

Chemistry Pacing Guide 2022-23

<u>Unit Name</u>	<u>New GSE Standards</u>	<u>Learning Targets</u>	<u>Days to teach unit</u>
<p>Unit 1: Never trust an atom</p> <p>Atomic Theory Quantum Mechanics Electron Configuration Periodic Table and Trends</p>	<p>SC1. Obtain, evaluate, and communicate information about the use of the modern atomic theory and periodic law to explain the characteristics of atoms and elements.</p> <p>a. Evaluate merits and limitations of different models of the atom in relation to relative size, charge, and position of protons, neutrons, and electrons in the atom.</p> <p>b. Construct an argument to support the claim that the proton (and not the neutron or electron) defines the element’s identity.</p> <p>c. Construct an explanation based on scientific evidence of the production of elements heavier than hydrogen by nuclear fusion.</p> <p>d. Construct an explanation that relates the relative abundance of isotopes of a particular element to the atomic mass of the element.</p> <p>e. Construct an explanation of light emission and the movement of electrons to identify elements.</p> <p>f. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms (i.e. including atomic radii, ionization energy, and electronegativity).</p> <p>**g. Develop and use models, including electron configuration of atoms and ions, to predict an element’s chemical properties.</p>	<p>LT1: I can identify atoms based on their subatomic particles.</p> <p>LT2: I can determine the average and relative abundance of isotopes.</p> <p>LT3: I can explain light emission and the movement of electrons to identify elements.</p> <p>LT4: I can develop and use models, including electron configuration of atoms and ions, to predict an element’s chemical properties.</p> <p>LT5: I can determine the location of an element based on periodic trends and electron configuration of the periodic table.</p>	<p>15 days</p>
<p>Unit 2: Let’ get together</p> <p>Chemical Bonding</p>	<p>SC2. Obtain, evaluate, and communicate information about the chemical and physical properties of matter resulting from the ability of atoms to form bonds.</p> <p>c. Construct an explanation about the importance of molecular-level structure in the functioning of designed materials. (Clarification statement: Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.)</p>	<p>LT1: I can identify covalent and ionic bonds based on the composition and properties of the elements in the compound.</p> <p>LT2: I can name and predict the formulas for ionic, covalent, and acidic compounds.</p> <p>LT3: I can calculate the percent composition and empirical/molecular</p>	<p>20 days</p>

	<p>d. Develop and use models to evaluate bonding configurations from nonpolar covalent to ionic bonding. (Clarification statement: VSEPR theory is not addressed in this element.)</p> <p>**e. Ask questions about chemical names to identify patterns in IUPAC nomenclature in order to predict chemical names for ionic (binary and ternary), acidic, and inorganic covalent compounds.</p> <p>f. Develop and use bonding models to predict chemical formulas including ionic (binary and ternary), acidic, and inorganic covalent compounds.</p> <p>**SC3c. Use mathematics and computational thinking to apply concepts of the mole and Avogadro's number to conceptualize and calculate • percent composition • empirical/molecular formulas • mass, moles, and molecules relationships • molar volumes of gasses</p>	<p>formulas.</p> <p>LT4: I can calculate mass, moles, and molecules relationships and molar volumes of gasses.</p> <p>Data</p>	
<p>Unit 3: You're over reacting</p> <p>Chemical Reactions</p>	<p>SC3. Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.</p> <p>**a. Use mathematics and computational thinking to balance chemical reactions (i.e., synthesis, decomposition, single replacement, double replacement, and combustion) and construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.</p> <p>b. Plan and carry out an investigation to determine that a new chemical has been formed by identifying indicators of a chemical reaction (e.g., precipitate formation, gas evolution, color change, water production, and changes in energy to the system).</p>	<p>LT1: I can identify indicators and types of reactions.</p> <p>LT2: I can write and balance chemical equations and understand how it relates to the Law of Conservation of Matter.</p> <p>LT3: I can predict the products of chemical reactions.</p> <p>Data</p>	10 days
<p>Unit 4: How much you got?</p> <p>Stoichiometry</p>	<p>SC3.</p> <p>*d. Use mathematics and computational thinking to identify and solve different types of reaction stoichiometry problems (i.e., mass to moles, mass to mass, moles to moles, and percent yield) using significant figures. (Clarification statement: For elements c and d emphasis is on use of mole ratios to compare quantities of reactants or products and on assessing students'</p>	<p>LT1: I can calculate the amount of reactants needed or products produced based on an initial amount.</p> <p>LT2: I can predict the limiting reactant in reaction, and calculate the amount of</p>	10 days

