CHEMISTRY CURRICULUM

Course 18004

Students in Chemistry will learn the terms, ideas, processes, and principles of the study of chemistry. They will learn to use scientific thinking, processes and tools to study chemistry. Topics to be covered include: atomic theory, the periodic table, ions, compounds, chemical composition, equations and reactions, states of matter, gases and gas laws, solutions, acids and bases, reaction rates, nuclear chemistry, organic chemistry, and biochemistry. Having passed Biology and the Algebra Keystone Exams are a prerequisite for this course.

CHEMISTRY OUTLINE:

Goals	Skills	Summative Assessments	Time Frame	Main Resources
• Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles. • Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table. • Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories. • Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. • Predict the amounts of products and reactants in a chemical reaction using mole relationships. • Explain the difference between endothermic and exothermic reactions. • Identify the factors that affect the rates of reactions. • Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. • Explain how carbon is uniquely suited to form biological macromolecules.	• Apply systems analysis, showing relationships, input and output, and measurements to explain a system and its parts. • Analyze and predict the effect of making a change in one part of a system on the system as a whole. • Use appropriate quantitative data to describe or interpret a system. • Apply the universal systems model of inputs, processes, outputs, and feedback to a working system and identify the resources necessary for operation of the system. • Compare the accuracy of predictions represented in a model to actual observations and behavior.	Chapter Tests	1-year	Holt Chemistry

CHEMISTRY MAP:

TIME FRAME	BIG IDEAS	CONCEPTS	ESSENTIAL QUESTIONS	STANDARDS	OBJECTIVES	DIFFERENTIATION	ASSESSMENT
Chapter 1 The Science of Chemistry (1 week)	• Chemistry is the study of chemicals, their properties, and the reactions in which they are involved. • Matter has both mass and volume; matter thus has density, which is the ratio of mass to volume	1. Physical states of matter 2. Changes of matter 3. Matter has mass and volume 4. Units of Measure 5. Properties of matter 6. Classifying matter 7. Pure substances 8. Mixtures.	• Are there good and bad chemicals and how do they differ? • What are some of the classifications of matter? • What is the difference between a chemical change and a physical change?	BIO.A.3.2.2 Describe the role of ATP in biochemical reactions. Chemistry S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons).	• Describe the characteristics of three common states of matter. • Set up conversion factors, and use them in calculations. • Distinguish between pure elements and compounds.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 2 Matter and Energy (2 weeks)	• Changes in matter can be chemical or physical, but only chemical changes produce new substances. • The scientific method is a strategy for conducting research.	1. Energy and change 2. Heat 3. The scientific method 4. Scientific explanations 5. Accuracy and precision 6. Significant figures 7. Scientific notation.	• When ice melts, what happens to its chemical composition? • What is a chemical property? • What is a physical property?	S11.A.1.1.1 Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession). S11.A.1.1.2 Analyze and explain the accuracy of scientific facts, principles, theories, and laws. S11.A.1.1.3 Evaluate the appropriateness of research questions (e.g., testable vs. not-testable). S11.A.1.1.4 Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's	• Explain that physical and chemical changes in matter involve transfers of energy. • Describe the purpose of controlling the conditions of an experiment. • Distinguish between accuracy and precision in measurements.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				germ theory, relativity, heliocentric theory, ideal gas laws). S11.A.1.1.5 Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars). S11.A.1.2.1 Explain and apply scientific concepts to societal issues using case studies (e.g., spread of HIV, deforestation, environmental health, energy). S11.A.1.2.2 Use case studies (e.g., Wright brothers' flying machine, Tacoma Narrows Bridge, Henry Petroski's Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for realworld problems. S11.A.1.3.1 Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data). S11.A.1.3.2 Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis). S11.A.1.3.3 Describe how changes in physical and biological indicators (e.g., soil, plants, animals) of water systems reflect changes in these systems (e.g. changes in bloodworm populations reflect changes in pollution levels in streams). S11.A.1.3.4 Compare the rate of use of natural resources and their impact on sustainability.			

