



Biology

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STANDARDS	PAGE REFERENCES
<p>STANDARD 1: Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> asking questions and stating hypotheses, using prior scientific knowledge to help guide their development; 	<p>Student Edition: 16, 18 <i>BioLab</i> 23, 51, 83, 173, 235, 287, 533, 567, 593, 653, 925, 1035 <i>Section Assessment</i> 21 (#6) Teacher Wraparound Edition: CT 18</p>
<ul style="list-style-type: none"> creating and defending a written plan of action for a scientific investigation; 	<p>Student Edition: 18-19 <i>BioLab</i> 23, 51, 83, 173, 235, 287, 533, 567, 593, 653, 925, 1035 <i>Section Assessment</i> 21 (#6) Teacher Wraparound Edition: CT 18</p>
<ul style="list-style-type: none"> selecting and using appropriate technologies to gather, process, and analyze data and to report information related to an investigation; 	<p>Student Edition: xxxiv-xli, 18-20 <i>BioLab</i> 23, 51, 83, 173, 235, 287, 533, 567, 593, 653, 783, 899, 925, 1035 Teacher Wraparound Edition: DC 20</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> identifying major sources of error or uncertainty within an investigation (<i>for example, particular measuring devices and experimental procedures</i>); 	<p>Student Edition: xxxiii BioLab 23, 173, 533, 567, 593, 925, 1035 MiniLab 19</p>
<ul style="list-style-type: none"> constructing and revising scientific explanations and models, using evidence, logic, and experiments that include identifying and controlling variables; 	<p>Student Edition: 19 BioLab 23, 173, 533, 567, 593, 925, 1035 MiniLab 19</p> <p>Teacher Wraparound Edition: CT 18</p>
<ul style="list-style-type: none"> communicating and evaluating scientific thinking that leads to particular conclusions; 	<p>Student Edition: 20 BioLab 23, 107, 173, 533, 567, 593, 783, 925, 1035 MiniLab 8, 66, 220, 975</p>
<ul style="list-style-type: none"> recognizing and analyzing alternative explanations and models; and 	<p>Student Edition: 20 BioLab 23, 173, 235, 533, 567, 593, 925, 1035 MiniLab 19</p>
<ul style="list-style-type: none"> explaining the difference between a scientific theory and a scientific hypothesis. 	<p>Student Edition: 11-12, 18 Section Assessment 15 (#1) Standardized Test Practice 27 (#5)</p>
<p>For students continuing their science education beyond the standards, what they know and are able to do may include</p>	
<ul style="list-style-type: none"> designing and completing an advanced scientific investigation—either individually or as part of a student team—that extends over several days or weeks; and 	<p>Student Edition: BioLab 23, 107, 259, 287, 533, 593, 653 Launch Lab 31</p> <p>Teacher Wraparound Edition: DE 134, 309</p>
<ul style="list-style-type: none"> continuing to practice and apply inquiry skills as they extend their understanding of science content through further study. 	<p>The following page references can be incorporated to meet this standard.</p> <p>Student Edition: BioLab 23, 107, 259, 287, 533, 593, 653</p> <p>Teacher Wraparound Edition: DE 134, 309</p>

STANDARDS	PAGE REFERENCES
<p>STANDARD 3: Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (Focus: Biology – Anatomy, Physiology, Botany, Zoology, Ecology)</p>	
<p>3.1 Students know and understand the characteristics of living things, the diversity of life, and how living things interact with each other and with their environment. As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> using and producing a variety of classification systems for organisms (<i>for example, the five-kingdom classification, classification based on behavior</i>); 	<p>Student Edition: 41-42, 484-489, 490-491, 499-503, 669 <i>BioLab</i> 623, 681 <i>Launch Lab</i> 483 <i>MiniLab</i> 488, 500 <i>Section Assessment</i> 44 (#3), 489 (#4), 503 (#3) Teacher Wraparound Edition: DE 488; SP 669</p>
