



BIOLOGY

AN EVERYDAY EXPERIENCE

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STANDARDS	PAGE REFERENCES
<p>I. HISTORY AND NATURE OF SCIENCE</p>	
<p>A. Scientific World View The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time.</p>	
<p>1. The student will be able to distinguish among hypothesis, theory and law as scientific terms and how they are used to answer a specific question.</p>	<p>Student Edition: 15-19 <i>Bio Tip</i> 19 <i>Check Your Understanding</i> 20 (#13) <i>Lab</i> 17, 28, 207, 266 Teacher Wraparound Edition: CD 19</p>
<p>2. The student will be able to explain how scientific and technological innovations as well as new evidence can challenge portions of or entire accepted theories and models including but not limited to cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease and big bang theory.</p>	<p>Student Edition: 20, 31, 589-591, 615-616 <i>Technology</i> 680 Teacher Wraparound Edition: PO 31, TE 680</p>

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<p>3. The student will recognize that in order to be valid, scientific knowledge must meet certain criteria including that it: be consistent with experimental, observational and inferential evidence about nature; follow rules of logic and reporting both methods and procedures; and be falsifiable and open to criticism.</p>	<p>Student Edition: 15-16, 18-19 <i>Applying Technology</i> 42-43, 454-455 <i>Lab</i> 17, 28, 207, 266 <i>Skill Handbook</i> 704-705 Teacher Wraparound Edition: CD 18, 19; CFU 18</p>
<p>4. The student will explain how traditions of ethics, peer review, conflict and general consensus influence the conduct of science.</p>	<p>The following page references can be incorporated into a discussion of the scientific method. Student Edition: 15-16, 18-19, 599, 704-705 <i>Science and Society</i> 21, 175 Teacher Wraparound Edition: CD 19</p>
<p>5. The student will recognize that some scientific ideas are incomplete, and opportunity exists in these areas for new advances.</p>	<p>Student Edition: 19, 600-601 <i>Check Your Understanding</i> 601 (#10) <i>Science and Society</i> 413 <i>Technology</i> 61, 680 Teacher Wraparound Edition: CD 19, 600; CFU 600</p>
<p>B. Scientific Inquiry The student will design and conduct a scientific investigation.</p>	
<p>1. The student will design and complete a scientific experiment using scientific methods by determining a testable question, making a hypothesis, designing a scientific investigation with appropriate controls, analyzing data, making conclusions based on evidence and comparing conclusions to the original hypothesis and prior knowledge.</p>	<p>Student Edition: 15-16, 18-19 <i>Applying Technology</i> 42-43, 454-455 <i>Lab</i> 17, 207, 355 Teacher Wraparound Edition: AS 17</p>
<p>2. The student will distinguish between qualitative and quantitative data.</p>	<p>Student Edition: 11-14, 18 <i>Appendix A</i> 694-695 <i>Applying Technology</i> 42-43, 198-199, 454-455, 668-669 <i>Lab</i> 28, 194, 355, 445 <i>Skill Handbook</i> 718-719</p>

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3. The student will apply mathematics and models to analyze data and support conclusions.	<p>Student Edition: <i>Applying Technology</i> 622-623 <i>Lab</i> 76, 224, 235, 298, 319, 467, 477, 571, 588</p> <p>Teacher Wraparound Edition: AS 588; TTL 319</p>
4. The student will identify possible sources of error and their effects on results.	<p>The following page references can be incorporated to meet this standard.</p> <p>Student Edition: <i>Applying Technology</i> 42-43, 198-199, 454-455, 668-669 <i>Lab</i> 17, 266, 686</p> <p>Teacher Wraparound Edition: CD 19</p>
5. The student will know that professional scientists and engineers have ethical codes.	<p>The following page references can be incorporated to meet this standard.</p> <p>Student Edition: <i>Check for Understanding</i> 601 (#10) <i>Science and Society</i> 21, 175, 281, 569</p> <p>Teacher Wraparound Edition: AC 600</p>
6. The student will give examples of how different domains of science use different bodies of scientific knowledge and employ different methods to investigate questions.	<p>Student Edition: 6-8, 10, 15, 617, 619 <i>Applying Technology</i> 42-43, 622-623 <i>Check Your Understanding</i> 10 (#1, #4) <i>Technology</i> 61, 356, 680</p> <p>Teacher Wraparound Edition: CC 623; GP 10; PO 7</p>
<p>C. Scientific Enterprise The student will understand the relationship between science and technology and how both are used.</p>	
1. The student will compare and contrast the purposes and career opportunities of engineering, technology and science.	<p>Student Edition: 15-16, 18-20 <i>Career Close-Up</i> 211, 342, 527, 555, 656 <i>Career Connection</i> 43, 199 <i>Science and Society</i> 419 <i>Technology</i> 86, 238, 593 <i>Technology Connection</i> 198, 668</p> <p>Teacher Wraparound Edition: CC 43, 199; GP 20; SK 20</p>

