Unit	Title
Unit 1	Scientific and Quantitative Principles
Unit 2	Particle Composition of Matter
Unit 3	Changes of Matter
Unit 4	Elements and the Periodic Table
Unit 5	Atomic Structure
Unit 6	Nuclear Chemistry
Unit 7	Electron Arrangement and Quantum Model
Unit 8	Periodic Properties
Unit 9	Ionic Compounds
Unit 10	Molecular Compounds
Unit 11	Moles
Unit 12	Reactions
	Semester 2
Unit 13	Stoichiometry
Unit 14	States of Matter
Unit 15	Thermodynamics
Unit 16	Gases
Unit 17	Solutions
Unit 18	Acids and Bases
Unit 19	Kinetics
Unit 20	Equilibrium

HS Science District Instructional Guides 2019

Course Name: Chemistry		**Quarter/Pacing: 1, Week 1-2**			
Unit Title: 1 Scientific and Quantitative Principles		**Essential Questions:** **1. What are the different types of measurements or observations?** **2. What are the different types of relationships between variables**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2**: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Understand similarities/differences in decimal and scientific notation. a) Convert between decimal and scientific notation. b) Perform calculations using decimal and scientific notation. B. Understand significant figures as a measure of precision in measurement. a) Determine the number of significant figures in a measurement b) Convert a value to a specific number of significant figures. c) Determine the correct number of significant figures for a calculated value. C. Classify measurements as quantitative or qualitative and as objective or subjective. D. Understand the concept of variable in science.	Measurement Variable Objective Subjective Qualitative Quantitative Direct relatiionship Positive Relationship Inverse Relationship Negative Relationship	Measurement Lab Graphing Lab	

HS Science District Instructional Guides 2019					
Course Name: Chemistry		**Quarter/Pacing: 1, Week 2-3**			
Unit Title: 2 Particle Composition of Matter		**Essential Questions:** **1. What are the three types of chemical particles?** **2. What are the classifications of matter?** **3 . What happens in a chemical change at the particle level?**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Know the definition of matter. B. Know the three basic principles of the kinetic molecular theory of matter. i) Matter is made up of particles. ii) The particles are always moving. iii) The particles are attracted to each other. C. Know the definition of temperature and be able to convert between Celsius and Kelvin units. D. Know the classification system for the different types of matter and the relevant definitions at the particle level: i) Pure substance and mixture ii) Homogeneous and heterogeneous mixtures iii) Elements and Compounds E. Know the three types of chemical particles: atom, molecule, ion. F. Understand the concept of a chemical formula for a particle and determine the composition of a particle from the chemical formula.			

HS Science District Instructional Guides 2019					
Course Name: Chemistry		**Quarter/Pacing: 1, Week 4-5**			
Unit Title: 3 Changes of Matter		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2**: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. Plus HS+C.P1U1.7 Use mathematics and computational thinking to determine stoichiometric relationship s between reactants and products in chemical reactions.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the difference between physical and chemical changes of matter at the particle level. B. Know the characteristics of the common three states of matter. C. Understand the concept of a chemical equation for both a physical and chemical change. D. Know the different parts and notations of chemical equations: i) reactants ii) products iii) arrow signifying change iv) states of particles given in parentheses E. Understand Lavosier's Law of Conservation of Matter. F. Understand, balance, and predict chemical equations for one type of chemical reaction- combustion. G. Perform dimensional analysis calculations using a balanced chemical equation as a set of conversion factors for calculating the number of each type of particle involved in a specific reaction.		Combustion Lab Changes in Matter Lab	

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 4 Periodic Chart		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.1** Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the organization of the periodic chart based on atomic number and chemical properties. B. Know the properties of the three classes of elements (metals, nonmetals, metalloids) and their relative position on the periodic chart. C. Be able to assign an element to one of the three classes based on the elements position on the periodic chart. Know the hydrogen is the exception. D. Understand the group numbers designated A. E. Know the elements associated with the terms: i) alkali metals ii) alkaline earth metals iii) halogens iv) noble gases v) transitional metals F. Determine the formula mass of a particle based on the chemical formula.		Imaginary Periodic Chart	

