTANDINGS:

The periodic table is set up based on the element's properties and atomic numbers.

Common Misconceptions within the Unit:

Students often think that losing electrons will mean the atom has a negative charge. The atom composition will be studied to show the balance between protons and electrons.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Periodicity project/element project/test – Students label different periodic tables with trend, groups, families, and key concepts. Student will research the history and key concepts relating to the development of the periodic table

Steps of Culminating Activity:

1. Label groups and color the families of the periodic table
2. Identify the sublevels as they relate to the PT. and why they are the way they are
3. Label valence electrons
4. Research key vocabulary
5. Correlate the configuration of the PT and the electron configuration.
6. Label the trends in the periodic table
7. Answer question on the PT
8. Pick an element and research properties as they relate to the periodic table
9. Present the information about the element research visually

Take the test

KNOW

Vocabulary: Actinides, Alkali Metal, Alkaline Earth Metal, Anion, Atomic Radius, Cation, Electronegativity, Halogen, Ion, Ionization Energy, Lanthanides, Main Group Elements, Periodic Law, Periodic Table, Transition Metal (Element), Valence Electrons

DO

- Describe the people who have influenced the development of the periodic table.
- Identify periodic trends by constructing their own Periodic Table given the information Mendeleev had and plotting the resulting periodic trends.
- Identify families and their properties.
- Identify group valence electrons and ions.
- Analyze an element's properties based on its position in the periodic table (*thinking*).
- Complete the Periodicity Project (*writing*).
- Analyze and an element and present in a visual manner (*culminating*).
- Inquiry Activity – Periodic Table.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 22 days

UNIT # 5: Chemical Bonding, Formulas, Compounds (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A1 • Use electro-negativity to explain the difference between polar and non-polar covalent bonds.
- 3.2.C.A2 • Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Predict the chemical formulas for simple ionic and molecular compounds. Use the **mole** concept to determine number of particles and **molar mass** for elements and compounds. Determine percent Compositions.
- 3.2.10.A2 • Compare and contrast different bond types that result in the formation of molecules and compounds.
- 3.2.12.A5 • MODELS/PATTERNS Use **VSEPR** theory to predict the **molecular geometry** of simple **molecules**.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 22 days

UNIT # 5: Chemical bonding, Formulas, Compounds (Essential)

GRADE: 11

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy. CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy. CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy. CCRA.W.10 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 22 days

UNIT # 5: Chemical bonding, Formulas, Compounds (Essential)

GRADE: 11

UNDERSTANDINGS:

In nature, most atoms are joined to other atoms by chemical bonds in order to provide a more stable arrangement of matter.

You can tell a compound's composition from its name.

A compound's properties are determined by its shape.

Common Misconceptions within the Unit:

Electronegativity difference is used to determining bonding type. EN difference is only a general guide for bonding type.

The difference between formula units and molecules. Formula units are ionic compounds and molecules are molecular compounds.

Many students forget that although polyatomic ions are involved in ionic bonding, the ions themselves are held together by covalent bonds.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Common Assessments:

Bonding types lab

Use models to demonstrate molecular geometry

Do a percent composition lab

Homework on the mathematically-based material

Homework on writing names and formulas

Quiz on naming

Quiz on writing formulas

Naming lab using blocks and/or bingo

Culminating Activity:

Unit Test

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 22 days

UNIT # 5: Chemical bonding, Formulas, Compounds (Essential)

GRADE: 11

KNOW

Define the following: Covalent Bond, Ionic Bond, VSEPR, Molecule, Octet Rule, Lone Pair (or unshared pairs), Cation, Polyatomic Ion, Intermolecular, Intramolecular, Hydrogen Bond, Triple bond, Resonance Structures, Covalent Network, Bond Energy, Bond Length, chemical bond, Dipole, Dipole-Dipole force, Electron Dot Notation, Formula Unit, Lewis Structure, Metallic Bonding, Non-Polar covalent, Bond, Polar, Polar covalent bond

