St. Lucie County Public Schools Chemistry Scope and Sequence 2012-2013

Course: Chemistry 1 Honors **Course Code: 2003350** **Quarter: 1 Unit 1**

Resources	Common Core	Pacing Guide

Topic of Study: Approaches to Science

Standards: N1 – Scientific Practices N2 – Scientific Knowledge N3 – Theories, Models, Laws

Concepts: Lab Safety, Lab procedures and equipment, Math review, Measurement, Theory and Law

Essential Question: What is the relationship between scientific practice, scientific explanations and scientific knowledge?

Key Learning: Science disciplines may differ from one another in what is studied, techniques used, and outcomes sought, but they share a common purpose and philosophy. Scientists construct explanations based on well-reasoned, logical arguments built upon multiple lines of valid scientific evidence using what they already know as a foundation.

Unit 1: 16 days (8 blocks)

NGSSS	Content	Target
SC.912.N.1.2 Describe and explain what characterizes science and its methods. Cognitive Complexity: Moderate	I What are the essential components of laboratory safety? A. Safety equipment in classroom 1. location 2. usage 3. Safety contract B. Chemicals 1. reading chemical labels 2. determining hazards 3. reading MSDS 4. disposing of hazardous chemical C. Proper procedures in lab 1. dress code 2. rules and behaviors 3. accidents and reporting	Describe safety practices in the chemistry laboratory (rules, procedures, and safety symbols). Comply with both oral and written directions during lab. Assess risk of chemical using labeling clues. Recognize that different types of wastes are disposed of in specific ways. Value the need for safety during lab by way of required dress code. Explain the need for safety contract.
SC.912.N.1.2 Describe and explain what characterizes science and its methods. Cognitive Complexity: Moderate SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), Cognitive Complexity: High	II How are various types of equipment useful in the laboratory? A. Scales 1. measuring on triple beam 3. proper moving procedures 4. proper storage B. Glassware 1. use and measuring 2. reading the meniscus For: a. beaker b. flasks c. graduated cylinders C. Burners and hot plates 1. proper use 2. proper moving procedures 3. proper storage III How do we use lab equipment to make accurate and precise measurements? A. Accuracy 1. determined by equipment 2. determined from measurements	Distinguish between different volumetric glassware based on relevancy. Demonstrate proper lighting and extinguishing of gas burner. Demonstrate proper transfer of chemicals from container to scale. Demonstrate accurate measurement reading from scales, thermometers and graduated cylinders. Restate the definitions of accuracy and precision. Illustrate the major difference between accuracy and precision in measurement Apply significant figures and rounding to reflect the certainty of data. Calculate and determine the % error of the data.

SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), Cognitive Complexity: High	B. Precision 1. significant figures 2. reflects accuracy in calculations using measured data. IV How can the accuracy of the experimental results be determined and interpreted? A. Error 1. determine accuracy from equipment 2. interpret accuracy of experimental results	Calculate using rules of significant figures and measurement data. Collect and organize data in charts, tables, and graphics. Collect and organize data in charts, tables, and graphics. Calculate theoretical values to use to determine percent error of given data.
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. pose questions about the natural world, 5. plan the investigation, 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), 10. communicate results of scientific investigations, 11. evaluate the merits of the explanations produced by others. Cognitive Complexity: High	V How is numerical data converted between units, and how can we express and calculate using very large or small numbers? A. Scientific Notation 1. placing numbers into notation 2. multiplying and dividing with scientific notation B. Standard system of measurement 1. units for length, volume, mass, time, energy 2. prefixes – kilo-, deci-, centi-, milli- VI. How can an equation be altered to solve for different variables? A. Density 1. solve for different variable 2. units of density	Convert between units in standard system. Write numbers in scientific notation, and use scientific notation in calculations. Demonstrate the ability to change an equation to solve for a different variable. Determine tools and methods that should be used to collect valid data to determine density. Determine how data will be collected to analyze the data. Determine appropriate and consistent standards of measurement for the data to be collected in the experiment. Produce lab report which includes, question and hypothesis, data, conclusions and error analysis
Vocabulary: accuracy, precision, theoretical yield, experimental yield, percent error, percent yield, inferring, empirical evidence, investigation, dependent and independent variables, mass, volume, density,		
SC.912.N.2.1 Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). Cognitive Complexity: High SC.912.N.2.2 Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion. Cognitive Complexity: High SC.912.N.2.3 Identify examples of pseudoscience (such as astrology, phrenology) in society. Cognitive Complexity: Low	VII How does science impact society? A. Science 1. explain natural phenomena 2. new information impact 3. characteristics 4. does not answers all problems B. Compare to pseudoscience and non-science 1. similarities 2. differences 3. socially relevant questions not investigated by science 4. arts, philosophy, religion	Explain that scientific knowledge is fluid – ever changing as new evidence is encountered. Distinguish science from other activities involving thought.

SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. Cognitive Complexity: High		
Vocabulary: inferring, empirical evidence, philosophy		
SC.912.N.3.1 Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. Cognitive Complexity: High SC.912.N.3.3 Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. Cognitive Complexity: Moderate SC.912.N.3.4 Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions. Cognitive Complexity: Moderate	VII What is the relationship between a theory and a law A. Theories a. reflect scientific explanations b. effect of new evidence B. Laws a. illustrate the patterns of the natural world b. describe phenomena	Distinguish a scientific theory from a hypothesis. Understand that theories change as new evidence becomes available. Distinguish a scientific theory from a scientific law. Assemble the path required for theories to form.
Vocabulary: law, theory, hypothesis, guess, prediction		Unit 1 – 16 days 8 block periods

Suggested Laboratories for Unit 1	Title	Lab Type	Resources: **P**-Pearson Textbook **G**-Glencoe Textbook **H**-Holt Textbook Reference pages
SC.912.N.1.1 Scientific Method	Bubbles	Quick Lab	P – page 17
	Developing Observation Skills	Mini Lab	G – page 15
SC.912.N.1.1 Density	Thickness of Aluminum Foil	Quick Lab	H – page 18
	Density of an Irregular Solid	Mini Lab	G – page 28

St. Lucie County Public Schools Chemistry Scope and Sequence 2012-2013

Course: Chemistry 1 Honor **Course Code: 2003350** **Quarter: 1 Unit 2**

Topic of Study: Atomic Structure

Standards: P8 – Matter P10 – Electromagnetic Energy L15 – Evolution and Radioactivity

Concepts: Atomic Theory, Atomic Structure, Radioactivity, Quantum Theory

Essential Question: How did development of atomic theory lead to an understanding of the structure and behavior of matter?

Key Learning: An understanding of atomic structure is essential to the study of chemistry.

Unit 2: 18 days (9 blocks)

NGSSS	Content	Target
SC.912.P.8.3 Explore the scientific theory of atoms(also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence. Cognitive Complexity: High SC.912.N.2.4 Describe how data and knowledge was shared and interpreted by various scientists over time to lead to the atomic theory. **(restated for this unit)** Cognitive Complexity: High SC.912.N.2.5 Describe how the backgrounds, talents, interests, and goals of a scientist impacted their interpretation and explanations of scientific discoveries. Cognitive Complexity: High	I How have atomic theories led to our understanding of atomic models? A. Historic Atomic Theories 1. Democritus 2. Dalton B. Historic Atomic Models 1. Thomson's Plum Pudding 2. Rutherford's Nuclear a. gold-foil experiment 3. Bohr's Planetary C. Changes through time 1. new technologies 2. influenced by the background of atomic theorists 3. new investigative techniques	Compare and contrast the atomic theories of Democritus and Dalton Sketch the three historic models with labels Understand how the experimental evidence supported Thomson's, Rutherford's and Bohr's models.
Vocabulary: atom, atomos, definite proportions, indivisible, proton, electron, nucleus, photon		
SC.912.P.8.4 Explore the scientific theory of atoms by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom. Cognitive Complexity: High SC.912.P.8.5 Relate properties of atoms and their position in the periodic table to the arrangement of their electrons. Cognitive Complexity: Moderate	II What is the arrangement and properties of the subatomic particles within the Bohr model? A. Protons 1. mass 2. electrical charge 3. location B. Electrons 1. mass 2. electrical charge 3. location C. Neutrons 1. mass 2. electrical charge 3. location D. Atomic properties 1. atomic number 2. mass number 3. neutrality 4. isotope 5. average atomic mass	Distinguish between the subatomic particles. Examine the importance of both Moseley and Millikan experiments to current atomic theory. Describe the role of atomic number in determining the identity of an atom and element. Examine the relationship of atomic number and mass number to isotopes of an element. Use atomic number and mass number to determine isotopes of elements. Calculate average atomic mass from isotopic data for an element.

