

CARLISLE AREA SCHOOL DISTRICT

Carlisle, PA 17013

Honors Chemistry I

GRADES 10-12

Date of Board Approval: June 19, 2014

CARLISLE AREA SCHOOL DISTRICT

PLANNED INSTRUCTION COVER PAGE

TITLE OF COURSE: Honors Chemistry **SUBJECT:** Science **GRADE LEVEL:** 10

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

PREREQUISITES: Biology I-II or Honors Biology, Honors Geometry **CREDIT:** 1 credit **LEVEL:** Honors (weighted course)
(A- average), Algebra II (can be taken concurrently)

Course Description/Objectives:

This course is for exceptional science students with strong mathematical backgrounds. This course will take advantage of students' stronger mathematical skills and apply these skills to more challenging problems than those in Chemistry I. Honors) emphasizes an experimental approach to chemistry, and therefore involves extensive laboratory work. It is important that students have strong writing and communication skills as Honors Chemistry students are required to submit a formal, written laboratory report for each experiment that they conduct. The basic subject material of the curriculum is the same as Chemistry I; however, the depth and the complexity of the topics encountered will be explored in greater detail and at a faster pace. This course is recommended for students considering a career in engineering, science or medicine. If a student plans to take AP Chemistry, he/she should take this course.

Text: *Honors Chemistry and Modern Chemistry* (Holt/Rinehart/Winston)

Curriculum Writing Committee: Sarah Deitch

COURSE TIME LINE

Unit 1a: Safety and Laboratory Basics (Important)	6 days
Unit 1b: Matter, Change, Measurements and Calculations (Essential)	21 days
Unit 2: Atomic Theory (Essential)	26 days
Unit 3: Periodicity	10 days
Unit 4: Nuclear Chemistry (Important)	7 days
Unit 5: Chemical Bonding, Formula, and Compounds	22 days
Unit 6: Chemical Reactions, Reaction Equations, and Stoichiometry	3 days
Unit 7: Equilibrium (Compact)	17 days
Unit 8: States of Matter and Gases (Essential)	5 days
Unit 9: Reaction Kinetics, and Thermochemistry	13 days
Unit 10: Types of Mixtures and Solutions (Important)	12 days
Review and Midterm & Final Exam	
TOTAL:	33 weeks

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 6 days

UNIT # 1a: Safety and Laboratory Basics (Important)

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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.

PA Academic Standards:

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

College, 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: Honors Chemistry

TIME FRAME: 6 days

UNIT # 1a: Safety and Laboratory Basics (Important)

GRADE: 10-12

UNDERSTANDINGS

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

Common Misconceptions within the Unit:

Nothing bad can happen to them while they are in the lab; however, by not following specific safety measures and protocols, accidents can happen within the lab setting. Safety measures will be stressed.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Take and pass the safety quiz – Students must achieve a 100% on the quiz in order to work in the chemistry lab.

KNOW

- Identify proper laboratory behavior.
- Identify lab equipment that will be used throughout the course of the year.
- How to correctly use lab equipment that will be used throughout the course of the year.

DO

- Correctly identify the location of safety equipment in the lab.
- Correctly light a Bunsen burner.
- Successfully read an MSDS sheet.
- Successfully identify the parts and ratings of the NFPA diamond.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 21 days

UNIT # 1b: Matter, Change, Measurements and Calculations (Essential)

GRADE: 10-12

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.A1 • Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.
- 3.2.C.A4 • Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.

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: Honors Chemistry

TIME FRAME: 21 days

UNIT # 1b: Matter, Change, Measurements and Calculations (Essential)

GRADE: 10-12

UNDERSTANDINGS

Chemistry is the study of matter, its chemical and physical 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 throughout all calculations.

Common Misconceptions within the Unit:

Students think of chemicals as artificial or unnatural, instead of the fact that everything we use daily is a chemical.

Students often think that all “metals” are the same instead of realizing their individual properties.

Students think that accuracy and precision are the same things. Accuracy is being close to the correct answer and precision is having a grouping of measurements close together.