<ul style="list-style-type: none"> predicting and describing the interactions of populations and ecosystems; 	<p>Student Edition: 38-39, 92, 94-99 <i>BioLab</i> 107 <i>Section Assessment</i> 40 (#3) Teacher Wraparound Edition: DC 38, 97; SP 38; WS 96</p>
<ul style="list-style-type: none"> explaining how adaptations (<i>for example, structure, behavior</i>) of an organism determine its niche (role) in the environment; 	<p>Student Edition: 38 <i>Chapter Assessment</i> 53 (#9) <i>Section Assessment</i> 40 (#4) Teacher Wraparound Edition: DC 38; DE 38; RS 38; SP 38</p>
<ul style="list-style-type: none"> explaining how changes in an ecosystem can affect biodiversity and how biodiversity contributes to an ecosystem's stability; and 	<p>Student Edition: 62-64, 116-121 Teacher Wraparound Edition: MI 116</p>
<ul style="list-style-type: none"> analyzing the dynamic equilibrium of ecosystems, including interactions among living and nonliving components (<i>for example, tropical deforestation is linked to decreased global precipitation; Mount St. Helens' eruption had impact on the local ecosystem</i>). 	<p>Student Edition: 35, 38, 62-64, 66, 126, 128 <i>MiniLab</i> 42 <i>National Geographic</i> 67 <i>Section Assessment</i> 44 (#4) Teacher Wraparound Edition: CB 124, 125, 225; CT 47; DE 126; FA 128</p>

STANDARDS	PAGE REFERENCES
<p>3.2 Students know and understand interrelationships of matter and energy in living systems.</p> <p>As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> comparing and contrasting the processes of photosynthesis and respiration (<i>for example, in terms of energy and products</i>); 	<p>Student Edition: 197, 220, 222, 228, 233 <i>MiniLab</i> 220 <i>Section Assessment</i> 221 (#6)</p> <p>Teacher Wraparound Edition: DC 232; FA 233</p>
<ul style="list-style-type: none"> explaining how simple molecules can be built into larger molecules within organisms (<i>for example, amino acids serve as building blocks of proteins; carbon dioxide and water are the basic materials for building sugars through photosynthesis</i>); 	<p>Student Edition: 166-171, 219-220, 222-224, 226-227, 336-338, 340 <i>National Geographic</i> 225, 339 <i>Section Assessment</i> 171 (#3), 227 (#1), 341 (#1)</p> <p>Teacher Wraparound Edition: DE 166; FA 227</p>
<ul style="list-style-type: none"> explaining how large molecules (<i>for example, starch, protein</i>) are broken down into smaller molecules, serving as an energy source or as basic building blocks in organisms; 	<p>Student Edition: 219-220, 228-232, 1020-1024 <i>BioLab</i> 1039 <i>MiniLab</i> 1023</p> <p>Teacher Wraparound Edition: AC 228; RS 229</p>
<ul style="list-style-type: none"> explaining how energy is used in the maintenance, repair, growth, and development of tissues (<i>for example, the production of new skin cells requires energy</i>); and 	<p>Student Edition: 10, 218-221</p> <p>Teacher Wraparound Edition: DC 219; MI 218</p>
<ul style="list-style-type: none"> describing the cycling of matter and the movement and change of energy through the ecosystem (<i>for example, some energy dissipates as heat as it is transferred through a food web</i>). 	<p>Student Edition: 41-44, 45-49 <i>MiniLab</i> 42 <i>Section Assessment</i> 44 (#2, #6)</p> <p>Teacher Wraparound Edition: DC 43; MI 45</p>

