FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

HONORS CHEMISTRY OF THE EARTH SYSTEM

Board Approval Date: June 20, 2019	**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):**	

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.	*Mathematical labs involving measurements, units and physical properties (Beverage Density Lab or Thickness of Aluminum Foil).
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 Periodic Table Code. *Lab: Flame Tests.	*Application of the Periodic Table through Unit Test and/or Project: Iron in the Ocean.
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. *Lab: Identification of cations and anions in solution.	*Lab: Design an experiment to investigate two different ionic substances.
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 provide explanations. *Intro to Collision Model. *Investigation into the release and absorption of energy in chemical reactions.	*Laboratory Activity: Identify the type of chemical reaction and predict the product(s) formed using observations.

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.	*Lab Report for Iron (III) and Copper (II) Chloride or other investigation into Stoichiometry.
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).	*Research Project: Scientific investigation of molecules and bulk properties using PubChem.
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.	*Lab Report on an Energy topic.
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.	*Design Lab: Investigate a factor affecting reaction rates.

		*Lab: Acid Rain (limiting reagent/solutions).	

ESSENTIAL STANDARDS:

HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (ELA/Literacy CCSS: RST.11-12.1, RST.11-12.2, RST.11-12.7 and Math CCSS: MP.2, HSN-Q.A.1, HSN-Q.A.2, HSN-Q.A.3)

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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (ELA/Literacy CCSS: RST.11-12.1, RST.11-12.7, WHST.11-12.8, WHST.9-12.9 and Math CCSS: HSN-Q.A.1, HSN-Q.A.3)

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total energy. (ELA/Literacy CCSS: SL.11-12.5 and Math CCSS: MP.4, HSN-Q.A.1, HSN-Q.A.2, 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-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (ELA/Literacy CCSS:RST.11-12.1, WHST.9-12.7, WHST.11-12.8, WHST.9-12.9 and Math CCSS: MP.2, MP.4)

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/

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/cascienceframework2016.asp

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 applies 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		*World of Chemistry*	Zumdahl, Zumdahl & DeCoste	Houghton Mifflin		*2002, 2006*
Yes		*Chemistry: The Central Science*	Brown, LeMay, Burston	Pearson	7th edition	*1997*

Other Resource Materials
None

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