				S11.A.2.1.1 Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design. S11.A.2.1.2 Critique the elements of the design process (e.g. identify the problem, understand criteria, create solutions, select solution, test/evaluate, communicate results) applicable to a specific technological design. S11.A.2.1.3 Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits. S11.A.2.1.4 Critique the results and conclusions of scientific inquiry for consistency and logic. S11.A.2.1.5 Communicate results of investigations using multiple representations. S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality) S11.A.2.2.2 Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision. S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, concept			

				maps), input and output, and measurements to explain a system and its parts. S11.A.3.1.2 Analyze and predict the effect of making a change in one part of a system on the system as a whole. S11.A.3.1.3 Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data). S11.A.3.1.4 Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating, motor, food production) and identify the resources necessary for operation of the system. S11.A.3.2.1 Compare the accuracy of predictions represented in a model to actual observations and behavior. S11.A.3.2.2 Describe advantages and disadvantages of using models to simulate processes and outcomes. S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps). S11.A.3.3.1 Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order. S11.A.3.3.2			

				Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties. S11.A.3.3.3 Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves). S11.B.1.1.1 Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical). S11.B.1.1.2 Compare and contrast the structural and functional similarities and differences among living things (e.g., classify organisms into classification groups, compare systems). S11.B.1.1.3 Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).			
Chapter 3 Atoms and Moles (2 Weeks)	• Three laws support the existence of atoms; the law of definite proportions, the law of conservation of mass, and the law of multiple proportions. • Protons, particles with a positive charge, and neutrons, particles with a negative charge, make up the nuclei of an atom.	1. Atomic Theory 2. Dalton's Atomic Theory 3. Subatomic Particles 4. Atomic number and Mass number 5. Atomic Models 6. Electrons and light 7. Quantum Numbers 8. Electron Configurations 9. Introduction to the mole.	• What is an atom? • What particles make up an atom? • Where are the particles that make up an atom located?	CHEM.B.1.1 Explain how the mole is a fundamental unit of chemistry. S11.A.1.3.2 Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis). S11.A.1.3.3 Describe how changes in physical and biological indicators (e.g., soil, plants, animals) of water systems reflect changes in these systems (e.g. changes in bloodworm populations reflect changes in pollution levels in streams). S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise	• State the three laws that support the existence of atoms. • Discuss the number of atoms of different elements in terms of their numbers of electrons, protons, and neutrons, and define the terms atomic number and mass number. • Compare the Rutherford,	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				quantitative and qualitative observations (e.g., to compare properties of materials, water quality) S11.A.2.2.2 Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision. S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts. S11.A.3.1.3 Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).	Bohr, and quantum models of an atom. • Compare the quantities and units for atomic mass with those for molar mass.		
Chapter 4 The Periodic Table (2 Weeks)	• The periodic law states that the properties of elements are periodic functions of the elements' atomic numbers. • Ionization energy, electronegativity, and electron affinity generally increase as you move across a period and decrease as you move down a group.	1. Patterns in element properties 2. The Periodic Law 3. The Main-Group elements 4. Periodic Trends 5. Ionization energy 6. Atomic radius 7. Electronegativity 8. Natural elements 9. Transmutations 10. Synthetic elements.	• What is the relationship between the protons and the number of electrons in a neutral atom? • As electrons fill orbitals, what patterns do you notice?	S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.4 Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table.	• Describe the historical development of the periodic table. • Locate metals on the periodic table, describe their characteristic properties, and relate their properties to their electron configurations. • Explain how a transmutation changes one element into another.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 5 Ions and Ionic compounds (2 weeks)	• Atoms may gain or lose electrons to achieve an electron configuration identical to that of a noble gas.	1. Chemical reactivity 2. Valence electrons 3. Atoms and ions 4. Ionic bonding	• What is the difference between an atom and an ion?	S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons).	• Relate the electron configuration of an atom to its chemical reactivity.	Students will be given the following: Preferential seating when applicable	Daily assessments End of chapter exams