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 5 Atomic Structure		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.1** Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. **Plus HS+C.P1U1.1** Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect the identity, stability, and properties of the element. **Plus HS+C.P1U1.2** Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Identify and describe the characteristics of the three subatomic particles. B. Determine the number of protons and electrons in a particle based on the chemical formula. C. Understand the concept of an isotope and interpret the two forms of isotope notation. D. Determine the number of protons, electrons, neutrons, and mass of a particle based on the chemical formula. E. Understand the concepts underlying the four key historical models of the atom. i) Dalton's ii) Thomson's iii) Rutherford's iv) Bohr's F. Understand the relationship between frequency, wavelength, and energy of light. G. Interpret atomic spectra data of elements.		Imaginary Periodic Chart	

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 6 Nuclear Chemistry		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications . **Plus HS+C.P1U1.1** Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect the identity, stability, and properties of the element. **Plus HS+C.P1U3.8** Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of fission, fusion, and radioactive decay.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand factors affecting the stability of the nucleus. B. Know the three types of radioactivity and the associated nuclear changes: i) Alpha ii) Beta iii) Gamma C. Be able to write nuclear reactions for alpha and beta radiation. D. Understand the biological effects of radiation. E. Understand the concept and requirements for nuclear fission. F. Be able to write nuclear reactions for nuclear fission. G. Understand the problems associated with power generated from nuclear fission.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 7 Electron Arrangment and the Quantum Model		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. Essential HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. Plus HS+C.P1U1.1 Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect the identity, stability, and properties of the element. Plus HS+C.P1U1.2 Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation. .	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the underlying concept of the quantum model - electrons as waves and not localized particles. B. Understand the concept of an orbital as defined by the quantum model. C. Understand the four variables that define the movement of electrons around an atom. i) energy level ii) orbital shape iii) orientation iv) spin D. Understand the three principles that govern the arrangement of electrons in an atom. i) Aufbau Principle ii) Pauli Principle iii) Hund's Rule E. Diagram the electron arrangement of an atom or ion containing up to a 38 electrons with an electron configuration diagram. Exceptions to the general Aufbau series are excluded. F. Describe the movement of a single electron in an electron configuration diagram based on the four variables of the quantum model. G. Be able to relate the electron arrangement of atoms predicted by the quantum model to the periodic chart. H. Be able to write the complete electron notation or the Noble gas notation for an atom or ion. Exceptions to the general Aufbau series are excluded.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 8 Periodic Properties		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. Essential HS.P1U1.1 Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. Plus HS+C.P1U1.1 Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect the identity, stability, and properties of the element. Plus HS+C.P1U1.2 Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation. .	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the concept of electronegativity (EN). B. Know the elements with the highest and lowest EN values, and be able to predict relative EN values based on an element's position on the periodic chart. C. Define the concept of atomic radius, and know its relationship to EN. D. Be able to predict relative atomic radius values based on an element's position on the periodic chart.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 9 Ionic Compounds		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.1** Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. **Essential HS.P1U1.2** Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. **Plus HS+C.P1U1.1** Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect the identity, stability, and properties of the element. **Plus HS+C.P1U1.2** Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the “Octet Rule”. B. Predict the composition and chemical symbol for the stable ions of group 1a-7a elements. C. Understand the naming system for ions and be able to name ions based on their chemical symbol. D. Know the special naming system for ions of multivalent elements. E. Understand the concepts of ionic compound and ionic bonds. F. Be able to determine if a compound is ionic or not based on the chemical formula. G. Be able to predict the chemical formula for an ionic compound based on its chemical name. H. Be able to determine the chemical name of an ionic compound based on its chemical formula. I. Understand the concept of polyatomic ions, and be able to predict chemical formulas or chemical names of ionic compounds containing polyatomic ions. J. Understand the general crystal structure of ionic compounds. K. Understand the concept of a hydrated ionic compound or hydrate, and be able to determine the formula mass of a hydrate based on the chemical formula. .			