



Biology

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STANDARDS	PAGE REFERENCES
Life Sciences	
<i>Characteristics and Structure of Life</i>	
1. Explain that living cells <ol style="list-style-type: none"> are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur) are the basic unit of structure and function of all living things come from pre-existing cells after life originated, and are different from viruses 	Student Edition: 6, 8, 166, 183, 185, 405-407, 525 <i>Assessment 186 (#3)</i> Teacher Wraparound Edition: MI 525; SP 167
2. Compare the structure, function and interrelatedness of cell organelles in eukaryotic cells (e.g., nucleus, chromosome, mitochondria, cell membrane, cell wall, chloroplast, cilia, flagella) and prokaryotic cells.	Student Edition: 185-186, 187-190, 191, 193-200, 516, 518 <i>Assessment 186 (#5)</i> Teacher Wraparound Edition: SP 518
3. Explain the characteristics of life as indicated by cellular processes including <ol style="list-style-type: none"> homeostasis energy transfers and transformation transportation of molecules disposal of wastes synthesis of new molecules 	Student Edition: 6-10, 187-190, 193-200, 201-207, 220-221, 222-227, 228-233, 336-341 <i>Assessment 190 (#1)</i> <i>MiniLab 203</i> Teacher Wraparound Edition: DC 199; MI 336; RS 195

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<p>4. Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells.</p>	<p>Student Edition: 8-9, 246-247, 248, 696-697 <i>National Geographic</i> 249 Teacher Wraparound Edition: DC 249, 696; FA 697</p>
<p><i>Heredity</i></p>	
<p>5. Illustrate the relationship of the structure and function of DNA to protein synthesis and the characteristics of an organism.</p>	<p>Student Edition: 171, 270, 336-338, 340-341 <i>National Geographic</i> 339 Teacher Wraparound Edition: CT 338; FA 341; MI 336</p>
<p>6. Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short).</p>	<p>Student Edition: 270, 278-279 <i>MiniLab</i> 281</p>
<p>7. Describe that spontaneous changes in DNA are mutations, which are a source of genetic variation. When mutations occur in sex cells, they may be passed on to future generations; mutations that occur in body cells may affect the functioning of that cell or the organism in which that cell is found.</p>	<p>Student Edition: 254, 345-349, 434, 522 Teacher Wraparound Edition: CT 349; DC 347</p>
<p>8. Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits and jumping genes) to explain inheritance.</p>	<p>Student Edition: 277-280, 302-309 <i>BioLab</i> 317 <i>MiniLab</i> 281 Teacher Wraparound Edition: CT 302; DC 279, 305; WS 280, 307</p>
<p><i>Diversity and Interdependence of Life</i></p>	
<p>9. Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids).</p>	<p>Student Edition: 10, 41-44, 45-49, 218-219 <i>MiniLab</i> 42 Teacher Wraparound Edition: DC 43; FA 49; MI 45; SP 44; WS 219</p>

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<p>10. Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation).</p>	<p>Student Edition: 10, 41-44, 197, 218-221, 222-224, 226-227, 228-233, 521 <i>Launch Lab</i> 217 <i>MiniLab</i> 220 <i>National Geographic</i> 225 Teacher Wraparound Edition: DE 231; FA 227, 233</p>
<p>11. Explain that living organisms use matter and energy to synthesize a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g., growth, reacting to the environment, reproduction and movement).</p>	<p>Student Edition: 10, 41, 166-171, 218-221, 222, 228 Teacher Wraparound Edition: DC 219</p>
<p>12. Describe that biological classification represents how organisms are related with species being the most fundamental unit of the classification system. Relate how biologists arrange organisms into a hierarchy of groups and subgroups based on similarities and differences that reflect their evolutionary relationships.</p>	<p>Student Edition: 9, 484, 486-488, 490-496, 498, 499-503 <i>BioLab</i> 505 <i>Data Analysis Lab</i> 494 <i>National Geographic</i> 497 Teacher Wraparound Edition: RS 491</p>
<p>13. Explain that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under gradually changing environmental conditions.</p>	<p>Student Edition: 116, 420, 429, 435, 522 Teacher Wraparound Edition: CT 522</p>
<p>14. Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation).</p>	<p>Student Edition: 10, 428-430, 434-436, 439-440 <i>Assessment</i> 441 (#4) <i>MiniLab</i> 429 Teacher Wraparound Edition: CT 439; DE 70, 429; FA 430; WS 439</p>
<p>15. Explain how living things interact with biotic and abiotic components of the environment (e.g., predation, competition, natural disasters and weather).</p>	<p>Student Edition: 35, 38-40, 62-63, 65, 94-96 <i>Assessment</i> 40 (#1) <i>BioLab</i> 107 <i>Data Analysis Lab</i> 39 Teacher Wraparound Edition: DC 35</p>

