IDAHO
Science Standards Grades 9-12
Biology: Living Systems © 2003

OBJECTIVES		PAGE REFERENCES
648.	**UNIFYING CONCEPTS OF SCIENCE.**	
01.	Understand systems, order, and organization.	
a.	Know the scientific meaning and application of the concepts of system, order, and organization.	SE: 118-122, 124, 366-375, 786-793 *Characterizing Life* 9 *MiniLab* 91 TWE: DEM 8 PO 122 CFU 124 MIN 366
02.	Understand concepts and processes of evidence, models, and explanation.	
a.	Know that observations and data are evidence on which to base scientific explanations.	SE: 33-34 *Thinking Lab* 24, 156, 624 *MiniLab* 33, 774, 800 *Investigation* 36-37, 148-149, 406-407, 452-453, 764-765
b.	Use models to explain how things work.	SE: *Investigation* 104-105, 230-231, 258-259, 424-425, 552-553 *MiniLab* 186 TWE: PR 186, 592 MIN 250
c.	Develop scientific explanations based on scientific knowledge, logic, and analysis.	SE: 33-35, 38-39, 42 *Thinking Lab* 24, 411 *Investigation* 36-37, 596-597, 676-677 *MiniLab* 71, 122, 348, 592 TWE: FCQ 35
03.	Understand constancy, change, and measurement.	
a.	Identify constancy in some concepts in science that do not change with time such as the speed of light.	SE: 42 TWE: FCQ 42
b.	Recognize that change occurs in and among systems and change can be measured.	SE: 6-12, 24-25, 46-48, 804-805, 858-860 TWE: UAA 6 CD 859
c.	Measure in both the metric and U.S. customary system.	SE: 46-48 *MiniLab* 47, 855 *Investigation* 120-121, 294-295 *Skill Handbook* 883-885 TWE: MIN 47 SJ 47

OBJECTIVES		PAGE REFERENCES
04.	Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	
a.	Know that the present arises from materials and forms of the past.	SE: 308-314, 318-322, 322-329, 342-351, 352-359 TWE: CFU 328 AS 329 DEM 355
b.	Understand evolution as a series of changes, some gradual and some sporadic, that account for present form and function of objects, organisms, and natural or mechanical systems.	SE: 316-323, 336-341, 342-351 *Thinking Lab* 345 TWE: MIS 319, 349 CC 337 CD 343 FCQ 347
c.	Know that equilibrium is a physical state in which forces and changes occur in opposite and offsetting directions.	SE: 9, 98-99, 323, 630, 680-682
05.	Understand concepts of form and function.	
a.	Know that form refers to function and function refers to form.	SE: 91-96, 109, 250-256, 336-341, 561-566, 580-588 *Investigation* 258-259 TWE: CFU 109 RT 341 CD 343
649.	**CONCEPTS OF SCIENTIFIC INQUIRY.**	
01.	Understand scientific inquiry and develop critical thinking skills.	
a.	Identify questions and concepts that guide scientific investigations.	SE: 11, 32-35, 38-41 TWE: BR 34 DS 35 CE 35
b.	Design and conduct scientific investigations.	SE: 33-35 *Investigation* 36-37, 148-149, 406-407, 452-453, 716-717, 764-765 TWE: EX 37, 149, 453
c.	Use technology and mathematics to improve investigations and communication.	SE: 44-45 *Investigation* 120-121, 204-205, 294-295, 338-339, 520-521 *MiniLab* 763 TWE: AL 44-45, 762-763
d.	Formulate and revise scientific explanations and models using logic and evidence.	SE: 38-39 *Investigation* 36-37, 148-149, 406-407, 452-453, 716-717, 764-765 TWE: DVB 39
e.	Recognize and analyze alternative explanations and models.	SE: 38-39 *Investigation* 36-37, 148-149, 406-407, 452-453, 716-717, 764-765 TWE: DVB 39 AS 453, 717
f.	Communicate and defend a scientific argument.	SE: 41 *Investigation* 36-37, 148-149, 406-407, 452-453, 716-717, 764-765

