Course Title: Chemistry 1 **Board Approval Date:** 3/18/13 **Credit / Hours:** 1.5 Credits

Course Description:

This course focuses on mastery of the PA Academic Standards for Science and Technology as well as Environment and Ecology. As students progress through this course, they will participate in a systematic study of matter and its changes. Chemistry I is a physical science based on knowledge gained from observation, study, and experimentation. The course concerns itself with the structure of matter and its composition, the physical and chemical changes of matter, and the products that result from these changes. In Chemistry I students put theory into practice. Students develop skills in proper laboratory techniques and in problem-solving. Students learn the organization of the periodic table and how to use it effectively. Students also become aware of the everyday need for chemistry and the chemistry behind everyday events.

Learning Activities / Modes of Assessment:

Large Group Instruction Teacher Observation Small Group Work Role Playing / Simulations Journals / Write-ups Laboratory Experiments Laboratory Reports Tests and Quizzes Various Websites Projects with Rubrics Computer Simulations Student Response Systems Audio/Visual Media Laboratory Data Collection Systems

Instructional Resources:

Buthelezi, T., Dingrando, L., Hainen, N., Wistrom, C., & Zike, D. (2008). *Chemistry: Matter and Change*. New York: Glencoe/McGraw-Hill School Pub Co.
Videos and media from Central Columbia media library
Various simulations
Various websites
Odyssey

Course: Chemistry		
Course Unit (Topic)	Length of Instruction (Days/Periods)	
1. Introduction to Chemistry – Lab Safety	5 days	
2. Introduction to Chemistry – Analyzing Data	14 days	
3. Matter and Energy	15 days	
4. The Structure of the Atom: Atomic History	20 days	
5. Electrons in Atoms	20 days	
6. Periodic Table	14 days	
7. Bonds – Chemical Bonds	14 days	
8. Chemical Reactions	14 days	
9. Stoichiometry	23 days	
10. Gases	16 days	
11. Solutions	<u>15 days</u>	
DAYS TOTAL	170 Days	

PENNSYLVANIA
Date: February 6, 2013 ET

Topic: 01 Introduction to Chemistry: Lab Safety

Subject(s): Science

Know:	Understand:	Do:
Laboratory equipment	Chemistry lab can be	Identify laboratory equipment.
Safety equipment	conducted safely when	
Laboratory procedures	procedures and	Locate and describe the uses of personal protective
	equipment are known.	equipment and safety equipment.
VOCAB:		
lab burner		Describe safe laboratory practices.
evaporating dish		
crucible		
graduated cylinder		
Erlenmeyer flask		
beaker		
tongs		
test tube		
pipestem triangle (clay		
triangle)		
ring stand		
clamp teet tube belder		
eye wasn oofot (obower		
fume bood		
fire blanket		
combustible		
flammable		
corrosive		
CONTUGINE		

Topic: 02 Introduction to Chemistry and Analyzing Data

Subject(s): Science

Topic: 02 Introduction to Chemistry and Analyzing Data Subject(s): Science

Date: February 6, 2013 ET

PENNSYLVANIA

Know:	Understand:	Do:
control conclusion qualitative data quantitative data base unit derived unit density scientific notation dimensional analysis conversion factor significant figure precision accuracy percent error error		