	• The opposite charges of cations and anions attract to form a tightly packed substance of bonded ions called crystal lattice. • Ionic compounds are named by joining the cation and anion names.	5. Ionic compounds 6. Naming and writing ion compounds and formulas.	• How can an atom become an ion? • Why do chemists call table salt sodium chloride?	S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.3 Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.	• Explain why the properties of ions differ from those of their parent forms. • Describe the process of forming an ionic bond. • Name cations, anions, and ionic compounds.	Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Labs and projects
Chapter 6 Covalent Compounds (2 Weeks)	• Atoms have less potential energy and more stability after they form a covalent bond. • In Lewis structure, the element's symbol represents the atom's nucleus and inner-shell electrons, and dots represent the atom's valence electrons. • VSEPR theory states that electron pairs in the valence shell stay as far apart as possible.	1. Sharing electrons 2. Energy and stability 3. Electronegativity and covalent bonding 4. Electronegativity and bond types 5. Lewis electron-dot structures 6. Multiple bonds 7. Naming covalent compounds 8. Determining molecule shapes.	• What determines whether two atoms will form a bond? • How can a hydrogen atom, which has one valence electron, bond with a chlorine atom, which has seven valence electrons? • What happens in terms of energy after a hydrogen atom bonds with a chlorine atom?	S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.3 Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories. S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).	• Describe the change in energy and stability that takes place as a covalent bond forms. • Draw Lewis structures to show the arrangement of valence electrons amoung atoms in molecules and polyatomic ions. • Predict the shape of a molecule using VSEPR theory.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 7 The Mole and Chemical Composition (2weeks)	• Avogadro's number is used to convert from number of moles to number of particles and vice versa. • The average atomic mass of an element is the average mass of the element's	1. Avogadro's number and the mole 2. Molar mass relates moles to grams 3. Average atomic mass and the periodic table	• What are some of the things that are sold by weight instead of by number? • Which would need a larger	CHEM.B.1.1 Explain how the mole is a fundamental unit of chemistry.	• Identify the mole as the unit used to count particles, whether atoms, ions, or molecules. • Use a periodic table or isotopic	Students will be given the following: Preferential seating when applicable Study guides	Daily assessments End of chapter exams Labs and projects

	isotopes, weighted by the percentage of their natural abundance. • Percentage composition gives the relative contribution of each element to the total mass of one molecule or formula unit.	4. Chemical formulas and moles 5. Using analytical data.	package, a kilogram of pencils or a kilogram of drinking straws? • If you counted one person per second, how many hours would it take to count the 6 billion people now in the world?		composition data to determine the average atomic masses of elements. • Determine a compound's empirical formula from its percentage composition.	Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	
Chapter 8: Chemical Equations and Reactions (2 Weeks)	• In a chemical reaction, atoms rearrange to form new substances. • A word equation is translated into a formula equation to describe the change of reactants into products.	1. Chemical change 2. Equations and reactions 3. Conserving mass 4. Balancing equations 5. Reaction types 1) Combustion reactions 2) Synthesis reactions 3) Decomposition reactions 4) Displacement reactions 5) Ionic equation.	• What are some signs that a chemical change may be taking place? • What are the reactants of a reaction? • What are the products of a reaction?	3.1.10.A2 Explain cell processes in terms of chemical reactions and energy changes. 3.2.10.A4 Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions. CHEM.B.2.1.1 Describe the roles of limiting and excess reactants in chemical reactions.	• List evidence that suggests that a chemical reaction has occurred and evidence that proves that a chemical reaction has occurred. • Relate the conservation of mass to the rearrangement of atoms in a chemical reaction. • Identify different types of chemical reactions and predict the product.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 9: Stoichiometry (2 Weeks)	• Reaction stoichiometry compares the amounts of substances in a chemical reaction. • The theoretical yield is the amount of product that can be	1. Calculating quantities in reactions 2. Limiting reactants and theoretical yield 3. Stoichiometry and cars.	• A recipe calls for a specific number of each ingredient, how much of each would be	3.2.10.A4 Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships.	• Use proportional reasoning to determine mole ratios from a balanced chemical equation.	Students will be given the following: Preferential seating when applicable Study guides	Daily assessments End of chapter exams Labs and projects