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<p>3.3 Students know and understand how the human body functions, factors that influence its structures and functions, and how these structures and functions compare with those of other organisms.</p> <p>As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> describing cellular organelles and their function (for example, the relationship of ribosomes to protein synthesis; the relationship of mitochondria to energy transformation); 	<p>Student Edition: 186, 191, 193-200 <i>National Geographic</i> 192 <i>Section Assessment</i> 200 (#1-#3, #6)</p> <p>Teacher Wraparound Edition: CT 194, 196; DC 199; FA 200; RS 195; WS 193</p>
<ul style="list-style-type: none"> differentiating among levels of organization (cells, tissues, and organs) and their roles within the whole organism; 	<p>Student Edition: 8, 632-634, 636-638, 639-647, 694, 936, 992-998, 1005-1007 <i>Section Assessment</i> 638 (#1, #2)</p> <p>Teacher Wraparound Edition: DE 694; MI 936; WS 694</p>
<ul style="list-style-type: none"> explaining human body functions in terms of interacting organ systems composed of specialized structures that maintain or restore health (for example, mechanisms involved in homeostasis [balance], such as feedback in the endocrine system); 	<p>Student Edition: 938-939, 946, 948, 968-972, 996, 998, 1000-1001, 1006-1007, 1031-1035, 1037 <i>MiniLab</i> 1035 <i>National Geographic</i> 1036 <i>Section Assessment</i> 940 (#1), 1009 (#1), 1037 (#3, #6)</p> <p>Teacher Wraparound Edition: DE 1001; UL 932</p>
<ul style="list-style-type: none"> comparing and contrasting characteristics of and treatments for various types of medical problems (for example, accidental, infectious, genetic); 	<p>Student Edition: 378, 939, 981, 1009, 1082-1083 <i>Biology & Society</i> 1066 <i>Cutting-Edge Biology</i> 952, 982 <i>Section Assessment</i> 981 (#5)</p> <p>Teacher Wraparound Edition: DC 1083; WS 999</p>
<ul style="list-style-type: none"> using examples to explain the relationship of structure and function in organisms; and 	<p>Student Edition: 10, 428-429, 452, 642, 644-645 <i>Launch Lab</i> 631, 791 <i>MiniLab</i> 464, 884 <i>National Geographic</i> 740, 766, 883</p> <p>Teacher Wraparound Edition: AC 452; DE 70; MI 639</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> describing the pattern and process of reproduction and development in several organisms (<i>for example, earthworm, chick, human</i>). 	<p>Student Edition: 9, 549, 551, 555, 560, 584-585, 662-667, 695, 712, 729, 838, 866, 887, 1048-1053, 1054-1056, 1058-1059 <i>National Geographic</i> 548</p> <p>Teacher Wraparound Edition: DC 663; DE 8, 663</p>
<p>3.4 Students know and understand how organisms change over time in terms of biological evolution and genetics. As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> comparing and contrasting the purpose and process of cell division (mitosis) with the production of sex cells (meiosis); 	<p>Student Edition: 246, 248, 250-252, 271-272, 274-276 <i>National Geographic</i> 249, 273 <i>Section Assessment</i> 276 (#2, #6)</p> <p>Teacher Wraparound Edition: DC 272; SP 275</p>
<ul style="list-style-type: none"> giving examples to show how some traits can be inherited while others are due to the interaction of genes and the environment (<i>for example, skin cancer triggered by over-exposure to sunlight or contact with chemical carcinogens</i>); 	<p>Student Edition: 254-255, 270, 277-280, 302-304, 309 <i>BioLab</i> 317</p> <p>Teacher Wraparound Edition: DE 309; MI 277</p>
<ul style="list-style-type: none"> describing how DNA serves as the vehicle for genetic continuity and the source of genetic diversity upon which natural selection can act; 	<p>Student Edition: 326, 329-331, 345-349, 431-436, 522</p> <p>Teacher Wraparound Edition: CB 436; CT 349</p>
<ul style="list-style-type: none"> describing how mutation, natural selection, and reproductive isolation can lead to new species and explain the planet's biodiversity; 	<p>Student Edition: 349, 420, 422, 431-441 <i>BioLab</i> 44 <i>National Geographic</i> 421 <i>Section Assessment</i> 441 (#3)</p> <p>Teacher Wraparound Edition: CT 438; DC 438; DE 438; MI 431; SP 437</p>