	E. Periodic Table – arranged by 1. number of protons 2. number of valence electrons	Describe the role of atomic number in determining the identity of an atom Describe the organization of elements on the periodic table
Vocabulary: electron cloud, atomic number, average atomic mass, mass number, isotope, electron spectrum, valence electrons, weighted average		
SC.912.P.10.18 Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, energy, and frequency and relate them to phenomena and applications. Cognitive Complexity: High **NOTE**:	III What is the electromagnetic spectrum? A. Wave functions 1. wavelength 2. frequency 3. energy B. application to Bohr's Hydrogen spectrum data **Provides background for quantum theory.**	Diagram wave functions and differentiate its parts. Contrast continuous electromagnetic spectra and atomic emission spectra. Explain how a vibrating charge produces an electromagnetic wave. Interpret the relationships among electromagnetic quantities.
Vocabulary: crest, trough, amplitude, wavelength, frequency,		
SC.912.P.10.9 Describe the quantization of energy at the atomic level. Cognitive Complexity: Moderate SC.912.P.10.9 Describe the quantization of energy at the atomic level. Cognitive Complexity: Moderate	IV How does electron configuration illustrate electron placement using the quantum model? A. Energy at the atomic level 1. Matter can gain or lose energy only in small, specific amounts 2. A quantum is the smallest amount of energy that can be gained or lost by an atom B. Electron Cloud Theory 1. valence electrons a. electron arrangement b. quantum numbers i. n = shell (level) ii. l = sublevel (state) iii. m = orbital iv. s = spin 3. orbital fill diagrams 4. Lewis dot structures for atoms	Define a quantum of energy Devise the relationship between a quantum to an energy change of matter Compare the Bohr and quantum mechanical models of the atom. Explain the relationships among a hydrogen's energy levels, sublevels, and atomic orbitals. Locate the four blocks of the periodic table based on electron configuration. Construct an electron configuration using the four blocks located on the periodic table. Apply the Pauli's exclusion principle, the Aufbau principle, and Hund's rule to write electron configuration notation. Predict electron placement in orbitals for an element using its electron configuration.
Vocabulary: electron configuration, energy level, shell, orbital, quantum, exclusion principle, aufbau principle, Hund's rule		
The placement of the nuclear chemistry section after the subatomic particles is left to the teacher who is the best judge of sequencing of these sections for the students.		

SC.912.P.10.10 Compare the magnitude and range of the four fundamental forces Cognitive Complexity: Moderate SC.912.P.10.11 Explain and compare nuclear reactions the energy changes associated with them and their associated safety issues. Cognitive Complexity: High SC.912.L.15.2 Recognize that radioactivity is caused by a break-down of atomic nuclei. (restated for this unit) Cognitive Complexity: Moderate SC.912.N.3.2 Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. Cognitive Complexity: Moderate . SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically- based perspective to inform society's decision making. Cognitive Complexity: Moderate SC.912.N.4.2 Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. Cognitive Complexity: High SC.912.L.17.11 Evaluate the costs and benefits of renewable and nonrenewable resources for energy. **(restated for unit**) Cognitive Complexity: High	V What are the different ways that the atomic nucleus can change? A. Four Fundamental Forces 1. magnitude and range for: a. gravitational b. electromagnetic c. weak nuclear d. strong nuclear B. Theory of Radioactivity 1. half-life 2. radiation 3. experiments with uranium ore and/or alpha rays from radium C. Nuclear reactions 1. radioactive decay 2. fission 3. fusion 4. safety and ethical issues a. include Chernobyl, Three Mile Island, Fukushima, Hiroshima 5. Benefits a. fuel for electricity generation b. medicine	Describe the four fundamental forces Compare and contrast the magnitude and range of the four fundamental forces Analyze how the theory of radioactivity used experimental evidence of Curies, Becquerel, Soddy, and Rutherford. Determine the amount of radioactive material remaining after a certain amount of time or certain number of half-lives. Compare the penetrating ability of the different types of radiation both particle and energy. Write nuclear equations containing alpha, beta and gamma radiation. Relate conservation of matter to nuclear equations. Predict products of alpha and beta decay reactions.

