PHYSICAL SCIENCE NXG SCIENCE STANDARDS

HIGH SCHOOL

PHYSICAL SCIENCE CONTENT

Topic	Structure and Properties of Matter				
S.HS.PS.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.				
S.HS.PS.2	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.				
S.HS.PS.3	develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.				
S.HS.PS.4	communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. *				
Topic	**Chemical Reactions**				
S.HS.PS.5	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.				
S.HS.PS.6	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.				
S.HS.PS.7	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.				
S.HS.PS.8	refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*				
S.HS.PS.9	use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.				
Topic	**Forces and Interactions**				
S.HS.PS.10	analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.				
S.HS.PS.11	use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.				
S.HS.PS.12	apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*				
S.HS.PS.13	use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.				
S.HS.PS.14	plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.				
Topic	**Energy**				
S.HS.PS.15	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.				
S.HS.PS.16	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 positions of particles (objects).				
S.HS.PS.17	design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*				
S.HS.PS.18	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).				
S.HS.PS.19	develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.				
Topic	**Waves and Electromagnetic Radiation**				
S.HS.PS.20	use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.				
S.HS.PS.21	evaluate questions about the advantages of using a digital transmission and storage of information				
S.HS.PS.22	evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.				

S.HS.PS.23	evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.				
S.HS.PS.24	communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*				

High School
Engineering, Technology, and Applications of Science

Topic	Engineering Design				
S.HS.ETS.1	analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.				
S.HS.ETS.2	design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.				
S.HS.ETS.3	evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.				
S.HS.ETS.4	use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.				

High School
Science Literacy

Topic	Reading- Key Ideas and Details				
S.11-12.L.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.				
S.11-12.L.2	determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.				
S.11-12.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.				
Topic	**Reading- Craft and Structure**				
S.11-12.L.4	determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.				
S.11-12.L.5	analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.				
S.11-12.L.6	analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.				
Topic	**Reading- Integration of Knowledge and Ideas**				
S.11-12.L.7	integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.				
S.11-12.L.8	evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.				
S.11-12.L.9	synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.				
Topic	**Reading- Range of Reading and Level of Text Complexity**				
S.11-12.L.10	by the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.				
Topic	**Writing- Text Types and Purposes**				
S.11-12.L.11	write arguments focused on *discipline-specific content*:				
	introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence.				
	develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases.				
	use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.				

	establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.				
	provide a concluding statement or section that follows from or supports the argument presented.				
S.11-12.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes:				
	• introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures and tables), and multimedia when useful to aid comprehension.				
	• develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.				
	• use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among complex ideas and concepts.				
	• use precise language, domain-specific vocabulary and techniques such as metaphor, simile and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.				
	• provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).				
Topic	**Writing- Production and Distribution of Writing**				
S.11-12.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.				
S.11-12.L.14	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.				
S.11-12.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information.				
Topic	**Writing- Research to Build and Present Knowledge**				
S.11-12.L.16	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.				
S.11-12.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.				
S.11-12.L.18	draw evidence from informational texts to support analysis, reflection and research.				
Topic	**Writing- Range of Writing**				
S.11-12.L.19	write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.				