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<p>16. Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy.</p>	<p>Student Edition: 61, 92, 94-96, 105 <i>Assessment</i> 99 (#2) <i>National Geographic</i> 93 Teacher Wraparound Edition: CT 61, 65; DC 94; WS 95, 96</p>
<p>17. Conclude that ecosystems tend to have cyclic fluctuations around a state of approximate equilibrium that can change when climate changes, when one or more new species appear as a result of immigration or when one or more species disappear.</p>	<p>Student Edition: 62-64, 125 <i>Assessment</i> 128 (#4) Teacher Wraparound Edition: DC 63; FA 128</p>
<p>18. Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes in technology/biotechnology can cause significant changes, either positive or negative, in environmental quality and carrying capacity.</p>	<p>Student Edition: 66, 123-128 <i>Biology & Society</i> 50, 870, 1010 <i>National Geographic</i> 67 Teacher Wraparound Edition: CB 124; MI 122; RS 123</p>
<p>19. Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production and sustainable vs. nonsustainable agriculture).</p>	<p>Student Edition: 66, 123-128, 129-130 <i>Biology & Society</i> 50, 592, 680, 1010 <i>National Geographic</i> 67 Teacher Wraparound Edition: DE 126; SP 130</p>
Evolutionary Theory	
<p>20. Recognize that a change in gene frequency (genetic composition) in a population over time is a foundation of biological evolution.</p>	<p>Student Edition: 422, 431-441</p>
<p>21. Explain that natural selection provides the following mechanism for evolution; undirected variation in inherited characteristics exist within every species. These characteristics may give individuals an advantage or disadvantage compared to others in surviving and reproducing. The advantaged offspring are more likely to survive and reproduce. Therefore, the proportion of individuals that have advantageous characteristics will increase. When an environment changes, the survival value of some inherited characteristics may change.</p>	<p>Student Edition: 420, 434-436, 522 <i>Assessment</i> 422 (#3) <i>Launch Lab</i> 417 <i>National Geographic</i> 421 Teacher Wraparound Edition: DC 421; FA 422</p>

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22. Describe historical scientific developments that occurred in evolutionary thought (e.g., Lamarck and Darwin, Mendelian Genetics and modern synthesis).	<p>Student Edition: 277-280, 401-407, 418-420, 422, 431-433, 440-441 <i>Assessment</i> 422 (#1)</p> <p>Teacher Wraparound Edition: CB 277; DC 406; WS 278, 402, 418</p>
23. Analyze how natural selection and other evolutionary mechanisms (e.g., genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms.	<p>Student Edition: 393, 420, 431-441 <i>National Geographic</i> 421</p> <p>Teacher Wraparound Edition: FA 441; SP 434</p>
24. Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved.	<p>Student Edition: 398-400, 402-407 <i>National Geographic</i> 397</p> <p>Teacher Wraparound Edition: FA 407</p>
Historical Perspectives and Scientific Revolutions	
25. Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology and discovering germs).	<p>Student Edition: 11-15, 148, 182-183, 277-280, 326-331, 401-407, 418-420, 422, 1076-1077 <i>BioDiscoveries</i> 350 <i>Discoveries in Genetics</i> 374 <i>From Cadavers to Artificial Hearts</i> 992 <i>History of Classification</i> 694</p> <p>Teacher Wraparound Edition: CB 12; CT 327; RS 326; WS 12, 402</p>
26. Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology and discovering germs).	<p>Student Edition: 11, 148, 182-183, 326-331, 363, 401-402, 418-420, 422, 1076-1077</p> <p>Teacher Wraparound Edition: CB 149; DC 363; WS 149, 330</p>
27. Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning).	<p>Student Edition: 363, 370-371, 373-376, 378-379 <i>Biology & Society</i> 258, 680, 1066 <i>Cutting-Edge Biology</i> 106, 208</p> <p>Teacher Wraparound Edition: DC 363, 370; MI 372; RS 370</p>

