Excerpts from: *Leadership Planning Guide, CALIFORNIA: Common Core State Standards and Assessments Implementation*

The CCSS are not a curriculum. Curriculum is the roadmap that teachers use to help students acquire and master the knowledge and skills detailed in the standards. A coherent and specific curriculum is mapped backwards from desired performances. Therefore, deciding what should be taught when is "job number one."

Indeed, E.D. Hirsch has noted that "The single most effective way to enhance teacher effectiveness is to create a more coherent multi-year curriculum, so that teachers at each level will know what students have already been taught."

J.D. Hirsch, Jr., "Why I'm for the Common Core: Teacher Bashing and Common Core Bashing Are Both Uncalled For" at http:// www.huffingtonpost.com/e- d-hirsch-jr/why-im-for-the- common-cor_b_3809618. html

The CCSS are sometimes written by grade spans, and decisions need to be made as to what concept should be taught at what grade level. In other words, it is likely work will need to be done on a new or revised scope and sequence before curriculum can be fully developed, and before lesson plans can be extensively designed.

The standards have to be broken apart and their spiraling nature understood (i.e., how the standards build on each other). Then the school and district curriculum needs to be examined and/or mapped, and the gaps or opportunities identified.

Scope & Sequence: (7041 Earth Science H)

Driving Questions	Suggested Pacing	Home study Weeks	Learning Targets	Standards Addressed: NGSS & CCSS	Performance Tasks
Use the driving questions in each unit of the NGSS.	How much time will it take to teach this theme? All the themes should be covered during the span of one school year.		What knowledge will the students gain? What skills will the students be able to do?	List the actual standards and reference letters and numbers.	How will these learning targets be measured?
ESS1: What is the universe, and what is Earth's place in it?	5 weeks	1b, 2b, 3b, 4b, 5b	The performance expectations in ESS1: Earth's Place in the Universe, help students formulate an answer to the question: "What is the universe, and what is Earth's place in it?" The ESS1 Disciplinary Core Idea from the NRC Framework is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the processes governing the formation, evolution, and workings of the solar system and universe. Some concepts studied are fundamental to science, such as understanding how the matter of our world formed during the Big Bang and within the cores of stars. Other concepts are practical, such as understanding how short-term changes in the behavior of our sun directly affect humans. Engineering and technology play a large role here in obtaining and analyzing the data that support the theories of the formation of the solar system and universe. The crosscutting concepts of patterns, scale, proportion, and quantity, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, using	ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.	Nuclear Fusion Activity or Lab Big Bang Theory Essay; Include the three pillars that support the Big Bang Theory (ESS1-2) Virtual Lab: Galaxies (Week 5b) Stars Webquest (Week 4b) Measuring Red-Shifts (Week 5b) HR Diagram Activity (Week 6b) (ESS1-2)

			mathematical and computational thinking, constructing explanations and designing solutions, engaging in argument, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.	ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	Color Code Periodic Table (N/A, ESS1-3) Orbiting Objects Activity (Week 3b, ESS1-4) Seafloor Spreading Activity or Lab Big Bang Theory Activity or Lab
ESS2: How and why is Earth constantly changing?	13 weeks	1a-5a, 7a-11 a, 13a-15 a	The performance expectations in ESS2: Earth's Systems, help students formulate an answer to the question: "How and why is Earth constantly changing?" The ESS2 Disciplinary Core Idea from the NRC Framework is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. For the purpose of the NGSS, biogeology has been addressed within the life science standards. Students develop models and explanations for the ways that feedbacks between different Earth systems control the appearance of Earth's surface. Central to this is the tension between internal systems, which are largely responsible for creating land at Earth's surface, and the sun-driven surface systems that tear down the land through weathering and erosion. Students begin to examine the ways that human	ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. 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. ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	Lab 20.1 (did not use in 7041 this year) Interactive Rock Cycle Activity (saved and pinned to Surface Processes) (ESS2-1) A Model of Three Faults (pinned to Surface Processes & Plate Tectonics) (new; ESS2-2) Map Project (modify directions to include JUST color-coding climates, sun