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2. The student will provide an example of a need or problem identified by science and solved by engineering or technology.	Student Edition: 20 <i>Science and Society</i> 413, 517 <i>Technology</i> 86, 238, 465 <i>Technology Connection</i> 42, 198 Teacher Wraparound Edition: GP 20; TE 86
3. The student will provide an example of how technology facilitates new discoveries and the development of scientific knowledge.	Student Edition: 10, 20, 31, 600-601 <i>Technology</i> 250, 593, 680 Teacher Wraparound Edition: CD 600; GP 20; PO 31
4. The student will know that technological changes and scientific advances are often accompanied by social, political, environmental and economic changes.	Student Edition: 20, 599-601, 677, 678-681, 683 <i>Check Your Understanding</i> 601 (#10) <i>Science and Society</i> 21, 281, 517, 569 Teacher Wraparound Edition: AC 600; CFU 600; GP 599; SB 681
5. The student will recognize that science and technology are influenced by cultural backgrounds and beliefs and by social needs, attitudes, values and limitations.	Student Edition: 20, 599-601 <i>Science and Society</i> 21, 127, 175, 413, 517, 569, 635 <i>Technology</i> 465, 593 Teacher Wraparound Edition: CD 600; CFU 600
D. Historic Perspectives The student will recognize the historical and cultural context of scientific endeavors and how they influence each other.	
1. The student will be able to trace the development of a scientific advancement, invention or theory and its impact on society.	Student Edition: 20, 21, 31, 51, 53-54, 82-83, 558-559, 589-591, 615-616 <i>Science and Society</i> 21 Teacher Wraparound Edition: AS 53; CD 82; CO 19; OP 16, 19, 615; PO 31; SJ 559, 590
2. The student will provide examples of scientific advancements contributed by other civilizations and cultures.	Student Edition: 31, 51, 53, 82, 558-559, 615-616 <i>Mini Lab</i> 53 Teacher Wraparound Edition: AS 53; CO 559; OP 16

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3. The student will compare and contrast the differences between scientific theories and theories from other bodies of knowledge, and the importance of each in a science discussion.	Student Edition: 19 <i>Bio Tip</i> 19 Teacher Wraparound Edition: CD 19
IV. LIFE SCIENCE	
A. Cells The student will comprehend that all living things are composed of cells, and that the life processes in a cell are based on molecular interactions.	
1. The student will relate cellular structures to their functions.	Student Edition: 32-35, 37, 114 Teacher Wraparound Edition: CFU 35; RT 35
2. The student will compare and contrast the structures found in typical plant, animal and bacterial cells.	Student Edition: 33, 35, 79-80 <i>Check Your Understanding</i> 37 (#7), 88 (#6) <i>Lab</i> 36 Teacher Wraparound Edition: AS 36; BB 32; DE 33, 80
3. The student will explain the role of the cell membrane as a highly selective barrier in diffusion, osmosis and active transport.	Student Edition: 32, 38-40 Teacher Wraparound Edition: OP 38
4. The student will describe the role of enzymes as catalysts in metabolism and cellular synthesis of new molecules.	Student Edition: 206 <i>Check for Understanding</i> 206 (#3) <i>Lab</i> 207 Teacher Wraparound Edition: AS 207
5. The student will differentiate between the processes of photosynthesis and respiration in terms of energy flow, reactants and products.	Student Edition: 27, 34, 35, 264, 405-409 <i>Lab</i> 28, 659 Teacher Wraparound Edition: CD 406; GP 27
6. The student will describe and compare the processes of mitosis and meiosis and their roles in the cell cycle.	Student Edition: 464-466, 468-470, 471-474 <i>Lab</i> 467 Teacher Wraparound Edition: AS 467; CD 469, 472; GP 473; PO 469