DO

- Calculate bond type based on electronegativity.
- Perform a bonding lab.
- Draw electron-dot structures.
- Draw Lewis Structures for simple molecules and ionic compounds.
- Show the movement of electrons in an ionic bond and identify the cation and anion.
- Compare and contrast ionic and covalent bonds (*writing*).
- Determine the molecular geometry of a compound using the VSEPR Theory (*thinking*).
- Identify polar and non polar molecules based on their structure.
- Perform the Covalent Molecule Lab.
- Name and write formulas for binary compounds.
- Calculate formula mass.
- Calculate mole problems to determine number of particles and molar mass of compounds.
- Determine the percent composition of a compound.
- Determine empirical formulas and molecular formulas.
- Predict and name chemical formulas for simple ionic and molecular compounds.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 23 days

UNIT # 6: Chemical Reactions and Reaction Equations and Stoichiometry (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A4 • Predict how combinations of substances can result in physical and/or chemical changes. Balance chemical equations by applying the laws of conservation of mass. Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion. Use stoichiometry to predict quantitative relationships in a chemical reaction.
- 3.2.10.A4 • Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using **mole** relationships.
- 3.2.10.A5 • Apply the **mole** concept to determine number of particles and **molar mass** for **elements** and **compounds**.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 23 days

UNIT # 6: Chemical Reactions and Reaction Equations and Stoichiometry (Essential)

GRADE: 11

College and Career Readiness Standards Reading:

CCSS.ELA-Literacy.

- Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCRA.R.1

CCSS.ELA-Literacy.

- Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCRA.R.2

College and Career Readiness Standards Writing:

CCSS.ELA-Literacy.

- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

CCRA.W.10

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 23 days

UNIT # 6: Chemical Reactions and Reaction Equations and Stoichiometry (Essential)

GRADE: 11-12

UNDERSTANDINGS:

Evolution of heat and light, production of a gas, formation of a precipitate and change of color are indicators of a chemical reaction.

A balanced chemical equation represents, with symbols and formulas, the identities and relative amounts of reactants and products in a chemical reaction.

A balanced chemical equation may be used to describe and predict relative amounts of reactants and products.

Common Misconceptions within the Unit:

Reactions only occur in the forward direction and always go to completion (100% yield). Limiting and excess reagents will be identified which results in actual yield and theoretical yield.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Graded homework
Quiz on math material
Quiz on reactions
Reaction pattern lab
Stoichiometry lab
Unit test

Unit Test

Description of Culminating Activity: Multiple choice, true and false, translating and balancing reaction, stoichiometry problems

KNOW

Vocabulary: Synthesis Rxn (Composition Rxn), Decomposition Rxn, Combustion Reaction, Single Replacement Rxn, Activity Series, Double Replacement Rxn, Stoichiometry, Mole Ratio, Limiting Reagent (Reactant), Excess Reagent (reactant), Theoretical Yield, Actual Yield

Percent Yield = $(\text{actual yield} / \text{theoretical yield}) \times 100$

DO

- Describe how you know that a reaction has occurred. (*writing*)
- Translated word equations into chemical equations.
- Balancing chemical equations. (*thinking*)
- Inquiry Activity on types of chemical reactions
- Identify reaction types.
- Predict if a reaction will occur based on the activity Series of Elements.
- Perform a lab on reaction types.
- Inquiry Activity on mole ratios
- Perform stoichiometry calculations.
- Identify limiting reactant and excess reactants.
- Calculate percent yield.
- Perform a stoichiometry lab.
- Predict if a double replacement reaction will occur by using the solubility chart.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT # 7: Oxidation and Reduction Reactions (Compact)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A4 • Use stoichiometry to predict quantitative relationships in a chemical reaction.
- 3.2.12.A4 • Apply oxidation/reduction principles to **electrochemical reactions**.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT # 7: Oxidation and Reduction Reactions (Compact)

GRADE: 11

UNDERSTANDINGS:

Redox is one type of chemical change involves the transfer of electrons.
This type of chemical change is used to produce electricity in such things as batteries.
Electricity can be used to produce an oxidation-reduction change.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

- Graded homework
- Quiz on balanced redox equations
- Voltaic cell lab
- Electrolysis lab
- Unit test

Unit Test

Multiple choice, short answer

KNOW

Define the following: Oxidation, Reduction, LEO says GER, OIL RIG, A RED CAT SAT ON AN OX, (Reduction at cathode; oxidation at anode), Redox reaction, Half reaction, Reducing agent, Oxidizing agent, Electrolysis, Electrolytic cell, Electrode, Anode, Cathode, Voltaic cell, Electroplating, Standard reduction potentials