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 10 Molecular Compounds		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Leaning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.2** Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. **Plus HS+C.P1U1.4** Develop and use models to predict and explain forces within and between molecules.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the concept of a covalent bond, and be able to compare/contrast covalent and ionic bonds. B. Be able to predict the relative polarity of a covalent bond based on EN values of the relevant elements, and the direction of the electron vector for the bond. C. Know the rules for naming simple molecular structures. D. Be able to convert between the name of a molecule and its chemical formula. E. Know the sequential steps for drawing a Lewis structure for a molecule. F. Understand the principles of VSEPR theory, and the concept of electron domains in a molecule. G. Classify a simple molecule in terms of its geometry: i) linear ii) bent iii) trigonal planar iv) trigonal pyramidal v) tetrahedral H. Understand the concept of symmetry in a simple molecule. I. Determine the net electron vector for a simple molecule and whether the molecule is polar or nonpolar .			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 11 Moles		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationship s between reactants and products in chemical reactions.	"Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function"	A. Understand the concept of a mole as a counting unit. B. Understand the relationship between formula mass and molar mass. C. Know the two key equivalencies (or conversion factors) for a mole of any substance: i) One mole = 6.02 x 1023 particles ii) One mole = formula mass in grams of the relevant particle D. Be able to convert among particle number, grams, and moles for any particle. E. Be able to extend the above calculations to parts of any particle. .			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 12 Reactions		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.2** Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Identify the different types of reactions based on the rearrangement of reactants and products: i) synthesis ii) decomposition iii) single replacement iv) double replacement v) combustion B. Understand the concept of precipitation. C. Balanced chemical equations.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 13 Stoichiomtery		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.2** Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Determine mole-ratios using a balanced chemical equation. B. Perform mole-mole, Dmole-mass, and mass-mass stoichiometric calculations. C. Identify the limiting reactant in a reaction. D. Perform stoichiometric calculations based on the limiting reactant i) Calculate the theoretical yield of a reaction in moles or mass. ii) Determine all quantitative aspects of a reaction using a reaction table based on moles. E. Determine the percent yield of a reaction given information on the actual yield.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 14 States of Matter		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.2** Develop and use models for the transfer or sharing of electrons to predict the formation of ions, molecules, and compounds in both natural and synthetic processes. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.4** Develop and use models to predict and explain forces within and between molecules.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Know the three basic principles of the kinetic molecular theory of matter. B. Describe the three states of matter in terms of shape and volume and using the three principles of the kinetic molecular theory. C. Identify the possible changes in the three states of matter in words and equations. D. Draw and interpret phase diagrams of a substance. E. Describe and recognize the four types of interparticle attractions. F. Distinguish between interparticle attractions and covalent bonds. G. Compare and contrast substances in terms of interparticle attractions, melting points, boiling points.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 15 Thermodynamics		Essential Questions:			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions. **Essential HS.P4U1.8** Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **Plus HS+Phy.P4U1.6** Analyze and interpret data to quantitatively describe changes in energy within a system and/or energy flows in and out of a system.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Understand the first law of thermodynamics. B. Know the concepts of system, surroundings, exothermic, endothermic, change in enthalpy (ΔH). C. Perform enthalpy calculations for phase changes using heats of fusion and heats of vaporization. D. Perform enthalpy calculations for temperatures changes. E. Understand the concepts and quantitative analysis of calorimetry experiments. F. Perform calorimetry calculations based on experimental data to determine specific heats. G. Understand the concepts and quantitative analysis of heating and cooling curves.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 16 Gases		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Plus HS+C.P1U1.3** Analyze and interpret data to develop and support an explanation for the relationships between kinetic molecular theory and gas laws. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Be able to define the four key variables of gas laws at the particle level – temperature, volume, amount, and pressure. B. Know the definition of standard temperature and pressure (STP). C. Be able to perform quantitative calculations using the combined gas law and its simplified derivatives. D. Be able to describe the relationships among the four key variables in qualitative terms based on the gas laws. E. Describe the the effects of temperature, moles, and volume changes on the pressure of a gas at the particle level. F. Be able to perform quantitative calculations using the combined gas law and the ideal gas law. F. Understand the concept of partial pressure for mixtures of gases. G. Understand the relationships among the concepts of force, kinetic energy, temperature, mass, and velocity at the particle level in qualitative terms..			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 17 Solutions		Essential Questions:			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P2U1.5** Construct an explanation for a field's strength and influence on an object (electric, gravitational, magnetic). **Plus HS+C.P1U1.4** Develop and use models to predict and explain forces within and between molecules. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Understand the concept of solution, solute, solvent, and concentration. B. Describe the quantitative measure of concentration - molarity. C. Perform molarity calculations. i) Determine molarity given an amount of solute and volume of solution. ii) Determine solute mass given a volume and molarity of a solution. iii) Determine the volume of a solution given solute mass and molarity. D. Understand the concept of dilution and perform simple dilution calculations. E. Understand the process and equations for the ionization of soluble ionic compounds in aqueous solutions. F. Perform calculations to determine the molarity of specific ions or total ions in a solution. G. Understand the concept of electrical conductivity in solutions and compare/contrast the conductivity of different solutions.. H. Know the relationship between solubility and temperature for solutions. I. Know the relationship between solubility and pressure for gases. J. Know the relationship between solute concentration and the the boiling point or freezing point of solutions in qualitative terms. K. Understand the relationship between absorbance and concentration in solutions, and determine the concentration of solutions using Beer's law and data from spectrophotometry experiments.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 18 Acids and Bases		**Essential Questions:**			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**
U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Plus HS+C.P1U1.4** Develop and use models to predict and explain forces within and between molecules. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties. **Plus HS+C.P1U1.7** Use mathematics and computational thinking to determine stoichiometric relationships between reactants and products in chemical reactions.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Understand the Arrhenius definitions of an acid and a base. B. Understand the autoionization of water and the related quantitative relationships between hydrogen and hydroxide ion concentrations in aqueous solutions. C. Understand the definition of pH and pOH. D. Understand the various quantitative definitions of an acidic or basic solution. E. Perform calculations relating pH, pOH, [H+], and [OH-] of an aqueous solution. F. Know the Bronsted-Lowry definitions of an acid and a base. G. Be able to identify the acid-base conjugate pairs in a reaction. H. Predict the neutralization reaction of an acid and strong base. I. Perform and quantitatively analyze titrations of an acid and strong base. J. Understand the concept of a pH indicator.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 19 Kinertrics		Essential Questions:			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.3** Ask questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors. **Essential HS.P4U1.8** Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A. Understand collision theory and its three stages. B. Describe the effects of particle size and concentration on reaction rates based on collision theory. C. Describe the two ways temperature affects reaction rates of reaction in terms of collision theory. D. Know the characteristics of a catalyst. E. Understand and interpret energy diagrams for: i) Forward and reverse reactions. ii) Catalyzed and uncatalyzed reaction. F. Understand and interpret reaction mechanisms. G. Be able to identify reactants, products, intermediates, and catalysts in a reaction mechanism.			

HS Science District Instructional Guides 2019					
		Quarter/Pacing: 1, Week 4-5			
Unit Title: 20 Equilibrirum		Essential Questions:			
		Phenomena:			
Standards	**Cross Cutting Concepts**	**Learning Objectives**	**Key Vocabulary**	**Resources (Activities/Labs)**	**Assessments**

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. **U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **Essential HS.P1U1.3** Ask questions, plan, and carry out investigations to explore the cause and effect relationship between reaction rate factors. **Essential HS.P4U1.8** Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **Plus HS+C.P1U1.5** Plan and carry out investigations to test predictions of the outcomes of various reactions, based on patterns of physical and chemical properties.	Patterns; Cause and effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and change; Structure and function	A.			