Vocabulary: radioactivity, radioisotope, half-life, fission, fusion, alpha particle, gamma radiation, beta particle, heavy water, isotopic tracers, nuclear stability

Unit 2 – 18 days
9 block periods

Suggested Laboratories for Unit 2	Title	Lab Type	Resources: **P**-Pearson Textbook **G**-Glencoe Textbook **H**-Holt Textbook Reference pages
SC.912.P.10.18 Electron Spectra	Flame Tests	Quick Lab	P – page 142
	Flame Tests	Mini Lab	G – page 125
SC.912.P10.11 Radioactivity	Radioactivity & Half-Lives	Small Scale	P – page 887
	Modeling Radioactive Decay	Mini Lab	G – page 819
	Half-Lives & Pennies	Start Up	H – page 641

St. Lucie County Public Schools Chemistry Scope and Sequence 2012-2013

Course: Chemistry 1 Honors **Course Code: 2003350** **Quarter: 1 Unit 3**

Topic of Study: Periodicity

Standards: P8 – Matter

Concepts: Periodic Law, Periodic Trends, Metals and Nonmetals

Essential Question: How does the periodic table predict the properties and behavior of elements?

Key Learning: The development of the periodic table has led to a better understanding of the relationship between elemental trends and properties

Unit 3: 12 days (6 blocks)

NGSSS	Content Limits	Target
SC.912.P.8.5 Relate properties of atoms and their position in the periodic table to the arrangement of their electrons. Cognitive Complexity: Moderate	I What can we learn about an element based on its position in the periodic table? A. Periodic Table 1. Discovery 2. Rearrangements 3. Organization a. groups or families b. periods 4. Element nomenclature and symbol B. Valence electrons 1. s, p, d, f blocks 2. groups and configuration 3. energy levels and periods C. Metals, Nonmetals, Metalloids 1. definition a. Octet rule 2. location 3. characteristics and properties 4. Metallic bonding a. electron sea	Explain Mendeleev's method of organizing the elements in his table. Analyze the contributions of Moseley and Seaborg to the Periodic Table's rearrangement. Identify location of groups and periods on the Modern Periodic table. Describe how elements are named and symbols are determined. Describe the organization of elements on periodic table. Determine location of element by its orbital and amount of valence electrons Discuss the varies placements of the elements hydrogen and helium. Indicate the location of metals, nonmetals, and metalloids Use the Octet Rule to define metals and nonmetals. Compare properties of metals and nonmetals. Explain how delocalized electrons produce metallic bonding in metals.
Vocabulary: alkali metals, alkaline earth metals, halogens, lanthanide/actinide series, metalloids, noble gases, transition metals, period, Mendeleev, Moseley, Seaborg, periodic groups, Octet Rule, electron sea, metallic bonding, delocalized electrons		
SC.912.P.8.5 Relate properties of atoms and their position in the periodic table to the arrangement of their electrons. Cognitive Complexity: Moderate	II How do periodic trends relate to the electron structure of an element? A. Periodic trends – in a group 1. Atomic radius 2. Ionization Energy	Determine the change in atom size within a group or period. Describe the affects of shielding and energy levels on atomic size.

