TEST SUMMARY AND FRAMEWORK

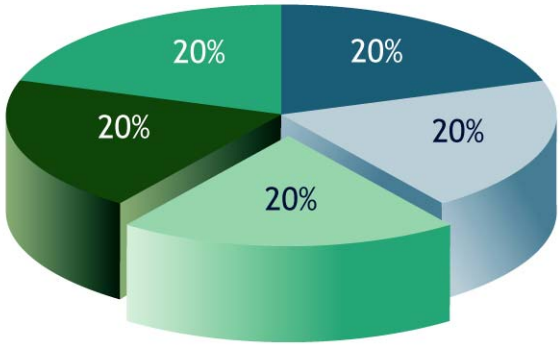
TEST SUMMARY

BIOLOGY

The Washington Educator Skills Tests—Endorsements™ (WEST-E™) are designed to measure a candidate's knowledge of the subject-area content contained in the test framework for each field. All WEST-E tests are fully aligned with the state's teacher endorsement competencies and, as applicable, the Essential Academic Learning Requirements.

This test summary describes general testing information as well as the approximate percentage of the total test score derived from each content domain. The test framework, organized by content domain, contains the objectives that define the content for the test.

Test Format	Multiple-choice questions
Number of Questions	Approximately 110
Test Session	Up to 5 hours (examinees may take more than one test per session)
Passing Score	240 (scores are calculated in a range from 100 to 300)
Test Code	022



Key	Approximate Percentage of Test	Content Domain	Range of Objectives
	20%	Communities and Ecosystems	0001-0004
	20%	Strategies of Life	0005-0008
	20%	Cells and the Chemistry of Life	0009-0012
	20%	Genetics and Evolution	0013-0016
	20%	Scientific Processes and Inquiry	0017-0020

TEST FRAMEWORK

BIOLOGY

COMMUNITIES AND ECOSYSTEMS

0001 Analyze the types and characteristics of ecosystems and biomes and the factors affecting their change over time.

For example:

- recognizing the interdependence of organisms and their roles in ecosystems based on their trophic levels
- identifying the biotic and abiotic factors that affect an ecosystem
- comparing and contrasting the types and characteristics of aquatic and terrestrial biomes and the types of flora and fauna in those biomes
- analyzing processes and patterns of ecological succession

0002 Analyze the flow of matter and energy in ecosystems.

For example:

- recognizing the characteristics of biogeochemical cycles in ecosystems and biomes
- analyzing the roles of organisms in biogeochemical cycles and the flow of matter in different types of ecosystems
- analyzing the types and sources of energy available to organisms in different ecosystems
- analyzing the flow of energy through trophic levels and between organisms and the physical environment in a variety of ecosystems
- recognizing the concept of limiting factors and the effects of limiting factors on the productivity and complexity of different ecosystems

0003 Analyze populations and communities.

For example:

- demonstrating knowledge of the concept of an ecological niche
- analyzing basic characteristics of populations and interpreting population growth curves
- demonstrating knowledge of factors that affect population size and growth rates
- analyzing the relationships among organisms in a community

0004 Analyze the effects of human activities on biomes, ecosystems, communities, and populations.

For example:

- recognizing the types and sources of environmental pollution
- analyzing the effects of pollution on natural systems
- analyzing the causes and biological consequences of global warming
- demonstrating knowledge of the use of technology to control pollution
- demonstrating knowledge of the conservation, use, and management of land and other resources

STRATEGIES OF LIFE

0005 Analyze the reproduction, development, and life cycles of living organisms.

For example:

- comparing the characteristics of sexual and asexual reproduction, including the advantages and disadvantages of each
- recognizing characteristics of embryos and processes related to their development (e.g., cleavage, organogenesis)
- analyzing factors that affect the growth and development of organisms
- demonstrating knowledge of the life cycles of plants, animals, and fungi
- analyzing how the characteristics and behaviors of organisms contribute to reproductive success and biological fitness

0006 Understand the organization, structures, and functions of systems in multicellular organisms.

For example:

- recognizing levels (e.g., tissues, organs, organ systems) of biological organization in multicellular organisms
- demonstrating knowledge of the structure and functioning of organ systems in plants
- demonstrating knowledge of the structure and functioning of organ systems in animals
- relating anatomical structures of different vertebrates to their functions
- analyzing anatomical and physiological relationships between organ systems in organisms

0007 Understand how organisms obtain and store matter and energy.

For example:

- analyzing the processes and strategies used by heterotrophs and autotrophs to obtain energy
- demonstrating knowledge of ways in which animals obtain food and water (e.g., biomolecules, structures, processes)
- demonstrating knowledge of ways in which plants obtain nutrients and water (e.g., biomolecules, structures, processes)
- demonstrating knowledge of strategies used by organisms to store nutrients (e.g., biomolecules, structures, processes)
- analyzing processes by which nutrients are obtained and distributed to all parts of an organism

0008 Understand human anatomy and physiology.

For example:

- analyzing the structure and functioning of the skeletal, muscular, and integumentary systems
- analyzing the structure and functioning of the digestive and excretory systems
- analyzing the structure and functioning of the respiratory, circulatory, and immune systems
- analyzing the structure and functioning of the nervous, endocrine, and reproductive systems
- recognizing characteristics of common diseases and disorders and relating these to normal body processes

CELLS AND THE CHEMISTRY OF LIFE

0009 Analyze cell structure and function.

For example:

- comparing prokaryotic and eukaryotic cells
- recognizing components of the cell and relating organelle structure to function
- analyzing interactions among cell organelles
- relating the structure and function of different types of cells in multicellular organisms

0010 Analyze the chemical components of cells.

For example:

- recognizing the structures and properties of carbon, hydrogen, and oxygen and how these elements combine into compounds with biologically important characteristics
- analyzing the structures and functions of carbohydrates and lipids in biological systems
- analyzing the structures, functions, and synthesis of proteins in biological systems
- analyzing the structures and functions of nucleic acids in biological systems
- comparing the structures and functions of different classes of biologically important molecules

0011 Analyze the physiological processes of cells.

For example:

- demonstrating knowledge of how cells maintain homeostasis (e.g., the effect of concentration gradients, the importance of surface-area-to-volume ratio)
- analyzing active and passive transport mechanisms across the cell membrane
- analyzing the processes of photosynthesis and cellular respiration and the relationships between them
- recognizing the role of electron transport systems and ATP in photosynthesis and cellular respiration
- analyzing the difference between anaerobic and aerobic respiration
- analyzing the role of enzymes in living systems

0012 Analyze the processes of cell division, growth, and differentiation.

For example:

- comparing the processes of mitosis, meiosis, and binary fission
- demonstrating knowledge of the stages of the cell cycle in eukaryotes and of the characteristics of each stage
- recognizing the significance of the cell cycle and its role in regulating cell growth
- relating the processes of cell differentiation and gene expression to tissue development
- analyzing factors (e.g., genetics, disease, nutrition) that affect cell division and differentiation

GENETICS AND EVOLUTION

0013 Apply the principles of heredity.

For example:

- applying knowledge of the laws of probability to determine genotypic and phenotypic frequencies in Mendelian inheritance
- relating the behavior of chromosomes during meiosis and fertilization to inheritance patterns
- identifying factors and processes (e.g., linkage, crossing over) that influence genetic diversity and gene transmission across generations
- recognizing how the genotype of an organism is manifested in the expression of traits in its phenotype
- recognizing effects of environmental factors on the expression of traits in the phenotype of an organism

0014 Understand the molecular basis of genetics and genetic engineering.

For example:

- identifying the structures and functions of DNA and RNA in organisms
- analyzing the mechanisms of replication, transcription, and translation
- describing and applying knowledge of the genetic code
- analyzing types of mutations and their consequences
- demonstrating knowledge of extranuclear inheritance (e.g., mitochondrial)
- recognizing techniques used in the isolation, manipulation, and analysis of genetic material
- recognizing applications of genetic engineering in medicine and agriculture
- demonstrating knowledge of ethical issues related to research in genetics and genetic engineering

0015 Apply the principles of taxonomy and classification in biology.

For example:

- demonstrating knowledge of the hierarchy of taxonomic levels, especially as it describes evolutionary relationships, and of the importance of heritable characteristics in biological classification
- recognizing and applying morphological, developmental, geologic, and molecular evidence to classify organisms
- demonstrating knowledge of the taxonomic relationships among organisms
- identifying distinguishing characteristics of taxonomic groups at the domain and kingdom levels
- identifying traits that are taxonomically useful and those that are not (e.g., homologous, analogous)
- demonstrating knowledge of major changes in biological diversity (e.g., Cambrian explosion) that have occurred over time

0016 Understand the theory, evidence, and mechanisms of evolution.

For example:

- demonstrating knowledge of the characteristics and historical development of Darwin's theory of evolution
- identifying sources of variation (e.g., mutation, migration, drift) in a population on which natural selection can act
- analyzing the role of natural selection in genotypic and phenotypic changes in a population over time
- demonstrating knowledge of population genetics, including factors that contribute to changing allele frequencies in a population
- demonstrating knowledge of factors that contribute to speciation
- evaluating evidence that species change over time

SCIENTIFIC PROCESSES AND INQUIRY

0017 Understand the principles and procedures of scientific investigation.

For example:

- formulating questions and testable hypotheses
- using empirical data and verifiable evidence to draw logical conclusions in a scientific investigation
- evaluating an experimental design for its validity in collecting data and testing a hypothesis
- identifying sources of bias and strategies for avoiding bias in scientific investigations
- recognizing the dynamic nature of scientific knowledge and how scientific knowledge builds and changes over time

0018 Understand the principles and procedures for analyzing and communicating scientific data and information.

For example:

- demonstrating knowledge of the procedures and criteria for formally reporting data and experimental results to the scientific community
- demonstrating knowledge of different formats for organizing and analyzing data
- applying appropriate mathematical concepts (e.g., simple descriptive statistics, proportional reasoning) to describe and analyze data
- using models (e.g., physical, graphic, mathematical) to describe biological processes and phenomena
- interpreting and assessing scientific information available in the media, including the Internet

0019 Demonstrate knowledge of scientific tools, instruments, materials, and safety practices.

For example:

- recognizing procedures and sources of information for the safe and proper use and storage of equipment and materials used in scientific investigations
- identifying potential safety hazards associated with the use of scientific equipment, materials, and procedures
- demonstrating knowledge of appropriate protocols for maintaining safety and responding to emergencies in laboratory situations
- selecting appropriate tools, procedures, units, and levels of precision to collect, measure, and represent data in scientific investigations
- demonstrating knowledge of procedures for the ethical use and care of living organisms in scientific research

0020 Understand the unifying principles of science and the historical and contemporary relationships among science, technology, and society.

For example:

- demonstrating knowledge of major unifying themes and concepts that are common to the various scientific disciplines (e.g., modeling, conservation of energy, systems)
- analyzing examples of the integration and interdependence of different technologies and of different scientific disciplines
- demonstrating knowledge of the historical development of major scientific ideas, including contributions from diverse cultures and individuals
- analyzing societal factors that influence developments in science
- assessing the personal, societal, and cultural implications of developments in biology
- identifying the potential and real benefits, risks, and ethical concerns in current areas of scientific research and in developing technologies for contemporary society