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<p>B. Diversity of Organisms The student will classify, compare and contrast the diversity of organisms on Earth and their modes of accommodating the requirements for life.</p>	
<p>1. The student will relate the structure, complexity and organization of organ systems to the methods of obtaining, transforming, releasing and eliminating the matter and energy used to sustain the organism.</p>	<p>Student Edition: 40-41, 208-212, 214-216, 222-223, 229-231, 264-265, 267-271 <i>Check for Understanding</i> 271 (#6) <i>Lab</i> 213 Teacher Wraparound Edition: GP 41; SJ 40</p>
<p>2. The student will recognize that organisms have both innate and learned behavioral responses to internal and external stimuli, including the tropic responses in plants.</p>	<p>Student Edition: 352-354, 356-357, 359-365, 443-444 <i>Lab</i> 355, 358, 445 <i>Mini Lab</i> 362 <i>Technology</i> 356 Teacher Wraparound Edition: BR 353, 354; CD 353, 443; CL 357</p>
<p>3. The student will use scientific evidence, including the fossil record, homologous structures, embryological development or biochemical similarities, to classify organisms in order to show probable evolutionary relationships and common ancestry.</p>	<p>Student Edition: 51, 53-55, 56-58, 60-62, 617, 619-621 <i>Check for Understanding</i> 62 (#12) <i>Technology</i> 61 Teacher Wraparound Edition: CD 58, 620; DI 57</p>
<p>C. Interdependence of Life The student will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.</p>	
<p>1. The student will describe the factors related to matter and energy in an ecosystem that both influence fluctuations in population size and determine the carrying capacity of a population.</p>	<p>Student Edition: 632, 634, 636 <i>Check Your Understanding</i> 636 (#3, #4) <i>Lab</i> 637 Teacher Wraparound Edition: EN 634; SJ 636</p>
<p>2. The student will explain how adaptations of species and co-evolution with other species are related to success in an ecosystem.</p>	<p>Student Edition: 606-607, 609 <i>Lab</i> 608 Teacher Wraparound Edition: BR 607; DI 606</p>

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<p>3. The student will identify examples of mutualism, commensalism, and parasitism in a stable ecosystem.</p>	<p>Student Edition: 644-646 <i>Check Your Understanding</i> 648 (#16, #18, #20) <i>Skill Check</i> 646</p> <p>Teacher Wraparound Edition: CD 645; DQ 644; GP 644</p>
<p>4. The student will predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity or introduction of invasive species, can affect both the number of organisms in a population and the biodiversity of species in the ecosystem.</p>	<p>Student Edition: 660-662, 674-677, 679-681, 683-685 <i>Applying Technology</i> 152 <i>Check Your Understanding</i> 677 (#2), 685 (#9) <i>Technology</i> 680</p> <p>Teacher Wraparound Edition: CD 675; PO 684</p>
<p>D. Heredity The student will explain how inherited characteristics are encoded by genes.</p>	
<p>1. The student will explain that the instructions for the characteristics of all organisms are carried in nucleic acids.</p>	<p>Student Edition: 586-587, 592-593 <i>Lab</i> 588</p> <p>Teacher Wraparound Edition: GP 587; USW 587</p>
<p>2. The student will define the relationship between DNA, genes and chromosomes.</p>	<p>Student Edition: 546-547, 587, 589</p> <p>Teacher Wraparound Edition: CD 589; OP 546; PO 546</p>
<p>3. The student will describe the structure and function of DNA and distinguish between replication, transcription and translation.</p>	<p>Student Edition: 586-587, 589-594 <i>Lab</i> 588 <i>MiniLab</i> 591</p> <p>Teacher Wraparound Edition: GP 592; PO 593</p>
<p>4. The student will know that different species of multicellular organisms have a characteristic number of chromosomes, and that in typical humans there are 22 autosomal pairs and 2 sex chromosomes.</p>	<p>Student Edition: 546-547, 566-568</p> <p>Teacher Wraparound Edition: CD 568; CFU 568; PO 546</p>
<p>5. The student will describe how genetic information is transmitted from parents to offspring through the processes of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction.</p>	<p>Student Edition: 471-475, 507-509, 548</p> <p>Teacher Wraparound Edition: CFU 509; GP 473, 507</p>

