

# BIOLOGY NXG SCIENCE STANDARDS

## GRADE 10

### LIFE SCIENCE

Topic	Structure and Function				
S.10.LS.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.				
S.10.LS.2	develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.				
S.10.LS.3	plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.				
Topic	Matter and Energy in Organisms and Ecosystems				
S.10.LS.4	use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.				
S.10.LS.5	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.				
S.10.LS.6	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.				
S.10.LS.7	construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.				
S.10.LS.8	use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.				
S.10.LS.9	develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.				
Topic	Interdependent Relationships in Ecosystems				
S.10.LS.10	use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.				
S.10.LS.11	use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.				
S.10.LS.12	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 conditions may result in a new ecosystem.				
S.10.LS.13	design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*				
S.10.LS.14	evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.				
S.10.LS.15	create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*				
Topic	Inheritance and Variation of Traits				
S.10.LS.16	use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.				
S.10.LS.17	ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.				
S.10.LS.18	make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.				
S.10.LS.19	apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.				
Topic	Natural Selection and Evolution				
S.10.LS.20	communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.				
S.10.LS.21	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.				

S.10.LS.22	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.				
S.10.LS.23	construct an explanation based on evidence for how natural selection leads to adaptation of populations.				
S.10.LS.24	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.				

## 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.				

## GRADE 9–10

### SCIENCE LITERACY

Topic	Reading- Key Ideas and Details				
S.9-10.L.1	cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.				
S.9-10.L.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.				
S.9-10.L.3	follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.				
Topic	Reading- Craft and Structure				
S.9-10.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 9–10 texts and topics.				
S.9-10.L.5	analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).				
S.9-10.L.6	analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.				
Topic	Reading- Integration of Knowledge and Ideas				
S.9-10.L.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.				
S.9-10.L.8	assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.				
S.9-10.L.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.				
Topic	Reading- Range of Reading and Level of Text Complexity				
S.9-10.L.10	by the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.				
Topic	Writing- Text Types and Purposes				
S.9-10.L.11	write arguments focused on <i>discipline-specific content</i> :				
	introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons and				
	develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.				

S.9-10.L.11	use words, phrases and clauses 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.9-10.L.12	write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes:				
	<ul style="list-style-type: none"> <li>introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g. figures, tables), and multimedia when useful to aiding comprehension.</li> </ul>				
	<ul style="list-style-type: none"> <li>develop the topic with well-chosen, relevant and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</li> </ul>				
	<ul style="list-style-type: none"> <li>use varied transitions and sentence structures to link the major sections of the text, create cohesion and clarify the relationships among ideas and concepts.</li> </ul>				
	<ul style="list-style-type: none"> <li>use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</li> </ul>				
	<ul style="list-style-type: none"> <li>establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</li> </ul>				
	<ul style="list-style-type: none"> <li>provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</li> </ul>				
<b>Topic</b>	<b>Writing- Production and Distribution of Writing</b>				
S.9-10.L.13	produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.				
S.9-10.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.9-10.L.15	use technology, including the Internet, to produce, publish and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.				
<b>Topic</b>	<b>Writing- Research to Build and Present Knowledge</b>				
S.9-10.L.16	conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem and narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.				
S.9-10.L.17	gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question and integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.				
S.9-10.L.18	draw evidence from informational texts to support analysis, reflection and research.				
<b>Topic</b>	<b>Writing- Range of Writing</b>				
S.9-10.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.				