Topic: 03 Matter and Energy

Subject(s): Science

Know:	Understand:	Do:
3.2.C.A1.a – Essential PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties. 3.2.C.A1.b – Essential PROPERTIES OF MATTER - Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.	Chemistry is the study of matter and the changes it undergoes. These changes in matter are accompanied by changes in energy.	 3.2.C.A1.a – Essential PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties. 3.2.C.A1.b – Essential PROPERTIES OF MATTER - Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. 3.2.C.A3.a – Essential MATTER AND ENERGY - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.
3.2.C.B3.a – Important HEAT/HEAT TRANSFER - Describe the law of conservation of energy.		3.2.C.A4.b – Essential REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions. CHEM.A.1.1.1 – Essential
3.2.10.A1.b – Important PROPERTIES OF MATTER - Identify properties of matter that depend on sample size. Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.		Classify physical or chemical changes within a system in terms of matter and/or energy. CHEM.A.1.1.2 – Important Classify observations as qualitative and/or quantitative. CHEM.A.1.2.2 – Important Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated).
3.2.10.A4.c – Important REACTIONS - Explain the difference between endothermic and exothermic reactions.		CHEM.B.1.2.2 – Important Apply the law of definite proportions to the classification of elements and compounds as pure substances.
Types of Matter		Relate the percent composition and mass of each element present in a compound.
Changes of Matter Forms and States of Energy		3.2.C.B3.b – Essential HEAT/HEAT TRANSFER - Explain the difference between an endothermic process and an exothermic process.
VOCAB:		

Topic: 03 Matter and Energy

Subject(s): Science

Know:	Understand:	Do:
Know: substance compound element mixture heterogeneous mixture homogeneous mixture matter chemical property physical property extensive property solution energy kinetic energy potential energy law of conservation of energy endothermic exothermic chemical change physical change law of definite proportions law of multiple proportions law of conservation of mass	Understand:	 Do: 3.2.10.A2.b - Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements. 3.2.10.A3 Essential MATTER & ENERGY - Describe phases of matter according to the kinetic molecular theory. 3.2.C.B2 ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Explore the natural tendency for systems to move in a direction of disorder or randomness (entropy). 3.2.C.B3.a - HEAT/HEAT TRANSFER - Describe the law of conservation of energy. 3.2.10.A1.b - PROPERTIES OF MATTER - Identify properties of matter that depend on sample size. Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth. 3.2.10.A4.c - REACTIONS - Explain the difference between endothermic and exothermic reactions. 3.2.12.A3 MATTER & ENERGY - Explain how matter is transformed into energy in nuclear reactions according to the equation E=mc2. 11-12.R.S.5 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideate

Topic: 04 The Structure of the Atom: Atomic History Subject(s): Science

Know:	Understand:	Do:	
3.2.C.A5.b – Important UNIFYING THEMES - 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.	Atomic theory explains the pieces of an atom, their arrangement, and the ways they interact. Atomic theory is the foundation for the study of chemistry.	 3.2.C.A5.a – Essential UNIFYING THEMES - 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. 3.2.C.A3.c – Important MATTER AND ENERGY - Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. 	
3.2.C.A3.d – Important MATTER AND ENERGY - Compare and contrast nuclear fission and nuclear fusion.		3.2.C.A3.b – Important MATTER AND ENERGY - Identify the th types of radioactive decay and compare th properties.	3.2.C.A3.b – Important MATTER AND ENERGY - Identify the three main types of radioactive decay and compare their properties.
3.2.12.A2.a – Important STRUCTURE OF MATTER - Distinguish among the isotopic forms of elements.		STRUCTURE OF MATTER - Explain how light is absorbed or emitted by electron orbital transitions. CHEM.A.2.1.2 – Important Differentiate between the mass number of an isotope and the average atomic mass of an element	
CHEM.A.2.1.1 – Important Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr.		 3.2.C.A4.b – Essential REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (defin proportions), and multiple proportions. 3.2.10.A2.b – Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elem SI.8-10.3 – Essential Identify questions and concepts that guide scienti investigations. SI.8-10.4 – Essential Formulate and revise explanations and models usi logic and evidence. 	 3.2.C.A4.b – Essential REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions. 3.2.10.A2.b – Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.
3.2.10.A5.a – Important UNIFYING THEMES - MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory.			
SI.11-12.1 – Compact Examine the status of existing theories.			

