

CVUSD Pacing Guide 2023 - 2024: NGSS Chemistry

Overview:

In this NGSS aligned chemistry course, students will explore physical science concepts that build comprehension around matter, its properties, and its interactions with other matter and energy. The units and chapters within this scope and sequence are presented thematically to provide a context for student learning.

In the fall semester, students will investigate atomic structure, the periodic table, the electromagnetic spectrum, molecular geometry, and chemical reactions. In the spring semester, students will develop their chemical understanding through stoichiometry, gas laws, acids and bases, thermodynamics, kinetics, and nuclear energy.

Rationale for flow:

This Chemistry Scope & Sequence follows a microscopic to macroscopic design. The fall semester focuses on building foundational concepts of chemistry and in the spring semester, students apply the fundamental concepts to more advanced topics. When students are provided with the opportunity to apply their foundational knowledge of chemistry concepts to relevant topics that include NGSS, we help prepare students for college, career, and life. Our students will graduate with learning experiences that prepare them to apply learning to personal decisions related to real-world problems. There will be several opportunities for students to focus on solutions to real world issues throughout the semester.

Semester	Fall 2023 (August 24 - Jan 23)					Spring 2024 (January 24 - June 11)			
Unit Title	Create and Maintain Effective Environments for Student Learning Quarter 1 (August 24 - October 27)	Atomic Structure and the Periodic Table Quarter 1 (August 24 - October 27)	The Electromagnetic Spectrum and Electron Configuration Quarter 1 (August 24 - October 27)	Molecular Geometry, Bonding, and Polarity Quarter 2 (October 30 - January 23)	Chemical Reactions Quarter 2 (October 30 - January 23)	Stoichiometry Quarter 3 (January 24 - April 8)	Gases, Acids, and Bases Quarter 3 (January 24 - April 8)	Thermodynamics Quarter 4 (April 9 - June 11)	Kinetics, Equilibrium, and Nuclear Energy Quarter 4 (April 9 - June 11)
Estimated Time	~ 5 days	~ 20 days	~20 days	~20 days	~20 days	~24 days	~24 days	~24 days	~24 days
Essential Question(s)	<ul style="list-style-type: none"> Introduce syllabus, routines, and procedures Teach prerequisite skills Build Relationships 	<ul style="list-style-type: none"> How do subatomic particles of an atom affect its characteristics? What is the relationship between the physical and chemical properties of an element and its placement on the periodic table? 	<ul style="list-style-type: none"> How can energy be transmitted? How does the configuration of electrons affect the atom's properties? 	<ul style="list-style-type: none"> How can we use our knowledge of molecular structure and molecular bonds to determine the properties of molecules? 	<ul style="list-style-type: none"> How can we use our knowledge of mass, matter, and energy to predict a chemical reaction? 	<ul style="list-style-type: none"> How can we use chemical quantities to determine relationships from balanced chemical equations? 	<ul style="list-style-type: none"> How do temperature, pressure, and volume affect a given quantity of a gas? What are the physical and chemical properties of acids and bases? 	<ul style="list-style-type: none"> What impact do the Laws of Thermodynamics have on chemical reactions? 	<ul style="list-style-type: none"> How do we measure the speed of a reaction? What factors affect the rate of a reaction? How does equilibrium compromise to changes in conditions? How is nuclear energy used?
NGSS Performance Expectations		HS-PS1-1 HS-PS1-3	HS-PS1-1 HS-ESS1-3 HS-PS1-2 HS-ESS1-6 HS-PS1-8	HS-PS1-3 HS-ESS2-5 HS-PS2-6* HS-PS1-1 HS-PS1-2	HS-PS1-2 HS-PS1-4 HS-PS1-7	HS-PS1-7	HS-PS1-2 HS-PS1-4 HS-PS1-5 HS-PS1-6 HS-PS1-7	HS-PS1-4	HS-PS1-5 HS-PS1-6 HS-PS1-8
Unit Description		In this unit, students are introduced to the three	In this unit, students will explain the electromagnetic	In this unit students will explore bond formation, valence shell electron pair	In this unit, students will explore how molecules interact with each other,	In this unit, students will understand the importance of the mole unit in order to	Students will explore kinetic molecular theory of gases. Students will explain	In this unit, students will continue to explore the conservation energy	In this unit, students will explore the rates of reactions, Le Chatelier's Principle,

