

Arizona Educator Proficiency Assessments (AEPA™)

FIELD 07: BIOLOGY TEST OBJECTIVES

Subarea	Range of Objectives	Approximate Test Proportions
I. Scientific Inquiry	1–5	22%
II. Cells and Cell Theory	6–9	16%
III. Characteristics of Organisms	10–13	16%
IV. Human Biology	14–16	13%
V. Principles of Heredity	17–20	16%
VI. Matter and Energy in Ecosystems	21–24	17%

Copyright © 2004 by National Evaluation Systems, Inc. (NES®)

"AEPA," "Arizona Educator Proficiency Assessments," and the "AEPA" logo are trademarks of the Arizona Department of Education and National Evaluation Systems, Inc. (NES®).

This document may not be reproduced for commercial use but may be copied for educational purposes.

**Arizona Educator Proficiency Assessments (AEPA™)
Subject Knowledge Test**

**Test Objectives
Field 07: Biology**

Subareas:

Scientific Inquiry
Cells and Cell Theory
Characteristics of Organisms
Human Biology
Principles of Heredity
Matter and Energy in Ecosystems

SCIENTIFIC INQUIRY

0001 Understand the historical and contemporary contexts of the study of biology.

For example: the significance of key events and contributions of individuals in the history of biology; the historical development of knowledge in biology; and the social and cultural contexts of biology (e.g., genetic understanding, medicine, agriculture).

0002 Understand the nature of science and scientific inquiry.

For example: processes by which new scientific knowledge and hypotheses are generated; processes by which science advances; the role of empirical data, verifiable evidence, and logical reasoning in scientific investigation; ethical issues related to scientific processes (e.g., accurately reporting experimental results, researcher bias); the role of communication among scientists and between scientists and the public in promoting scientific progress; and the relationship of facts, laws, and theories to one another and to scientific inquiry.

0003 Understand principles and procedures of scientific investigations.

For example: the identification of questions that can be answered using methods of scientific inquiry; procedures and considerations in setting up and conducting a scientific investigation; sampling techniques; the use of control and experimental groups to test hypotheses; the appropriateness of a specified experimental design to test a given biology hypothesis; and the selection and use of materials and techniques for biology investigations.

TEST OBJECTIVES
FIELD 07: BIOLOGY

0004 Understand the processes of gathering, organizing, reporting, and analyzing scientific data in the context of biology investigations.

For example: the appropriateness of a given method or procedure for collecting data for a specified purpose; the design and use of models; appropriate and effective graphic representations (e.g., graph, table, diagram) for organizing and reporting experimental data; the application of simple descriptive statistics to data (e.g., mean, median, mode); the analysis of data to identify limitations, make predictions, and draw conclusions; and procedures for formally reporting experimental results and data to the scientific community.

0005 Understand how biology interrelates with society, technology, and the other sciences and applies to everyday life.

For example: unifying concepts and processes (e.g., systems, constancy, form and function) among the sciences; the impact of biology and technology on one another and on society; similarities and differences between science and technology (e.g., science as investigating the natural world, technology as solving human adaptation problems); and the application of biology to daily life and personal decision making.

CELLS AND CELL THEORY

0006 Understand cell structure and function and the cell theory.

For example: structures, functions, and interrelationships between cell organelles and other cell components; specializations of cells and the relationship between a cell's structure and its function; comparison of different types of cells (e.g., plant and animal cells, prokaryotic and eukaryotic cells); and basic tenets and implications of cell theory.

0007 Understand the chemical components of living systems and basic principles of biochemistry.

For example: the physical and chemical characteristics of water and its role in living organisms; and structures, functions, and composition of lipids, carbohydrates, proteins, amino acids, and nucleic acids.

0008 Analyze physiological processes of cells.

For example: processes of protein synthesis, photosynthesis, and respiration (anaerobic and aerobic) and the role of enzymes in regulating these processes; and processes by which cells obtain nutrients and maintain homeostasis (e.g., diffusion, facilitated diffusion, osmosis, active transport, exocytosis, endocytosis).

TEST OBJECTIVES
FIELD 07: BIOLOGY

0009 Analyze cell growth, division, and differentiation.

For example: the cell cycle; processes of mitosis and meiosis; cell structures involved in mitosis and meiosis; consequences of normal and abnormal mitotic and meiotic divisions; the role of mitosis and meiosis in living organisms; and factors that affect cell growth, division, and differentiation.

CHARACTERISTICS OF ORGANISMS

0010 Understand principles of taxonomy and classification in biology.

For example: characteristics of biological classification (e.g., hierarchy of taxonomic levels, importance of heritable characteristics in classifying organisms, relationship of taxonomic classification to evolutionary history); the biological species concept; procedures and criteria used to classify organisms; and taxonomic relationships among organisms (including both living and extinct organisms).

0011 Analyze reproduction, development, and life cycles of living organisms.

For example: characteristics of sexual and asexual reproduction; advantages and disadvantages of sexual and asexual reproduction; reproductive strategies of common organisms; characteristics of developing embryos of plants and animals; processes related to developing embryos (e.g., cleavage, gastrulation); and life cycles of common organisms.

