

CARLISLE AREA SCHOOL DISTRICT

Carlisle, PA 17013

Applied Chemistry

GRADES 11 and 12

Date of Board Approval: June 19, 2014

CARLISLE AREA SCHOOL DISTRICT

PLANNED INSTRUCTION COVER PAGE

TITLE OF COURSE: Applied Chemistry **SUBJECT:** Science **GRADE LEVEL:** 11-12
COURSE LENGTH: Year **DURATION:** 50 minute class period **FREQUENCY:** 5 days/week
PREREQUISITES: Biology I- Option I, Algebra I or Integrated Math I **CREDIT:** 1 credit **LEVEL:** Applied (option I)

Course Description/Objectives:

Emphasizing student experimentation, this course presents the basic principles of chemistry and relates them to conditions in today's world. Mastery of the language of chemistry (memorization of symbols, ionic and covalent compound formulas and equation writing) is required of all students. The course is designed primarily for students who want exposure to the concepts of chemistry and their relationships to everyday life with mathematic assistance. This course would be beneficial for students enrolled in the culinary or childcare programs.

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

Curriculum Writing Committee: Jennifer Mohr

COURSE TIME LINE

Unit 1:	Safety and Lab basics	4 days
Unit 2:	Classification of matter and the basis of chemistry	19 days
Unit 3:	The development of the atom	19 days
Unit 4:	The development of the periodic table	12 days
Unit 5:	Types of compounds	19 days
Unit 6:	Types of reactions	18 days
Review and Midterm Exam		3 days
Unit 7:	Phases of matter and gas laws	23 days
Unit 8:	Types of mixtures	18 days
Unit 9:	Organic Chemistry	15 days
Unit 10:	Nuclear Chemistry	9 days
Unit 11:	Reduction Oxidation	1 day
Review and Final exam		3 days
TOTAL:		163 days

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 4 days

UNIT # 1: Safety and Laboratory Basics (Important)

GRADE: 11-12

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.

College, Career Readiness Standards Writing:

- CCSS.ELA-Literacy.CCRA.W.1 • 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: Applied Chemistry

TIME FRAME: 4 days

UNIT # 1: Safety and Laboratory Basics (Important)

GRADE: 11-12

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.

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

Common Misconceptions within the Unit:

Misconception – The hood is a place to hang out or a location is a city

Correction - The hood in chemistry is a place to work with volatile chemicals.

Misconception - Nothing bad can happen to them while they are in the chemistry lab.

Correction – We work with harmful chemicals and fire. Accidents can occur, students must work safely in the lab.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Description of Culminating Activity 1: Take and pass the safety quiz – Students must achieve a 90% on the quiz in order to work in the chemistry lab

Steps of Culminating Activity 1:

Part 1: match the location of safety equipment to the location on a map of the chemistry lab

Part 2: open ended questions about safety and proper laboratory equipment

Description of Culminating Activity 2: Students will complete the “Working in the Lab” experiment

Steps of Culminating Activity 2:

Part 1: label lab equipment

Part 2: read metric volumes in several different pieces of glassware

Part 3: Use an electronic balance to take several masses

Part 4: observe four different times

Part 5: take metric distance measurements and do two calculations

Part 5: Light the Bunsen burner and bend glass

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

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 4 days

UNIT # 1: Safety and Laboratory Basics (Important)

GRADE: 11-12

KNOW

Define the following vocabulary:

- Hood – a place to use volatile chemicals and provides ventilation
- Erlenmeyer flask – has a narrow neck, used for mixing liquids



- Evaporating dish – used to heat liquid
- Safety shower – used if you catch on fire
- 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
- Pole clamps – used to hold items to the ring stand



Facts:

- 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 so no one gets hurt in the lab
- Compare when to use the fire blanket, water, fire extinguisher, and watch glass to put out different types of fires.

DO

- Take a safety quiz and pass with a 90% 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
 - Bend glass

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 day

UNIT # 2: Classification of mater and the basis of chemistry (Essential)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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.
- CC3.5.11-12.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
- 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.

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.A1 • Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.
- 3.2.C.B3 • Explain the difference between an **endothermic** process and an **exothermic** process.
- 3.2.C.A6 • Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.
- 3.2.C.B7 • (see 3.2.C.A6)

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 2: Classification of matter and the basis of chemistry (essential)

GRADE: 11-12

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.

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.

Chemistry is the study of matter and has real world applications

Common Misconceptions within the Unit:

Misconception - Chemistry is the study of chemicals or elements.