	3. Electronegativity 4. Electron affinity B. Periodic trends – in a period 1. Atomic radius 2. Ionization Energy 3. Electronegativity 4. Electron affinity C. Ion Formation 1. within a group 2. within a period 3. ionic size	Arrange based on similarities within a group and/or period the trends of ionization energy, electron affinity and electronegativity. Apply the Octet Rule to determine charge of the representative elements. Predict the ionic charges based on an element's position on the periodic table. Organize the change in ion charge within the A groups as you move from left to right on periodic table. Compare the size of metals to their ions. Compare the size of nonmetals to their ions.

Vocabulary: periodic law, atomic radius, ionic radius, ionization energy, electronegativity, electron affinity, representative elements

Unit 3 – 12 days
6 block periods

Suggested Laboratories for Unit 3	Title	Lab Type	Resources: **P**-Pearson Textbook **G**-Glencoe Textbook **H**-Holt Textbook Reference pages
SC.912.P.8.5 Periodic Table	Periodic Trends in Atomic Radii	Quick Lab	P – page 180
	Periodicity in Three Dimensions	Small Scale	P – page 184
	The Mendeleev Lab in 1869	Skills Lab	H – page 778
	Periodicity of Molar Heats	Mini Lab	G – page 164

End of First Quarter – 45 days

Unit 4 – Nature of Science is next. It is to be used throughout the first quarter and the remaining three quarters.

Course: Chemistry 1 Honors **Course Code: 2003350** **Quarter: 1 Unit 4**

Topic of Study: Experimental Design

Standards: N – Nature of Science

Concepts: Pose a Question, Conduct Research, Develop a Hypothesis, Design the Experiment, Collect and Analyze Data, Draw Conclusions, Communicate Results

Essential Question: What influence does the scientific method have on the practice of science?

Key Learning: Scientists conduct investigations for a wide variety of reasons. The practice of science is a multifaceted activity employing certain principles scientists use to guide scientific research and experimentation.

NGSSS	Content	Target
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: chemistry and do the following 1. pose questions about the natural world, 2. conduct systematic observations, 3. examine books and other sources of information to see what is already known, 4. review what is known in light of empirical evidence, Cognitive Complexity: High SC.912.N.1.2 Describe and explain what characterizes science and its methods. Cognitive Complexity: Moderate	I How can I use prior empirical evidence to develop a testable question? A. Develop the Question 1. Safety precautions, equipment need, cost, school rules 2. identification of variables, topic interest, availability of research 3. prior empirical evidence B. Conduct research 1. Develop research questions a. key words from testable question as a guide for your search b. questions on prior empirical evidence. 2. keep continual bibliography a. use books, journals, periodicals b. online reputable websites – educational, periodicals, organization c. possible sources – writing companies, organization, or local scientists d. information is used in reporting your experiment.	Define a scientific problem or question based on the specific body of knowledge correlated to chemistry. Explain the difference between an experiment and other types of scientific investigations. Recognize systematic inference as one form of scientific investigation. Use appropriate reference materials to support scientific investigations of various types, such as systematic observation or experiments. Describe the creative means scientists must use to design an investigation. Explain that science is based on evidence based facts.
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: chemistry and do the following 5. plan investigations, 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data, tables, and graph 8. generate explanations that explicate or describe natural phenomena (inferences), 9. use appropriate evidence and reasoning to justify these explanations to others,	II How does a hypothesis reflect the relationship between my independent and dependent variable? A predict 1. use research collect to help 2. contain the variables 3. must be testable a. measure what you do b. measure what will happen	Develop a hypothesis with one independent variable (tested variable). Distinguish between dependent variables (outcome variable), independent variables (tested variable), controls, and variables that are held constant in a variety of activities. Develop hypotheses and determine what data should be collected to test