Topic: 04 The Structure of the Atom: Atomic History

Subject(s): Science

Know:	Understand:	Do:
Know: SI.8-10.1 – Important Compare and contrast scientific theories. How the model of the atom was developed over time. Fundamental Particles of the Atom Isotopes Nuclear Reactions and Equations	Understand:	Do: 3.2.C.A5.b - UNIFYING THEMES - 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.A3.d - MATTER AND ENERGY - Compare and contrast nuclear fission and nuclear fusion. 3.2.12.A2.a - STRUCTURE OF MATTER - Distinguish among the isotopic forms of elements. CHEM.A.2.1.1 - Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr. 3.2.10.A5.a - UNIFYING THEMES - MODELS Describe the historical development of models of the atom and how they contributed to modern atomic
VOCAB: atom nucleus proton neutron electron atomic number atomic number atomic number atomic mass mass number isotope nuclear symbol nuclear reaction nuclear reaction nuclear equation radioactivity radioactive decay alpha particle beta particle gamma ray half-life		atom and how they contributed to modern atomic theory. 3.2.12.A2.b - STRUCTURE OF MATTER - Explain the probabilistic nature of radioactive decay based on subatomic rearrangement in the atomic nucleus. 3.2.12.A3 MATTER & ENERGY - Explain how matter is transformed into energy in nuclear reactions according to the equation E=mc2. SI.11-12.1 - Examine the status of existing theories. SI.8-10.1 - Compare and contrast scientific theories.

Topic: 05 Electrons in Atoms

Subject(s): Science

Know:	Understand:	Do:
 Know: 3.2.C.A2.a – Essential STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table. 3.2.C.A2.b – Essential STRUCTURE OF MATTER - 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. CHEM.A.2.2.3 – Important Explain the relationship between the electron configuration and the atomic structure of a given atom or ion (e.g., energy levels and/or orbitals, shapes of orbitals). 3.2.10.A5.a – Important UNIFYING THEMES - MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory. SI.11-12.1 – Compact Examine the status of existing theories. 	Understand: How does the number and arrangement of electrons determine the properties of an element?	Do: 3.2.C.A2.a – Essential STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table. 3.2.C.A2.b – Essential STRUCTURE OF MATTER - 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. CHEM.A.2.1 – Important Predict the ground state electronic configuration and/or orbital diagram for a given atom or ion. CHEM.A.2.2.4 – Important Relate the existence of quantized energy levels to atomic emission spectra. CHEM.A.2.2.7 – Essential Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity). 3.2.12.A2.c – Important STRUCTURE OF MATTER - Explain how light is absorbed or emitted by electron orbital transitions. SI.8-10.2 – Essential Monow that both direct and indirect observations are used by scientists to study the natural world and universe. SI.8-10.3 – Essential Identify questions and concepts that guide scientific investigations. CHEM.A.2.2.3 - Explain the relationship between the electron configuration and the atomic structure of a given atom or ion (e.g., energy levels and/or orbitals with electrons, distribution of electrons in orbitals, shapes of orbitals).
		3.2. IU.AD.a - UNIFYING THEMES - MODELS