Correction – Chemistry is the study of matter and is universal.

Misconception - Accuracy and precision are the same word.

Correction – Accuracy is getting the correct answer, precision is getting the same answer every time. You can be precise but not very accurate.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Common Assessments:

Unit 1 Quiz

Metric Quiz

Unit 1 station Review

Description of Culminating Activity:

Unit Test

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 2: Classification of matter and the basis of chemistry (essential)

GRADE: 11-12

KNOW

Define the following vocabulary:

- Chemistry – the study of matter
- Physical property – a description
- Physical change – a change in a physical property, no new substance is formed
- Chemical change – a substance's ability to change
- Chemical property – a change in a chemical property, a new substance is formed
- SI – international system of units – used by scientists
- Accuracy – getting the correct answer
- Precision – getting the same results over and over again
- Guess digit – the last digit in a measurement that is a guess
- Significant figures – important #'s in a measurement
- Base units – grams, liters, meters, Joules
- Specific heat capacity – (Cp) – the amount of heat needed to raise 1 gram of a substance 1 degree Celsius
- Exothermic – heat is given off in a reaction
- Endothermic – heat is taken in during a reaction

Students will use the following formulas to do calculations:

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

$$D = \text{Mass} / \text{Volume}$$

$$H = mCp\Delta T$$

Facts:

- Apply the concept of density to real life.
- Use the metric step later to manipulate numbers within the metric system.
- Use and distinguish between the different types of measurement taken in chemistry and what units go with that measurement in the three different systems of measurement.
- Chemistry is a universal science and is used everywhere in your life.

DO

- Read the forensic reading assignment (writing, thinking, reading). Complete the assigned questions included with the reading. The reading is chunked and students will summarize sections, draw conclusions, analyze what they have read, and/or talk to the text.
- Compare and contrast physical and chemical changes and properties through a laboratory setting. (*writing*)
- Classify element, compound, homogeneous mixture, and heterogeneous mixture (*thinking*).
- Convert numbers in the metric system.
- Perform a metric experiment for students to manipulate numbers in the metric system to see real life application.
- Convert numbers into scientific notation.
- Distinguish between accuracy and precision.
- Calculate density calculations.
- Perform density lab, analyze data.
- Calculate the percent error of a human and of limestone and oil
- Perform the human density experiment
- Demonstrate ability to calculate % error.
- Classify units into the correct scale
- Calculate specific heat calculations
- Perform the specific heat lab, apply specific heat equation
- Observe different lab equipment and take readings using the correct # of significant digits and the guess digit. Instruments include: rulers, volumetric readings (cylinders and beakers) and scales

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 3: The development of the atom (essential)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B
- Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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 with other sources of information.

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.A2
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 3.2.C.A5
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 3.2.C.A6
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 3.2.12.A2
- 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.
- CCSS.ELA- Literacy.CCRA.R.3
- Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

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: Applied Chemistry

TIME FRAME: 19 days

UNIT # 3: The development of the atom (essential)

GRADE: 11-12

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

The theory of the atom has evolved from a basic theory of atoms by Democritus to the electron configuration theory by Schrödinger.

Common Misconceptions within the Unit:

Misconception - Students confuse the atomic number and the mass number.

Correction – The atomic number is the same number as the number of protons of an element and is blue on the periodic table, the mass number is due to the average number of isotopes and determined by the number of protons and number of neutrons added together and is red on the periodic table.

Misconception - Electrons orbit around the nucleus like the planets orbit the sun.

Correction – According to Schrödinger, electrons do not orbit around the nucleus (Bohr theory), they move around the atom in shells and orbitals.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Common Assessments:

Parts of the atom quiz

Mole quiz

Culmination Assessment

Parts and History of the atom Assessment

Parts of the assessment:

Additional Activities

The Flame test lab with show students how and what electrons do when heated

Element quizzes

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 3: The development of the atom (essential)

GRADE: 11-12

KNOW

Define the following vocabulary:

- Democritus – first person to develop an atomic theory
- Dalton – first scientists to develop an accepted atomic theory
- Isotope - atoms with the same number of protons but different number of neutrons
- Thomson – discovered the electron
- Rutherford – discovered the proton and nucleus
- Chadwick – discovered the neutron
- Mass number - # of protons an atom has
- Atomic mass = protons + neutrons
- Bohr- came up with the planet model of the atom
- Electron cloud - where electrons are located outside the nucleus
- Orbital – a pathway for the electrons to move within the shell (s, p, d, f)
- Schrödinger – developed quantum mechanics
- Electromagnetic spectrum – a spectrum that includes electromagnetic radiation
- Mole – a measurement in chemistry that is equal to 6.02×10^{23} atoms
- Avogadro's number = 6.02×10^{23}

