Chemistry Scope and Sequence 1st Quarter 2017-2018

HOP: Habits of Practice

Practice 1: Asking Questions/Defining Problems
Practice 2: Developing and Using Models
Practice 3: Planning/Carrying Out Investigations
Practice 4: Analyzing/Interpreting Data
Practice 5: Using Math & Computational Thinking
Practice 6: Constructing Explanations/Designing Solutions
Practice 7: Engaging in Argument from Evidence
Practice 8: Obtaining/Evaluating/Communicating Info
Practice 9: Metacognition

Sequence of Concepts	Rationale for Sequence	Prior Knowledge
Syllabus/Lab Safety	Students should understand the requirement for the specific teacher's class as well as lab safety rules prior to beginning the course.	
Investigate the characteristic properties of matter. • differentiate between elements, compounds, and mixtures. • investigate the methods for separation of mixtures • identify chemical and physical properties of matter as well as the difference between chemical and physical changes.	After students understand the make-up of the atom and its various attributes, they can more easily understand why elements behave in different ways.	• Density • Flammability • Solubility • Reactivity • Chemical change • Physical change • Phase changes
Apply the kinetic molecular theory to describe solids, liquids, and gases. • describe the difference in spacing, energy of particles, shape, and volume between the three states of matter and in phase changes. • understand the relationship between temperature and kinetic energy, specifically in gases.	With a clear understanding of how scientists describe the characteristics of matter as well as knowledge of what makes a substance an element, compound or mixture, students can investigate why substance exist as solids, liquids or gases at room temperature.	• Kinetic energy • Temperature • Heat • Potential Energy • Expansion versus contraction • Phase changes •
Investigate characteristics associated with the gaseous state. • given temperature, pressure and/or volume, predict the impact of a change in one variable on the others.	After a basic introduction to gases, students can study the behaviors of gas in more depth.	• Volume • pressure
Discuss phase diagrams of one-component systems. • interpret phase diagrams and heating and cooling curves. • predict the impact of a change in temperature and pressure on the state of matter and possible phase change.	A fundamental understanding of the three states of matter allows students to analyze the transitions between phases as they relate to temperature and pressure.	• Included in prior sections
Explore the interactions between matter and energy.	Students have investigated the impact of temperatures and pressure on the states of	• Exothermic • Endothermic

• compare and contrast exothermic and endothermic changes in regards to chemical and physical changes • explore the calorimetry equation and specific heat capacity • interpret potential energy diagrams for both exothermic and endothermic reactions.	matter and now can look at the impact of adding or losing energy on phase changes as well as in chemical reactions.	

Websites Utilized:
Teacher Notes

Chemistry Scope and Sequence 2st Quarter 2017-2018

HOP: Habits of Practice

Practice 1: Asking Questions/Defining Problems
Practice 2: Developing and Using Models
Practice 3: Planning/Carrying Out Investigations
Practice 4: Analyzing/Interpreting Data
Practice 5: Using Math & Computational Thinking
Practice 6: Constructing Explanations/Designing Solutions
Practice 7: Engaging in Argument from Evidence
Practice 8: Obtaining/Evaluating/Communicating Info
Practice 9: Metacognition

Sequence of Concepts	Rationale for Sequence	Prior Knowledge
Compare and contrast historical models of the atom • Study the models of Dalton, Thomson, Rutherford, Bohr and the quantum mechanical models of the atom. • Understand the key experiments that led to these models including cathode ray tube and gold foil experiments.	Studying the progression of historical knowledge of the atom enables students to grasp how this knowledge has changed over time and to see that our understanding of the atom is ever-changing and still evolving.	• Subatomic particles (proton, neutron, electron) • Metals, nonmetals, metalloids • Bohr model • Nucleus • Energy levels
Describe an atom in terms of its composition and electron characteristics. • use the periodic table (PT) to identify the number of protons, electrons and neutrons for a given isotope. • determine the electron configuration of an atom. • use the PT to predict valence shell electrons and ion formation of main block/representative elements. • understand the concept of average atomic mass and perform calculations to determine this given isotope masses and abundances.	A deep understanding of the atom is fundamental to understanding chemistry; reactions, states of matter, ionization, and bonding are all connected to the structure of the atom.	• Atomic number • Mass number • Isotopes
Analyze chemical and nuclear reactions. • predict the products of alpha and beta decay • describe the three types of radioactive decay and their energy/penetrating power (alpha, beta, gamma) • apply the concept of half-life to various scenarios.	Students have studied those chemical changes that are caused by the rearranging of bonds to make new chemicals. The next step is to study the chemical changes that occur when an unstable atom undergoes radioactive decay.	• Decay • Radioactivity • Radiation
Analyze the organization of the modern periodic table • explain the rationale for the organization of the PT.	Once students understand the make-up of atoms, they can build on this knowledge to explain the organization of the periodic table as well as the trends of atomic characteristics.	• Families/columns/rows of periodic table • Physical versus chemical properties

• predict chemical and physical properties of given atom type based on the element's location on the PT. • use the PT to predict the trends of atomic radius, ionization energy, and electronegativity.		