DO

- Inquiry Activity on Oxidation and Reduction .
- Write and balance redox equations (*thinking*).
- Draw and label an electrochemical cell.
- Compare and contrast electrochemical and voltaic cells (*writing*).
- Use reduction potentials to predict the voltage in a redox reaction.
- Perform a voltaic cell lab.
- Perform electrolysis.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT # 8: States of Matter and Gases (Essential)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E
 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H
 - Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J
 - By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B
 - Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C
 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I
 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H
 - Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A3
 - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.
- 3.2.10.A3
 - Describe phases of matter according to the **kinetic molecular theory**.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1
 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2
 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10
 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT # 8: States of Matter and Gases (Essential)

GRADE: 11

UNDERSTANDINGS:

Identify the broad ideas, big understandings, enduring learning that you want students to remember 6 months or 10 years from now. These understandings are the foundation of the unit. Without this understanding, students would have “holes” in their learning.

The Kinetic Molecular Theory of matter is used to explain the properties of solids, liquids and gases. Gases are affected by volume, pressure and temperature.

The relationship between the solids, liquids and gases can be described by phase diagrams and heating curves.

Common Misconceptions within the Unit:

Students may believe that all gases will behave ideally. Conditions for non ideal behavior will be addressed.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

- Inquiry based on the gas laws
- Quizzes on the vocabulary, math, and graphs
- Graded homework
- Mass volume lab
- Boyles or Charles law lab (Vernier)

2 Unit Tests (First test covers states of matter, second test covers gas laws)

Steps of Culminating Activity:

Test 1 – analyze a graph, matching, using phase diagram, define vocabulary, true false, labeling diagrams

Test 2 – pressure conversions, calculate using the gas laws, matching on vocabulary

KNOW

Vocabulary: Kinetic Molecular Theory, Expansion, Density, Fluidity, Diffusion, Pressure, Barometer, Mm Hg, Torricelli, Atm, Volume, Real Gas, Ideal Gas, Ideal Gas Law, Combined Gas Law, Boyles Law, partial Pressure, STP, Atmosphere, Gay-Lussac’s law, Charles Law, Ideal gas constant, Ideal gas law, Standard molar volume of gas, Effusion, diffusion, Absolute Zero, Kelvin, Surface tension, Capillary action, Phase, Phase changes, Crystalline, Amorphous, Lattice, Phase Diagram, Triple Point, Critical Point, Super Critical Fluid, Vapor Pressure, Volatile liquids.

DO

- Compare and contrast the properties of solids, liquids and gases (*writing*).
- Identify phase changes and relate changes to particle motion (KMT).
- Label and analyze a phase diagram.
- Describe the properties of water.
- Perform pressure calculations.
- Inquiry Activity on gas variables.
- Identify Boyle’s Law, Charles Law and Gay-Lussac’s Law.
- Solve combined gas law equations.
- Solve equations using Dalton’s Law of Partial Pressures.
- Solve Ideal Gas Law Equations.
- Calculate gas stoichiometry problems.
- Investigate gas property relationships in an experimental setting (*thinking*).

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 15 days

UNIT # 9: Types of Mixtures and Solutions (Important)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A2 • Describe how changes in energy affect the rate of chemical reactions.
- 3.2.10.A1 • Explain the unique properties of water (**polarity**, high boiling point, forms **hydrogen bonds**, high **specific heat**) that support life on Earth.
- 3.2.10.A4 • Identify the factors that affect the rates of reactions.
- 3.2.12.A1 • Compare and contrast the unique properties of water to other liquids.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 15 days

UNIT # 9: Types of Mixtures and Solutions (Important)

GRADE: 11

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10
- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

UNDERSTANDINGS:

Water is the universal solvent.

The classification of mixtures is determined by particle size.

Common Misconceptions within the Unit:

Students often think that fluid and liquid are synonymous. Gases are fluid also.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Graded homework
Quiz molarity
Quiz solution types
Solubility lab
Unit test

Unit Test: Multiple choice, matching on types, short answer questions pertaining to solubility factors.