Facts

- Students will be able to give the symbol and name of 45 elements.
- Describe the history of the atom and how the theories have changed over the years.
- Identify, compare and contrast the scientist who helped develop the atomic theory and the structure of the atom.
- Locate the parts of the atom according to the Bohr and Schrödinger theories.
- Describe how light and electrons are related.
- Describe the difference between atomic mass and mass number.
- Analyze the electromagnetic spectrum in terms of electrons.

DO

- Determine the number of protons, neutrons, electrons, mass number and atomic number of a given element/isotope.
- Diagram the atom using the shell filling based on the quantum mechanic theory
- Calculate mole problems.
- Identify orbital shapes and explain how they relate to the atom.
- Perform the mole lab and calculate mole problems to analyze results
- Perform the Flame Test Lab to show what electrons do when heated.
- Describe the people who have influenced the development of the atom (thinking and writing)

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 12 days

UNIT # 4: The Development and arrangement of the periodic table (essential)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12A • Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- 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.G • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CC.3.5.11-12.I • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

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.H • Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.11-12.G • Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

PA Academic Standards:

- 3.2.C.A1 • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 12 days

UNIT # 4: The Development and arrangement of the periodic table (essential)

GRADE: 11-12

3.2.C.A2

- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

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.

CCSS.ELA- Literacy
.CCRA.R.7

- Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

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.

CCSS.ELA- Literacy
.CCRA.W.2

- Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

CCSS.ELA- Literacy
.CCRA.W.3

- Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

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.7

- Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

CCSS.ELA- Literacy
.CCRA.W.8

- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 12 days

UNIT # 4: The Development and arrangement of the periodic table (essential)

GRADE: 11-12

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.

Elements are organized in a systematic way by their properties and atomic numbers on the periodic table.

Common Misconceptions within the Unit:

Misconception - The larger that atomic number the bigger the atom size.

Correction – the size of the atom increases as you go down the group and move from right to left on the periodic table.

Misconception - Synthetic means fake.

Correction – synthetic means man made.

Misconception - Periodic once and a while.

Correction – Periodic in chemistry means it cycles or repeats on a regular basis.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Description of Culminating Activity:

Element project

Periodic table project

Common Assessment:

Students will take the unit test that combines and show the connection between atoms and the periodic table.

Common Assessment:

Periodic table quiz

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 12 days

UNIT # 4: The Development and arrangement of the periodic table (essential)

GRADE: 11-12

KNOW

Vocabulary:

- Natural element – a nature made element
- Periodic – something that cycles or repeats
- Period – horizontal rows on the periodic table
- Group/family – vertical columns on the periodic table
- Atomic radius – size of the atom
- Synthetic element – man made element
- Metalloid – elements with properties of metals and nonmetal
- Inert - nonreactive
- Alkali metals – group 1 on the periodic table
- Alkaline earth metals – group 2 on the periodic table
- Halogens – group 17 on the periodic table
- Nobel gases – group 18 on the periodic table
- Transition metal – the center section of the periodic table
- Rare earth metals – f block on the period table
- Electronegativity – an atom's ability to gain an electron
- Valence electrons – electrons used in bonding

Facts:

- Summarize the historical development of the periodic table.
- Describe the organization of the periodic table.
- Describe the Families of the periodic table and their properties.
- Identify trends in the periodic table and how they relate to an element's properties.

DO

- Describe the people who have influenced the development of the periodic table.
- Identify periodic trends.
- Identify families and their properties.
- Analyze an element's properties based on its position in the periodic table. (*thinking*)
- Complete the Periodicity Project (*writing*)
- Analyze an element and present in a visual manner. (*culminating*)
- Predict an element's behavior based on a trend on the periodic table

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 5: Types of Compounds

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- 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.

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.A1 • Use electro-negativity to explain the difference between polar and nonpolar 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.C.A6 • Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.

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: Applied Chemistry

TIME FRAME: 19 days

UNIT # 5: Types of Compounds

GRADE: 11-12

UNDERSTANDINGS:

Atoms form chemical bonds and make compounds in order to provide a more stable arrangement.

A compound's composition can be obtained from its name.