<ul style="list-style-type: none"> explaining why variation within a population improves the chances that the species will survive under new environmental conditions; 	<p>Student Edition: 116, 275-276, 283, 420, 522 <i>National Geographic</i> 421 <i>Section Assessment</i> 121 (#7)</p> <p>Teacher Wraparound Edition: CT 522</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> describing the general structure and function of the gene (DNA) and its role in heredity and protein synthesis (<i>for example, replication of DNA and the role of RNA in protein synthesis</i>); and 	<p>Student Edition: 171, 193, 330-331, 333-335, 336-338, 340-341 <i>MiniLab</i> 331, 334 <i>National Geographic</i> 339 <i>Section Assessment</i> 341 (#1-#4)</p> <p>Teacher Wraparound Edition: DC 199, 335; DE 330, 339; MI 336; WS 336</p>
<ul style="list-style-type: none"> calculating the probability that an individual will inherit a particular single gene trait (<i>for example, calculating the probability of offspring inheriting cystic fibrosis when both parents are carriers for the disease</i>). 	<p>Student Edition: 280-282 <i>MiniLab</i> 281 <i>Section Assessment</i> 282 (#3), 301 (#5), 310 (#6)</p> <p>Teacher Wraparound Edition: CT 297; DC 305</p>
<p>For students continuing their science education beyond the standards, what they know and are able to do may include</p>	
<ul style="list-style-type: none"> describing how, over long periods of time, ecosystems can remain stable and, if altered by factors such as climatic change, return to stability; 	<p>Student Edition: 60-64, 66</p> <p>Teacher Wraparound Edition: FA 64</p>
<ul style="list-style-type: none"> explaining specializations that allow different types of cells to perform different functions; 	<p>Student Edition: 8, 632-633, 637-638, 942, 947, 962, 997, 998 <i>MiniLab</i> 634</p> <p>Teacher Wraparound Edition: CT 967; DC 962</p>
<ul style="list-style-type: none"> describing how balance (homeostasis) is maintained within an organism when its environment is altered (<i>for example, the relationship between blood glucose level and insulin production; carbon dioxide and oxygen balance in the body</i>); 	<p>Student Edition: 10, 885, 938, 1002, 1005-1006, 1031-1035, 1037 <i>MiniLab</i> 1035 <i>Section Assessment</i> 1009 (#1), 1037 (#2, #3, #6)</p> <p>Teacher Wraparound Edition: MI 1031; RS 10</p>
<ul style="list-style-type: none"> describing the role of gene mutations that result in uncontrolled cell division (<i>for example, cancer</i>); 	<p>Student Edition: 254-255, 349 <i>Section Assessment</i> 257 (#2), 349 (#1)</p> <p>Teacher Wraparound Edition: CT 255; DE 255; FA 257</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> explaining the role of exposure to certain factors (<i>for example, chemical, biological, radiation</i>) that may increase the rate of mutation, and therefore the incidence of cancer and other diseases; 	<p>Student Edition: 254-255, 348-349 <i>Data Analysis Lab</i> 348 <i>MiniLab</i> 255 <i>Section Assessment</i> 349 (#2)</p> <p>Teacher Wraparound Edition: CT 348</p>
<ul style="list-style-type: none"> determining the degree of kinship between organisms or species from estimations of the similarity of their nucleic acid sequences, which often closely match classifications based on anatomical similarities; and 	<p>Student Edition: 427, 461, 493-495 <i>Data Analysis Lab</i> 494 <i>Section Assessment</i> 430 (#3), 498 (#7)</p> <p>Teacher Wraparound Edition: CT 493; DC 457, 493; SP 427, 461</p>