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<p>6. The student will use Mendel's laws of segregation and independent assortment to determine the genotype and phenotype of a monohybrid cross.</p>	<p>Student Edition: 552-553, 555, 557-561 <i>Check Your Understanding</i> 561 (#8) <i>Lab</i> 556 Teacher Wraparound Edition: MO 553</p>
<p>7. The student will differentiate between dominant, recessive, codominant, incompletely dominant, polygenic and sex-linked traits.</p>	<p>Student Edition: 549, 572-576 <i>Lab</i> 577 Teacher Wraparound Edition: CD 549, 573; CFU 575</p>
<p>E. Biological Populations Change Over Time The student will understand how biological evolution provides a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.</p>	
<p>1. The student will understand that species change over time and the term biological evolution is used to describe this process.</p>	<p>Student Edition: 606-607, 609-614, 615-616 Teacher Wraparound Edition: OP 611, 615; PO 607</p>
<p>2. The student will use the principles of natural selection to explain the differential survival of groups of organisms as a consequence of:</p> <ul style="list-style-type: none"> o The potential for a species to increase its numbers; o The genetic variability of offspring due to mutation and recombination of genes; o A finite supply of the resources required for life; and o The ensuing selection based on environmental factors of those offspring better able to survive and produce reproductively successful offspring. 	<p>Student Edition: 606-607, 609-610, 615-616 <i>Lab</i> 608 <i>MiniLab</i> 615 Teacher Wraparound Edition: BR 609; CD 610; CFU 612; OP 615; PO 607</p>
<p>3. The student will describe how genetic variation between populations is due to different selective pressures acting on each population, which can lead to a new species.</p>	<p>Student Edition: 610-612 <i>Check for Understanding</i> 614 (#2) Teacher Wraparound Edition: OP 611</p>

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4. The student will use biological evolution to explain the diversity of species.	Student Edition: 60-62, 604 Teacher Wraparound Edition: BR 604; PO 63
F. Flow of Matter and Energy The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components.	
1. The student will explain the relationship between abiotic and biotic components of an ecosystem in terms of the cycling of water, carbon, oxygen and nitrogen.	The terms <i>abiotic</i> and <i>biotic</i> can be incorporated into the discussion of ecosystems. Student Edition: 638-640, 644-648, 654-658 <i>Applying Technology</i> 668-669 <i>Check Your Understanding</i> 658 (#1, #2, #5) <i>Lab</i> 659 <i>Mini Lab</i> 657 Teacher Wraparound Edition: CD 655; CFU 657; DE 655
2. The student will know that all matter tends to become more disorganized over time, and that living systems require a continuous input of energy in order to maintain their chemical and physical organizations and prevent death.	Student Edition: 641-643 <i>Check Your Understanding</i> 643 (#15)
3. The student will explain that sunlight is transformed into chemical energy by photosynthetic organisms.	Student Edition: 35, 405-408, 639, 641, 642, 643 <i>Check Your Understanding</i> 409 (#6), 640 (#7) Teacher Wraparound Edition: GP 639
4. The student will explain that respiration releases chemical energy through the breakdown of molecules.	Student Edition: 27, 264, 658 <i>Check Your Understanding</i> (#4) <i>Lab</i> 28
5. The student will understand that matter and energy flow through different levels of organization of living systems, from cells to communities, as well as between living systems and the physical environment as chemical elements are recombined in different ways. Each recombination results in both storage and dissipation of energy.	Student Edition: 641-643, 658 <i>Check Your Understanding</i> 643 (#15) <i>Lab</i> 659 Teacher Wraparound Edition: CD 27; CQ 641

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<p>G. Human Organism The student will understand how all organ systems, including the nervous system, interact to maintain homeostasis.</p>	
<p>1. The student will understand and describe the basic anatomy and physiology of the nervous system and sense organs.</p>	<p>Student Edition: 312-318 <i>Applying Technology</i> 326-327 <i>Lab</i> 319 Teacher Wraparound Edition: CD 313, 315; GP 314; PO 314</p>
<p>2. The student will describe how the functions of individual organ systems are integrated to maintain a homeostatic balance in the body.</p>	<p>Student Edition: 214, 229, 244-245, 250, 256, 268-269, 275-276, 279, 320, 323-324 Teacher Wraparound Edition: GP 279</p>