OBJECTIVES		PAGE REFERENCES
g.	Know the differences among observations, hypotheses, and theories.	SE: 34, 42 TWE: FCQ 42 PO 42
651.	**CELLULAR AND MOLECULAR CONCEPTS.**	
01.	Understand the cell is the basis of form and function for all living things and how living things carry out their life functions.	
a.	Know that cells have particular structures that underlie their functions.	SE: 91-96, 109-110, 126-135 TWE: PR 91, 131 PO 132 SJ 135 CFU 137
b.	Know that most cell functions involve chemical reactions.	SE: 76-77, 81-83, 144-151, 152-161 *MiniLab* 147 TWE: RT 77 SJ 145, 160 AS 151
c.	Know that cells store and use information in the form of DNA to guide their functions.	SE: 76, 130, 173, 230-233, 237-242 TWE: MIN 257 BR 257
d.	Know that cell functions are regulated by expressed genes that provide code for the synthesis of proteins.	SE: 230-233, 237-242, 250-258 *Appendix D* 920-921 TWE: MIN 257 BR 257
e.	Know that cellular differentiation is regulated through the expression of different genes. A single cell can differentiate to form the many specialized cells, tissues, and organs.	SE: 522-524 *Thinking Lab* 523
02.	Understand the form and function of DNA.	
a.	Know that the instructions for specifying the characteristics of the organism are carried in DNA.	SE: 76, 183, 198, 226, 237-242, 250
b.	Know that genetic information is both encoded in genes and replicated.	SE: 174-177, 182-187, 233, 234-236, 237-240 TWE: CD 233
c.	Know that most of the cells in a human contain 23 pairs of chromosomes, and that transmission of chromosomal information to offspring occurs through the combination of egg and sperm cells.	SE: 182-184, 497, 500-502 TWE: CDIV 182
d.	Know that changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism whereas others can change cells and organisms. Only mutations in gametes can create the variation that changes an organism's offspring.	SE: 236, 261-266, 337 *MiniLab* 263 TWE: MIN 261 MIS 262 RE 262

OBJECTIVES		PAGE REFERENCES
e.	Know that DNA plays a major role in health issues. Through the development of new technologies we have discovered new information about the human genome, medical disorders, and forensic sciences.	SE: 290-296 *Issues* 245-246, 297-298 *Biotechnology* 271-272, 299 TWE: SJ 269 STS 279 AC 281 EN 291
652.	**INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**	
01.	Understand the theory of biological evolution.	
a.	Know that the theory of evolution explains how species evolve over time and how evolution is the consequence of interactions of: - Potential of a species to increase its numbers; - Genetic variability; - A finite supply of resources; - Selection by the environment of those offspring better able to survive and leave offspring.	SE: 318-323, 336-341, 342-351 *Thinking Lab* 345 *MiniLab* 348 TWE: CD 343, 345, 347 MIS 349
b.	Know that natural selection and its evolutionary consequences provide 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 organisms.	SE: 306-315, 318-322 *Biotechnology* 331 TWE: PO 312 MIN 317
c.	Know that the theory of evolution explains how different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.	SE: 318-322, 326-329 TWE: CFU 328
d.	Know that biological classifications are based on similarities, which reflect their evolutionary relationships.	SE: 314, 370-375, 377-380 *Biotechnology* 383 TWE: BR 372 STS 373
02.	Understand the interdependence of organisms.	
a.	Know that atoms and molecules cycle among the living and nonliving components of the biosphere.	SE: 16-17, 791-792, 795-796 TWE: DEM 17 CD 790 FCQ 792 CE 792
b.	Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.	SE: 14-18, 786-790 TWE: DS 15 SJ 16 DEM 17 PO 790
c.	Know that organisms both cooperate and compete in ecosystems.	SE: 13, 15-16, 764, 767-769, 771-774, 792-794 *MiniLab* 774 *Thinking Lab* 793 TWE: DS 793