			activities cause feedbacks that create changes to other systems. Students understand the system interactions that control weather and climate, with a major emphasis on the mechanisms and implications of climate change. Students model the flow of energy between different components of the weather system and how this affects chemical cycles such as the carbon cycle. The crosscutting concepts of cause and effect, energy and matter, structure and function and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.	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. ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	strength, and winds.) (Week 11a and 12b ESS2-3) Frost Wedging Lab (Week 13a; ESS2-5) Peppermint Candy Lab (Week 15a; ESS2-5) Virtual Lab: Carbon Cycle (ESS2-6) Calculating Residence Time: The Global Carbon Cycle (ESS2-6)
ESS3: How do Earth's surface processes and human activities affect each other?			The performance expectations in ESS3: Earth and Human Activity help students formulate an answer to the question: "How do Earth's surface processes and human activities affect each other?" The ESS3 Disciplinary Core Idea from the NRC Framework is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the complex and significant interdependencies between humans and the rest of Earth's systems through the impacts of natural hazards, our dependencies on natural resources, and the significant environmental impacts of human activities. Engineering and technology figure prominently here, as students use mathematical thinking and the analysis of geoscience data to examine and construct solutions to the many challenges facing long-term human sustainability on Earth. The crosscutting concepts of cause and effect, systems and system models, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance	ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. ESS3-2 Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios* ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations and biodiversity.	Liquid Gold:California's Water (ESS3-1 and ESS3-3;-ETS1-1 and ETS1-3)

			expectations, students are expected to demonstrate proficiency in developing and using analyzing and interpreting data, mathematical and computational thinking, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.	ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems* 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. ESS3-6 Use a computational representation to illustrate the relationship among Earth systems and how those relationships are being modified due to human activity.	Students conduct an experiment to determine CO_2 levels in four different gases, examine evidence of global warming in our environment, and consider their own role in contributing to global warming.**** http://www.pbslearningmedia.org/resource/ess05.sci.ess.watcyc.lp_global2/global-climate-change-the-effects-of-global-warming/ (HS-ESS3-5) Ocean Acidification: Too Much of a Good Thing? http://serc.carleton.edu/eslabs/carbon/7a.html (HS-ESS3-6)
Final Exams	2 weeks	17a, 18b			
Project Week	1 week	18a			
Performance Tasks	4 weeks	6a, 12a, 6b, 16b			
Intro	1 week	1a			

Review for Finals	2 weeks	16a, 17b			
	Total: 36 weeks				

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

This scope and sequence is designed to address CCSS Literacy outcomes and the Next Generation Science Standards. The overarching focus for this scope and sequence is the building of student's content knowledge and literacy skills as they develop knowledge about the world.

Each unit provides several weeks of instruction. Each unit also includes various formative and summative assessments.

Taken as a whole, this curriculum map is designed to give teachers recommendations and some concrete strategies to address the shifts required by CCSS and the Next Generation Science Standards.

Building knowledge through content-rich nonfiction	JCS's approach emphasizes effective literacy instruction integrated with content knowledge to engage students and promote inquiry. The texts are sequenced around a topic leading to the big idea and essential questions in order to provide a clear and explicit purpose for instruction. · •Curriculum includes a rich variety of texts, including literature, nonfiction, media, primary sources, and visuals. · •Curriculum is based in part on what resources teachers likely already have, but also includes additional authentic texts needed to craft a coherent learning progression within and among grade levels. · •The curriculum includes literacy standards, but these enhance rather than replace the currently adopted content area standards in Science and Social Science.
Reading, writing and speaking grounded in evidence from text, both literary and informational	JCS's approach emphasizes working with evidence, including students self-assessing, learning to ask strong text-dependent strategic questions as they read. It emphasizes performance tasks that require students to cite textual evidence, to revise and reflect on their own writing as well as their peers' writing. It emphasizes students building expertise about a topic and often sharing that expertise with classmates or a wider audience. · •Throughout instruction, students are asked to return to the text through sequenced, rich, and rigorous evidence based questioning, discussions, and varied, engaging tasks. · •Students write routinely, including a balance of on-demand and process writing. Students will draw evidence from texts to produce clear and coherent writing that informs, explains, or makes an argument in various written forms. · •All end-of-unit performance tasks directly build on the reading students have been doing in the unit. Many are designed to build students' engagement by asking them to do a more real-world task. · •Performance tasks may include narratives, but emphasize informative and argumentative writing.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Regular practice with complex text and its academic language	JCS's approach emphasizes active reading of complex texts by all students. Students will read a progression of complex texts and focus on building academic language and syntax in context. · •Texts are chosen to reflect a variety of factors: Lexile level, complexity of the topic/concept, the appropriateness of the text given the specific literacy standard or task. · •Texts cultivate students' interests, are relevant to their culture, and engage them in reading, writing, and speaking. · •Curriculum directly address supports for meeting the needs of a wide range of learners in order for every student to become a more proficient and independent reader. · •Curriculum emphasizes academic and domain specific vocabulary as well as other words ELLs or other struggling readers might not know · •Curriculum strongly emphasize teaching students how to figure out words in context. · •Students are expected to do regular independent reading to build on concepts and ideas in each unit. Research shows that students must read a high volume of text at their reading level in order to build a strong vocabulary.