Topic: 05 Electrons in Atoms

Subject(s): Science

SI.8-10.2 - Essential Know that both direct and indirect observations are used by scientists to study the natural world and universe.Describe the historical development of models of th atom and how they contributed to modern atomic theory. SI.11-12.1 - Examine the status of existing theories 11-12.W.1 - Write arguments to support claims in a analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. 11-12.W.1a - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s), counterclaims, reasons, and evidence.How an electron is able to absorb/emit energy.Electromagnetic SpectrumCharacteristics of LightThat a strike the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and reasons and evidence, and between claim(s) and reasons and evidence claim and evidence claim(s) and reasons and evidence claim and evidence claim(s) and reasons and evidence claim a	Know:	Understand:	Do:
Duration operationCounterclaints.Quantum Numbers11-12.W.1d - Establish and maintain a formal style and Objective tone while attending to the norms and conventions of the discipline in which they are writing.Electron Configurations and Rules11-12.W.1d - Provide a concluding statement or section that follows from and supports the argumen presented.How to draw electron diagrams.11-12.W.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.VOCAB: electromagnetic radiation continuous wavelength frequency amplitude quantized photon electromagnetic spectrum11-12.W.2a - Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia whee useful to ading comprehension.Planck's constant energy level quanta photoelectric effect atomic emission spectrum11-12.W.2c - Use appropriate to the audience's knowledge of the topic.Planck's tate excited state11-12.W.2c - Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among	Now:SI.8-10.2 - Essential Know that both direct and indirect observations are used by scientists to study the natural world and universe.How to draw a Bohr model diagram.How an electron is able to absorb/emit energy.Electromagnetic SpectrumCharacteristics of LightEmission Spectra Quantum NumbersLectron Configurations and RulesHow to draw electron diagrams.VOCAB: electromagnetic radiation continuous wavelength frequency amplitude quantized photon electromagnetic spectrumPlanck's constant energy level quanta photoelectric effect atomic emission spectrum ground state excited state		 Describe the historical development of models of the atom and how they contributed to modern atomic theory. SI.11-12.1 - Examine the status of existing theories. 11-12.W.1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. 11-12.W.1a - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. 11-12.W.1c - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. 11-12.W.1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 11-12.W.1e - Provide a concluding statement or section that follows from and supports the argument presented. 11-12.W.2a - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. 11-12.W.2a - Introduce a topic; organize complex ideas, concepts, and informating (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. 11-12.W.2b - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. 11-12.W.2c - Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among

Topic: 05 Electrons in Atoms

Subject(s): Science

Know:	Understand:	Do:
Heisenberg Uncertainty Principle quantum number atomic orbital electron configuration aufbau principle Pauli exclusion principle Hund's rule valence electrons octet rule ion		 complex ideas and concepts. 11-12.W.2d - Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. 11-12.W.2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 11-12.W.2f - Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). 11-12.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. 11-12.W.8 - 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 task, purpose, and audience; integrate information. 11-12.W.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research. 11-12.R.S.3 - 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. 11-12.R.S.7 - 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.

Topic: 06 Periodic Table

Subject(s): Science

Know:	Understand:	Do:
Know: CHEM.A.2.3.1 – Important Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. CHEM.A.2.3.2 – Important Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends.	Understand: The periodic table is organized in repeating patterns.	Do: 3.2.C.A1.c – Essential PROPERTIES OF MATTER - 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. CHEM.A.2.2.2 – Essential Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity). CHEM.A.2.3.1 – Important Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. CHEM.A.2.3.2 – Important Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements
3.2.C.A2.b – Essential STRUCTURE OF MATTER - 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.		by using their locations on the periodic table and known trends.
Periodic Table Parts/Families of the Periodic Table How the elements are organized.		11-12.R.S.4 - 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.
Periodic Trends		
group/family periods metals		

Topic: 06 Periodic Table

Subject(s): Science

Know:	Understand:	_Do:
nonmetals metalloids/semi-metals alkali metals alkaline earth metals transition metals halogens noble gases electronegativity ionization energy electron affinity atomic radius malleable ductile periodic law ions		
anion		

Topic: 07 Bonds. Chemical Bonds.

