



ARIZONA
Science Standards Proficiency (Grades 9-12)
***Biology: the Dynamics of Life* © 2004**

OBJECTIVES	PAGE REFERENCES
Standard 1: Science As Inquiry	
1SC-P1. Propose solutions to practical and theoretical problems by synthesizing and evaluating information gained from scientific investigations	
PO 1. Evaluate scientific information for relevance to a given problem	SE: <i>MiniLab</i> 6 <i>Problem-Solving Lab</i> 16, 447, 492, 773 <i>Design Your Own BioLab</i> 58-59, 496-497, 910-911 TWE: TTPK 13
PO 2. Propose solutions to a problem, based on information gained from scientific investigations	SE: <i>Investigate BioLab</i> 104-105 <i>Problem-Solving Lab</i> 115 <i>MiniLab</i> 122 <i>Internet BioLab</i> 274-275 TWE: AS 115
1SC-P2. Compare observations of the real world to observations of a constructed model (e.g., an aquarium, a terrarium, a volcano)	
PO 1. Assess the capability of a model to represent a "real world" scenario	SE: <i>Investigate BioLab</i> 84-85, 104-105, 354-355 <i>MiniLab</i> 198, 268 <i>Internet BioLab</i> 414-415 TWE: QD 53 UM 206, 289
1SC-P3. Analyze and evaluate reports of scientific studies	
PO 1. Analyze reports of scientific studies for elements of experimental design	SE: 15, 18 <i>MiniLab</i> 14 <i>Problem-Solving Lab</i> 16 <i>Design Your Own BioLab</i> 58-59, 734-735 TWE: AL 12-13 BR 15 QD 15
PO 2. Compare conclusions to original hypotheses	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 522-523, 734-735, 756-757 <i>Internet BioLab</i> 544-545 TWE: AL 12-13
PO 3. Evaluate validity of conclusions	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 330-331, 496-497, 834-835 <i>Investigate BioLab</i> 104-105 TWE: AL 12-13 AS 59, 165, 215

OBJECTIVES		PAGE REFERENCES
1SC-P4. Create and defend a written plan of action for a scientific investigation		
PO 1.	Design an appropriate protocol (written plan of action) for the investigation of a scientific problem	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 496-497, 522-523, 544-545, 756-757 <i>Apply Your Skill</i> 59 TWE: UAA 11 AS 119, 545
PO 2.	Justify the protocol in terms of the elements of experimental design	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 496-497, 522-523, 544-545, 756-757 <i>Apply Your Skill</i> 59 TWE: UAA 11 AS 119, 545
1SC-P5 Apply the concepts of equilibrium, form and function to a variety of phenomena		
PO 1.	Predict the effects of various factors on the equilibrium of a system	SE: <i>Design Your Own BioLab</i> 58-59, 964-965 <i>MiniLab</i> 198 <i>Problem-Solving Lab</i> 514, 896, 932 TWE: UM 9 AS 896 CA 961
PO 2.	Explain how the relationships between form and function are evident in natural and designed systems	SE: 179-185, 187, 281-287, 397-399, 612-621 <i>MiniLab</i> 561, 608, 764, 795 TWE: QD 285, 765 UM 607
PO 3.	Describe how present form and function of an object, organism or system could have evolved from prior form and function	SE: 67-69, 383-385, 396, 397-402, 404-407 <i>Problem-Solving Lab</i> 68 TWE: EX 69, 385 VL 396 MA 397 UM 398
1SC-P6. Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings		
PO 1.	Construct a researchable question	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 496-497, 522-523, 544-545, 756-757 TWE: BR 12 AS 30
PO 2.	Employ a research design that incorporates a scientific method to carry out an experiment	SE: <i>Design Your Own BioLab</i> 58-59, 164-165, 496-497, 522-523, 544-545, 756-757 TWE: AL 12-13
PO 3.	Analyze experimental data	SE: <i>Internet BioLab</i> 24-25, 238-239, 544-545 <i>Design Your Own BioLab</i> 164-165, 330-331, 496-497 <i>Investigate BioLab</i> 874-875 TWE: AL 316-317
PO 4.	Communicate experimental findings to others	SE: <i>Internet BioLab (Share Your Data)</i> 238-239, 274-275, 414-415, 544-545, 686-687 <i>Design Your Own BioLab</i> 570-571 TWE: AS 965