Conceptual Shifts from Next Generation Science Standards:

1. Focuses on deeper understanding and application of content.
2. Reflects real world interconnections.
3. Integrates science content, engineering practices and crosscutting concepts.
4. Coordinates with English Language Arts and Mathematics Common Core State Standards.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

How to Read this Document

· •The purpose of this document is to provide a high-level summary of each unit and name the standards each unit addresses.
· •First, read each module overview paragraph. This describes the purpose for the unit the connections with previous and subsequent units.
· •On the map, note the titles across the year: These show the progression of literacy skills.
· •Note the distinction between standards in each unit vs. central for this unit.

- Standards labeled in each unit are foundational to the CCSS shifts, and therefore are taught early and reinforced through the year.
- Standards central for this unit are the focus for that specific unit.
- Standards formally assessed are in **bold**.

· Text: **Bold** indicates the main extended text for the unit.

Grade:	**High School Biology**
Unit 1	**Interdependent Relationships in Ecosystems:** The performance expectations in the topic **Interdependent Relationships in Ecosystems** help students answer the question, "How do organisms interact with the living and non-living environment to obtain matter and energy?" This topic builds on the other topics as high school students demonstrate an ability to investigate the role of biodiversity in ecosystems and the role of animal behavior on survival of individuals and species. Students have increased understanding of interactions among organisms and how those interactions influence the dynamics of ecosystems. Students can generate mathematical comparisons, conduct investigations, use models, and apply scientific reasoning to link evidence to explanations about interactions and changes within ecosystems.
Unit 2	**Structure and Function:** The performance expectations in the topic **Structure and Function** help students formulate an answer to the question: "How do the structures of organisms enable life's functions?" High school students are able to investigate explanations for the structure and function of cells as the basic units of life, the hierarchical systems of organisms, and the role of specialized cells for maintenance and growth. Students demonstrate understanding of how systems of cells function together to support the life processes. Students demonstrate their understanding through critical reading, using models, and conducting investigations. The crosscutting concepts of structure and function, matter and energy, and systems and system models in organisms are called out as organizing concepts.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Unit 3	**Matter and Energy in Organisms and Ecosystems:** The performance expectations in the topic **Matter and Energy in Organisms and Ecosystems** help students answer the questions: "How do organisms obtain and use energy they need to live and grow? How do matter and energy move through ecosystems?" High school students can construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. They can apply mathematical concepts to develop evidence to support explanations of the interactions of photosynthesis and cellular respiration and develop models to communicate these explanations. They can relate the nature of science to how explanations may change in light of new evidence and the implications for our understanding of the tentative nature of science. Students understand organisms' interactions with each other and their physical environment, how organisms obtain resources, change the environment, and how these changes affect both organisms and ecosystems. In addition, students can utilize the crosscutting concepts of matter and energy and Systems and system models to make sense of ecosystem dynamics.
Unit 4	**Inheritance and Variation of Traits:** The performance expectations in the topic **Inheritance and Variation of Traits** help students in pursuing an answer to the question: "How are the characteristics from one generation related to the previous generation?" High school students demonstrate understanding of the relationship of DNA and chromosomes in the processes of cellular division that pass traits from one generation to the next. Students can determine why individuals of the same species vary in how they look, function, and behave. Students can develop conceptual models for the role of DNA in the unity of life on Earth and use statistical models to explain the importance of variation within populations for the survival and evolution of species. Ethical issues related to genetic modification of organisms and the nature of science can be described. Students can explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expression. Crosscutting concepts of structure and function, patterns, and cause and effect developed in this topic help students to generalize understanding of inheritance of traits to other applications in science.
Unit 5	**Natural Selection and Evolution:** The performance expectations in the topic **Natural Selection and Evolution** help students answer the questions: "How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms? How does biodiversity affect humans?" High school students can investigate patterns to find the relationship between the environment and natural selection. Students demonstrate understanding of the factors causing natural selection and the process of evolution of species over time. They demonstrate understanding of how multiple lines of evidence contribute to the strength of scientific theories of natural selection and evolution. Students can demonstrate an understanding of the processes that change the distribution of traits in a population over time and describe extensive scientific evidence ranging from the fossil record to genetic relationships among species that support the theory of biological evolution. Students can use models, apply statistics, analyze data, and produce scientific communications about evolution. Understanding of the crosscutting concepts of patterns, scale, structure and function, and cause and effect supports the development of a deeper understanding of this topic.
Unit 6	**Human Body Emphasis on Structure and Function:** The performance expectations in the topic **Structure and Function** help students formulate an answer to the question: "How do the structures of organisms enable life's functions?" High school students are able to investigate explanations for the structure and function of cells as the basic units of life, the hierarchical systems of organisms, and the role of specialized cells for maintenance and growth. Students demonstrate understanding of how systems of cells function

	together to support the life processes. Students demonstrate their understanding through critical reading, using models, and conducting investigations. The crosscutting concepts of structure and function, matter and energy, and systems and system models in organisms are called out as organizing concepts. ***This unit is a repeat of Unit 2, with specific emphasis on the human body.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

