

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



Chemistry of Earth Systems

Board Approval Date: June 15, 2023	Course Length: 2 Semesters
Grading: A-F	Credits: 5 Credits per Semester
Proposed Grade Level(s): 10, 11, 12	Subject Area: Physical Science Elective Area (if applicable):
Prerequisite(s): None	Corequisite(s): Integrated Math 1
CTE Sector/Pathway:	
Intent to Pursue 'A-G' College Prep Status: Yes	
A-G Course Identifier: (d) Laboratory Science	
Graduation Requirement: Yes	
Course Intent: District Course Program (if applicable):	
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COURSE DESCRIPTION:

Chemistry of the Earth System is a course in the California Next Generation Science Standards (CA NGSS) three course model and includes disciplinary core ideas related to Physical Science and integrates a selection of the Earth and Space Science concepts. This course also incorporates the eight Science and Engineering Practices and seven Crosscutting Concepts related to the NGSS. In this course, students will explore the structure and properties of matter, conservation and transfer of energy, chemical reactions and processes in everyday life, and chemical changes in Earth systems. Engineering Core Ideas are used to explore applications of chemistry concepts. Students apply algebraic processes to describe and predict phenomena.

DETAILED UNITS OF INSTRUCTION:

Unit Number/Title	Unit Essential Questions	Examples of Formative Assessments	Examples of Summative Assessment
1. Particle Model: Combustion	What is energy, how is it measured, and how does it flow within a system? What mechanisms allow us to utilize the energy of our foods and fuels?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Explorations of particle phenomena, comparisons of solid, liquids and gases, energy measurements)	*Unit Test *Project *Lab or other means of assessment
2. Heat and Energy in the Earth System	How is energy transferred and conserved? How can energy be harnessed to perform useful tasks?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Gas laws labs and activities, unit conversions, heat and energy measurement activities)	*Unit Test *Project *Lab or other means of assessment
3. Patterns and Interactions of the Periodic Table	What are inside atoms and how does this affect how they interact? What models can we use to predict the outcomes of chemical reactions?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Exploration of properties of metals and non-metals, exploring reactivity, periodic table trends)	*Unit Test *Project *Lab or other means of assessment
4. Applications of Chemical Reactions	What holds atoms together in molecules? How do chemical reactions absorb and release energy?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Exploration of bonding)	*Unit Test *Project *Lab or other means of assessment

		properties, nomenclature practice, writing chemical formulas of ionic compounds, endothermic and exothermic processes, determining reaction types)	
5. Chemistry of Climate Change	What regulates weather and climate? What effects are humans having on the climate?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Exploration of products of combustion, feedback mechanisms related to temperature)	*Unit Test *Project *Lab or other means of assessment
6. Dynamics of Chemical Reactions and Ocean Acidification	How can you alter chemical equilibrium and reaction rates? How can you predict the relative quantities of products in a chemical reaction?	*Vocabulary *Quizzes *Labs *Lab/activities (i.e. Exploration of carbon dioxide and acidity of water, activities exploring pH and reversible reactions, factors that affect reaction rate, stoichiometry activities, labs and practice).	*Unit Test *Project *Lab or other means of assessment

ESSENTIAL STANDARDS:

HS-PS1-1: 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. (ELA/Literacy CCSS: RST.9-10.7)

HS-PS1-2: Construct and revise 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. (ELA/Literacy CCSS: RST.11-12.2, RST.11-12.5 and Math CCSS: HSN-Q.A.1, HSN-Q.A.3)

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. (ELA/Literacy CCSS: RST.11-12.1, RST.11-12.2 and Math CCSS: MP.2, HSN-Q.A.1, HSN-Q.A.3)

HS-PS1-6: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* (ELA/Literacy CCSS: RST.11-12.7)

HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (Math CCSS: MP.2, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3)

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.(ELA/Literacy CCSS - RST.11-12.1, RST.11-12.8 and Math CCSS HSN.Q.A.1, HSN.Q.A.2, HSN.Q.A.3)

HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (Math CCSS HSN.Q.A.1, HSN.Q.A.2, HSN.Q.A.3)

RELEVANT STANDARDS AND FRAMEWORKS, CONTENT/PROGRAM SPECIFIC STANDARDS:

Link to Common Core Standards (if applicable):

Educational standards describe what students should know and be able to do in each subject in each grade. In California, the State Board of Education decides on the standards for all students, from kindergarten through high school.

9th-10th <http://www.corestandards.org/ELA-Literacy/RST/9-10/> 11th-12th <http://www.corestandards.org/ELA-Literacy/RST/11-12/> <https://www.cde.ca.gov/be/st/ss/documents/ccssmathstandardaug2013.pdf>

Link to Framework (if applicable):

Curriculum frameworks provide guidance for implementing the content standards adopted by the State Board of Education (SBE). Frameworks are developed by the Instructional Quality Commission, formerly known as the Curriculum Development and Supplemental Materials Commission, which also reviews and recommends textbooks and other instructional materials to be adopted by the SBE.

<https://www.cde.ca.gov/ci/sc/cf/documents/scifwchapter7.pdf>

Link to Subject Area Content Standards (if applicable):

Content standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level.

Link to Program Content Area Standards (if applicable):

Program Content Area Standards apply to programs such as International Baccalaureate, Advanced Placement, Career and Technical Education, etc.

TEXTBOOKS AND RESOURCE MATERIALS:

Textbooks

Board Approved	Pilot Completion Date (If applicable)	Textbook Title	Author(s)	Publisher	Edition	Date
Yes		<i>Chemistry in the Earth Systems</i>	Michael DiSpezio, Thomas O'Brien, Bernadine Okoro	Houghton Mifflin Harcourt	1st	1/1/2020

Other Resource Materials

SIRC, SASP, PhET, Pogil, PBS Learning, NOVA Videos, Crash Course, Khan Academy, Bozeman Science, Pear Deck, EdPuzzle, NIH, Moana Loa Observatory, PBS Learning, NOVA videos, Crash Course, Bozeman Science, National Center for Case Studies in Science Teaching, Pear Deck, EdPuzzle, PhET, Stanford NGSS Assessment Project, CASE, NIH, Moana Loa Observatory, Scripps Institute, SIRC, SASP, CA Environmental

Literacy Initiative, Exploratorium, California Academy of Science, Science Learning Hub ([science learn.org](http://science.learn.org)), Concord Consortium, Khan Academy, Verner Scientific, POGIL, Pasco, PubChem, ChemThink, InteractiveChemistry.org

Supplemental Materials

Board approved supplemental materials (Including but not limited to: Film Clips, Digital Resources, Supplemental texts, DVDs, Programs (Pebble Creek, DBQ, etc.): Gizmos