OBJECTIVES	PAGE REFERENCES
Standard 2: History and Nature of Science	
2SC-P1. Identify and describe key factors (e.g., technology, competitiveness, world events, personalities, societal views) that affect the development and acceptance of scientific thought	
PO 1. Define key factors that affect the development of scientific thought	SE: 11-18, 21-22 <i>Focus On</i> 1060-1061 TWE: QD 15 PR 16 TS 17 CA 17 IN 1060 CB 1061
PO 2. Describe how different key factors affect the development and acceptance of scientific thought	SE: 11-18, 21-22 <i>Focus On</i> 1060-1061 TWE: QD 15 PR 16 CA 17 TS 17 IN 1060 CB 1061
2SC-P2. Explain how scientific innovations can challenge accepted ideas	
PO 1. Describe how an accepted idea could be challenged by scientific innovation	SE: 171-172, 380-382, 393-395 <i>Connection to Earth Science</i> 438 <i>Focus On</i> 1060-1061 TWE: VL 381 CD 394
2SC-P3. Explain the impact on society of major scientific developments (e.g., germ theory, molecular biology, relativity)	
PO 1. Describe the benefits, limitations, and consequences of major scientific developments in pure and applied science	SE: 21-22, 345, 347-348, 351-353 <i>BioTechnology</i> 304, 356, 688, 966 <i>Problem-Solving Lab</i> 353 TWE: DIN 30 EN 345 AL 350-351 BJ 353
PO 2. Explain how major scientific developments in pure and applied science have affected, or could affect, society	SE: 21-22, 345, 347-348, 351-353 <i>Connection to Chemistry</i> 106 <i>BioTechnology</i> 304, 356, 688, 966 <i>Problem-Solving Lab</i> 353 TWE: EN 345 AL 350-351 BJ 353

OBJECTIVES	PAGE REFERENCES
2SC-P4. Trace the development and consequences of an invention, theory or discovery to demonstrate the dynamic nature of science	
PO 1. Trace the development of a selected invention, theory or discovery from its inception to modern day	SE: 171-172, 253-260, 281-283, 380-385, 393-397, 443-446 <i>Connection to Earth Science</i> 438 <i>Focus On</i> 1060-1061, 1070-1073 TWE: EX 18 EN 282 VL 381 CD 394 IN 444
PO 2. Explain the progression of changes in the invention, theory or discovery	SE: 171-172, 253-260, 281-283, 380-385, 393-397, 443-446 <i>Connection to Earth Science</i> 438 <i>Focus On</i> 1060-1061, 1070-1073 TWE: EX 18 EN 282 VL 381 CD 394 IN 444
PO 3. Describe the impact of the invention, theory or discovery on further scientific thought	SE: 171-172, 253-260, 281-283, 380-385, 393-397, 443-446 <i>Connection to Earth Science</i> 438 <i>Focus On</i> 1060-1061, 1070-1073 TWE: EX 18 EN 282 VL 381 CD 381, 394 IN 444
2SC-P5. Explain how theory, law and fact are developed in science to answer a specific question	
PO 1. Define theory, law and fact	SE: 17, 18 <i>BioDigest</i> 30 <i>Focus On</i> 1060-1061 TWE: TS 17 EX 18
PO 2. Describe the relationships among theories, laws and facts	SE: 17, 18 <i>BioDigest</i> 30 <i>Focus On</i> 1060-1061 TWE: TS 17 EX 18
PO 3. Explain how theories, laws and facts are used to answer specific questions	SE: 17, 18 <i>BioDigest</i> 30 <i>Focus On</i> 1060-1061 TWE: TS 17 EX 18