The number of significant figures can be dictated by the teacher. Significant figures are determined by the number of significant figures in the measurements.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Element quizzes

Introduction lab experiment to demonstrate basic laboratory skills

Density experiment

Classifying experiment

Topic quizzes (short answer questions)

End of the unit Exam

KNOW

- Define Chemistry. Chemistry is the study of the composition, structure, and properties of matter, the processes that matter undergoes, and the energy changes that accompany these processes.
- Recall the definition of accuracy versus precision. Accuracy is the closeness of measurements to the correct or accepted value of the quantity measured. Precision refers to the closeness of a sample of measurement to each other. Precision also indicates the number of numbers in a given measurement.

DO

- Analyze various substances to determine their matter type (*thinking*).
- Compare and contrast states of matter.
- Compare and contrast physical and chemical changes and properties (*writing*).
- Perform a Scientific Method Lab.
- Calculate conversions in the metric system.
- Convert numbers into scientific notation.
- Perform calculations using proper significant figure rules.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 21 days

UNIT # 1b: Matter, Change, Measurements and Calculations (Essential)

GRADE: 10-12

KNOW (cont.)	DO (cont.)
<ul style="list-style-type: none">• Define qualitative and quantitative observations. Qualitative observations are descriptive in nature where as quantitative observations contain numerical information.• Define Significant Figures. Sig Figs in a measurement consist of all the digits known with certainty plus one final digit that is an estimate.• Define Système International d'Unités. Système International d'Unités, also called SI Units, is the measurement system that is accepted worldwide.	<ul style="list-style-type: none">• Distinguish between accuracy and precision.• Perform density calculations.• Perform density and measurement lab.• Demonstrate ability to calculate % error.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 26 days

UNIT # 2: Atomic Theory (Essential)

GRADE: 10-12

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.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.C.A2
 - Compare the electron configurations for the first twenty elements of the periodic table.
- 3.2.12.A2
 - Explain how light is absorbed or emitted by electron orbital transitions.

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: Honors Chemistry

TIME FRAME: 26 days

UNIT #2: Atomic Theory (Essential)

GRADE: 10-12

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 evolution of atomic theory from Bohr's Model to the Quantum Model gives scientists the ability to complete several types of electron configurations. This includes the ability to assign each electron in an atom with four specific quantum numbers.

Common Misconceptions within the Unit:

Students think it is not the number of protons that determine the identity of the atom, when in fact it is.

Students confuse the terms atomic mass (weighted average of all isotopes) and molar mass (mass of a mole of a substance).

Students confuse the terms mass number (specific for each isotope) and atomic mass (weighted average of all isotopes).

Students believe that the electrons are arranged around the nucleus like the planets are arranged around the sun (Bohr's model) instead of the electron clouds of probability (Quantum model).

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Flame Test lab
Obsertainer lab
Spectral line lab

Quizzes throughout the unit to break up large chunks of material
Law of conservation of mass lab
End of Unit Exam

KNOW

- Identify the following scientists: John Dalton, Bohr, J.J. Thompson, Rutherford, and Schrodinger.
- Define Orbital. An orbital is a three-dimensional region around the nucleus that indicate4s the probable location of an electron.
- Define mass number. Mass number is the total number of protons and neutrons that make up the nucleus of an isotope.
- Define atomic mass. Atomic mass is the weighted average of the atomic masses of the naturally occurring isotopes of an element.
- Define electron configuration. The arrangement of electrons in an atom is its electron configuration.
- Define quantum numbers. Quantum numbers specify the properties of atomic orbitals and the properties of electrons in orbitals.
- Explain the following: Aufbau Principle, Pauli Exclusion Principle, Hund's Rule, Quantum Theory and Heisenberg Uncertainty Principle.

DO

- Determine the number of protons, neutrons, electrons, mass number and atomic number of a given element/isotope.
- Calculate mole problems.
- Perform light and energy equations.
- Analyze how the Atomic Theory has evolved over time. (*thinking*)
- Compare and contrast the different atomic theories. (*writing*)
- Identify orbital shapes.
- Determine electron configurations, using various methods, for elements.
- Perform the Flame Test Lab.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 10 days

UNIT # 3: Periodicity

GRADE: 10-12

STANDARDS:

PA Core Standards:

- CC.3.5.9-10.B
 - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- 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.A1
 - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, 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.

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.
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 - 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: Honors Chemistry

TIME FRAME: 10 days

UNIT # 3: Periodicity

GRADE: 10-12

UNDERSTANDINGS:

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

Common Misconceptions within the Unit:

Students think that something has to vary uniformly in order to vary periodically. They should instead focus on the overall trend.