STANDARDS	PAGE REFERENCES
Science and Technology	
<i>Understanding Technology</i>	
<p>1. Cite examples of ways that scientific inquiry is driven by the desire to understand the natural world and how technology is driven by the need to meet human needs and solve human problems.</p>	<p>Student Edition: 4-6, 11-15, 363-371, 372-376, 378-379 <i>BioDiscoveries</i> 22, 350 <i>BioLab</i> 381 <i>Biology & Society</i> 258, 680 <i>Cutting-Edge Biology</i> 208, 532, 952, 982 Teacher Wraparound Edition: RS 375</p>
<p>2. Describe examples of scientific advances and emerging technologies and how they may impact society.</p>	<p>Student Edition: 363, 370-371, 373-376, 378-379 <i>Biology & Society</i> 258, 680, 1066 <i>Cutting-Edge Biology</i> 106, 208 Teacher Wraparound Edition: DC 363, 370; MI 372; RS 370</p>
<i>Abilities To Do Technological Design</i>	
<p>3. Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the design.</p>	<p>*Aspects of technological design can be incorporated into the following topics. Student Edition: <i>BioLab</i> 871 <i>Biology & Society</i> 50 <i>Cutting-Edge Biology</i> 208, 982 Teacher Wraparound Edition: ATD 871</p>
Scientific Inquiry	
<i>Doing Scientific Inquiry</i>	
<p>1. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation).</p>	<p>Student Edition: xxviii-xxxii, 21 <i>BioLab</i> 173, 351, 533, 1039 Teacher Wraparound Edition: 42T-43T; DC 21; SP 173, 1039</p>
<p>2. Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.</p>	<p>Student Edition: 21 <i>BioLab</i> 51, 173, 287, 653, 783 <i>Skillbuilder Handbook</i> 1115-1118</p>

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<p>3. Use mathematical models to predict and analyze natural phenomena.</p>	<p>Student Edition: 280-282, 431-432 <i>BioLab</i> 51, 287, 443 <i>Data Analysis Lab</i> 14 <i>MiniLab</i> 66, 127, 245, 281 Teacher Wraparound Edition: CB 432; DC 432</p>
<p>4. Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations.</p>	<p>Student Edition: <i>BioLab</i> 23, 107, 173, 235, 287, 593, 653, 925 <i>MiniLab</i> 255, 558, 583</p>
<p>5. Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected.</p>	<p>Student Edition: 11-14, 16-20, 326-331, 401-404, 418-420, 1076-1077 <i>BioDiscoveries</i> 350, 752, 842 <i>National Geographic: In the Field</i> 408 Teacher Wraparound Edition: CB 12; RS 326; WS 12</p>
<p>Scientific Ways of Knowing</p>	
<p><i>Nature of Science</i></p>	
<p>1. Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines.</p>	<p>Student Edition: 4-6, 11-15, 32-33, 277, 363, 394 <i>Cutting-Edge Biology</i> 106 <i>Milestones in Biology</i> 12-13 <i>National Geographic: In the Field</i> 286, 380, 566, 622, 1038 Teacher Wraparound Edition: BA 106; CB 20; SP 13</p>
<p>2. Describe that scientists may disagree about explanations of phenomena, about interpretation of data or about the value of rival theories, but they do agree that questioning, response to criticism and open communication are integral to the process of science.</p>	<p>Student Edition: 11-15, 16, 18-20 <i>BioDiscoveries</i> 842 <i>National Geographic: In the Field</i> 408 Teacher Wraparound Edition: AG 408; DC 13; WS 12</p>
<p>3. Recognize that science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena.</p>	<p>Student Edition: 11-14, 16, 18-20 <i>Launch Lab</i> 3 <i>National Geographic</i> 17 Teacher Wraparound Edition: CB 12, 17; CT 18; DC 16; SP 17; WS 12</p>

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<i>Ethical Practices</i>	
4. Recognize that ethical considerations limit what scientists can do.	<p>*Discussion of ethics can be incorporated into discussion of the following.</p> <p>Student Edition: 15, 363, 370-371, 378 <i>Biology & Society</i> 258, 680, 1066, 1096</p> <p>Teacher Wraparound Edition: BA 258; DC 363; FD 208; RS 370</p>
5. Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws.	<p>*Research on human subjects can be incorporated into discussion of the following.</p> <p>Student Edition: 15, 370, 378 <i>Biology & Society</i> 258, 1066 <i>Cutting-Edge Biology</i> 208, 982</p> <p>Teacher Wraparound Edition: FD 208</p>
6. Recognize that animal-based research must be conducted according to currently accepted professional standards and laws.	<p>*Discussion of animal-based research can be incorporated into the following.</p> <p>Student Edition: 15, 363, 370 <i>BioDiscoveries</i> 22, 924 <i>BioLab</i> 717, 753 <i>Cutting-Edge Biology</i> 982</p>
<i>Science and Society</i>	
7. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.	<p>Student Edition: 4-6 <i>Careers in Biology</i> 9, 144, 184, 200, 590, 637, 816, 939, 1028, 1060 <i>National Geographic: In the Field</i> 82, 286, 316, 782, 1038</p> <p>Teacher Wraparound Edition: DC 375</p>