Websites Utilized:
Teacher Notes

Chemistry Scope and Sequence 3rd Quarter 2017-2018

HOP: Habits of Practice

Practice 1: Asking Questions/Defining Problems
Practice 2: Developing and Using Models
Practice 3: Planning/Carrying Out Investigations
Practice 4: Analyzing/Interpreting Data
Practice 5: Using Math & Computational Thinking
Practice 6: Constructing Explanations/Designing Solutions
Practice 7: Engaging in Argument from Evidence
Practice 8: Obtaining/Evaluating/Communicating Info
Practice 9: Metacognition

Sequence of Concepts	Rationale for Sequence	Prior Knowledge
Investigate chemical bonding. • draw Lewis Dot structures for atoms, ions, and simple covalent molecules and polyatomic ions. • name and predict the formulas of simple covalent and ionic compounds based on IUPAC rules given a periodic table and sheet of common polyatomic ions • describe the difference in the bonding and electron behavior in covalent and ionic compounds. • recognize the chemical formulas that represent an acid or a base and identify how these are indicated by phenolphthalein and litmus.	Based on their understanding of the atom, students can now use this knowledge to predict how atoms behave in compounds and to analyze the differences in covalent and ionic compounds as well as how they form.	• Bonding • Covalent compounds • Ionic Compounds
Explore the mathematics of chemical formulas and equations • calculate the empirical formula, percent composition of covalent and ionic compounds. • determine molar mass of a compound • perform gram to mole, gram to particle, gram to L calculations.	After developing an understanding of the differences between covalent and ionic compounds, students can determine formulas given percentage compositions and can calculate make-up by percent given formulas.	• Percentage • Chemical formula
Explain the law of conservation of mass/energy. • demonstrate the law of conservation of mass. • balance chemical equations • identify the five major types of chemical reactions (composition, decomposition, single replacement, double displacement, combustion) • predict the products of these types of reaction when provided reactants.	When students understand the fundamental types of elements and compounds, they can now develop an understanding of how they interact in chemical reactions in given ratios that demonstrate that atoms are not created or destroyed.	Definitions of: • Mass • Conservation • law • energy

Websites Utilized:
Teacher Notes

Chemistry Scope and Sequence 4st Quarter 2017-2018

HOP: Habits of Practice

Practice 1: Asking Questions/Defining Problems
Practice 2: Developing and Using Models
Practice 3: Planning/Carrying Out Investigations
Practice 4: Analyzing/Interpreting Data
Practice 5: Using Math & Computational Thinking
Practice 6: Constructing Explanations/Designing Solutions
Practice 7: Engaging in Argument from Evidence
Practice 8: Obtaining/Evaluating/Communicating Info
Practice 9: Metacognition

Sequence of Concepts	Rationale for Sequence	Prior Knowledge
Explore the mathematics of chemical formulas and equations. • identify and solve stoichiometry problems that interconvert volume of gases at STP, moles, and mass. • apply the concepts of percent yield and percent error to evaluate lab results. • understand the concept of limiting and excess reagents.	Once a student can balance and identify a chemical reaction, he can use the mole-ratios from the balanced equation in stoichiometry to solve between reagents.	• Chemical reaction • Chemical equation • Ratios • Factor-label or dimensional analysis method
Apply the kinetic molecular theory to describe solids, liquids, and gases • explain the effects of pressure changes on the volume of a gas • solve complex combined and ideal gas law problems to quantitatively explain the behaviors of gases • describe the behavior of an ideal gas	Students should have a solid understanding of the moles concept, so they can now apply this concept to complete complex calculations involving the combined and ideal gas laws to deepen their understanding of how gases behave.	• Gas • Mole • Isolation of the variable
Investigate the characteristic properties of matter. • describe solutions, solute, solvent • calculate concentrations of solutions in molarity, ppm, percent composition • investigate the uses of molarity in stoichiometric calculations.	In order to further grasp how chemists measure and calculate stoichiometric yields, students learn about how the concentrations of solutions are calculated and used in chemical problem-solving.	• Solution • Solute • Solvent • Concentration • Percent

Websites Utilized:
Teacher Notes