OBJECTIVES		PAGE REFERENCES
d.	Know that living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.	SE: 760-766, 767-768 *Investigation* 764-765 TWE: UTI 761 CD 762 AS 765
e.	Know that human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption.	SE: 775-779, 804-805, 844-863 *Issues* 27, 384, 444 *Biotechnology* 243 TWE: EX 779 CD 847, 859 PO 853 PR 854
653.	**MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**	
01.	Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.	
a.	Know that all matter tends toward more disorganized states.	SE: 18, 789-790
b.	Know that living systems require a continuous input of energy to maintain their chemical and physical organization.	SE: 14, 78, 144, 161, 544
c.	Know that the energy for life is primarily derived from the sun through photosynthesis.	SE: 14, 152-161, 787 *Biotechnology* 443-444 *Appendix C* 916-919 TWE: DS 15 AC 161
d.	Understand cellular respiration and the synthesis of macromolecules.	SE: 15, 146-151, 160 *Appendix C* 913-916 TWE: MIN 147
e.	Know that chemical bonds of food molecules contain energy, which is released when the bonds are broken.	SE: 15, 16-17, 146-148, 544-545, 913
f.	Know that cells usually store energy as adenosine triphosphate (ATP).	SE: 144-148, 913 TWE: MIN 145, 146 SJ 145
g.	Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy.	SE: 761, 763, 764-765, 767-768, 778 *Investigation* 764-765 TWE: AS 765
h.	Trace how matter cycles and energy flows through different levels of organization of living systems – cells, organs, organisms, communities – and between living systems and the physical environment.	SE: 14-18, 786-792 TWE: DS 15 DEM 17 CD 790 SJ 792
02.	Understand the individual behavior of organisms and their interactions in populations and communities as influenced by physiological and environmental factors.	
a.	Know that multi-cellular animals have nervous systems that generate behavior.	SE: 700, 710-719 TWE: SJ 702 AL 704-705 PR 711 AC 711

OBJECTIVES		PAGE REFERENCES
b.	Know that the nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules.	SE: 700-709 TWE: CFU 708 CD 708
c.	Know that organisms have behavioral responses to internal changes and to external stimuli. The broad patterns of behavior have evolved to ensure reproductive success.	SE: 340, 773-775 TWE: SJ 702 UTI 773
d.	Know that behaviors often have an adaptive logic when viewed in terms of natural selection.	SE: 340, 773-775 TWE: SJ 702 UTI 773
655.	**TECHNOLOGY.**	
01.	Understand the relationship between science and technology and develop the abilities of technological design and application.	
a.	Know the ways that science advances technology and technology advances science.	SE: 33, 43, 44-45 *Biotechnology* 26, 331, 383, 606 TWE: GF 26
b.	Recognize that science and technology are pursued for different purposes and that scientific inquiry is driven by the desire to understand the natural world and technological design is driven by the need to meet human needs and solve human problems.	SE: 33, 43, 268-270 *Biotechnology* 138, 299, 539, 751 *Health Connection* 267 *MiniLab* 269 TWE: MIS 34
c.	Know that critical thinking, creativity, imagination, and a good knowledge base are all required in the work of science and engineering.	SE: 32-35, 38-41 *Investigation* 148-149, 406-407, 452-453, 764-765 TWE: BR 34 GF 871
d.	Know the elements of technological design, which include the following: - Identify a problem or design an opportunity; - Propose designs and choose between alternative solutions; - Implement a proposed solution; - Evaluate the solution and its consequences; - Communicate the problem, process, and solution.	SE: *Investigation* 230-231, 424-425 TWE: PO 20 GF 163, 360, 871 AC 866
e.	Use available technology to assist in solving problems.	SE: 20-21 *Issues* 752-753 TWE: PO 20 BR 25 GF 753, 871