10. communicate results of scientific investigations, and 11. evaluate the merits of the explanations produced by others. Cognitive Complexity: High		Explain why scientific investigations should be replicable. Conduct, discuss, and compare similar investigations by working cooperatively in groups. Distinguish the difference between a scientific law and theory vs. a societal law.
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: chemistry and do the following 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data, tables, and graph Cognitive Complexity: High	III How can I use experiment ? A. Design the Experiment 1. procedures and materials 2. technology and math a. measurement in metric 3. Groups – experimental and control 4. number of trials or sample size B. Conduct the Experiment 1. follow your design 2. record a. quantitative – data in chart or table b. qualitative – detailed notes throughout the experiment c. potential problems or procedural adjustments	Determine tools and methods that should be used to collect valid data. Determine how data will be collected to analyze the data. Determine appropriate and consistent standards of measurement for the data to be collected in a survey or experiment. Calculate and determine the % error of the data.
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: chemistry and do the following 7. pose answers, explanations, or descriptions of events, 8. generate explanations that explicate or describe natural phenomena (inferences), 9. use appropriate evidence and reasoning to justify these explanations to others, 10. communicate results of scientific investigations, and 11. evaluate the merits of the explanations produced by others Cognitive Complexity: High	IV How does my data impact what I predicted? A. Analyze Data 1. examine data mathematically a. percentages, means, median, range and mode b. average your trials 2. Graphing a. labeling axes x- axis(independent variable) y-axis (dependent variable) B. Draw Conclusion 1. Explanations a. what you learned b. data collected c. support/lack of support for hypothesis d. evaluation of procedures and equipment e. discuss ideas or further testing	Present individual or group data after a scientific investigation, analyze the evidence, and reach a class consensus. Justify conclusions based upon all the available evidence, not on expressed opinions. Collect, organize, and analyze data sets. Determine the best format for the data as: bar graphs, line graphs, scatter plots, cumulative frequency graphs.
Vocabulary: independent variable, dependent variable, hypothesis, inference, predict, data, x-axis, y-axis		
SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the	V. What is the role of the scientist? Educational training Interests Work ethic Peer Reviewer	Identify that a scientist's interest and educational background influence their research. Understand that variations in both

active consideration of alternative scientific explanations to explain the data presented. Cognitive Complexity: Low SC.912.N.2.5 Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. Cognitive Complexity: High		personal and educational background are essential when researching a topic. Understand that all scientific discoveries are put through strict peer review by scientists in the same field.
SC.912.N.2.1 Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). Cognitive Complexity: High SC.912.N.2.3 Identify examples of pseudoscience (such as astrology, phrenology) in society. Cognitive Complexity: Low SC.912.N.2.2 Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion. Cognitive Complexity: High	VI What science cannot answer? 1. Difference between a. science and art b. science and philosophy 2. Pseudoscience vs. Science a. astronomy vs. astrology b. organic chemistry vs. organic food c. pharmaceutical vs. homeopathic	Describe the creative means scientists must use to design an investigation. Explain that science is based on evidence based facts and not opinions. Differentiate between science and pseudoscience. Identify how pseudoscience can mislead people based on the information presentation.
SC.912.N.1.5 Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. Cognitive Complexity: Moderate SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. Cognitive Complexity: High	VII How is scientific knowledge presented throughout time? 1. Theories 2. Laws 3. Models a. Visual/Physical b. Conceptual c. Mathematical d. Benefits e. Limitations 4. Must be replicable by other scientists around the world	Explain why scientific investigations should be replicable. Justify conclusions based upon all the available evidence, not on expressed opinions. Distinguish the difference between a scientific law and theory vs. a societal law. Describe the role consensus plays in the historical development of a theory in chemistry.

SC.912.N.3.1 Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. Cognitive Complexity: High SC.912.N.3.2 Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. Cognitive Complexity: Moderate SC.912.N.3.3 Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do no to offer explanations for those relationships. Cognitive Complexity: Moderate SC.912.N.3.4 Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions. Cognitive Complexity: Moderate SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. Cognitive Complexity: Moderate		
SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically- based perspective to inform society's decision making. Cognitive Complexity: Moderate SC.912.N.1.7 Recognize the role of creativity in constructing scientific questions, methods and explanations. Cognitive Complexity: Low SC.912.N.4.2 Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. Cognitive Complexity: High	VIII How science affects our society? 1. Technology based on scientific theories 2. Environmental concerns a. hazardous waste b. air quality c. petroleum products d. drilling and mining	Give examples of how advances in technology have affected scientific theories and laws. Describe the effects of technology on environmental quality.

NOTE: This unit is used continuously through the quarter and for the remaining 3 quarters.