	formed from a given amount of limiting reactant. • Stoichiometry can be used to determine passenger safety, fuel efficiency, and pollution.		needed if the recipe is quadrupled ? • A bicycle mechanic has 10 frames and 16 wheels in the shop. How many complete bicycles can be assembled from these parts?	Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions. 3.2.10.A5 MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory. SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds. 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.B.1.1.1 Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, molecules, and/or formula units). CHEM.B.1.2.3 Relate the percent composition and mass of each element present in a compound. CHEM.B.2.1.1 Describe the roles of limiting and excess reactants in chemical reactions. CHEM.B.2.1.2 Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction. S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).	• Identify the limiting reactant for a reaction and use it to calculate theoretical yield. • Relate volume calculations in stoichiometry to inflation of automobile safety air bags.	Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	

Chapter 10: Causes of Change (2 weeks)	• Heat is energy transferred from a region at one temperature to a region at a lower temperature. • The enthalpy of a system can be its total energy.	1. Energy transfer 2. Using Enthalpy 3. Changes in enthalpy during reactions 4. Order and spontaneity.	• Can a chemical reaction generate energy as heat? • What is specific heat? • Does a thermometer measure temperature as heat?	3.2.10.A4 Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions. 3.2.10.A5 MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory. SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds. 3.2.10.B3 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures. S11.A.1.3.2 Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis). S11.A.3.1.4 Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating, motor, food production) and identify the resources necessary for operation of the system. S11.C.2.1.2	• Distinguish between heat and temperature. • Calculate the enthalpy change for a given amount of substance for a given change in temperature. • Explain the principles of calorimetry.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				Describe energy changes in chemical reactions. S11.C.2.1.3 Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration, rocket propulsion, heat pump). S11.C.2.2.1 Explain the environmental impacts of energy use by various economic sectors (e.g., mining, logging, transportation) on environmental systems. S11.C.2.2.2 Explain the practical use of alternative sources of energy (i.e., wind, solar, and biomass) to address environmental problems (e.g., air quality, erosion, resource depletion). S11.C.2.2.3 Give examples of renewable energy resources (e.g., wind, solar, biomass) and nonrenewable resources (e.g., coal, oil, natural gas) and explain the environmental and economic advantages and disadvantages of their use. Pennsylvania			
Chapter 11: States of Matter and Inter-molecular Forces (2 weeks)	• Solid particles vibrate in fixed positions, thus solids have a definite shape, volume, and density. • The strongest force attracting particles together is the ionic force. • Energy is needed to change solid to liquid, solid to gas, and liquid to gas, thus melting, sublimation, and evaporation are endothermic processes.	1. States and state changes 2. Intermolecular forces 3. Energy of state changes 4. Phase equilibrium.	• What happens when you heat an ice cube? • What force is there between oppositely charged objects?	3.2.10.A3 Describe phases of matter according to the kinetic molecular theory. CHEM.B.1.3.2 Classify a bond as being polar covalent, non-polar covalent, or ionic. CHEM.B.2.2.1 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). S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are	• Relate the properties of a state to the energy content and particle arrangement of that state of matter. • Define the molar enthalpy of fusion and the molar enthalpy of vaporization, and identify them for a substance by using the heating curve.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				composed of even smaller particles (e.g., protons, neutrons, electrons). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.5 Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law). S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).	• Interpret a phase diagram to identify melting points and boiling points.		
Chapter 12: Gases (2 weeks)	• Gases are fluids, have low density, and are compressible, because of the relatively large intermolecular distances between gas particles. • Pressure and volume of a gas at constant temperature are inversely proportional.	1. Characteristics of gases 2. The gas laws 3. Molecular composition of gases.	• Among the states of matter, what is unique about gases? • Do gases have mass and weight? • Why are gases considered fluids?	3.2.3.A1 Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas. S11.A.1.1.4 Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws). S11.C.1.1.5 Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law). S3.C.1.1.1 Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, state).	• Describe the general properties of gases. • State all of the gas laws including; Boyle's Law, Charles's Law, Gay-Lussac's Law, and Avogadro's Law • Solve problems using the ideal gas law.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				S3.C.1.1.2 Classify matter using observable physical properties (e.g., weight, mass, shape, size, color, texture, state). S3.C.1.1.3 Classify a substance as a solid, liquid, or gas.			