OBJECTIVES	PAGE REFERENCES
2SC-P6. Analyze evidence that supports past and current scientific theories about a specific topic	
PO 1. Distinguish between evidence which supports a given scientific theory (e.g., model of the atom, plate tectonics, natural selection) and evidence which does not support the theory	SE: 142-144, 378-379, 397-403 <i>Problem-Solving Lab</i> 372 <i>Biology and Society</i> 388 <i>Focus On</i> 1060-1061 TWE: IN 378 CA 379
Standard 3: Personal and Social Perspectives in Science and Technology	
3SC-P1. Apply scientific thought processes and procedures to personal and social issues	
PO 1. Apply scientific thought processes of skepticism, empiricism, objectivity and logic to seek a solution to personal and social issues	SE: 11-18 <i>Problem-Solving Lab</i> 124, 1011 <i>Biology and Society</i> 600, 990, 1044 <i>MiniLab</i> 927, 1028 TWE: IN 1060
PO 2. Apply a scientific method to the solution of personal and social issues	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 496-497 <i>Problem-Solving Lab</i> 1027-1028 TWE: AS 497
3SC-P2. Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	
PO 1. Describe a problem or need	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 58-59, 834-835 <i>Investigate BioLab</i> 104-105, 386-387 <i>Internet BioLab</i> 274-275 TWE: CA 101
PO 2. Propose a solution to the problem or design a product to meet the need	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 58-59, 834-835 <i>Investigate BioLab</i> 104-105, 386-387 <i>Internet BioLab</i> 274-275 TWE: CA 101
PO 3. Design a method of testing the solution or design a model or simulation to test the product	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 58-59, 834-835 <i>Investigate BioLab</i> 104-105, 386-387 <i>Internet BioLab</i> 274-275 TWE: CA 101
PO 4. Carry out the test of the solution or product	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 58-59, 834-835 <i>Investigate BioLab</i> 104-105, 386-387 <i>Internet BioLab</i> 274-275 TWE: CA 101
PO 5. Evaluate the test results	SE: <i>MiniLab</i> 14 <i>Design Your Own BioLab</i> 58-59, 834-835 <i>Investigate BioLab</i> 104-105, 386-387 <i>Internet BioLab</i> 274-275 TWE: CA 101

OBJECTIVES		PAGE REFERENCES
3SC-P3. Compare and contrast the goals of science and technology		
PO 1.	Define the goals of science and the goals of technology	SE: 5-6, 21-23 TWE: DIN 23
PO 2.	Compare the goals of science and the goals of technology	SE: 5-6, 21-23 <i>Section Assessment 23</i> TWE: DIN 23
PO 3.	Describe the impact of technology on the life, physical, earth and space sciences	SE: 341-348, 349-353 <i>BioTechnology</i> 304, 356, 966 <i>Physics Connection</i> 912 <i>Focus On</i> 1064-1065 TWE: QD 342 CA 344
3SC-P4. Identify and describe the basic processes of the natural ecosystems and how these processes affect, and are affected by, humans		
PO 1.	Describe the basic processes of the natural ecosystems (e.g., water cycle, nutrient cycles)	SE: 52-54, 56-57 <i>MiniLab</i> 54 <i>Inside Story</i> 55 TWE: QD 53 PR 55 RE 56 MA 57
PO 2.	Explain how these processes affect, and are affected by, humans	SE: 118-120 <i>Biology and Society</i> 60 TWE: EN 56 AL 118-119
3SC-P5. Describe and explain factors that affect population size and growth (e.g., birth and death rates, quality of environment, disease, education)		
PO 1.	Describe biotic and abiotic factors that affect populations	SE: 37-38, 65-66, 97-99 <i>MiniLab</i> 36 <i>Problem-Solving Lab</i> 37 <i>Design Your Own BioLab</i> 58-59 TWE: IS 36 CA 37 PR 41
PO 2.	Predict the effect of a change in a specific factor on a population	SE: 96-99, 117-120 <i>MiniLab</i> 36 <i>Problem-Solving Lab</i> 37, 115 <i>Design Your Own BioLab</i> 58-59 TWE: AL 38-39
Standard 4: Life Science		
4SC-P1. Use and construct a variety of classification systems, including evolutionary relationships.		
PO 1.	Employ classification systems to identify organisms	SE: 443-449 <i>MiniLab</i> 446, 726 <i>Appendix A</i> 1110-1111 TWE: AS 446 MA 449 IN 458