Subject(s): Science

Know:	Understand:	Do:
3.2.C.A2.c – Important STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.	Chemical bonding is a result of attractive forces between particles.	 3.2.C.A1.d – Essential PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds. 3.2.C.A2.c – Important STRUCTURE OF MATTER - Explain how atoms
3.2.12.A5.a – Compact UNIFYING THEMES - MODELS/PATTERNS Use VSEPR theory to predict the molecular geometry of simple molecules.		CHEM.A.1.1.4 – Essential Relate the physical properties of matter to its atomic or molecular structure.
3.2.12.A1.b – Compact PROPERTIES OF MATTER - Compare and contrast the unique properties of water to other liquids.		 CHEM.A.1.2.1 – Important Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating). CHEM.B.1.3.2 – Essential Classify a bond as being polar covalent, nonpolar covalent, or ionic.
CHEM.A.1.2.5 – Compact Describe how chemical bonding can affect whether a substance dissolves in a given liquid.		CHEM.B.1.3.3 – Important Use illustrations to predict the polarity of a molecule. CHEM.B.1.4.2 – Important Utilize Lewis dot structures to predict the structure and bonding in simple compounds.
CHEM.B.1.3.1 – Essential Explain how atoms combine to form compounds through ionic and covalent bonding.		 CHEM.A.2.2.2 – Essential Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity). 3.2.C.A2.e – Essential
		STRUCTURE OF MATTER - Draw Lewis dot structures for simple molecules and ionic compounds. 3.2.10.A2.a – Essential STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.

Topic: 07 Bonds. Chemical Bonds.

Subject(s): Science

Topic: 08 Chemical Reactions, Nomenclature, and Chemical Equations Subject(s): Science

Know:	Understand:	Do:
3.2.C.A4.a – Important REACTIONS - Predict how combinations of substances can result in physical and/or chemical changes.	Chemical reactions are predictable.	 3.2.C.A2.d – Essential STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons. 3.2.C.A2.e – Essential STRUCTURE OF MATTER - Draw Lewis dot
3.2.12.A4.a – Compact REACTIONS - Apply oxidation/reduction principles to electrochemical reactions.		structures for simple molecules and ionic compounds. 3.2.C.A2.f – Essential STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.
Types of Chemical Formulas		3.2.C.A4.d – Essential REACTIONS - Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.
for chemical compounds.		3.2.C.A4.c – Essential REACTIONS - Balance chemical equations by
How to name chemical formulas.		applying the laws of conservation of mass.
Relationship between Empirical and Molecular Formula		CHEM.A.1.1.5 – Essential Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions).
Types of Chemical Reactions		CHEM.B.1.2.1 – Important Determine the empirical and molecular formulas of compounds
How to balance chemical equations.		CHEM B 1 2 2 - Important
VOCAB:		Apply the law of definite proportions to the classification of elements and compounds as pure
polyatomic ion binary compound hydrate acid chemical reaction chemical equation		CHEM.B.2.1.4 – Important Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion).
reactant product coefficient aqueous solution synthesis		CHEM.B.2.1.5 – Essential Balance chemical equations by applying the Law of Conservation of Matter.

Topic: 08 Chemical Reactions,	Nomenclature,	and Chemical	Equations
Subject(s): Science			

Know:	Understand:	Do:
know: decomposition single replacement activity series double replacement combustion neutralization base		 CHEM.B.2.1.3 – Important Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion. 3.2.10.A2.b – Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements. 3.2.10.A4.a – Essential REACTIONS - Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. 3.2.12.A4.b – Important REACTIONS - Describe the interactions between acids and bases. 3.2.12.A4.a – REACTIONS - Predict how combinations of substances can result in physical and/or chemical changes. 3.2.12.A4.a - REACTIONS - Apply oxidation/ reduction principles to electrochemical reactions. 11-12.R.S.3 - 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. 11-12.R.S.4 - 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. 11-12.R.S.7 - 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.