Students think that ionization energy concerns the gaining or losing of electrons instead of strictly the losing of electrons.

Students think that atoms should become more negative as they lose electrons. In reality the positively charged subatomic particles now outnumber the negatively charged subatomic particles leaving the ion with a positive charge.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Periodicity Project Packet

End of the unit Exam

KNOW

- Define Ion. It is an atom with a charge.
- Define cation and anion. Cation is an atom with a positive charge where as an anion is an atom with a negative charge.
- Describe the development of the periodic table citing the contributions by Cannizzaro, Mendeleev, and Moseley.

DO

- Describe the people who have influenced the development of the periodic table.
- Identify 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 an element and present the information in a visual manner (*culminating*).

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 7 days

UNIT # 4: Nuclear Chemistry (Important)

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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: Honors Chemistry

TIME FRAME: 7 days

UNIT # 4: Nuclear Chemistry (Important)

GRADE: 10-12

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.
- Perform a nuclear lab.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 22 days

UNIT #5: Chemical Bonding, Formula, and Compounds

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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.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. Draw Lewis dot structures for simple molecules and ionic compounds. 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, empirical formulas, and molecular formulas.
- 3.2.12.A5 • MODELS/PATTERNS Use VSEPR theory to predict the molecular geometry of simple molecules.
- 3.2.10.A2 • Compare and contrast different bond types that result in the formation of molecules and compounds

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: Honors Chemistry

TIME FRAME: 22 days

UNIT # 5: Chemical Bonding, Formula, and Compounds

GRADE: 10-12

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:

Students confuse ionic formula units with molecular formulas and compounds. They do not realize that the transfer or sharing of electrons determine the types of bonds and therefore the names of the compounds.

Students forget that polyatomic ions participate in ionic bonding but that they themselves contain covalent bonds.

Students misinterpret a subscript after a parenthesis incorrectly.

Students think that a molecular formula should be like an ionic formula is that it should show the lowest whole number ratio.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Bonding types lab
 Do a percent composition lab
 Roll-A-Formula

Quiz on naming
 Quiz on writing formulas
 End of the unit Exam

KNOW

- Define ionic bond.
- Define covalent bond.
- Define empirical formula.
- Define molecular formula.

DO

- Calculate bond type based on electronegativity.
- Perform a bonding lab.
- Draw electron-dot structures.
- Draw Lewis Structures.
- Show the movement of electrons in an ionic bond and identify cation and anion

DO (cont.)

- 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.
- Write binary, ternary, and acidic compound formulas from chemical names.
- Name binary, ternary, and acidic compounds.
- Determine oxidation numbers of elements in compounds.
- Calculate formula mass.
- Calculate mole problems with compounds.
- Determine the percent composition of a compound.
- Determine empirical and molecular formulas.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 22 days

UNIT # 6: Chemical Reactions, Reaction Equations, and Stoichiometry

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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. 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.

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: Honors Chemistry

TIME FRAME: 22 days

UNIT # 6: Chemical Reactions, Reaction Equations, and Stoichiometry

GRADE: 10-12

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 when in reality many reactions are reversible and stop when they reach equilibrium.

The calculations required to determine limiting reagent and percent yield are complex and completely unrelated to everyday life. In reality, the calculations are similar to math computations that the students complete mentally on a regular basis.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

Type of Reactions lab
Roll-A-Reaction
Quiz on Predicting Products

Stoichiometry lab
Quiz on calculation portion of unit
End of the unit Exam

KNOW

- Identify the five basic types of reactions.
- Define limiting reactant.
- Define excess reactant.
- Define theoretical yield.
- Define percent yield.

DO

- Describe how you know that a reaction has occurred (*writing*).
- Translated word equations into chemical equations.
- Balancing chemical equations (*thinking*).
- Identify reaction types.
- Predict products for all of the types of reactions discussed.
- Perform a lab on reaction types.
- Perform stoichiometry calculations.
- Calculate limiting reactant.
- Calculate percent yield.
- Perform a stoichiometry lab.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 3 days

UNIT # 7: Equilibrium (Compact)

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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:

- 3.2.12.A5 • **CONSTANCY AND CHANGE** Predict the shift in equilibrium when a system is subjected to a stress.

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: Honors Chemistry

TIME FRAME: 3 days

UNIT # 7: Equilibrium (Compact)

GRADE: 10-12

UNDERSTANDINGS

Reactions do not always go to completion.