Common Misconceptions within the Unit:

Misconception - Compounds can be easily separated. Correction – Compounds containing ionic bonds are difficult to separate.

Misconception - Electrons are moving in a compound. Correction - There is a specific way electrons move it is not at random.

Misconception – The Roman numeral tells how many atoms are in a compound. Correction – The roman numeral tells the charge of a transition metal.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Unit 5 Test

Common Assessments:

Bonding Quiz

Naming / Formula writing Quiz

Moles/Molecules Quiz

Do an experiment to show percent composition, analyze the results to determine what percent of an element is in a compound

KNOW

Vocabulary:

- Chemical bond – the attraction between one atom's protons and another atom's electrons
- Metallic bond – bonding of metals
- Ionic bond – transfer of electrons
- Covalent bond – sharing of electrons
- Nonpolar covalent- even sharing in a covalent bond
- Polar covalent – uneven sharing in a covalent bond
- Ion – an atom with a charge

DO

- Calculate the type of bond using the electronegativity.
- Compare and Contrast the types of bonds. (thinking and writing)
- Do the types of bonds experiment to determine the type of bond of four different compounds.
- Write ions using the periodic table and the polyatomic ion sheet
- Do the bonding activity. (writing)
- Write compounds using the crossover method.
- Use the naming compounds flow chart to name chemical formulas.
- Symbolize compounds from the name.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 19 days

UNIT # 5: Types of Compounds

GRADE: 11-12

KNOW

Vocabulary (cont.):

- Cation – a positive atom
- Anion – a negative atom
- Roman numeral – charge on a transition metal
- Acid – compounds that start with H+1
- Molecular mass/formula mass – mass of a compound
- Percent composition – the percentage an element takes up in a compound
- Molecule – smallest form of an element – 6.02×10^{23} molecules = 1 mole

Facts

- Predict difference in electronegativity between two elements determines its bond type.
- Explain how the crossover method must be used to write compounds.
- Recall that all acids start with hydrogen.
- Utilize the flow chart for naming.
- Describe how percent composition applies to real life.
- Describe how the terms molecule, molecular mass, and mole are all related.

DO

- Do an experiment to apply the knowledge of naming.
- Calculate the molecular mass of compounds.
- Calculate the percent composition of compounds.
- Do an experiment to show percent composition, analyze the results to determine what percent of an element is in a compound.
- Calculate mole problems using molecules and compounds.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 18 days

UNIT # 6: Types of reactions (essential)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

CC.3.5.11-12B

- Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CC3.5.11-12.D

- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

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.

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.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. 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.C.A6/

- Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.

3.2.C.B7

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: 18 days

UNIT # 6: Types of reactions (essential)

GRADE: 11-12

UNDERSTANDINGS:

Compounds and elements react in chemical reactions that form new products
A balanced formula equation can be used to predict amounts of reactants and products that are needed in a given situation.

Common Misconceptions within the Unit:

Misconception: A reaction always results in a fire or explosion
Misconception: There is no systematic way for a reaction to occur – compounds just “do their own thing.”
Misconception: Matter can be destroyed

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Common assessments:

Reactions quiz
Reaction project
Stoichiometry quiz

KNOW

Define the following vocabulary:

- Chemical reaction – a process where reactants produce products
- Precipitate – a solid formed in a chemical reaction
- Chemical equation – the sentence form of a chemical reaction
- Aqueous – dissolved in what
- Reactants – what you start with in a chemical reaction
- Products – what you get in a chemical reaction
- Diatomic element – elements that cannot be alone
- Law of conservation – matter can never be created or destroyed
- Coefficients – numbers used to balance a reaction
- Balancing – the process of making the reactants equal the products based on law of conservation

DO

- Translate word equations into symbol equations.
- Classify different reactions by their reaction pattern (thinking).
- Balance equations.
- Complete the reaction project (writing, culminating).
- Perform stoichiometry calculations.
- Perform a lab and use the concepts of stoichiometry to analyze the results.
- Do a law of conservation lab and predict the results then do the reaction to determine if the law of conservation can be violated.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 18 days

UNIT # 6: Types of reactions (essential)

GRADE: 11-12

KNOW

Define the following vocabulary:

- Reaction pattern – the way reactants react
- Synthesis – two or more items becoming one
- Decomposition – one item becoming two or more
- Single replacement – $A+BC \rightarrow AC + B$
- Double replacement – $AB + CD \rightarrow AD + CB$
- Stoichiometry – a four step process to convert grams of one item to grams of another within a reaction
- Limiting reactant – the reactant you run out of first

Facts

- Recall a chemical equation has two sides, reactants and products.
- State a balanced equation must be used to do stoichiometry calculations.
- Understand that there are four reaction patterns.
- Rely on a balance equation must be used so the law of conservation is not violated.