OBJECTIVES		PAGE REFERENCES
656.	**PERSONAL AND SOCIAL PERSPECTIVES.**	
01.	Understand common environmental quality issues, both natural and human induced.	
a.	Identify issues, including but not limited to: - Water quality; - Air quality; - Hazardous waste; - Forest health.	SE: 844-869 *Issues* 330, 444-445 *Considering the Environment* 837-838, 870-871 *Investigation* 856-857 *Thinking Lab* 868 TWE: AC 853 PO 859 LC 868
02.	Understand the causes and effects of population change.	
a.	Understand the impact of technological development and the growth of human population on the living and nonliving environment.	SE: 775-779, 804-805, 844-863 *Issues* 27, 384, 444 *Biotechnology* 243 TWE: EX 779 CD 847, 859 PO 853 PR 854
b.	Understand the impact of population change on natural resources and community infrastructure.	SE: 760-779 *MiniLab* 763 TWE: BE 768 FCQ 768 CD 770 RT 779
03.	Understand the importance of natural resources and the need to manage and conserve them.	
a.	Understand the differences between renewable and nonrenewable resources.	SE: 864 TWE: PO 866
b.	Understand the differences between preservation and conservation.	SE: 864-868 **Issues* 330, 361, 444-445, 837-838 *These features can be used to highlight differences between preservation and conservation.
c.	Understand the role and effect of management of natural resources.	SE: 844-863, 864-868 *Issues* 330, 361, 444-445, 837-838 TWE: SJ 860 AC 863 DIS 864
04.	Understand different uses of technology in science and how they affect our standard of living.	
a.	Identify examples of technologies used in scientific fields, including but not limited to: - Weather forecasting; - Food production; - Environmental cleanup; - Advances in medicine; - Communications; - The space program.	SE: 268-270, 291-296 *Biotechnology* 26, 299, 539, 606, 694 *Chemistry Connection* 85 *Considering the Environment* 162-163 TWE: GF 85

OBJECTIVES		PAGE REFERENCES
657.	**HISTORY OF SCIENCE.**	
01.	Understand the significance of major scientific milestones.	
a.	Understand the social and economic impact of historical scientific events.	SE: 659 *History Connection* 372, 599 TWE: STS 171 PR 316 DIS 323 SJ 660
b.	Understand the contributions of notable scientists.	SE: 32, 90-91, 170-172, 198-203, 226-233, 316-322, 325-326 TWE: SJ 32 PO 227 SJ 227 AS 323 CDIV 324
658.	**INTERDISCIPLINARY CONCEPTS.**	
01.	Understand that interpersonal relationships are important in scientific endeavors.	
a.	Know the importance of working in interdisciplinary teams to solve scientific problems.	SE: *Global Connection* 40-41 *Career Connection* 41 *Physics Connection* 49, 360 *Considering the Environment* 445
02.	Understand technical communication.	
a.	Read for information.	SE: *Math Connection* 174-175, 740-741 *Thinking Lab* 256, 651, 828 *Biotechnology* 271, 507, 751 TWE: EN 41 PR 41
b.	Write and articulate technical information.	SE: *Investigation* 424-425 TWE: PO 20, 866 MIN 293 PR 864

Codes Used for TWE Pages

AC	Activity
AL	Alternate Lab
AS	Assessment
BE	Bioethics
BR	Brainstorming
CC	Chemistry Connection
CD	Concept Development
CDIV	Cultural Diversity
CE	Chalkboard Example
CFU	Check for Understanding
DEM	Demonstration
DIS	Discussion
DS	Display
DVB	Different Viewpoints in Biology
EN	Enrichment
EX	Extension
FCQ	Figure Caption Question
GF	Going Further
LC	Literature Connection
MIN	Meeting Individual Needs
MIS	Misconception
PO	Portfolio
PR	Project
RE	Reinforcement
RT	Reteach
SJ	Student Journal
STS	Science, Technology, and Society
UAA	Using an Analogy
UTI	Using the Illustration