



COLORADO
Content Standards Grades 9-12
***Biology: The Dynamics of Life* © 2004**

STANDARDS	PAGE REFERENCES
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	
<ul style="list-style-type: none"> asking questions and stating hypotheses, using prior scientific knowledge to help guide their development; 	SE: 4, 12-15 <i>Design Your Own BioLab</i> 58-59, 164-165, 330-331, 496-497, 522-523, 570-571, 734-735, 756-757, 834-835, 964-965 <i>Internet BioLab</i> 274-275 TWE: BR 12 TPN 13 IS 14, 66 MA 39 AS 757
<ul style="list-style-type: none"> creating and defending a written plan of action for a scientific investigation; 	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 330-331, 496-497, 522-523, 570-571, 734-735, 834-835, 964-965 TWE: AL 13, 119
<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; 	SE: <i>MiniLab</i> 228 <i>Apply Your Skill</i> 105 <i>Design Your Own BioLab</i> 164-165, 496-497, 522-523, 756-757, 834-835 TWE: PR 16, 257 MA 18 TS 1064 GF 166
<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>); 	SE: <i>Problem-Solving Lab</i> 20 <i>Error Analysis</i> 25, 59, 85, 105, 165, 189, 215, 387, 415, 437, 545, 571, 687, 911, 965, 989 TWE: CA 255
<ul style="list-style-type: none"> constructing and revising scientific explanations and models, using evidence, logic, and experiments that include identifying and controlling variables; 	SE: 13, 30, 1105 <i>Design Your Own BioLab</i> 164-165 <i>Section Assessment</i> 18 #6 <i>Internet BioLab</i> 544-545 TWE: AS 16, 239
<ul style="list-style-type: none"> communicating and evaluating scientific thinking that leads to particular conclusions; 	SE: 16-18 <i>Internet BioLab</i> 126-127, 238-239, 274-275, 414-415, 544-545, 626-627, 686-687, 1042-1043 TWE: CA 17

STANDARDS	PAGE REFERENCES
<ul style="list-style-type: none"> recognizing and analyzing alternative explanations and models; and 	SE: 16 <i>Section Assessment 23 #1</i> TWE: AS 267 IN 1060
<ul style="list-style-type: none"> explaining the difference between a scientific theory and a scientific hypothesis. 	SE: 18 <i>BioDigest 30</i> <i>Section Assessment 18 #3, 6</i> <i>Focus On 1060-1061</i> TWE: PR 1061
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)	
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	
<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>); 	SE: 46-49, 443-459, 570-571 <i>MiniLab 446, 453</i> <i>Investigate BioLab 460-461, 810-811</i> <i>BioDigest 466-469</i> <i>Focus On 1070-1073</i> TWE: CA 44, 446 DI 409 EX 455 RE 47 UM 453
<ul style="list-style-type: none"> predicting and describing the interactions of populations and ecosystems; 	SE: 36, 38-45, 71-83, 407-408 <i>MiniLab 37</i> <i>Problem-Solving Lab 37, 713</i> <i>Section Assessment 45, #3, 4, 5, 6</i> <i>Design Your Own BioLab 58-59</i> TWE: AS 39 PR 41 TML 64 CA 82 AS 83
<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; 	SE: 42-45, 72-83, 397-403 <i>MiniLab 397, 398</i> TWE: CB 43 BJ 78 CA 82 PO 399 CD 412 RE 412
<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 	SE: 67-69, 113-120, 122 <i>Biology and Society 60</i> <i>BioDigest 135</i> TWE: AS 112 IN 116 PR 114, 117 QD 117

STANDARDS	PAGE REFERENCES
<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>). 	SE: 9, 67-69, 118, 369 <i>Biology and Society</i> 60, 758 <i>Problem-Solving Lab</i> 68, 72 TWE: TP 68 EN 77, 117
3.2 Students know and understand interrelationships of matter and energy in living systems. As students in grades 9-12 extend their knowledge, what they know and are able to do includes	
<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>); 	SE: 184-185, 225-237 <i>MiniLab</i> 228 STP 243 #24 <i>BioDigest</i> 247 TWE: RM 184 BJ 234 AL 234-235 TP 236
<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>); 	SE: 145-148, 157-163, 221-224, 233, 281-287, 288-295 <i>Inside Story</i> 229 <i>Problem-Solving Lab</i> 291 <i>MiniLab</i> 293 TWE: PSC 146 UM 146, 222 QD 159, 289 RE 292
<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; 	SE: 231-237 <i>Inside Story</i> 162 <i>MiniLab</i> 236 <i>BioDigest</i> 244-245 TWE: VL 162 QD 232 DI 237 CA 245
<ul style="list-style-type: none"> explaining how energy is used in the maintenance, repair, growth, and development of tissues (<i>for example, in the production of new skin cells requires energy</i>); and 	SE: 9, 46, 199, 221-222, 224, 231, 233-234, 807, 944 <i>BioDigest</i> 247 TWE: UA 221 CD 233
<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>). 	SE: 46-57 <i>Problem-Solving Lab</i> 50 <i>Inside Story</i> 55 <i>BioDigest</i> 133 <i>Physical Science Connection</i> 185 TWE: CA 48 PSC 52