<ul style="list-style-type: none"> explaining how the rate of environmental change may exceed the capacity of organisms to respond to change, leading to the extinction of species. 	<p>Student Edition: 122-123, 399</p> <p>Teacher Wraparound Edition: WS 122</p>
<p>STANDARD 5: Students know and understand interrelationships among science, technology, and human activity and how they can affect the world. As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> analyzing benefits, limitations, costs, and consequences involved in using technology or resources (<i>for example, X-rays, agricultural chemicals, natural gas reserves</i>); 	<p>Student Edition: 123-128, 129-130, 254-255, 256-257, 363 <i>Biology & Society</i> 50, 258, 680 <i>Cutting-Edge Biology</i> 208, 982</p> <p>Teacher Wraparound Edition: DC 257, 363; DE 126; DIB 50, 680; RS 123; WIB 280</p>
<ul style="list-style-type: none"> analyzing how the introduction of a new technology has affected or could affect human activity (<i>for example, invention of the telescope, applications of modern telecommunications</i>); 	<p>Student Edition: 15, 182-185, 363-371, 372-376, 378-379 <i>BioLab</i> 381 <i>Biology & Society</i> 258 <i>Cutting-Edge Biology</i> 106, 208, 952, 982 <i>National Geographic</i> 377</p> <p>Teacher Wraparound Edition: CB 363; DC 364, 375</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> demonstrating the interrelationships between science and technology (<i>for example, building a bridge, designing a better running shoe</i>); and 	<p>Student Edition: 5-6, 363-371, 372-376, 378-379 <i>BioLab</i> 681 <i>Cutting-Edge Biology</i> 106, 208, 504, 982</p> <p>Teacher Wraparound Edition: CB 20; DC 364</p>
<ul style="list-style-type: none"> explaining the use of technology in an occupation. 	<p>Student Edition: 5-6, 314-315 <i>BioLab</i> 381 <i>Careers in Biology</i> 150, 184, 254, 278, 663, 970, 1060 <i>National Geographic: In the Field</i> 380, 566, 1038</p> <p>Teacher Wraparound Edition: AG 566</p>
<p>For students continuing their science education beyond the standards, what they know and are able to do may include</p>	
<ul style="list-style-type: none"> applying their knowledge and understanding of chemical and physical interactions to explain present and anticipated technologies (<i>for example, lasers, ultrasound, superconducting materials, photocopy machines</i>); and 	<p>Student Edition: 266-267, 314-315, 370-371, 374-376, 378-379 <i>BioLab</i> 1067 <i>Biology and Society</i> 258, 680 <i>Cutting-Edge Biology</i> 106, 208, 504, 532, 808, 952, 982 <i>Data Analysis Lab</i> 376</p> <p>Teacher Wraparound Edition: WS 257</p>
<ul style="list-style-type: none"> exploring the scientific and technological aspects of contemporary problems (<i>for example, issues related to nutrition, air quality, natural resources</i>). 	<p>Student Edition: 66, 100-103, 126-127, 130 <i>Biology & Society</i> 50, 680, 1096 <i>MiniLab</i> 101 <i>National Geographic</i> 67 <i>National Geographic: In the Field</i> 172 <i>Section Assessment</i> 105 (#4)</p> <p>Teacher Wraparound Edition: DE 126; DIB 680</p>

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<p>STANDARD 6: Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. As students in grades 9-12 extend their knowledge, what they know and are able to do includes</p>	
<ul style="list-style-type: none"> evaluating print and visual media for scientific evidence, bias, or opinion; 	<p>Student Edition: 15 <i>Skillbuilder Handbook</i> 1111 Teacher Wraparound Edition: CT 11, 18; DC 15</p>
<ul style="list-style-type: none"> explaining that the scientific way of knowing uses a critique and consensus process (<i>for example, peer review, openness to criticism, logical arguments, skepticism</i>); 	<p>Student Edition: 11-14, 16, 18-20 <i>National Geographic</i> 17 <i>Section Assessment</i> 21 (#1) Teacher Wraparound Edition: DC 13; WS 12</p>