HS Biology – Semester 1

Timeline	8 **weeks**	**4 weeks**	**4 weeks**
	UNIT 1	**UNIT 2**	**UNIT 3**
TITLE	Interdependent Relationships in Ecosystems	Structure and Function	Matter and Energy in Organisms and Ecosystems
END OF UNIT PERFORMANCE TASK	Research plankton and create a one page report on the differences between phytoplankton (suspended aquatic microscopic plants such as green algae) and zooplankton (small, generally microscopic animals and fat-rich eggs of animals that float with currents). Report should describe the importance of plankton and its place in the food chains, and should include a drawing. Cite your source.	READ: Connection to Literature - The Lives of a Cell on p. 190, and complete the writing assignment at the bottom of the page, "Critique, Evaluate Dr. Thomas's comparison of Earth to a cell. How do you think Earth is like a cell? How would you disagree with this model?"	Create a comic strip or a pop up book that traces the path of a single carbon atom as it is cycled between the major spheres of the earth. Be specific about the structure that carbon forms within each reservoir. (Major spheres are listed below.)
BIG IDEA AND ESSENTIAL QUESTIONS	**Organisms interact with the living and non-living environment to obtain matter and energy.** · •How do organisms interact with the living and non-living environment to obtain matter and energy? · •What factors affect the carrying capacity of ecosystems? · •What factors affect biodiversity and populations in ecosystems? · •What evidence exists for the cycling of matter and the flow of energy in aerobic and anaerobic conditions? · •How does energy flow and matter cycle through organisms in an ecosystem? · •Why do ecosystems maintain relatively consistent numbers and types of	**Organisms live and grow.** · •How do the structures of organisms enable life's functions? · •How does the structure of DNA determine the structure of proteins? · •How do proteins carry out the essential functions of life? · •How are complex organisms produced and maintained through cellular division and differentiation? · •How does photosynthesis transform light energy into stored chemical energy? · •How do carbon, hydrogen and oxygen from sugar molecules combine with other elements to form amino	**Organisms obtain and use energy they need to live and grow. Matter and energy move through ecosystems.** ● How do organisms obtain and use energy they need to live and grow? ● How do matter and energy move through ecosystems? ● How can cellular respiration be represented in a model? ● How does photosynthesis transform light energy into stored chemical energy? ● What is the role of photosynthesis and cellular respiration in the cycling of carbon among the

	organisms in stable conditions, while new ecosystems may result from changing conditions? · •How can the impacts of human activities on the environment and biodiversity be reduced? · •What is the role of group behavior on individual and species' chances to survive and reproduce? * How does matter cycle and energy flow among organisms in an ecosystem?	acids and/or other large carbon-based molecules? · •How do feedback mechanisms maintain homeostasis? ● What are the basic units of life? ● How do systems of cells function together to support life's processes? ● How do feedback mechanisms maintain homeostasis?	biosphere, atmosphere, hydrosphere, and geosphere?

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	8 **weeks** **UNIT 1**	**4 weeks** **UNIT 2**	**4 weeks** **UNIT 3**
COMPLEX TEXTS	Read various, current articles found by the instructor, examples below: Ecology of Tide pool Photosynthesis and Cellular Respiration Trophic Transfer of Energy in an Ecosystem The dead sea: Global warming blamed for 40% decline in ocean's phytoplankton Keystone species-Sea Otters, Prairie Dogs, African Elephant, and Grey Wolf Reading for Annotated Matrix Freshwater mussel biodiversity and conservation Motor boat turbulence kills zooplankton Gillnets taking toll on seabirds Seaweed records impact of global warming	Journal articles of breakthroughs in DNA studies, cancer, cell regulation.	Photosynthesis and Cellular Respiration, Journal articles

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	**8 weeks** **UNIT 1**	**4 weeks** **UNIT 2**	**4 weeks** **UNIT 3**
OTHER TEXTS	Glencoe Biology Text Chapters 2, 3, 4, 5	Glencoe Biology Text Chapters 6, 7	Glencoe Biology Text Chapters 8, 9
LAB ACTIVITIES Lab activities specifically listed, are suggestions for the teacher. Each teacher will have at least five formal labs per semester.	• How does an abiotic factor affect food production? P. 37 • How do you distinguish between primary and secondary consumers? P. 68 • How rapidly can bacteria reproduce? P. 95 • Measure species diversity P. 112	• Determine pH P. 151 • Is the plasma membrane a selective barrier? P. 176	• What happens to the surface area of a cell as its volume increases? P. 203 • Why is fat the choice? P. 222
CONTENT STANDARDS Next Generation Science Standards	HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS2-4. Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing	*This unit reinforces LS 1.A. "Systems of specialized cells within organisms help them perform the essential functions of life", which lays the foundation for HS-LS 1.1. It also reinforces LS 1.C. "The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells," which lays the foundation for HS-LS1-7. HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling

	conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	**8 weeks** **UNIT 1**	**4 weeks** **UNIT 2**	**4 weeks** **UNIT 3**
READING INFORMATIONAL STANDARDS CENTRAL TO THIS UNIT	**Bundled Reading Informational Text Standard(s):** **RST.10-11. 1.** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.9-10. 2.** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. 7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**Bundled Reading Informational Text Standard(s):** **RST.9-10. 1.** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.9-10. 2**. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	**Bundled Reading Informational Text Standard(s):** **RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **RI.9-10.8** Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.
WRITING	**Bundled Writing Standard(s):** **WHST.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **WHST.9-10.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.		

	WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.		
LISTENING AND SPEAKING STANDARDS	**Bundled Speaking and Listening Standard(s):** SL 9-10 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.		

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	**8 weeks**	**4 weeks**	**4 weeks**
	UNIT 1	**UNIT 2**	**UNIT 3**
LANGUAGE STANDARDS	L.9-10.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.9-10.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.9-10.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.9-10.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases		

	based on grades 9–10 reading and content, choosing flexibly from a range of strategies. L.9-10.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.		
ELD STANDARDS	Part IC-9: Expressing information and ideas in formal oral presentations on academic topics PartIC-10 Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology Part1C-11. Justifying/arguing a) Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge, using appropriate register.		
CROSS-CONTENT/ REAL WORLD CONNECTIONS	The stability of our ecosystem is extremely susceptible to human impact. Understanding the interdependent relationship of all organisms may help in developing the necessary technology and conservation techniques needed to ensure that our planet can sustain our growing populations. There are several environmental and geopolitical	All life is composed of cells, yet unregulated cell growth leads to several forms of cancer that have touched many of our students' lives.	The vast majority of organisms on our planet are dependent on the sun as their initial source of energy. There are a number of chemotroph organisms that are not reliant on the sun; this has opened the discussion of the search for life in previous unsought areas both terrestrial and extraterrestrial. Over the last 150 years humans have significantly altered the normal cycle of carbon and other elements

	connections that can be made within this unit.		on our planet through industrial byproducts. The potential negative outcome from our global impact has just recently fully become clear.

High School Biology - Semester 2

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	8-**9 weeks**	**3-4 weeks**	**5-6 weeks**
	UNIT 4	**UNIT 5**	**UNIT 6**
TITLE	Inheritance and Variation of Traits	Natural Selection and Evolution	Structure and Function- Human Body Emphasis
END OF UNIT PERFORMANCE TASK	Research paper/poster on if certain extinct species (i.e. Mammoth, Tyrannosaurus Rex) should be cloned and how that might be accomplished.	Research paper on the history of eugenics and artificial selection and the possible implications of eugenics in future human populations.	Make a drawing of at least two body systems that are working together to accomplish a task. Give your drawing a title, label important items in your picture, and write small explanations next to each vital step.
BIG IDEA AND ESSENTIAL QUESTIONS	**The characteristics from one generation are related to the previous generation.** ● How are the characteristics from one generation related to the previous generation? ● How can variation in a population be explained? ● Why do individuals of the same species vary in how they look, function and behave? ● How do concepts of statistics and probability explain the variation and distribution of expressed traits in a population? ● What is the relationship between the role of DNA and chromosomes in coding the instructions for	**Different species are related. There are many similarities among plants, animals and microorganisms.** ● How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms? ● How does biodiversity affect humans? ● What scientific information supports common ancestry and ● biological evolution? ● What is the role of genetic variation in natural selection? ● How does natural selection lead to adaptation of populations? ● What are the four factors upon	**Organisms live and grow.** · •How do the structures of organisms enable life's functions? · •How do feedback mechanisms maintain homeostasis? ● What are the basic units of life? ● How do systems of cells function together to support life's processes? ● How do feedback mechanisms maintain homeostasis?

	characteristic traits passed from parents to offspring?	which the process of evolution is based? • How can the adverse impacts of human activity on biodiversity be mitigated?	