	<p>use of mathematical thinking and not on memorization and rote application of problem-solving techniques.)</p> <p>e. Plan and carry out an investigation to demonstrate the conceptual principle of limiting reactants.</p> <p>SC5. c. Develop and use models to quantitatively, conceptually, and graphically represent the relationships between pressure, volume, temperature, and number of moles of a gas.</p>	<p>remaining reactant.</p> <p>LT3: I can predict and calculate the volume or moles of gas created in a chemical reaction.</p> <p>Data</p>	
<p>Unit 5: Speed it up or balance it out</p> <p>Equilibrium Reaction Rate</p>	<p>SC4. Obtain, evaluate, and communicate information about how to refine the design of a chemical system by applying engineering principles to manipulate the factors that affect a chemical reaction.</p> <p>a. Plan and carry out an investigation to provide evidence of the effects of changing concentration, temperature, and pressure on chemical reactions. (Clarification statement: Pressure should not be tested experimentally.)</p> <p>b. Construct an argument using collision theory and transition state theory to explain the role of activation energy in chemical reactions. (Clarification statement: Reaction coordinate diagrams could be used to visualize graphically changes in energy (direction rateflow and quantity) during the progress of a chemical reaction.)</p> <p>c. Construct an explanation of the effects of a catalyst on chemical reactions and apply it to everyday examples.</p> <p>d. Refine the design of a chemical system by altering the conditions that would change forward and reverse reaction rates and the amount of products at equilibrium. (Clarification statement: Emphasis is on the application of LeChatelier's principle.)</p>	<p>LT1: I can predict the effects of changing the concentration, temperature, and pressure on the rate of a chemical reaction.</p> <p>LT2: I can explain the role of activation energy of a chemical reaction using collision theory and explain how a catalyst affects the activation energy of a chemical reaction.</p> <p>LT3: I can predict the shift in equilibrium caused by changes of conditions within a system.</p> <p>Data</p>	10 days
<p>Unit 6: It's getting hot in here?</p> <p>Thermochemistry</p>	<p>SC2. Obtain, evaluate, and communicate information about the chemical and physical properties of matter resulting from the ability of atoms to form bonds.</p> <p>a. Plan and carry out an investigation to gather evidence to compare the physical and chemical properties at the macroscopic scale to infer the strength of intermolecular and intramolecular forces.</p>	<p>LT1: I can identify differences in inter- and intramolecular forces based on chemical and physical properties of substances and predict the bond strength based on those differences.</p> <p>LT2: I can interpret graphs to describe</p>	10 days

	<p>b. Construct an argument by applying principles of inter- and intra- molecular forces to identify substances based on chemical and physical properties.</p> <p>g. Develop a model to illustrate the release or absorption of energy (endothermic or exothermic) from a chemical reaction system depends upon the changes in total bond energy.</p> <p>SC5.</p> <p>a. Plan and carry out an investigation to calculate the amount of heat absorbed or released by chemical or physical processes. (Clarification statement: Calculation of the enthalpy, heat change, and Hess’s Law are addressed in this element.)</p> <p>**b. Construct an explanation using a heating curve as evidence of the effects of energy and intermolecular forces on phase changes.</p>	<p>the differences between endothermic and exothermic reactions.</p> <p>LT3: I can calculate the change in enthalpy, ΔH, for a reaction given bond energies, heats of formation, or enthalpies of reactions with a common intermediate.</p> <p>LT4: I can interpret a heating or cooling curve, indicating the state(s) present in each portion of the curve and the energy involved in each phase change.</p> <p>Data</p>	
<p>Unit 7: It’s all about the base!</p> <p>Solutions Acids and Bases</p>	<p>SC6. Obtain, evaluate, and communicate information about the properties that describe solutions and the nature of acids and bases. a. Develop a model to illustrate the process of dissolving in terms of solvation versus dissociation.</p> <p>b. Plan and carry out an investigation to evaluate the factors that affect the rate at which a solute dissolves in a specific solvent.</p> <p>c. Use mathematics and computational thinking to evaluate commercial products in terms of their concentrations (i.e., molarity and percent by mass).</p> <p>d. Communicate scientific and technical information on how to prepare and properly label solutions of specified molar concentration.</p> <p>e. Develop and use a model to explain the effects of a solute on boiling point and freezing point.</p> <p>f. Use mathematics and computational thinking to compare, contrast, and evaluate the nature of acids and bases in terms of percent dissociation, hydronium ion concentration, and pH. (Clarification statement: Understanding of the mathematical relationship between negative logarithm of the hydrogen</p>	<p>LT1: I can predict the solubility of compounds in different solutions based on compound composition.</p> <p>LT2: I can explain the effects of temperature, pressure, and concentration on the rate that a substance dissolves.</p> <p>LT3: I can calculate the concentration of a solution, create the solution in the lab, and predict the effects that the concentration will have on the physical properties of the substance.</p> <p>LT4: I can explain the difference in acid and basic solutions and predict the</p>	<p>5 days</p>

	<p>concentration and pH is not expected in this element. Only a conceptual understanding of pH as related to acid/basic conditions is needed.)</p> <p>g. Ask questions to evaluate merits and limitations of the Arrhenius and Bronsted-Lowry models of acid and bases.</p> <p>h. Plan and carry out an investigation to explore acid-base neutralization.</p>	products of an acid/base reaction.	
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**Power Standards