

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



HONORS CHEMISTRY OF THE EARTH SYSTEM

Board Approval Date: June 1, 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): B or better in Biology and Integrated Math 2	Corequisite(s): Enrollment in Integrated Math 3 is strongly recommended
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):	
<p>The Folsom Cordova Unified School District prohibits discrimination, intimidation, harassment (including sexual harassment) or bullying based on a person’s actual or perceived ancestry, color, disability, race or ethnicity, religion, gender, gender identity or gender expression, immigration status, national origin, sex, sexual orientation, or association with a person or group with one or more of these actual or perceived characteristics. For concerns/questions or complaints, contact the Title IX Coordinator(s), Equity Compliance Officer(s) and Section 504 Coordinator(s) :</p> <p>Donald Ogden, Associate Superintendent – Human Resources kmorales@fcusd.org 916-294-9000 ext. 104410 Jim Huber, ED. D., Assistant Superintendent – Educational Services jhuber@fcusd.org 916-294-9000 ext. 104625 Shannon Diaz, Director of Compliance (Investigator) sdiaz@fcusd.org 916-294-9000 ext. 104620 1965 Birkmont Drive, Rancho Cordova, CA 95742</p>	

COURSE DESCRIPTION:

Honors 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 integrating 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. The following core ideas from Chemistry in the Earth System will be amplified in this course: structure and properties of matter, conservation and transfer of energy, periodic trends and organization, chemical bonding, chemical reactions and processes in everyday life, and chemical equilibrium and its role in Earth Systems. In addition, core ideas in engineering are used to explore applications of chemistry concepts, along with Algebraic processes to describe and predict phenomena. There will also be a strong math component in this course.

DETAILED UNITS OF INSTRUCTION:

Unit Number/Title	Unit Essential Questions	Examples of Formative Assessments	Examples of Summative Assessment
1. Introduction to Chemistry	What is Chemistry? What skills are essential to learning Chemistry?	*Activities from Particle Model. *Claim-Evidence-Reasoning(CER). *Student explanations through whiteboarding. *Robbie's review. *Measurement activities. *Identity of an unknown substance based on physical and chemical properties. *Dimensional analysis. *Metrics, SI Units.	*Unit Test *Project *Lab or other means of assessment
2. Atomic Structure and Periodic Trends	What is inside atoms and how does this affect how they interact? What models can we use to predict the outcomes of chemical reactions?	*Periodic Table card sort. *Analysis of periodic data. *POGIL - Periodicity, Electron configuration, Isotopes, Average atomic mass, Cracking the PeriodicTable Code. *Lab: Flame Tests	*Unit Test *Project *Lab or other means of assessment
3. Chemical Names and Formulas	How are chemicals named and used in scientific literature?	*Investigating Chemical Formulas. *Pattern Activity and extension. *POGIL: Naming ionic compounds, Naming covalent compounds, Naming acids.	*Unit Test *Project *Lab or other means of assessment

		*Lab: Identification of cations and anions in solution.	
4. Chemical Reactions and Types	How is matter conserved in a chemical reaction? How do you know what the product of a chemical reaction will be? How do chemical reactions absorb and release energy?	*Building energy diagram models using PhET simulations and providing explanations. *Intro to Collision Model. *Investigation into the release and absorption of energy in chemical reactions.	*Unit Test *Project *Lab or other means of assessment
5. Stoichiometry	How can you predict the relative quantities of products in a chemical reaction?	*Calculations practice involving stoichiometry. *Whiteboarding. *Group and individual practice. *Lab: Antacid. *Lab: Formula of a Hydrate. *Lab: Smore Lab. *Lab: The Ratio of Hydrogen and Oxygen	*Unit Test *Project *Lab or other means of assessment
6. Chemical Bonding	What holds atoms together in molecules?	*Investigating bulk properties of compounds. *PhET: Molecular shapes. *Lab: Melting points for a covalent and ionic compound. *Database lab investigating bulk properties of different types of bonds (PubChem Project). *Lab: Bonding Properties(Pasco).	*Unit Test *Project *Lab or other means of assessment
7. Energy	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? How is energy transferred and conserved? How can energy be harnessed to perform useful tasks?	*PhET Simulation - States of Matter. *Lava Lamp Activity. *Investigating the interior of the earth. *Heat capacity of different materials. *Lab: Calorimetry with/without combustion. *Lab: Enthalpy of Magnesium Oxide. *Lab: Gibbs Free Energy. *Activity: Hess' Law.	*Unit Test *Project *Lab or other means of assessment

8. Solution Chemistry and Kinetics	How can you alter chemical equilibrium and reaction rates? What impact does chemical equilibrium have on Earth systems?	*Lab: Titration of an acid and base. *Lab: Murder Mystery (Solution Concentration). *Lab: Concentration of acid. *Activity: Serial dilutions. *Lab: Le Chatelier's Lab. *Equilibrium activities (soda water and bromothymol blue in a syringe). *Lab: Reaction rates. *Lab: Acid Rain (limiting reagent/solutions).	*Unit Test *Project *Lab or other means of assessment
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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.

<http://www.corestandards.org/ELA-Literacy/RST/9-10/> <http://www.corestandards.org/ELA-Literacy/RST/11-12/> Math <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.

<https://www.nextgenscience.org/>

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>HMH Chemistry of the Earth Systems</i>	Michael DiSpezio, Thomas O'Brien, Bernadine Okoro	Houghton Mifflin Harcourt, HMH	1st	1/1/2020

Other Resource Materials

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), 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, Chemistry the Central Science (Brown, LeMay, Burston), Pearson Baccalaureate IB Chemistry Standard Level