STANDARDS	PAGE REFERENCES
<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 (<i>for example, the relationship of ribosomes to protein synthesis; the relationship of mitochondria to energy transformation</i>); 	<p>SE: 175-178, 179-187, 294, 944-945 <i>MiniLab</i> 182, 198 <i>Inside Story</i> 205 <i>BioDigest</i> 246</p> <p>TWE: TS 186 CA 180, 205 UM 184, 270 QD 185</p>
<ul style="list-style-type: none"> differentiating among levels of organization (<i>cells, tissues, and organs</i>) and their roles within the whole organism; 	<p>SE: 7, 210, 605-621, 675, 893, 901-902, 905, 918, 929-935, 943-950, 951-955, 956, 971-974, 975-984, 985-987, 995-1004 <i>Inside Story</i> 894, 908, 1001 <i>MiniLab</i> 934, 1035 <i>Problem Solving</i> 903, 906 <i>Section Assessment</i> 898, 909, 923, 935</p> <p>TWE: AS 934 AL 896-897 PR 1007</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 (<i>for example, mechanisms involved in homeostasis [balance], such as feedback in the endocrine system</i>); 	<p>SE: 896, 901, 906, 920-923, 929-935, 944-945, 948-949, 973-974, 981-984, 986-987, 998, 1002-1004 <i>Design Your Own BioLab</i> 910-911 <i>Problem-Solving Lab</i> 896 <i>Physical Science Connection</i> 897</p> <p>TWE: TML 892 CA 901, 972 PR 908 UM 1000</p>
<ul style="list-style-type: none"> comparing and contrasting characteristics of and treatments for various types of medical problems (<i>for example, accidental, infectious, genetic</i>); 	<p>SE: 212-213, 299-301, 311-314, 323-324, 327, 347, 351, 352, 898, 904, 957-958, 1026-1030, 1037-1041 <i>Biotechnology</i> 356, 966, 978-979 <i>Connection to Chemistry</i> 812 <i>Problem-Solving Lab</i> 326, 328-329, 922, 1011</p> <p>TWE: TP 298 CA 310, 312, 934, 1055 EX 329, 904 CD 959 UM 1024</p>

OBJECTIVES	PAGE REFERENCES
<ul style="list-style-type: none"> using examples to explain the relationship of structure and function in organisms; and 	SE: 398, 400-403, 509, 677, 683, 771, 805, 901, 906, 920, 931, 935, 944-945, 949, 973, 1002, 1007 <i>Connection to Physics</i> 778 <i>Inside Story</i> 422, 678, 694, 699, 708, 723, 731, 752, 766, 801, 819, 829, 846 <i>MiniLab</i> 764, 795, 843 <i>Focus on Adaptations</i> 469, 786, 886 TWE: QD 285 UA 267, 269 AC 400, 681 PO 401 EN 61
<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>). 	SE: 519, 646-657, 696, 700, 722, 730, 746, 828-829, 1002-1004, 1005-1011, 1012-1015 <i>Biotechnology</i> 1018 <i>Design Your Own BioLab</i> 834-835 <i>Investigate BioLab</i> 1016-1017 <i>MiniLab</i> 806 <i>Problem-Solving Lab</i> 518 TWE: AL 998-999 IN 668, 1013 TS 819 UM 84
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	
<ul style="list-style-type: none"> comparing and contrasting the purpose and process of cell division (mitosis) with the production of sex cells (meiosis); 	SE: 204-209, 210, 263-273 <i>BioDigest</i> 247, 361 <i>Inside Story</i> 272, 1001 <i>Investigate BioLab</i> 214-215 TWE: EX 273 PO 270 AL 266-267
<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>); 	SE: 212-213, 253, 296-301, 313-314, 321-322, 324-329 <i>Connection to Health</i> 216 <i>Connection to Social Studies</i> 332 TWE: PO 324 PR 321
<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; 	SE: 7, 113, 180-181, 281-295, 296-301, 341-348, 409-412 <i>History and Biology Timeline</i> 250-251 <i>MiniLab</i> 293 <i>Problem-Solving Lab</i> 283 TWE: CA 180 CD 406 TML 280 IN 285

