



# TEST SUMMARY AND FRAMEWORK

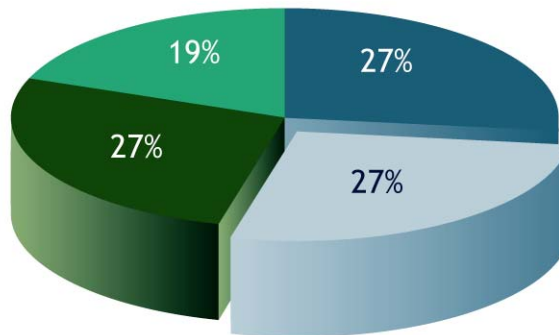
## TEST SUMMARY

### SCIENCE

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.

<b>Test Format</b>	Multiple-choice questions
<b>Number of Questions</b>	Approximately 110
<b>Test Session</b>	Up to 5 hours (examinees may take more than one test per session)
<b>Passing Score</b>	240 (scores are calculated in a range from 100 to 300)
<b>Test Code</b>	021



Key	Approximate Percentage of Test	Content Domain	Range of Objectives
Dark Blue	27%	Physical Science	0001-0006
Light Blue	27%	Earth and Space Science	0007-0012
Dark Green	27%	Biology	0013-0018
Light Green	19%	Scientific Processes and Inquiry	0019-0022



# TEST FRAMEWORK

## SCIENCE

### PHYSICAL SCIENCE

#### **0001 Understand the structure and properties of matter.**

For example:

- demonstrating knowledge of the structure and properties of and forces within the atom
- distinguishing among elements, compounds, mixtures, and solutions
- demonstrating knowledge of physical and chemical properties of matter
- comparing different types of chemical bonds
- applying knowledge of the organization of the periodic table and its trends to explain the properties and interactions of the elements
- interpreting chemical symbols and formulas

#### **0002 Understand physical, chemical, and nuclear changes in matter.**

For example:

- analyzing physical, chemical, and nuclear changes in matter and examples of these changes in everyday life
- recognizing types and characteristics of radioactivity and radioactive decay
- applying the law of conservation of matter and energy to physical, chemical, and nuclear changes
- identifying the components and properties of solutions and factors that affect solubility
- analyzing types and characteristics of chemical reactions and factors that affect rates of chemical reactions
- recognizing characteristics of a system at equilibrium



**0003 Understand principles and concepts related to energy.**

For example:

- identifying forms (e.g., mechanical, thermal, chemical) and types (e.g., potential, kinetic) of energy and their characteristics
- applying the first and second laws of thermodynamics in the analysis of physical and chemical systems
- applying the kinetic molecular theory to explain the properties and behavior of solids, liquids, and gases
- demonstrating knowledge of the gas laws (e.g., Boyle's law, Charles's law)
- analyzing the transfer and transformation of energy within a system and during changes in states of matter, including interpreting phase diagrams

**0004 Demonstrate knowledge of forces and motion.**

For example:

- demonstrating knowledge of Newton's laws of motion and gravitation and their application to everyday situations, including solving problems involving force, mass, and acceleration
- identifying the forces (e.g., normal, gravity, friction) acting on an object in a given situation
- analyzing graphs and solving problems involving distance, direction, time, velocity, and momentum
- applying knowledge of the concepts of work, power, efficiency, and mechanical advantage
- demonstrating knowledge of simple machines and their uses

**0005 Understand properties of waves, sound, and light.**

For example:

- demonstrating knowledge of the types and characteristics of waves
- analyzing the properties and behavior of sound and light in various media, including how light is affected by mirrors, prisms, and lenses
- demonstrating knowledge of the characteristics of the electromagnetic spectrum
- recognizing how wave interactions (e.g., superposition, interference) affect the character and propagation of waves
- analyzing wave phenomena in everyday life (e.g., echoes, rainbows, mirages, Doppler effect)



**0006 Understand the principles of electricity and magnetism.**

For example:

- recognizing the basic principles of electrostatics and everyday phenomena associated with static electricity
- demonstrating knowledge of the characteristics of electric circuits, including the relationships among potential difference, resistance, and current
- comparing parallel and series circuits
- recognizing the properties of magnets and magnetic fields
- demonstrating knowledge of the relationship between electricity and magnetism and applications of electromagnetic induction (e.g., motors, generators, transformers)
- analyzing the processes involved in the transformation of mechanical energy into electrical energy and in the transmission of electrical energy

**EARTH AND SPACE SCIENCE**

**0007 Understand characteristics of the solar system and universe.**

For example:

- demonstrating knowledge of historical and contemporary theories of the origin and evolution of the solar system and universe
- recognizing characteristics of objects in the solar system and in the universe
- analyzing the effects of gravity on objects in the solar system
- recognizing the causes of the apparent motions of objects in the sky
- analyzing interactions and movements of the sun, moon, and earth to explain tides, moon phases, seasons, and eclipses

**0008 Understand the characteristics of the hydrosphere and its role in earth processes.**

For example:

- recognizing how the physical and chemical characteristics of water determine its properties
- analyzing the hydrologic cycle and its relationship to atmospheric and geologic processes
- demonstrating knowledge of the physical and chemical properties of freshwater and marine systems
- analyzing the causes and effects of waves, currents, and tides



**0009 Demonstrate knowledge of the earth's atmosphere, climate, and weather.**

For example:

- identifying the characteristics and properties of the different layers in the atmosphere
- recognizing the atmospheric conditions and geographic factors that produce different types of weather in Washington State and elsewhere
- analyzing the characteristics of different climates and the role of atmospheric circulation, air masses, and pressure systems in the distribution of different types of climates
- recognizing the causes and effects of global climate changes in the past and the climatological evidence for and mechanisms implicated in global warming
- demonstrating knowledge of the technology used to predict and analyze weather and climate

**0010 Demonstrate knowledge of the composition, structure, and history of the earth.**

For example:

- demonstrating knowledge of the structure and composition of the earth's crust, mantle, and core
- recognizing igneous, metamorphic, and sedimentary rocks based on their characteristics and formation
- recognizing common rocks and minerals and the strategies used to identify them
- demonstrating knowledge of the theory of plate tectonics and the evidence supporting the theory
- recognizing theories and evidence of the earth's origin and major events in the earth's history (e.g., continental glaciation, mass extinction, the formation of an oxygen-rich atmosphere)
- identifying the circumstances in which fossils form and understanding their use in paleontology
- demonstrating knowledge of methods for determining the relative and absolute age of geologic strata (e.g., stratigraphic relationships, fossil assemblages, radiometric dating)



**0011 Demonstrate knowledge of the geologic processes acting on the earth.**

For example:

- identifying the processes of the rock cycle and soil formation
- demonstrating knowledge of the processes and consequences of weathering, erosion, and deposition
- recognizing the sources of and phenomena associated with the earth's internal energy
- analyzing the processes associated with the movement of tectonic plates (e.g., convection, subduction, seafloor spreading)
- identifying the processes involved in the formation of major geologic features in Washington State (e.g., the Channeled Scablands, the Cascade Range, the Columbia Plateau)
- analyzing the causes and effects of volcanism and earthquakes in Washington State and elsewhere

**0012 Understand the distribution and use of the earth's natural resources and the effects of human activities on the environment.**

For example:

- identifying types and characteristics of renewable and nonrenewable resources and analyzing factors that influence how resources are used
- recognizing the sun as a major source of energy on the earth's surface and analyzing its relationship to hydrologic and atmospheric processes
- analyzing the effects of human activities on the earth's natural resources and on the environment
- identifying methods for conserving and protecting natural resources and the environment



## BIOLOGY

### 0013 Understand the structure and function of cells.

For example:

- recognizing the tenets of cell theory
- relating the structures of plant and animal cells to their functions
- comparing the characteristics of prokaryotic and eukaryotic cells
- analyzing the function of specialized cells in plants and animals
- identifying the molecular building blocks of life and the basic chemical processes of the cell
- identifying the characteristics of mitosis and meiosis
- demonstrating knowledge of photosynthesis and respiration

### 0014 Understand the characteristics, classification, and life processes of living systems.

For example:

- identifying distinguishing characteristics of taxonomic groups at the domain and kingdom level
- recognizing the basic principles of taxonomy and classification and the methods biologists use to classify organisms
- analyzing the life cycles and reproductive strategies of common organisms from each kingdom
- analyzing the relationships between specialized structures and their functions in plants and animals
- analyzing the ways in which organisms obtain and use matter and energy, including the metabolic and behavioral mechanisms organisms use to maintain homeostasis

### 0015 Understand human physiology and anatomy.

For example:

- relating the structures and functions of the circulatory and respiratory systems
- recognizing the structures and functions of the nervous and endocrine systems
- recognizing the characteristics and functions of muscles and the skeletal system
- recognizing the structures and functions of the digestive and excretory systems
- analyzing the structures and functions of the reproductive system
- recognizing how the human body protects against disease and infection



**0016 Demonstrate knowledge of the principles and processes of the inheritance of biological traits.**

For example:

- identifying the structures and functions of DNA, RNA, genes, and chromosomes and analyzing their roles in storing and transmitting the genetic code
- comparing and contrasting sexual and asexual reproduction in organisms
- identifying processes that contribute to genetic variability (e.g., meiosis, crossing over, mutations)
- applying the basic principles of inheritance and Mendel's laws to analyze inheritance problems
- demonstrating knowledge of applications of genetic engineering and DNA technology

**0017 Understand biological evolution and the processes of natural selection and adaptation.**

For example:

- analyzing the roles of variation, natural selection, and adaptation in biological evolution
- evaluating evidence for evolutionary change in organisms and for evolutionary relationships among organisms (e.g., Darwin's finches, paleontological record, DNA analysis)
- identifying behavioral and physiological adaptations that help organisms survive in a variety of environments
- demonstrating knowledge of the biotic and abiotic factors that affect the evolution of species, including migration, geographic isolation, genetic mutations, and hybridization

**0018 Demonstrate knowledge of the dependence of organisms on one another and the flow of energy and matter in ecosystems.**

For example:

- recognizing the characteristics of populations, communities, and ecosystems
- analyzing how biotic and abiotic factors affect the growth of organisms living in different types of ecosystems
- analyzing the flow of energy and cycling of matter through marine and terrestrial ecosystems
- analyzing the relationships among organisms in an ecosystem
- analyzing the effects of human activities on populations and communities of organisms



## SCIENTIFIC PROCESSES AND INQUIRY

### 0019 Understand the principles and procedures of scientific investigations.

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
- recognizing how physical, conceptual, and mathematical models represent and are used to investigate objects, events, systems, and processes

### 0020 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
- interpreting and assessing scientific information available in the media, including the Internet



**0021 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

**0022 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
- analyzing how scientific principles are used to design solutions to problems
- 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 societal implications of developments in science
- identifying the potential and real benefits, risks, and ethical concerns in current areas of scientific research and developing technologies for contemporary society
- recognizing the scientific, mathematical, and technological knowledge, training, and experience needed for careers in science and technology