0012 Analyze the processes used by living organisms to obtain, store, and use energy.

For example: processes used by organisms to obtain energy; structures used to store food; processes involved in the distribution of food to all parts of an organism; and ways in which organisms use food.

0013 Analyze the anatomy and physiology of living organisms.

For example: anatomical structures and physiological processes that allow organisms to carry out specific life functions (e.g., maintaining homeostasis, respiration, photosynthesis); levels of biological organization (i.e., tissues, organs, and organ systems) in multicellular organisms; functions of and relationships among given tissues, organs, and organ systems; and adaptations of structures and processes.

TEST OBJECTIVES

FIELD 07: BIOLOGY

HUMAN BIOLOGY

0014 Understand the structures and functions of the human skeletal, muscular, integumentary, circulatory, and immune systems.

For example: types, structures, and functions of bone, muscle, and connective tissues; the relationship between the structure of the skin and its functions; structures and processes of the circulatory and immune systems; components and functions of blood and lymph; common diseases and disorders of the skeletal, muscular, integumentary, circulatory, and immune systems; and homeostatic roles of the skeletal, muscular, integumentary, circulatory, and immune systems within the body.

0015 Understand the structures and functions of the human respiratory, excretory, and digestive systems, and the principles of human nutrition.

For example: structures and processes of the respiratory, excretory, and digestive systems; the relationship between surface area and volume in the functioning of the respiratory, excretory, and digestive systems; the exchange of materials and gases between the blood and other tissues; roles in the body of basic nutrients found in foods (e.g., water, vitamins, proteins, carbohydrates, lipids); common diseases and disorders of the respiratory, excretory, and digestive systems; and homeostatic roles of the respiratory, excretory, and digestive systems within the body.

0016 Understand the structures and functions of the human nervous, endocrine, and reproductive systems, and the processes of embryonic development.

For example: structures and functions of the central and peripheral nervous systems; the transmission of nerve impulses within and between neurons; structures of the endocrine system and the functions of specific hormones; structures and functions of the male and female reproductive systems; the role of feedback mechanisms in the functioning of the nervous, endocrine, and reproductive systems; gametogenesis, fertilization, and the processes and stages of embryonic development; common diseases and disorders of the nervous, endocrine, and reproductive systems; and homeostatic roles of the nervous, endocrine, and reproductive systems within the body.

PRINCIPLES OF HEREDITY

0017 Understand the principles of Mendelian and non-Mendelian genetics.

For example: evidence that certain characteristics are inherited; basic principles of heredity (e.g., independent assortment); the relationship of Mendelian genetics to the structure and behavior of chromosomes; crossing-over and its effect on genotype and phenotype; sex-linked characteristics; incomplete dominance and co-dominance; polygenic inheritance; and application of genetic principles to solve problems involving genetic crosses.

TEST OBJECTIVES
FIELD 07: BIOLOGY

0018 Understand the synthesis of DNA, RNA, and protein.

For example: processes of replication, transcription, and translation; the relationship of molecular structure to these processes; and the genetic code (including analysis of problems involving codons and anticodons).

0019 Understand genes, chromosomes, and changes in genetic material.

For example: gene structure and function; the relationship between genes and chromosomes; factors contributing to genetic mutations and their consequences; the influence of environment on heredity; the use of genetic engineering; and changes in genetic material.

0020 Understand the processes of natural selection and adaptation.

For example: the concept of variation in populations (including genetic and phenotypic variation); the role of natural selection on the survival of individual organisms and species; the influence of selection pressures on species adaptations; factors that contribute to speciation; evidence that species change over time; and proposed mechanisms of biological evolution.

MATTER AND ENERGY IN ECOSYSTEMS

0021 Understand populations and communities.

For example: basic requirements of organisms (e.g., food, habitat, shelter); factors that affect population size (e.g., carrying capacity, competition, predation); common patterns of interdependence and interrelationships among species in a community (including the roles of producers, consumers, and decomposers); the concept of niche; and energy relationships within food chains and food webs.

0022 Understand types and characteristics of ecosystems and biomes, and factors affecting their change over time.

For example: common patterns of interdependence and interrelationships among species in an ecosystem; biotic and abiotic factors that affect ecosystems and biomes; types and characteristics of biomes; characteristic flora and fauna of biomes; and the process of ecological succession.

0023 Analyze the cycling of materials through an ecosystem.

For example: characteristics and processes of biogeochemical cycles (e.g., water, carbon-oxygen, nitrogen, phosphorus); roles of organisms in biogeochemical cycles; the concept of limiting factors; and implications of biogeochemical cycles for living things.

TEST OBJECTIVES
FIELD 07: BIOLOGY

0024 Understand the physical and societal effects of human activities on the environment.

For example: characteristics and consequences of human population growth; food production and the world food supply; issues related to the availability, distribution, and use of water, space, and energy; types, sources, and effects of pollution (e.g., depletion of the ozone layer); chemical and physical mechanisms (e.g., burning of fossil fuels) by which pollutants (e.g., acid precipitation) are created; consequences of habitat destruction; and methods of pollution control, resource conservation (e.g., recycling), land reclamation, and environmental preservation.