Topic: 09 Stoichiometry

Subject(s): Science

Know:	Understand:	Do:
CHEM.B.2.1.1 – Compact Describe the roles of limiting and excess reactants in chemical reactions.	The mole is essential to chemistry, and we use it for chemical calculations.	 3.2.C.A4.e – Essential REACTIONS - Use stoichiometry to predict quantitative relationships in a chemical reaction. 3.2.C.A2.g – Essential STRUCTURE OF MATTER - Use the mole concept
3.2.10.A4.b – Important REACTIONS - Predict the amounts of products and reactants in a chemical reaction using mole relationships.		to determine number of particles and molar mass for elements and compounds.
3.2.10.A5.b – Important UNIFYING THEMES - SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds.		CHEM.B.1.1.1 – Essential Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, molecules, and/or formula units).
What a mole is		Relate the percent composition and mass of each element present in a compound.
How a mole is used Calculations using formulas and chemical		CHEM.B.2.1.2 – Important Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction.
equations Limiting Reagents VOCAB:		CHEM.B.1.2.2 – Important Apply the law of definite proportions to the classification of elements and compounds as pure substances.
mole Avogadro's number molar mass mole ratio STP molar volume stoichiometry percent composition limiting reagent/reactant percent yield		 CHEM.B.2.1.1 - Describe the roles of limiting and excess reactants in chemical reactions. 3.2.10.A4.b - REACTIONS - Predict the amounts of products and reactants in a chemical reaction using mole relationships. 3.2.10.A5.b - UNIFYING THEMES - SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds.

Topic: 09 Stoichiometry

Subject(s): Science

Know:	Understand:	Do:
		 SI.11-12.5 - Communicate and defend a scientific argument. 11-12.W.1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. 11-12.W.1a - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. 11-12.W.1c - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. 11-12.W.1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 11-12.W.1e - Provide a concluding statement or section that follows from and supports the argument presented. 11-12.W.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. 11-12.W.2a - Introduce a topic; organize complex ideas, concepts, and information so that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. 11-12.W.2b - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. 11-12.W.2b - Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. 11-12.W.2d - Use precise language, domain-specific

Topic: 09 Stoichiometry

Subject(s): Science

Know:	Understand:	Do:
		vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. 11-12.W.2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 11-12.W.2f - Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). 11-12.W.8 - 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 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. 11-12.R.S.3 - 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.

Topic: 10 Gases

Subject(s): Science

Know:	Understand:	Do:
Relationships among the properties of gases (pressure, temperature, volume) How to describe a gas according to the kinetic molecular theory. VOCAB: pressure Boyle's Law Charles' Law Gay-Lussac's Law ideal gas ideal gas law Dalton's Law of Partial	 among the gases nperature, ibe a gas the kinetic eory. Law of Partial ypothesis stant cular theory 	 3.2.C.A3.a – Essential MATTER AND ENERGY - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. CHEM.B.2.2.1 – Important Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle's law, Charles's law, Dalton's law of partial pressures, the combined gas law, and the ideal gas law). CHEM.B.2.2.2 – Important Predict the amounts of reactants and products involved in a chemical reaction using molar volume of a gas at STP.
Pressure Avogadro's hypothesis STP absolute zero ideal gas constant kinetic molecular theory		's hypothesis :ero constant olecular theory
		11-12.R.S.4 - 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.

Topic: 11 Solutions

Subject(s):

Days: 15 Grade(s):

Know:	Understand:	Do:	
CHEM.A.1.2.4 – Unranked Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).	Forces between molecules affect solubility.	 CHEM.A.1.2.1 – Important Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating). CHEM.A.1.2.3 - Describe how factors (e.g., temperature, concentration, surface area) can affect solubility. CHEM.A.1.2.4 - Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume). CHEM.A.1.2.5 - Describe how chemical bonding can affect whether a substance dissolves in a given liquid. 3.2.12.A1.a - PROPERTIES OF MATTER - Compare and contrast colligative properties of mixtures. 3.2.12.A1.b - PROPERTIES OF MATTER - Compare and contrast the unique properties of water to other liquids. 11-12.R.S.4 - Determine the meaning of symbols, key terms, and other domain-specific words and 	
CHEM.A.1.2.5 – Compact Describe how chemical bonding can affect whether a substance dissolves in a given liquid.			
3.2.12.A1.b – Compact PROPERTIES OF MATTER - Compare and contrast the unique properties of water to other liquids.			
Like dissolves like		phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	
Factors that Affect Solubility			
VOCAB: dissolve solution solute solvent molarity mass percent percent by volume colligative property			