OBJECTIVES		PAGE REFERENCES
PO 2.	Create classification systems to identify organisms	SE: <i>Investigate BioLab</i> 460-461, 810-811 <i>Design Your Own BioLab</i> 570-571 TWE: IN 444 AS 811
PO 3.	Use a biological classification scheme to infer and discuss the degree of divergence of various species from prior organisms	SE: 452-453, 456 <i>Problem-Solving Lab</i> 447 <i>MiniLab</i> 453 TWE: CA 451 IN 452 UM 453
4SC-P2. Describe the molecular basis of heredity (e.g., DNA, genes, chromosomes and mutations)		
PO 1.	Explain the relationships among DNA, genes and chromosomes	SE: 203-204, 211, 263, 281-283 <i>Inside Story</i> 205 <i>Problem-Solving Lab</i> 264 TWE: AS 264 AL 282-283
PO 2.	Describe the structure and function of DNA and its role in heredity	SE: 281-285 <i>Problem-Solving Lab</i> 283 <i>BioDigest</i> 361 TWE: DI 282 CE 284
PO 3.	Describe how the various types of mutations may act as a source of genetic diversity	SE: 296-297, 298-299, 406 <i>MiniLab</i> 300
PO 4.	Describe how genetic information is transmitted from parents to offspring	SE: 253-254, 265-266, 1005-1006 <i>MiniLab</i> 254 TWE: IN 265
4SC-P3. Describe the basic cellular processes of photosynthesis, respiration, protein synthesis and cell division		
PO 1.	Differentiate between the processes of photosynthesis and respiration in terms of energy flow, reactants and products	SE: 225-228, 230, 231-232, 234, 237 <i>Inside Story</i> 229, 233 <i>Section Assessment</i> 237 <i>BioDigest</i> 247 TWE: AL 234
PO 2.	Describe the process of protein synthesis	SE: 291-295 <i>MiniLab</i> 293 <i>Investigate BioLab</i> 302-303 <i>BioDigest</i> 362 TWE: BJ 292 CA 294 PO 294
PO 3.	Compare the purpose and process of mitosis with the purpose and process of meiosis	SE: 203-204, 206-210, 265-270 <i>BioDigest</i> 247, 361 TWE: VL 266 PO 270 IN 361

OBJECTIVES		PAGE REFERENCES
4SC-P4. Describe and explain the cycling of matter and the flow of energy through the ecosystem's living and non-living components		
PO 1.	Explain the relationships among abiotic and biotic components of an ecosystem in terms of energy flow and the cycling of matter	SE: 46-54, 56-57 <i>Problem-Solving Lab</i> 50 <i>Inside Story</i> 55 TWE: CA 50 PSC 52 PR 55
4SC-P5. Describe and explain how energy is used in the maintenance, repair, growth and development of cells		
PO 1.	Describe the energy demands required by physiological mechanisms needed to regulate homeostasis	SE: 9, 221-222, 224 <i>Section Assessment</i> 230 TWE: EX 224 MA 224
PO 2.	Describe the energy demands required by cells for growth, development and repair	SE: 8, 9, 184, 224 TWE: EX 224 MA 224
4SC-P6. Describe and explain how the environment can affect the number of species and the diversity of species in an environment		
PO 1.	Explain how the adaptations of various species are related to their success in an ecosystem	SE: 42-43, 404-413 <i>Problem-Solving Lab</i> 397 <i>MiniLab</i> 398 TWE: VL 42 IN 43 AS 398 PO 399, 401
PO 2.	Explain why genetic variation within a population can impact the success of a species subjected to new environmental conditions	SE: 269-270, 296, 407-409 TWE: PR 400 AL 408-409
PO 3.	Predict how a change in an environmental factor can affect the number of organisms in a population	SE: 37, 38, 65-66, 96-99, 118-120 <i>MiniLab</i> 36 TWE: AS 36 AL 118-119
PO 4.	Predict how a change in an environmental factor can affect the biodiversity in an ecosystem	SE: 116-120 <i>MiniLab</i> 112 <i>Problem-Solving Lab</i> 115 TWE: EN 117 QD 117
4SC-P7. Describe the role of the systems (e.g., nervous, digestive, respiratory) that regulate the behaviors of multi-celled organisms		
PO 1.	Describe the physiological relationship of the systems and their function in homeostasis	SE: 896-897, 929-935, 974, 984, 987 <i>Problem-Solving Lab</i> 896, 932 TWE: AS 896 MA 932