<ul style="list-style-type: none"> using graphs, equations, or other models to analyze systems involving change and constancy (<i>for example, comparing the geologic time scale to shorter time frames</i>); 	<p>Student Edition: 42-44, 62-64, 96-99, 396, 398-400, 495 <i>BioLab</i> 83 <i>MiniLab</i> 42, 203 <i>National Geographic</i> 397 Teacher Wraparound Edition: AC 97; DC 97; DE 203, 396, 495; RS 495</p>
<ul style="list-style-type: none"> analyzing and comparing models of cyclic change as used within and among scientific disciplines (<i>for example, water cycle, circular motion, sound waves, weather cycles</i>); 	<p>Student Edition: 45-49, 62-64, 66, 974 <i>National Geographic</i> 67 <i>Section Assessment</i> 49 (#1-#5) Teacher Wraparound Edition: CT 47; DC 46, 63, 67; MI 45</p>
<ul style="list-style-type: none"> identifying and predicting cause-effect relationships within a system (<i>for example, the effect of temperature on gas volume, effect of carbon dioxide level on the greenhouse effect, effects of changing nutrients at the base of a food pyramid</i>); 	<p>Student Edition: 66, 94-96, 127, 938-939, 962-965, 967 <i>MiniLab</i> 42 <i>National Geographic</i> 67 <i>Section Assessment</i> 44 (#4), 99 (#4) Teacher Wraparound Edition: CT 47; DC 67; DE 126; WS 96, 966</p>

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> identifying and describing the dynamics of natural systems (<i>for example, weather systems, ecological systems, body systems, systems at dynamic equilibrium</i>); 	<p>Student Edition: 34-35, 41-44, 45-49, 66, 885, 968-972, 992-998, 1005-1007, 1020-1024, 1031-1035 <i>MiniLab</i> 42, 1035 <i>National Geographic</i> 67</p> <p>Teacher Wraparound Edition: FA 972; SP 1032</p>
<ul style="list-style-type: none"> identifying and testing a model to analyze systems involving change and constancy (<i>for example, a mathematical expression for gas behavior; constructing a closed ecosystem such as an aquarium</i>); 	<p>Student Edition: <i>BioLab</i> 83, 107, 443 <i>Launch Lab</i> 31, 417 <i>MiniLab</i> 66</p> <p>Teacher Wraparound Edition: DE 126</p>
<ul style="list-style-type: none"> explaining an exponential model (<i>for example, pH scale, population growth, Richter scale</i>); and 	<p>Student Edition: 97, 165 <i>Section Assessment</i> 165 (#3)</p> <p>Teacher Wraparound Edition: AC 97; DC 97</p>
<ul style="list-style-type: none"> refining a hypothesis based on an accumulation of data over time (<i>for example, Alvarez's theory on dinosaur extinction</i>). 	<p>Student Edition: 11-12, 326-331, 401-407, 419-420, 421, 440-441, 472 <i>BioDiscoveries</i> 350, 474 <i>National Geographic: In the Field</i> 408</p> <p>Teacher Wraparound Edition: WS 12, 330, 402</p>
<p>For students continuing their science education beyond the standards, what they know and are able to do may include</p>	
	<ul style="list-style-type: none"> relating small-scale phenomena to large-scale properties (<i>for example, intermolecular forces related to physical properties</i>); and <p>Student Edition: 45-49, 152-155, 161, 201-205 <i>MiniLab</i> 203 <i>National Geographic</i> 162</p> <p>Teacher Wraparound Edition: CB 204; CT 47; FA 165; MI 201; SP 161</p>

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<ul style="list-style-type: none"> tracing the development of an invention, theory, or discovery to demonstrate the dynamic nature of science. 	<p>Student Edition: 12-13, 182-183, 326-331, 401-407, 418-420, 422 <i>BioDiscoveries</i> 350 <i>Launch Lab</i> 325 <i>National Geographic: In the Field</i> 408</p> <p>Teacher Wraparound Edition: CB 149; DC 403; SP 13; WS 149, 402</p>