		subatomic particles and identify their characteristics and location within the atom. Students will learn how the periodic table is organized and how the properties of the elements repeat periodically so that elements in the same group have similar properties.	spectrum and identify different types of EM radiation. Students will be able to explain that emission spectra generated upon excited electron return to the ground state act as a unique barcode for elements. Students will be able to describe how electrons occupy defined orbitals of specific energy.	repulsion (VSEPR), electronegativity and how it determines molecular polarity, intermolecular forces. Students will be able to define a covalent bond, make predictions on how many bonds an atom can make based on the octet rule.	chemical reactions, the Law of the Conservation of Matter, changes in bond energies in chemical reactions, and chemical energy. Students will be able to write word equations, skeleton equations, balance chemical equations, and classify the five general types of chemical reactions.	describe a given number of particles. Students will perform an array of calculations including mole-mole, mass-mass, mole-volume, molar mass, percent composition, and mole-particles/molecules using dimensional analysis.	why gases are easier to compress than solids or liquids. Students will be able to describe the relationships among the temperature, pressure, and volume of a gas. Students will be able to describe acid-base theories and perform pH and H ⁺ /OH ⁻ concentrations.	through dimensional analysis, chemical energy, 1 st and 2 nd Laws of Thermodynamics, phase changes, and heat/enthalpy. Students will model what is happening to the energy of the system in relation to the molecules making up the reactants and the products.	equilibrium, and nuclear energy. Students will be able to model what happens when a stress is applied to a system. Students will be able to explain the purpose of the Band of Stability and determine whether an isotope would be stable and define half-life. Students will be able to read decay curves and distinct between fission vs fusion.
Disciplinary Core Ideas addressed in NGSS PEs		Structure and Properties of Matter Types of Interactions	Structure and Properties of Matter Types of Interactions Definition of Energy Electromagnetic Radiation	Structure and Properties of Matter Types of Interactions	Structure and Properties of Matter Chemical Reactions Energy in Chemical Processes	Structure and Properties of Matter Chemical Reactions Types of Interactions	Chemical Reactions Definitions of Energy Conservation of Energy and Energy Transfer Structure and Properties of Matter	Chemical Reactions Conservation of Energy and Energy Transfer Energy in Chemical Reactions	Chemical Reactions Optimizing the Design Solution Energy in Chemical Reactions
Science and Engineering Practices addressed in NGSS PEs		The 8 Science and Engineering Practices should be used throughout each year with an emphasis on 2-3 per unit.							
		<ul style="list-style-type: none"> Developing and Using Models 	<ul style="list-style-type: none"> Developing and Using Models Constructing Explanations and Developing Solutions 	<ul style="list-style-type: none"> Planning and Carrying Out Investigations Obtaining, Evaluating, and Communicating Information 	<ul style="list-style-type: none"> Constructing Explanations and Developing Solutions Developing and Using Models Using Mathematics and Computational Thinking Planning and Carrying Out Investigations 	<ul style="list-style-type: none"> Developing and Using Models Analyzing and Interpreting Data Using Mathematics and Computational Thinking 	<ul style="list-style-type: none"> Developing and Using Models Planning and Carrying Out Investigations Using Mathematics and Computational Thinking 	<ul style="list-style-type: none"> Developing and Using Models Constructing Explanations and Developing Solutions Analyzing and Interpreting Data Planning and Carrying Out Investigations 	<ul style="list-style-type: none"> Constructing Explanations and Developing Solutions Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking
Crosscutting Concepts addressed in NGSS PEs		The 7 Crosscutting Concepts should be used throughout each year with an emphasis on 2-3 per unit.							
		<ul style="list-style-type: none"> Structure and Function Patterns Energy and Matter 	<ul style="list-style-type: none"> Patterns Energy and Matter Systems and System Models 	<ul style="list-style-type: none"> Patterns Structure and Function 	<ul style="list-style-type: none"> Patterns Energy and Matter 	<ul style="list-style-type: none"> Cause and Effect Energy and Matter Stability and Change Patterns 	<ul style="list-style-type: none"> Energy and Matter Systems and System Models Cause and Effect Patterns 	<ul style="list-style-type: none"> Patterns Systems and System Models Stability and Change Cause and Effect Energy and Matter 	<ul style="list-style-type: none"> Stability and Change Systems and System Models Patterns Structure and Function