Chemistry in the Earth System

Length & Dates	Unit of Study	Overview	Guiding Questions	Formative Assessments
3 Days: Aug.22-Aug.24	1. Science and Engineering Practices	In this brief introductory unit, students engage in the practices used by scientists and engineers to conduct investigations and design solutions. They recognize that scientific investigations involve repeating the same steps many times to account for new information and ideas.	• How do scientists learn about the world? • How do scientists answer scientific questions?	--
2 Weeks: Aug.27-Sept.7	2. Combustion	Students investigate the amount of stored chemical potential energy in food. They make observations of material properties at the bulk (macroscopic) scale that they will later explain in the atomic scale. Combustion and CO_2 are foundational themes for all other units.	• What is energy? • How is energy measured? • How does energy flow within a system? • What mechanisms allow us to utilize the energy of foods and fuels?	
6 Weeks: Sept.10-Oct.19	3. Heat and Energy	Students develop models of energy conservation within systems and the mechanisms of heat flow. They relate macroscopic heat transport to atomic scale interactions of particles, which they will apply in later units to construct models of interactions between atoms.	• How is energy transferred? • How is energy conserved? • Why do some reactions release energy and others absorb it?	
1 Week: Oct.22-Oct.26	• Quarter 1 Review • Quarter 1 Benchmark Assessment			
2 Weeks: Oct.29-Nov.9	4. Heat an Energy in the Earth System	Students develop a model of Earth's interior and use evidence from Earth's surface to infer the heat transport processes at work in the planet's interior. They relate the model of density driven flow to plate tectonics	• If the interior of Earth is solid, how can it convect? • What is the evidence that this motion is occurring?	
6 Weeks: Nov.13-Jan.18	5. Atoms, Elements, and Molecules	Students recognize patterns in the properties and behavior of elements, as illustrated on the periodic table. They use these patterns to develop a model of the interior structure of atoms and to predict how different atoms will	• What is inside atoms and how does this affect how they interact?	

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		interact based on their electron configurations. They use chemical equations to represent these interactions and begin to make simple stoichiometric calculations.	• What models can we use to predict the outcomes of chemical reactions?	
1 Week: Jan.22-Jan.24	• Quarter 2/Semester 1 Review • Quarter 2/Semester 1 Benchmark Assessment			
7 Weeks: Jan.28-Mar.15	6. Chemical Reactions	• Students refine their models of chemical bonds and chemical reactions. They compare the strength of different types of bonds and attractions and develop models of how energy is stored and released in chemical reactions.	• What holds atoms together in molecules? • How do chemical reactions absorb and release energy?	
1 Week: Mar.18-Mar.22	• Quarter 3 Review • Quarter 3 Benchmark Assessment			
5 Weeks: Mar.25-May 3	7. Chemistry of Climate Change	• Students develop models of energy flow in Earth's climate. They revisit combustion reactions from IS1 to focus on emissions from fossil fuel energy sources. They apply models of the structures of molecules to explain how different molecules trap heat in the atmosphere. Students evaluate different chemical engineering solutions that can reduce the impacts of climate change.	• What regulates weather and climate? • What effects are humans having on the climate?	
5 Weeks: May 6-June 7	8. Dynamics of Chemical Reactions & Ocean Acidification	• Students investigate the effects of fossil fuel combustion on ocean chemistry. They develop models of equilibrium in chemical reactions and design systems that can shift the equilibrium. Students conduct original research on the interaction between ocean water and shell-building organisms.	• How can you alter chemical equilibrium and reaction rates? • How can you predict the relative quantities of products in a chemical reaction?	
1 Week: June 10-June 13	• Quarter 4/Semester 2 Review • Quarter 4/Semester 2 Benchmark Assessment			

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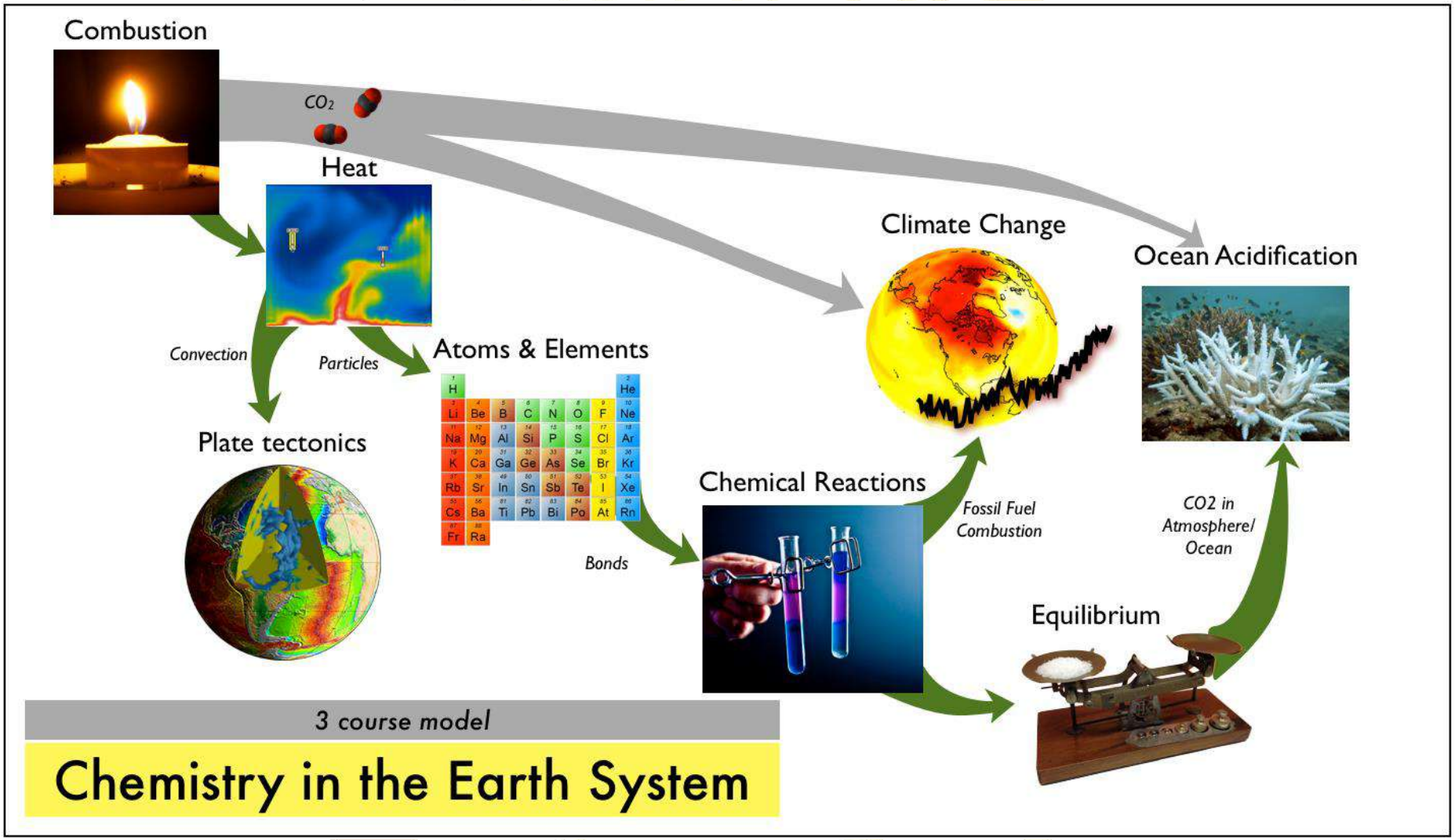
Conceptual Flow



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