By utilizing an understanding of chemicals and the reaction, we are able to push reactions in the desired direction to suit our purposes.

Common Misconceptions within the Unit:

Reactions only occur in the forward direction and always go to completion when in reality many reactions are reversible and stop when they reach equilibrium.

Students believe that reactions occur independently of our involvement. In reality, we have the ability to push a reaction in one direction or another.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Le Chatelier's Principle
Unit Exam

KNOW

- Define Equilibrium.
- Define Le Chatelier's Principle.
- Explain the common ion effect.

DO

- 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: Honors Chemistry

TIME FRAME: 17 days

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

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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.A2
 - Use the mole concept to determine number of particles and molar mass for elements and compounds.
- 3.2.C.A3
 - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.
- 3.2.12.A1
 - Compare and contrast the unique properties of water to other liquids.
- 3.2.10.A3
 - Describe phases of matter according to the kinetic molecular theory.

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.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 17 days

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

GRADE: 10-12

Understandings

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:

They believe that Kinetic Molecular Theory only applies to gases as opposed to all states of matter.

Students think that there are only 3 states of matter as opposed to the actual 5.

Students believe that melting and freezing occur at different temperatures when in fact they occur at the same temperature.

In addition, they think that boiling and condensation occur at different temperatures when in fact they occur at the same temperature.

Students believe that temperature is a measure of heat when in fact it is a measure of kinetic energy.

Students believe that cold is an actual substance. In reality, cold is just the absence of heat.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Graded Homework
Gas Law Lab
Unit Exam

KNOW

- Define Kinetic Molecular Theory.
- List 6 changes of state.
- Define Absolute Zero.
- Define Ideal Gas.

DO

- Compare and contrast the properties of solids, liquids and gases (*writing*).
- Identify phase changes.
- Label and analyze a phase diagram.
- Describe the properties of water.
- Perform pressure calculations.
- 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.
- Compare molecular size to speed of particles (Graham's Law).
- Calculate gas stoichiometry problems.
- Investigate gas property relationships in an experimental setting (*thinking*).

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 5 days

UNIT # 9: Reaction Kinetics, and Thermochemistry

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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.

PA Academic Standards:

- 3.2.10.A4 • Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions.

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.
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KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 5 days

UNIT # 9: Reaction Kinetics, and Thermochemistry

GRADE: 10-12

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 Misconceptions within the Unit:

Students believe that temperature measures heat instead of kinetic energy.

Students believe that heat has the same effect on every substance. They have no grasp on the concept of specific heat.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Graded Homework
Specific Heat Lab
End of the unit Exam

KNOW

- Define Thermochemistry.
- Define enthalpy.
- Define entropy.
- Define specific heat.

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*).
- Complete heat calculations.
- Describe the role of a catalyst.

KNOW, UNDERSTAND, DO

COURSE: Honors Chemistry

TIME FRAME: 13 days

UNIT # 10: Types of Mixtures and Solutions (Important)

GRADE: 10-12

STANDARDS:

PA Core Standards:

- 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.

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..
- 3.2.12.A1 • Compare and contrast colligative properties of mixtures. Compare and contrast the unique properties of water to other liquids.

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.
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- 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: Honors Chemistry

TIME FRAME: 13 days

UNIT # 10: Types of Mixtures and Solutions (Important)

GRADE: 10-12

UNDERSTANDINGS

Water is the universal solvent.

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

Common Misconceptions within the Unit:

Students do not understand that solutions are not static. They do not know that dissolving and dissolution are continual processes.

Students believe that crystals at the bottom of a solution indicate supersaturated solutions when in fact it is an indication of a saturated solution.

Students struggle with the fact that homogenous mixtures are by definition solutions.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Graded Homework
Solubility lab
End of the unit Exam

KNOW

- Define concentration.
- Define solution.
- Define saturation.

DO

- Classify types of solutions.
- Identify factors that affect solubility.
- Calculate molarity of solutions.
- Use solution molality to predict the change in colligative properties (*thinking*).
- Write dissociation equations for ionic compounds.
- Identify if compounds are soluble or insoluble by using the solubility chart.
- Write net ionic equations for precipitation reactions.
- Experimentally determine the relationship between solubility and temperature.
- Compare and contrast the properties of solutions, suspensions and colloids (*writing*).

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)