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	8-9 **weeks** **UNIT 4**	**3-4 weeks** **UNIT 5**	**5-6 weeks** **UNIT 6**
	• What evidence exists that inheritable genetic variations may result from new genetic combinations through meiosis? • What evidence exists that inheritable genetic variations may result from viable errors occurring during replication? • What evidence exists that inheritable genetic variations may result from mutations caused by environmental factors? • What is the role of cellular division and differentiation in producing and maintaining complex organisms?	• What are the results of changes in environmental conditions over time? • How can statistics and probability be used to support the idea that organisms with advantageous heritable traits tend to increase in proportion to organisms lacking this trait?	
COMPLEX TEXTS	Can include: Letter from Francis Crick to his 12 year old son	Can include: Journal articles	Can include: Chart: "How do body systems work together" from http://www.rsd.edu/schools/carmichael/masters/pdf/hwsystmswrky.pdf
OTHER TEXTS	Glencoe Biology Text Chapters 10, 11, 12, 13	Glencoe Biology Text Chapters 14 and 15	Glencoe Biology Text Chapters 35, 36, 37

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	8-**9 weeks**	**3-4 weeks**	**5-6 weeks**
	UNIT 4	**UNIT 5**	**UNIT 6**
LAB ACTIVITIES Lab activities specifically listed, are suggestions for the teacher. Each teacher will have at least five formal labs per semester.	• Problem solving lab: Pea Analysis P. 262 • Can you identify homologous chromosomes? P. 264 • What type of mutation results in sickle-cell anemia? P. 299 • What are the chances? P. 311 • How is Duchenne's muscular dystrophy inherited? P. 326 • When is a test cross practical? P. 339 • How is identification made from a DNA fingerprint? P. 353	• Could ferns have lived in Antarctica? P. 372 • How can natural selection be observed? P. 397	• How is digestion affected if the gallbladder is removed? P. 922 • What is BMI? P. 928 • How does exercise affect levels of exercise and glucagon? P. 932 • When are loud sounds dangerous to our hearing? P. 954 • How do different drugs affect the levels of neurotransmitters in synapses? P. 957 • How do inhaled and exhaled air compare? P. 973
CONTENT STANDARDS Next Generation Science Standards	HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic	HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to	HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

	combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	survive and reproduce in the environment. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	**8-9 weeks** **UNIT 4**	**3-4 weeks** **UNIT 5**	**5-6 weeks** **UNIT 6**
READING INFORMATIONAL STANDARDS CENTRAL TO THIS UNIT	**Bundled Reading Informational Text Standard(s):** **RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **RI.9-10.8** Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.		
WRITING	**Bundled Writing Standard(s):** **WHST.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **WHST.9-10.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. **WHST.9-10.9** Draw evidence from informational texts to support analysis, reflection, and research.		
LISTENING AND SPEAKING STANDARDS	**Bundled Speaking and Listening Standard(s):** **SL 9-10** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.	**Bundled Speaking and Listening Standard(s):** **SL 9-10** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization,	**Bundled Speaking and Listening Standard(s):** **SL 9-10** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization,

		development, substance, and style are appropriate to purpose, audience, and task.	development, substance, and style are appropriate to purpose, audience, and task.

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline	8-**9 weeks** **UNIT 4**	**3-4 weeks** **UNIT 5**	**5-6 weeks** **UNIT 6**
LANGUAGE STANDARDS	**L.9-10.1** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. **L.9-10.2** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. **L.9-10.3** Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. **L.9-10.4** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies. **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level;		

	demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.		
ELD STANDARDS	**Part IC-9:** Expressing information and ideas in formal oral presentations on academic topics **PartIC-10**: Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology ***11. Justifying/arguing*** a) Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge, using appropriate register.		
CROSS-CONTENT/ REAL WORLD CONNECTIONS	Technology advances have influenced the progress of science and science has influenced advances in technology.	Scientific knowledge is based on assumption that natural laws operate today as they did in the past and they will continue to do so in the future, but as technology continues to improve some of these assumptions are becoming concrete. Technological advances have opened a new realm of possibilities that have new ethical concerns.	Understanding the body as a series of inter-working systems instead of separate entities is vital to understanding one's health. Each system works together to maintain a viable homeostatic environment.

Grade:	High School Biology

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Unit 5	**Natural Selection and Evolution:** The performance expectations in the topic **Natural Selection and Evolution** help students answer the questions: "How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms? How does biodiversity affect humans?" High school students can investigate patterns to find the relationship between the environment and natural selection. Students demonstrate understanding of the factors causing natural selection and the process of evolution of species over time. They demonstrate understanding of how multiple lines of evidence contribute to the strength of scientific theories of natural selection and evolution. Students can demonstrate an understanding of the processes that change the distribution of traits in a population over time and describe extensive scientific evidence ranging from the fossil record to genetic relationships among species that support the theory of biological evolution. Students can use models, apply statistics, analyze data, and produce scientific communications about evolution. Understanding of the crosscutting concepts of patterns, scale, structure and function, and cause and effect supports the development of a deeper understanding of this topic.