Chapter 13: Solutions (2 weeks)	• A solution is a homogeneous mixture of a solute dissolved in a solvent. • Units of concentration express the ration of solute to solution, or solute to solvent, that is present throughout a solution. • Whether substances dissolve in each other depends on their chemical nature, on temperature, and on their ability to form hydrogen bonds.	1. What is a solution 2. Concentration and molarity 3. Solubility and the dissolving process 4. Physical properties of solutions.	• What main components do these solutions consist of? • How do you know that each of these examples is actually a solution?	3.1.C.A1 Explain the chemistry of metabolism. CHEM.A.1.2.1 Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.3 Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.	• Distinguish between solutions, suspensions, and colloids. • Define molarity, and calculate the molarity of a solution. • Predict the solubility of an ionic compound by using a solubility table. • Describe how a solute affects the freezing point and boiling point of a solution.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 14: Chemical Equilibrium (2 weeks)	• During completion reactions, products do no significantly re-form reactants, but during reversible reactions, products re-form the original reactants. • Equilibrium constants and solubility product constants have no unit.	1. Reversible reactions and equilibrium 2. Systems at equilibrium 3. Equilibrium systems and stress.	• What is a solution? • How do you know that a reaction has taken place? • How do reactants differ from products?	3.2.7.A3 Explain how energy transfer can affect the chemical and physical properties of matter. 3.2.7.A4 Describe how reactants change into products in simple chemical reactions. S7.C.1.1.1 Use characteristic physical or chemical properties of matter to distinguish one substance from another (e.g., density, freezing/melting points, solubility, and ability to rust). S7.C.1.1.2 Recognize that the atom is the basic building block for all matter.	• Contrast reactions that go to completion with reversible ones. • Describe chemical equilibrium. • State Le Chatelier's principle.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				S7.C.1.1.3 Explain the differences between elements, compounds, and mixtures. S7.C.1.1.4 Describe the relationship between mass and volume as density. S7.C.1.2.1 Identify the reactants and products of simple chemical reactions (e.g., photosynthesis, cellular respiration). S7.C.1.2.2 Compare the behavior of particle motion in solids, liquids, and gasses.			
Chapter 15: Acids and Bases (2 Weeks)	• Acids solutions have distinctive properties attributable to the H3O+ ion, while bases have distinctive properties attributable to the OH- ion. • A neutralization reaction between and acid and a base produces water.	1. What are acids and bases? 2. Acidity, basicity, and pH 3. Neutralization and titrations 4. Equilibria of weak acids and bases.	• What polyatomic ion does the hydrogen ion, H+, form in aqueous solution? • Acids are said to "neutralize" bases, and vice versa. How would you define the term neutralize?	3.1.B.A2 Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high energy bonds. Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function. 3.1.B.A7 Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.	• Describe the distinctive properties of strong and weak acids, and relate their properties to the Arrhenius definition of an acid. • Describe two methods of measuring pH. • Predict the product of an acid-base reaction.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.			
Chapter 16: Reaction Rates (1 week)	• The rate of a chemical reaction is calculated from changes in reactant or product concentration during a small time interval. • Rate laws, which are used to suggest mechanisms, are determined by studying how reaction rate depends on concentration	1. Rates of chemical change 2. Factors affecting rate 3. Rate laws 4. Catalysts	• What affects the rate of a reaction? • How can reaction rates be explained?	3.1.B.A2 Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. 3.1.C.A2 Describe how changes in energy affect the rate of chemical reactions. 3.2.10.A4 Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions. BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function. CHEM.B.2.1.1 Describe the roles of limiting and excess reactants in chemical reactions. S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).	• Define the rate of a chemical reaction in terms of concentration and time. • Calculate the rate of reaction from concentration-versus-time data. • Describe the effect that catalysts can have on reaction rate and how this effect occurs.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects
Chapter 17: Oxidation, Reduction, and Electro-chemistry (2 weeks)	• The loss or gain of electrons in a chemical reaction is called oxidation or reduction, respectively.	1. Oxidation-reduction reactions 2. Introduction to electrochemistry 3. Galvanic cells	• What type of charge results from losing electrons? • What type of charge	3.2.12.A4 Apply oxidation/reduction principles to electrochemical reactions. Describe the interactions between acids and bases.	• Assign oxidation numbers to atoms in compounds and ions.	Students will be given the following: Preferential seating when applicable	Daily assessments End of chapter exams