STANDARDS	PAGE REFERENCES
<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; 	SE: 112-113, 296-301, 397-403, 404-413, 451 <i>MiniLab</i> 299 <i>Biology and Society</i> 498 TWE: CA 411 PR 410 UM 412
<ul style="list-style-type: none"> explaining why variation within a population improves the chances that the species will survive under new environmental conditions; 	SE: 113-114, 269-270, 407-409 <i>Problem-Solving Lab</i> 397 <i>MiniLab</i> 407 TWE: AS 112 CA 468 MA 397
<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 	SE: 211, 281-287, 288-295 <i>BioDigest</i> 361-362 <i>Inside Story</i> 286-287 <i>Investigate BioLab</i> 302-303 <i>MiniLab</i> 293, 300 <i>Problem-Solving Lab</i> 283, 291 TWE: AS 293 CA 292, 300 PR 286 UM 285, 289
<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>). 	SE: 261-262, 270, 311-312 <i>Connection to Math</i> 276 <i>Problem-Solving Lab</i> 262, 311, 326 TWE: CD 269 UA 406
<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>); 	SE: 22-23 <i>Section Assessment #4, #5</i> 23 <i>Problem-Solving Lab</i> 124 Analysis of benefits, limitations, costs and consequences can be incorporated into a discussion of each of the following features. <i>Biology and Society</i> 26 <i>Biotechnology</i> 304, 966 <i>Connection to Chemistry</i> 812 TWE: IN 345
<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>); 	SE: 21-23, 119 <i>Biology and Society</i> 26, 60, 600 <i>Biotechnology</i> 356, 660, 966, 1018 <i>Connection to Chemistry</i> 106 <i>Connection to Physics</i> 912 TWE: AL 118-119 EN 119

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 	SE: <i>Biotechnology</i> 166, 304, 356, 688, 1018 TWE: PSC 119, 744 TML 138 EN 894 Relationships between science and technology can be brought into discussions of joint and bone injury, corrective eye surgery, and hearing impairment.
<ul style="list-style-type: none"> explaining the use of technology in an occupation. 	SE: <i>Careers in Biology</i> 150, 230, 351, 732 <i>Biotechnology</i> 304, 356, 660, 688, 966 TWE: CD 8 TP 92
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	
<ul style="list-style-type: none"> evaluating print and visual media for scientific evidence, bias, or opinion; 	SE: 16-17 <i>Problem-Solving Lab</i> 16 <i>Biology and Science</i> 938 TWE: QD 15 AS 16 CA 17
<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>); 	SE: 16-18 <i>Design Your Own BioLab</i> 58-59, 164-165, 330-331, 496-497, 522-523, 570-571, 734-735, 756-757, 834-835, 964-965 In a discussion of peer review and skepticism, see the caption on the inside back cover concerning the proposed discovery of Elements 116 and 118 in 1999. TWE: TS 17 As students become familiar with science journals, letters to the editors can be reviewed where scientists comment on the work of others.
<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>); 	SE: 20, 66, 204, 909 <i>Problem-Solving Lab</i> 37, 212, 343, 384, 713 TWE: UM 375
<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>); 	SE: 53, 55-57, 374-375 <i>Inside Story</i> 229, 233 <i>Investigate BioLab</i> 214 A discussion of sound waves can be included with the discussion of hearing.
<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>); 	SE: 72, 97-99, 118, 213, 931, 949 <i>Section Assessment # 6</i> 120 <i>Problem-Solving Lab</i> 176, 222, 896, 932 <i>Biology and Society</i> 716 TWE: GF 758

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>); 	SE: 41, 48-52, 155-156, 198-200, 612-619 TWE: CA 980
<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>); 	SE: <i>MiniLab</i> 198 TWE: AL 864-865 CA 980
<ul style="list-style-type: none"> explaining an exponential model (<i>for example, pH scale, population growth, Richter scale</i>); and 	SE: 92-93, 150-151 <i>Problem-Solving Lab</i> 95 <i>MiniLab</i> 151 TWE: TS 94 RM 118
<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>). 	SE: <i>Error Analysis</i> 25, 59, 85, 105, 165, 189, 215, 387, 415, 437, 545, 571, 687, 911, 965, 989

Codes Used for TWE Pages

AC	Activity
AL	Additional Lab
AS	Assessment
BJ	Biology Journal
BR	Brainstorming
CA	Challenge Activity
CB	Content Background
CD	Cultural Diversity
DI	Discussion
EN	Enrichment
EX	Extension
GF	Going Further
IN	Inquiry
IS	Inclusion Strategies
MA	Modified Assessment
PO	Portfolio
PR	Project
PSC	Physical Science Connection
QD	Quick Demo
RE	Reinforcement
RM	Revealing Misconceptions
TML	Two-Minute Chapter Launcher
TP	Tech Prep
TPN	Tying to Prior Knowledge
TS	Teaching Strategy
UA	Using an Analogy
UM	Using Models
VL	Visual Learning