High School Biology - Semester 2

JCS Common Core & NGSS Aligned Scope and Sequence HS Biology

Timeline **3-4 weeks**

UNIT 5

TITLE	Natural Selection and Evolution
END OF UNIT PERFORMANCE TASK	Research paper on the history of eugenics and artificial selection and the possible implications of eugenics in future human populations.
BIG IDEA AND ESSENTIAL QUESTIONS	**Different species are related. There are many similarities among plants, animals and microorganisms.** • How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms? • How does biodiversity affect humans? • What scientific information supports common ancestry and • biological evolution? • What is the role of genetic variation in natural selection? • How does natural selection lead to adaptation of populations? • What are the four factors upon which the process of evolution is based? • How can the adverse impacts of human activity on biodiversity be mitigated?

Timeline **3-4 weeks**

UNIT 5

	• What are the results of changes in environmental conditions over time? • How can statistics and probability be used to support the idea that

	organisms with advantageous heritable traits tend to increase in proportion to organisms lacking this trait?
COMPLEX TEXTS	Can include: Journal articles
OTHER TEXTS	Glencoe Biology Text Chapters 14 and 15

Timeline **3-4 weeks**

UNIT 5

LAB ACTIVITIES Lab activities specifically listed, are suggestions for the teacher. Each teacher will have at least five formal labs per semester.	• Could ferns have lived in Antarctica? P. 372 • How can natural selection be observed? P. 397
CONTENT STANDARDS **Next Generation Science Standards**	HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result

	in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

READING INFORMATIONAL STANDARDS CENTRAL TO THIS UNIT	
WRITING	
LISTENING AND SPEAKING STANDARDS	**Bundled Speaking and Listening Standard(s):** **SL 9-10** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LANGUAGE STANDARDS	
ELD STANDARDS	
CROSS-CONTENT/ REAL WORLD CONNECTIONS	Scientific knowledge is based on assumption that natural laws operate today as they did in the past and they will continue to do so in the future, but as technology continues to improve some of these assumptions are becoming concrete. Technological advances have opened a new realm of possibilities that have new ethical concerns.

Excerpts from: *Leadership Planning Guide, CALIFORNIA: Common Core State Standards and Assessments Implementation*

The CCSS are not a curriculum. Curriculum is the roadmap that teachers use to help students acquire and master the knowledge and skills detailed in the standards. A coherent and specific curriculum is mapped backwards from desired performances. Therefore, deciding what should be taught when is "job number one."

Indeed, E.D. Hirsch has noted that "The single most effective way to enhance teacher effectiveness is to create a more coherent multi-year curriculum, so that teachers at each level will know what students have already been taught."

J.D. Hirsch, Jr., "Why I'm for the Common Core: Teacher Bashing and Common Core Bashing Are Both Uncalled For" at http:// www.huffingtonpost.com/e- d-hirsch-jr/why-im-for-the- common-cor_b_3809618. html

The CCSS are sometimes written by grade spans, and decisions need to be made as to what concept should be taught at what grade level. In other words, it is likely work will need to be done on a new or revised scope and sequence before curriculum can be fully developed, and before lesson plans can be extensively designed.

The standards have to be broken apart and their spiraling nature understood (i.e., how the standards build on each other). Then the school and district curriculum needs to be examined and/or mapped, and the gaps or opportunities identified.

Scope & Sequence: (CP Chemistry)

Driving Questions	Suggested Pacing	Learning Targets	Standards Addressed: NGSS & CCSS	Performance Tasks
Use the driving questions in each unit of the NGSS.	How much time will it take to teach this theme? All the themes should be covered during the span of one school year.	What knowledge will the students gain? What skills will the students be able to do?	List the actual standards and reference letters and numbers.	How will these learning targets be measured?
Matter and Energy: "How can one explain the structure, properties, and interactions of matter?"	4 Weeks	**Matter and Energy:** The performance expectations in this topic help students formulate an answer to the question, "How can one explain the structure, properties, and interactions of matter?" The existence of atoms, now supported by evidence from modern instruments, was first postulated as a model that could explain both qualitative and quantitative observations about matter (e.g., Brownian motion, ratios of reactants and products in chemical reactions). Matter can be understood in terms of the types of atoms present and the interactions both between and within them. The states (i.e., solid, liquid, gas, or plasma), properties (e.g., hardness, conductivity), and reactions (both physical and chemical) of matter can be described and predicted based on the types, interactions, and motions of the atoms within it. Chemical reactions, which underlie so many observed phenomena in living and nonliving systems alike, conserve the number of atoms of each type but change their arrangement into molecules. Nuclear reactions involve changes in the types of atomic nuclei present and are key to the energy release from the sun and the balance of isotopes in matter.	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. RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	Classification of matter lab – Using household materials, classify each mixture, describe the appropriate technique for separating each, and identify each component as an element, compound, mixture, and/or pure substance.
Atomic Structure & Periodicity: "How can one explain the structure and properties of matter?"	6 weeks	**Atomic Structure & Periodicity:** The performance expectations in this topic help students formulate an answer to the question, "How can one explain the structure and properties of matter?" Two sub-ideas from the NRC Framework are addressed in these performance expectations: the structure and properties of matter, and nuclear processes. Students are expected to develop understanding of the substructure of atoms and provide more mechanistic explanations of the properties of the substances. Students are able to use the periodic table as a tool to explain and predict the properties of elements. Phenomena involving nuclei are also important to understand, as they explain the formation and abundance of	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. 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.	