OBJECTIVES	PAGE REFERENCES
PO 2. Describe an organism's behavioral responses to internal and external stimuli	SE: 859-867 <i>MiniLab</i> 860 <i>Investigate BioLab</i> 874-875 TWE: AS 860 CA 861 IN 861
PO 3. Compare the selective advantage of several behavioral responses	SE: 859-867, 869-872 TWE: RE 863 VL 863, 864, 865 AL 864-865 EX 867
4SC-P8. Explain how 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.	
PO 1. Using fossil records, trace the changes in number and type of organisms over time	SE: 370, 374-379, 399-400 <i>MiniLab</i> 376 TWE: CA 377 IN 377, 378 MA 379
PO 2. Compare the fossil record of one ancient organism to the modern form of that organism (e.g., ammonite to nautilus, eohippus to horse) identifying molecular and/or structural similarities	SE: 450-453 <i>MiniLab</i> 371, 453 <i>Problem-Solving Lab</i> 433 <i>Investigate BioLab</i> 436-437 TWE: VL 377, 396 IS 378, 401 UM 398
4SC-P9. Use scientific evidence to demonstrate that descent from common ancestors produced today's diversity of organisms over more than 3.5 billion years of evolution.	
PO 1. Using scientific evidence (e.g., the fossil record, homologous structures, embryological development or biochemical similarities), illustrate that descent from common ancestors produced today's diversity of organisms	SE: 397-403, 450-453, 454 <i>Problem-Solving Lab</i> 433 <i>Investigate BioLab</i> 446-447 <i>MiniLab</i> 453 TWE: AC 400 DS 401 DVB 402 CA 451
4SC-P10. Demonstrate an understanding of the theory of evolution by natural selection as a consequence of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring	
PO 1. Identify the components of natural selection	SE: 395-397, 407-409 <i>Internet BioLab</i> 414-415 <i>BioDigest</i> 468 TWE: PR 394 VL 408 DIN 413

OBJECTIVES		PAGE REFERENCES
PO 2.	Predict the success or failure of a population of organisms over time when exposed to changing environmental factors	SE: 270, 395-399, 407-409 <i>Design Your Own BioLab</i> 58-59 <i>Problem-Solving Lab</i> 397 TWE: PR 400 PO 401 RE 408
PO 3.	Predict the success or failure of a population of organisms over time based on the genetic variability of offspring and ability to reproduce	SE: 270, 296-297, 397, 404-409 TWE: PR 400 RE 408

Codes Used for TWE Pages

AC	Activity
AL	Additional Lab
AS	Assessment
BJ	Biology Journal
BR	Brainstorming
CA	Challenge Activity
CB	Content Background
CD	Concept Development
CE	Chalkboard Example
DI	Discussion
DIN	Daily Intervention
DS	Display
DVB	Different Viewpoint in Biology
EN	Enrichment
EX	Extension
IN	Inquiry
IS	Inclusion Strategy
MA	Modified Assessment
PO	Portfolio
PR	Project
PSC	Physical Science Connection
QD	Quick Demo
RE	Reinforcement
TS	Teaching Strategies
TTPK	Tying to Prior Knowledge
UAA	Using an Analogy
UM	Using Models
VL	Visual Learning