DO

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 23 days

UNIT # 7: Phases of Matter and Gas Laws (Essential)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B
 - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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.D
 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.11-12.G
 - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- 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.

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.G
 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- 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.A3
 - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions
- 3.2.C.B2
 - Explore the natural tendency for systems to move in a direction of disorder or randomness (entropy).

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 23 days

UNIT # 7: Phases of Matter and Gas Laws (Essential)

GRADE: 11-12

- 3.2.C.A6
 - Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.
- 3.2.12.A1
 - Compare and contrast the unique properties of water to other liquids relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.
- 3.2.12.B3.
 - Describe the relationship between the average kinetic **molecular** energy, temperature, and phase changes.
- 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.
- 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
- CCSS.ELA-Literacy.CCRA.W.
 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

2

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 23 days

UNIT # 7: Phases of Matter and Gas Laws (Essential)

GRADE: 11-12

UNDERSTANDINGS:

Solids, liquids and gases are determined by the speed of the particles in the substance.

Gases are affected by volume, pressure, and temperature.

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

Common Misconceptions within the Unit:

Misconception - The type of weather is associated with the temperature

Correction – The type of weather is based on a combination of pressure and temperature.

Misconception - All gases are ideal and follow the ideal gas law rules.

Correction – Most gases act ideal, but tend to not follow the ideal gas laws at extreme temperatures and pressures.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Common Assessments:

Packet 1 Quiz

Packet 2 Quiz

Packet 3 Quiz

Culminating Activity

Unit Test

Snowflake Lab

Investigate gas property relationships

KNOW

Vocabulary:

- Sublimation – solid directly to a gas
- Phase – solid, liquid, and gases
- Phase change – change in phase
- Enthalpy – heat of a system
- Entropy – disorganization of a system
- Vapor pressure – pressure created by heating a liquid
- Absolute zero – 0 Kelvin, point where all motion stops
- STP – standard temperature and pressure (0°C and 1 atm)

DO

- Compare and contrast the properties of solids, liquids and gases (*writing*).
- Answer questions on reading of absolute zero (reading).
- Identify phase changes and supply examples of how the phases change and what is happening on the subatomic atomic level.
- Label and analyze a phase diagram. Answer questions based on the diagram.
- Perform pressure calculations.
- Solve equations using Dalton's Law of Partial Pressures.
- Solve Ideal Gas Law Equations.
- Compare molecular size to speed of particles. (Graham's Law).

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 23 days

UNIT # 7: Phases of Matter and Gas Laws (Essential)

GRADE: 11-12

KNOW

Vocabulary (cont.):

- Boyles Law – pressure increases, volume decreases
- Charles Law – temperature increases, volume increases
- Gay-Lussac's Law – temperature increases, pressure increases
- Dalton's Law – the pressure of a container equals the sum of the partial pressures
- Graham's law – the larger the gas, the slower it moves
- Phase diagram - a diagram that shows the phases at a given temperature and pressure
- Barometer – a device that measure pressure
- Real gas – the way gases actually act in the real world
- Ideal gas – the way a gas should act according to the Kinetic Molecular Theory
- Kinetic molecular theory – a theory that explains gas behavior
- Molar volume – a gas at standard temperature and pressure has a volume of 22.4L

Equations

Ideal gas law equation: $(\text{Pressure})(\text{Volume})=(\text{mole})(R)(\text{change in temperature})$

Dalton's Law: $P_t = P_1 + P_2 + P_3 \dots$

Facts

- Describe how scientists are trying to achieve absolute zero
- Compare and contrast the difference between heat and temperature
- Identify different factors that affect gases
- Identify Boyle's Law, Charles Law and Gay-Lussac's Law.
- Relate the different gas laws to everyday examples
- Using stoichiometry, mathematically relate 22.4L to a stoichiometry problem.

DO

- Read the scuba diving article and relate it to the gas laws
- Do the CO₂ cartridge calculation and relate it to the ideal gas law and predict the pressure within the cartridge.
- Calculate gas stoichiometry problems.
- Investigate gas property relationships in an experimental setting. (*thinking*)
- Do an ideal gas law experiment, relate, analyze and calculate the pressure using the ideal gas law equation.
- Do the snow flake lab, analyze the results and relate them to the phases of matter.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 18 days

UNIT # 8: Types of Mixtures (Important)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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.
- CC3.5.11-12.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- 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.

