

**Year at a Glance – Tenth Grade Science**

**Guiding Crosscutting Concept: Heat energy is transferred between microscopic particles & at macroscopic scales, influencing Earth’s systems & driving plate motions. Earth’s climate is a thermodynamic system within which stability & change is altered by molecules with structures that disrupt the flow of energy.**

**Official 2019-20 Version**
**What Students Learn**

Students explain how chemical processes help drive the Earth system. They recognize that Earth and space scientists possess a strong background in the fundamentals of matter and chemistry in order to interpret processes that shape the Earth system. Students can model a raindrop falling through the air, interacting with the CO and becoming slightly acidic. They explain how water flows through rock reacting with the minerals to form clays that will easily erode. Students analyze how ocean water reacts with volcanic rocks on the ocean floor so that their physical properties change completely. They understand that when these rocks are dragged down into the Earth along plate boundaries, minerals that were once strong enough to withstand great forces now act as lubricants along this great plate boundary fault system. They create and interpret visual representations of the flow of heat generated deep within the Earth, in which the processes of conduction and convection work to equalize temperature differences between Earth’s interior and outer space. They explain how this expression of thermodynamics turns an otherwise dead planet into a hotbed of geologic activity. Students apply concepts of chemistry to model reactions that explain what we see on Earth today. They use engineering principles to design and test solutions for many of society’s challenges, from natural hazards to global warming or to minimize our impact on the natural world.

| Units  | Key Learning Outcomes   |
|--|---|
| Combustion   | <ul style="list-style-type: none"> <li>● HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.</li> <li>● 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.)</li> <li>● 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.</li> <li>● HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.</li> <li>● HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems.</li> <li>● HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.</li> <li>● 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.</li> </ul> |
| Heat & Energy in the Earth System                    |   |
| Atoms, Elements & Molecules                          |   |
| Chemical Reactions                                   |   |
| Chemistry of Climate Change                          |   |
| Dynamics of Chemical Reactions & Ocean Acidification |   |