KNOW

Vocabulary: Solubility, Solution, Solvent, Solute, Suspension, Tyndall Effect, Saturated Solution, Miscible, Unsaturated Solution, solvation, concentration, Diluted, Concentrated, Molarity, colloid, Hydrogen Bonding, Non Electrolyte, Electrolyte, Strong Electrolyte, Weak Electrolyte, Colligative Properties, Freezing Point Depression, Boiling Point Elevation, Polar, Non polar, Like dissolves Like

DO

- Classify types of solutions.
- Inquiry Activity on saturated and unsaturated solutions.
- Identify factors that affect solubility.
- Inquiry Activity on molarity.
- Calculate molarity of solutions.
- Identify if compounds are soluble or insoluble by using the solubility chart.
- Experimentally determine the relationship between solubility and temperature (*thinking*).
- Compare and contrast the properties of solutions, suspensions and colloids (*writing*).

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 8 days

UNIT #10: Acids and Bases (Important)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.C.A4 • Use stoichiometry to predict quantitative relationships in a chemical reaction.
- 3.2.12.A4 • Describe the interactions between acids and bases.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 8 days

UNIT #10: Acids and Bases (Important)

GRADE: 11

UNDERSTANDINGS:

Identify the properties of acids and bases.

The pH scale describes the acidity and alkalinity of aqueous solutions.

Common Misconceptions within the Unit:

Acids are all very strong chemicals that are harmful. Discuss strong versus weak acids and introduce vinegar and citric acid.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Graded homework

Quiz on math material

Quiz on conjugate acid base pairs

pH lab

Neutralization/ titration lab

Unit test

Unit Test: Multiple choice, true and false, identify acid base pairs and perform stoichiometry neutralization problems, calculate pH and pOH.

KNOW

Vocabulary: Acid, Base, Alkaline, Binary Acid, Oxyacid, Hydronium ion, Arrhenius Theory, Bronsted-Lowry Theory, Lewis Theory, Strong acid/base, Weak acid/base, Monoprotic acid, Polyprotic acid, Conjugate acid, Conjugate base, Amphoteric, Neutralization Reaction, Salt, pH, pOH, pH Scale, Titration, Acid-base indicators, End Point, Buret, K.

DO

- Inquiry Activity on acids and bases.
- Compare and contrast the general properties of acids and bases (*writing*).
- Classify types of acids and bases.
- Identify conjugate acids and bases in reactions.
- Inquiry activity on strong acids versus weak acids.
- Write neutralization reactions.
- Inquiry activity on calculating pH.
- Calculate K_w , $[H^+]$, $[OH^-]$, pH, and pOH.
- Identify substances as acids, bases or neutral based on pH (*thinking*).
- Perform a lab based on pH.
- Perform a titration.
- Calculate neutralization reaction equations.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT #11: Thermochemistry and Kinetics (Important)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C
- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E
- Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H
- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J
- By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B
- Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I
- Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H
- Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.10.A3
- Explain the difference between exothermic and endothermic reactions. Identify the factors that affect the rate of reactions.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1
- Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2
- Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10
- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT #11: Thermochemistry and Kinetics (Important)

GRADE: 11

UNDERSTANDINGS:

The spontaneity of a chemical reaction is determined by the change in enthalpy and entropy.
Kinetics is the study of the reaction rates and reaction mechanisms.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Graded homework
Interpret potential energy diagrams
Rate of chemical reaction lab
Unit test

Unit Test: Multiple choice, short answer.

KNOW

Vocabulary: Thermochemistry, Calorimeter, Specific Heat, Enthalpy, Entropy, Free Energy, Reaction Mechanism, Intermediate, Collision Theory, Activation Energy, Catalyst Activated Complex, Chemical Kinetics, Reaction Rate, Rate Determining Step.

DO

- Draw a potential energy diagram and use it to characterize reactions, products, activated complex, effect of a catalyst for an endothermic and exothermic reaction (*thinking and writing*).
- Inquiry Activity on calorimetry.
- Experimentally determine the effect of temperature and concentration on the rate of chemical reactions.
- Describe the role of a catalyst.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT #12: Equilibrium (Important)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.E • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CC.3.5.11-12.H • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CC.3.5.11-12.J • By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing:

- CC.3.6.11-12.B • Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- CC.3.6.11-12.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.11-12.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- CC.3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.