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.A1 • Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.
- 3.2.12.A1 • Compare and contrast colligative properties of mixtures.,
- 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: Applied Chemistry

TIME FRAME: 18 days

UNIT # 8: Types of Mixtures (Important)

GRADE: 11-12

UNDERSTANDINGS:

Water is the universal solvent.

There are different types of mixtures and their concentration and solubility affect their properties.

pH is used in the world all around us to determine if a substance is an acid, base or neutral.

Common Misconceptions within the Unit:

Misconception - Table salt is the only salt. Corrected – A salt in chemistry is a product of an acid-base reaction

Misconception - All mixtures fall into one category. Corrected – Many mixtures have properties of two or more categories

Misconception - Strong and weak refer to the dangerousness of a solution. Corrected – Strong and weak refer to the strength of the electrical current that a solution can carry.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Common Assessments:

- Concentration Quiz
- Acid base Quiz
- pH quiz
- Unit Test

Culminating Activities:

- pH lab
- Liquid chromatography lab
- Freezing point depression lab

KNOW

Vocabulary:

- Solute- what is being dissolved in a solution
- Solvent – what is doing the dissolving in a solution
- Solution – a homogeneous mixture of a solute and a solvent
- Suspension – a mixture with chunks that can be separated out
- Colloid – a thick mixture that cannot be separated
- Tyndall effect - the scattering of light by colloid particles
- Emulsion – a mixture of two items that do not mix until a third item is added
- Concentration – the amount of solute per amount of solvent
- Saturation – the maximum amount of a solute that will dissolve in a solvent at a given temperature

DO

- Classify types of solutions when given examples and student given examples.
- Identify factors that affect solubility, relate them to the theories on the subatomic level.
- Calculate molarity of solutions.
- Calculate molality of solutions.
- Use solution molality to predict the change in colligative properties (*thinking*).
- Identify if compounds are soluble or insoluble by using the solubility chart.
- Calculate freezing point depression problems.
- Calculate boiling point elevation problem..
- Compare and contrast the properties of solutions, suspensions and colloids (*writing*).
- Do the liquid chromatography lab, analyze data and relate it to the types of mixtures and separation methods theories.
- Do the freezing point depression lab, analyze results to determine the freezing

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 18 days

UNIT # 8: Types of Mixtures (Important)

GRADE: 11-12

KNOW

Vocabulary (cont.):

- Solubility – the ability to dissolve a substance into a solvent
- Colligative properties – a property that depends on how much of a substance is dissolved NOT what the substance is
- Strong – completely ionizes
- Weak – slightly ionizes
- Acid - a compound that starts with H^{+1} and has a pH lower than 7
- Base – a compound that ends with OH^{-1} and has a pH higher than 7
- Salt – a substance that is formed from a neutralization reaction
- pH – a scale that tells how acidic or basic a substance is
- Methods of separation – Steps and ways mixtures can be separated based on its properties

Equations

Molarity = Moles/Liter

Molality = moles / kilogram

Boiling point elevation: $\Delta T_b = (\text{molality})(k_b)(\# \text{ ions})$

Freezing point depression: $\Delta T_f = (\text{molarity})(k_f)(\# \text{ ions})$

Facts

- Compare and contrast how to separate different types of mixtures.
- Describe the four types of mixtures and their properties (solution, suspension, emulsion, colloid).
- Indicate that water is the universal solvent.
- Relate the types of mixtures to real life application.
- Relate colligative properties to real life applications.
- Understand and describe the pH scale and how it is used in the everyday world.
- Describe the tyndall effect and how it relate to driving.
- Describe how and why water is the universal solvent.

DO

- point of a sugar solution.
- Compare and contrast acids, bases, and salts examples and properties.
- Do the pH lab – construct a pH scale of household items.
- Label a pH scale and identify acid, base and neutral.
- Apply the pH scale knowledge to classify if given substances are an acid, base or neutral or student give examples that fall on the pH scale.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 15 days

UNIT # 9: Organic chemistry (important)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12B • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 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 with other sources of information.