		the elements, radioactivity, the release of energy from the sun and other stars, and the generation of nuclear power. The crosscutting concepts of patterns, energy and matter, and structure and function are called out as organizing concepts for these disciplinary core ideas. In these Performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and conducting investigations, and communicating scientific and technical information; and to use these practices to demonstrate understanding of the core ideas.	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. RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	
Bonding & Nomenclature: How do particles combine to form the variety of matter one observes?	6 weeks	**Bonding & Nomenclature:** The performance expectations in this topic help students formulate an answer to the questions: How do particles combine to form the variety of matter one observes? While too small to be seen with visible light, atoms have substructures of their own. They have a small central region or nucleus—containing protons and neutrons—surrounded by a larger region containing electrons. The number of protons in the atomic nucleus (atomic number) is the defining characteristic of each element; different isotopes of the same element differ in the number of neutrons only. Despite the immense variation and number of substances, there are only some 100 different stable elements. Each element has characteristic chemical properties. The periodic table, a systematic representation of known elements, is organized horizontally by increasing atomic number and vertically by families of elements with related chemical properties. The development of the periodic table (which occurred well before atomic substructure was understood) was a major advance, as its patterns suggested and led to the identification of additional elements with particular properties. Moreover, the table's patterns are now recognized as related to the atom's outermost electron	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. 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. 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 bond energy. RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	

		patterns, which play an important role in explaining chemical reactivity and bond formation, and the periodic table continues to be a useful way to organize this information.	WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	
Chemical Reactions & Math for Chemistry: "How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?"	9 weeks	**Chemical Reactions & Math for Chemistry:** The performance expectations in this topic help students formulate an answer to the questions: "How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?" Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and rearrangements of atoms. Using this expanded knowledge of chemical reactions, students are able to explain important biological and geophysical phenomena. Students are also able to apply an understanding of the process of optimization in engineering design to chemical reaction systems. The crosscutting concepts of patterns, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, using mathematical thinking, constructing explanations, and designing solutions; and to use these practices to demonstrate understanding of the core ideas.	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. 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. 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.* HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. MP.2 Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7) HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)	Types of Chemical Reactions Lab

Physical and Chemical Interactions of Matter: “How is energy transferred and conserved?”	9 Weeks	**Physical and Chemical Interactions of Matter:** The performance expectations associated with this topic help students formulate an answer to the question, “How is energy transferred and conserved?” The disciplinary core idea expressed in the Framework for PS3 is broken down into four sub- core ideas: Definitions of Energy, Conservation of Energy and Energy Transfer, the Relationship between Energy and Forces, and Energy in Chemical Process and Everyday Life. Energy is understood as quantitative property of a system that depends on the motion and interactions of matter and radiation within that system, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students develop an understanding that energy at both the macroscopic and the atomic scale can be accounted for as either motions of particles or energy associated with the configuration (relative positions) of particles. In some cases, the energy associated with configuration of particles can be thought of as stored in fields. Students also demonstrate their understanding of engineering principles when they design, build, and refine devices associated with the conversion of energy. The crosscutting concepts of cause and effect; systems and system models; energy and matter; and the influence of science, engineering, and technology on society and the natural world are further developed in the performance expectations associated with PS3. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, using computational thinking, and designing solutions; and to use these practices to demonstrate understanding of the core ideas. Understanding chemical reactions and the properties of elements is essential not only to the physical sciences but also is foundational knowledge for the life sciences and the earth and space sciences. The cycling of matter and associated transfers of energy in systems, of any scale, depend on physical and chemical processes. The reactivity of hydrogen ions gives rise to many biological and geophysical phenomena. The capacity of carbon atoms to form the backbone of extended molecular structures is essential to the chemistry of life. The carbon cycle involves transfers between carbon in the atmosphere—in the form of carbon dioxide—and carbon in living matter or formerly living matter (including fossil fuels). The proportion of oxygen molecules (i.e., oxygen in the form O2) in the atmosphere also changes in this cycle.	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 bond energy. HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects) RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS3-4) WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS3-3), (HS-PS3-4),(HS-PS3-5)	● Make a Hot Pack Lab ● Types of Chemical Reactions Design Lab ● Flame Lab