	• Many examples of galvanic cells are power sources that generate electrical energy from chemical energy.	4. Electrolytic cells.	results from gaining electrons? • Why are batteries marked with positive and negative terminals?		• Describe the relationship between voltage and the movement of electrons. • Identify conditions that lead to corrosion and ways to prevent it.	Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Labs and projects
Chapter 18: Nuclear Chemistry (2 weeks)	• The strong force overcomes the repulsive force between protons to keep a nucleus intact. • Unstable nuclei are radioactive and can emit radiation in the form of alpha particles, beta particles and gamma rays. • Half-life is the time required for one half of the mass of a radioactive isotope to decay.	1. Atomic nuclei and nuclear stability 2. Nuclear change 3. Uses of nuclear chemistry.	• What particles make up an atom? • Can energy be created? • What quantities are conserved in a chemical reaction?	3.2.12.A3 Explain how matter is transformed into energy in nuclear reactions according to the equation E=mc2. 3.2.C.A3 Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. Identify the three main types of radioactive decay and compare their properties. Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. Compare and contrast nuclear fission and nuclear fusion. 3.4.10.E3 Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others. CHEM.A.1.1.3 Utilize significant figures to communicate the uncertainty in a quantitative observation. CHEM.B.2.2.1 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	• Describe how the strong force attracts nucleons • Identify examples of nuclear fission, and describe potential benefits and hazards of its use. • Describe some uses of nuclear chemistry.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

				law, Dalton's law of partial pressures, the combined gas law, and the ideal gas law). CHEM.B.2.2.2 Predict the amounts of reactants and products involved in a chemical reaction using molar volume of a gas at STP. S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure. S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).			
Chapter 19: Carbon and Organic Compounds (1 Week)	• The properties of carbon allotropes depend on the arrangement of the atoms and how they are bonded to each other. • The names of the alkanes form the basis for naming most other organic compounds.	1. Compounds of carbon 2. Names and Structures of organic compounds 3. Organic reactions.	• How many covalent bonds can a carbon atom form? • How does the structure of a compound affect its chemical relativity? • What are two possible ways to show the structure of CH4?	3.3.10.A2 Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources of energy. BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules. S11.A.3.2.1 Compare the accuracy of predictions represented in a model to actual observations and behavior. S11.D.2.1.1 Describe how changes in concentration of minor components (e.g., O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.	• Explain the unique properties of carbon that make the formation of organic molecules possible. • Name simple hydrocarbons from their structural formulas. • Describe and distinguish between substitution and addition reaction.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects

Chapter 20: Biological Chemistry (1 week	• Carbohydrates are compounds of carbon, hydrogen, and oxygen made by living things for storage and support. • Green plants use solar energy, carbon dioxide, and water to synthesize glucose during photosynthesis.	1. Carbohydrates and Lipids 2. Proteins 3. Nucleic Acids 4. Energy in living systems.	• What biological molecule contains the information that determines your traits? • In chemical terms, what is the purpose of the food we eat?	3.1.C.A1 Explain the chemistry of metabolism. BIO.A.3.1.1 Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations. BIO.A.3.2.1 Compare and contrast the basic transformation of energy during photosynthesis and cellular respiration. BIO.A.3.2.2 Describe the role of ATP in biochemical reactions. S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons). S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure.	• Relate the structure of carbohydrates to their role in biological systems. • Describe the general amino acid structure. • Relate the structure of nucleic acids to their function as carriers of genetic information.	Students will be given the following: Preferential seating when applicable Study guides Guided notes when applicable Extended time for assignment when needed Separate testing environment when applicable.	Daily assessments End of chapter exams Labs and projects