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:

- 3.1.C.A7 • Illustrate the formation of carbohydrates, lipids, proteins, and nucleic acids.
- 3.4.12.E1 • Compare and contrast the emerging technologies of telemedicine, nanotechnology, prosthetics, and biochemistry as they relate to improving human health.
- 3.2.C.A6 • Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.

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.
- CCSS.ELA-Literacy. CCRA.R.6 • Assess how point of view or purpose shapes the content and style of a text.

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: Applied Chemistry

TIME FRAME: 15 days

UNIT # 9: Organic chemistry (important)

GRADE: 11-12

UNDERSTANDINGS:

Organic compounds are carbon based compounds.

There are structural formula differences in the organic families.

Functional groups determine an organic compounds name, structure, properties, and reaction type.

Common Misconceptions within the Unit:

Misconception - Everything that is organic is natural.

Correction – In chemistry, organic is defined as any substance containing Carbon.

Misconception - The sciences do not overlap.

Correction – this unit has biology and chemistry overlapping

Misconception - Alcohol only refers to the liquid that is consumed as a beverage.

Correction – An alcohol contains an -OH. There are three main types of alcohol in the real world (methanol, ethanol, propanol).

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Common Assessment:

Quiz on naming organic compounds – just hydrocarbons

Quiz on organic compounds including functional groups

Quiz on isomers

Culminating Activity

Unit test

Model lab

KNOW

Vocabulary:

- Organic chemistry – the study of carbon
- Polymer – long chains of carbon with repeating parts
- Isomer – compounds with the same formula but different structure and properties

DO

- Manipulate hydrocarbon structures using the theory of isomers
- Name different hydrocarbons (thinking).
- Draw compounds based on their name.
- Compare and contrast different types of fats (writing).
- Use models to form different types of compounds and name the

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 15 days

UNIT # 9: Organic chemistry (important)

GRADE: 11-12

KNOW	DO
<p>Vocabulary (cont.):</p> <ul style="list-style-type: none">• Volatile- evaporates quickly• Hydrocarbon – compounds with hydrogen and carbon only• Substitutions – carbon based compounds with carbon and something other than hydrogen• Functional group – the part of an organic structure that determines the compound's family• Fermentation – the making of organic alcohol• Saponification –the making of soap• Carbohydrates – compounds with carbon and water• Alcohol – compounds with an OH group attached• Esther – used in smells and flavors• Fat – an organic compounds with at least ten carbons• Soap – a substance formed from lye and a fat <p>Equations:</p> <p>Complete combustion $C_xH_y + O_2 \rightarrow CO_2 + H_2O$</p> <p>Incomplete combustion $C_xH_y + O_2 \rightarrow CO + H_2O$</p> <p>Facts</p> <ul style="list-style-type: none">• Recall the 8 properties of organic chemistry.• State there are many different types of organic compounds because of the number of isomers.• Describe how biochemistry is a large part of the medical field.• Relay how and why carbon is the bases of organic chemistry.• Describe how and why carbon is the bases of the human life.• State how organic chemistry is used in many areas of the human life.	<ul style="list-style-type: none">• Write organic reactions.• Apply organic reactions in a laboratory setting.• Describe how chemistry and biology are related during the biochemistry section.• Describe different carbohydrates and how they are good (or not so good) for the human body.• Identify different functional groups.• Describe everyday organic compounds and their properties (<i>writing</i>).• Compare and contrast the structural characteristics of carbohydrates, lipids, and proteins (<i>thinking</i>).

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 9 days

UNIT # 10: Nuclear Chemistry (compact)

GRADE: 11-12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.11-12A • Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- CC3.5.11-12.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
- CC3.5.11-12F • Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

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.
- CC3.6.11-12.H • Draw evidence from informational texts to support analysis, reflection, and research.
- 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.A • Write arguments focused on *discipline-specific content*.

PA Academic Standards:

- 3.2.C.A3 • 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.
- 3.4.12.B1 • Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.E1 • Compare and contrast the emerging technologies of telemedicine, nanotechnology, prosthetics, and biochemistry as they relate to improving human health.
- 3.4.12.E3 • Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.
- 3.2.C.A6 • Communicate and defend a scientific argument.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 9 days

UNIT # 10: Nuclear Chemistry (compact)

GRADE: 11-12

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.
- CCSS.ELA- Literacy .CCRA.R.3 • Analyze how and why individuals, events, or ideas develop and interact over the course of a text.
- CCSS.ELA- Literacy. CCRA.R.6 / • Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
- CCSS.ELA- Literacy. CCRA.R.8

College and Career Readiness Standards Writing:

- CCSS.ELA- Literacy. CCRA.W.1 • Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
- 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.W.7 • Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 9 days

UNIT # 10: Nuclear Chemistry (compact)

GRADE: 11-12

UNDERSTANDINGS:

Nuclear chemistry has many uses which involve the radioactive decay of elements.
The development of the nuclear bomb had huge effects not only during the world war but on power supplies and post nuclear war uses.