PA Academic Standards:

- 3.2.12.A • **CONSTANCY AND CHANGE** Predict the shift in **equilibrium** when a **system** is subjected to a stress.

College and Career Readiness Standards Reading:

- CCSS.ELA-Literacy.CCRA.R.1 • Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 • Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

College and Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.10 • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 3 days

UNIT #12: Equilibrium (Important)

GRADE: 11

UNDERSTANDINGS:

Reversible reactions form a dynamic equilibrium.

LeChataliers' principle describes the effect of changes in concentration, temperature, and pressure on a system in equilibrium.

An equilibrium expression is written to quantitatively describe the relationship between the concentrations of reactants and products.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Graded homework

Analyze equilibrium reactions

Le Chatalier's reaction lab

Unit test

Unit Test: Multiple choice, short answer.

KNOW

Vocabulary: Equilibrium, Reversible Reaction, Equilibrium Expression

DO

- Inquiry Activity on equilibrium.
- Recognize an equilibrium expression.
- Describe the effects of changes in concentration, temperature, and pressure on gaseous and aqueous equilibria (*writing*).
- Observe and analyze changes in equilibrium (*thinking*).

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 4 days

UNIT #13: Nuclear Chemistry (Important)

GRADE: 11

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.C
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.H
 - Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- CC.3.6.9-10.B
 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C:
 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.I
 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

PA Academic Standards:

- 3.2.C.A4
 - Predict how combinations of substances can result in physical and/or chemical changes. Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.
- 3.2.C.A3
 - Identify the three main types of radioactive decay and compare their properties. Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. Compare and contrast nuclear fission and nuclear fusion.

College and Career Readiness Standards:

- CCSS.ELA-Literacy.CCRA.W.4
 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.W.10
 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
- CCSS.ELA-Literacy.CCRA.R.1
 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2
 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

KNOW, UNDERSTAND, DO

COURSE: Chemistry I

TIME FRAME: 4 days

UNIT #13: Nuclear Chemistry (Important)

GRADE: 11

UNDERSTANDINGS:

Student should be aware of the difference between nuclear fission and nuclear fusion. In addition they should be aware of the positive uses of nuclear radiation. Lastly, they should be able to apply the Law of Conservation of Mass in solving natural and artificial transmutation problems.

Common Misconceptions within the Unit:

Students believe that nuclear radiation is only harmful and that it does not possess any positive purposes. They are unaware of many of the positive uses including medical diagnosis and treatments.

Students are unaware that nuclear fusion occurs in nature, for example the sun.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Radiation Town Activity

Nuclear lab

End of the unit Exam

KNOW

- Define nuclear fusion.
- Define nuclear fission.
- Define transmutation

DO

- Calculate natural decay problems.
- Compare and contrast the different types of radiation (thinking).
- Describe the effects of radiation poisoning on a human.
- Calculate artificial radiation problems.
- Debate nuclear pros and cons of nuclear radiation.
- Do a nuclear lab.

Adaptations/Modifications for Students with I.E.P.s

Adaptations or modifications to this planned course will allow exceptional students to earn credits toward graduation or develop skills necessary to make a transition from the school environment to community life and employment. The I.E.P. team has determined that modifications to this planned course will meet the student's I.E.P. needs.

Adaptations/Modifications may include but are not limited to:

INSTRUCTION CONTENT

- Modification of instructional content and/or instructional approaches
- Modification or deletion of some of the essential elements

SETTING

- Preferential seating

METHODS

- Additional clarification of content
- Occasional need for one to one instruction
- Minor adjustments or pacing according to the student's rate of mastery
- Written work is difficult, use verbal/oral approaches
- Modifications of assignments/testing
- Reasonable extensions of time for task/project completion
- Assignment sheet/notebook
- Modified/adjusted mastery rates
- Modified/adjusted grading criteria
- Retesting opportunities

MATERIALS

- Supplemental texts and materials
- Large print materials for visually impaired students
- Outlines and/or study sheets
- Carbonless notebook paper
- Manipulative learning materials
- Alternatives to writing (tape recorder/calculator)