Common Misconceptions within the Unit:

Misconception - If you are exposed to nuclear radiation you will gain superhero powers.
Correction – If you are exposed to nuclear radiation, you suffer radiation poisoning and can die.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Culminating Activity 1
Unit Test

Culminating Activity 2
Debate the pros and cons of nuclear power and reactors
Do a nuclear lab and apply theories of nuclear chemistry

KNOW

Vocabulary:

- Natural radiation – the natural breakdown of an element when radiation is given off
- Radioactivity – a spontaneous release of energy
- Artificial radiation – radiation caused by man
- Dosemeter - a device that measures radiation
- Nuclear reactor – a device that controls a nuclear fission reaction
- Nuclear reaction – a reaction that involves the nucleus of an atom
- Fission – the splitting of an atom
- Background radiation - radiation you are exposed to everyday
- FX scale – scale used to describe radiation exposure and poisoning
- Trinity Test – test of the nuclear bomb

DO

- Calculate natural decay problems apply the theory of radioactivity.
- Compare and contrast the different types of radiation (thinking).
- Describe the effects of radiation poisoning on a human (writing).
- Calculation how much background radiation we are exposed to in one year using resources from the nuclear coalition.
- Calculate artificial radiation problems.
- Observe a video on the development and the dropping of the nuclear bomb.
- Debate pros and cons of nuclear radiation.
- Discover what happen at TMI and Chernobyl and discuss how it changed people’s opinions of nuclear science.
- Do a nuclear lab and apply theories of nuclear chemistry.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 9 days

UNIT # 10: Nuclear Chemistry (compact)

GRADE: 11-12

KNOW	DO
<p>Vocabulary (cont.):</p> <ul style="list-style-type: none">• Manhattan Project – the building of the first nuclear bomb• TMI – Three Mile Island – worst nuclear accident in the US to date• Chernobyl – worst nuclear reaction in the world to date <p>Facts</p> <ul style="list-style-type: none">• Describe the development of nuclear radiation• Describe how scientists detect radiation• Describe the effects of radiation poisoning• Realize that many items give off radiation• State the historical development of the nuclear bomb• Evaluate the historical development of nuclear energy and its uses and how it has affected our current views of radiation• Summarize how nuclear chemistry is applied in current times	<ul style="list-style-type: none">• Describe and identify scientists who have influenced the development of nuclear chemistry.

KNOW, UNDERSTAND, DO

COURSE: Applied Chemistry

TIME FRAME: 1 day

UNIT # 11: Oxidation and reduction reactions (compact)

GRADE: 11-12

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
- CC3.5.11-12.D
- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
- CC3.5.511-12H
- 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.

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
- 3.1.C.A2
- Describe how changes in energy affect the rate of chemical reactions
- 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
- 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.
- 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: Applied Chemistry

TIME FRAME: 1 day

UNIT # 11: Oxidation and reduction reactions (compact)

GRADE: 11-12

UNDERSTANDINGS:

Redox is one type of chemical change that 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-reaction change.

Common Misconceptions within the Unit:

Misconception - Electrons are not used when there is a reaction.
Corrected – Electrons are lost and gained in an oxidation-reduction reaction.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Culminating activity 1: Quiz on electricity

Culminating activity 2: Voltaic cell lab

KNOW

Define the following vocabulary:

- Oxidation – loss of an electron
- Reduction - gaining of an electron
- Redox reaction – a reaction involving reduction and oxidation
- Half reaction – a reaction involving either reduction or oxidation
- Reducing agent – the item that has gained electrons
- Oxidizing agent - the item that has lost the electron
- Electrolysis – a reaction involving redox
- Electrolytic cell – a system that contains two electrodes separated by an electrolyte phase
- Electrode – a conductor used to establish electrical contact with a nonmetallic part of a circuit
- Anode – the electrode where oxidation occurs
- Cathode - the electrode where reduction occurs
- Electroplating – a electrolytic process where a metal plates another substance

Facts

- Relay how redox relates to real life.
- Describe how a voltaic cell works.

DO

- 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.

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)