



## **Field 045: Science—Life Science Assessment Blueprint**

### **Domain I—Foundations of Science**

- 0001 The Nature and Processes of Science (Standard 1)
- 0002 Central Concepts and Connections in Science (Standard 2)

### **Domain II—Cell Structure and Chemistry**

- 0003 Cellular Chemistry and Structure (Standard 3)

### **Domain III—Organisms and Environment**

- 0004 Organisms (Standard 4)
- 0005 Interdependence (Standard 5)

### **Domain IV—Genetics and Evolution**

- 0006 Heredity and Genetics (Standard 6)
- 0007 Evolution (Standard 7)

### **Domain V—Science Instruction and Assessment**

- 0008 Science Instruction and Assessment (Standard 8)

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<b>Domain</b>	<b>Objectives</b>	<b>Standards</b>	<b>Approximate Test Weight</b>
I. Foundations of Science	0001–0002	1–2	10%
II. Cell Structure and Chemistry	0003	3	16%
III. Organisms and Environment	0004–0005	4–5	32%
IV. Genetics and Evolution	0006–0007	6–7	32%
V. Science Instruction and Assessment	0008	8	10%

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## **Standard 1: The Nature and Processes of Science**

**Life science teachers have a broad and comprehensive understanding of the nature of science and the processes of scientific inquiry, including:**

- 1.1** the characteristics, assumptions, and goals of science
- 1.2** the tentative nature of scientific knowledge, which is subject to change as new evidence, new tools, or new ways of thinking become available
- 1.3** the formulation of testable hypotheses and the principles and procedures for designing and conducting scientific investigations
- 1.4** common tools, materials, and technology used in life science investigations
- 1.5** the collection, organization, analysis, interpretation, and communication of scientific data, including the use of technology
- 1.6** the safe execution of laboratory exercises and safe storage and disposal of chemicals and other materials
- 1.7** the role and applications of mathematics in science
- 1.8** the characteristics and uses of various sources of scientific information and the evaluation of scientific information, claims, and arguments
- 1.9** the role of peer review and critical evaluation of the results of scientific investigations, models, and explanations

## **Standard 2: Central Concepts and Connections in Science**

**Life science teachers have a comprehensive understanding of the core ideas in other science disciplines and of the relationships between science, engineering, technology, and society, including:**

- 2.1** the unifying concepts and processes that cut across the sciences and engineering
- 2.2** the basic concepts and major principles of physical science
- 2.3** the basic concepts and major principles of Earth and space science
- 2.4** the basic characteristics, principles, and goals of the engineering, or technological, design process
- 2.5** the interconnections between the various disciplines of science
- 2.6** the interrelationships between science and technology
- 2.7** the social, cultural, and ethical aspects of science and technology
- 2.8** the historical development of important ideas in science from different periods and cultures

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### **Standard 3: Cellular Chemistry and Structure**

**Life science teachers have a broad and comprehensive understanding of cellular chemistry, structures, and functions, including:**

- 3.1** the properties of biologically important elements, ions, and compounds, such as carbon and water, and their roles in living systems
- 3.2** the structures, properties, and functions of carbohydrates, lipids, proteins, and nucleic acids and the processes involved in their synthesis and breakdown
- 3.3** the properties of enzymes and enzyme-mediated reactions
- 3.4** the structures and functions of membranes, organelles, and other cellular and extracellular components
- 3.5** the inputs and products, biochemical pathways, and cellular structures and components involved in photosynthesis and cellular respiration
- 3.6** the characteristics and functions of cells from various types of organisms and specialized cells within multicellular organisms
- 3.7** basic physiological functions and homeostatic mechanisms of cells

### **Standard 4: Organisms**

**Life science teachers have a broad and comprehensive understanding of the organization and structures of organisms and the processes involved in growth, maintenance, and reproduction, including:**

- 4.1** the hierarchical levels of organization in multicellular organisms
- 4.2** the characteristics of stem cells and the process of cellular differentiation
- 4.3** the structure, organization, function, and roles of different types of tissues in organisms
- 4.4** the functions and interrelationships of organs in organ systems
- 4.5** the structures, physiological processes, and behaviors of various organisms for carrying out essential life functions, including obtaining and using matter and energy
- 4.6** the structures, processes, and strategies used by organisms to maintain homeostasis
- 4.7** reproductive strategies, developmental characteristics, and life cycles of organisms from different taxonomic groups
- 4.8** basic anatomy and physiology of the primary components of human body systems

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### **Standard 5: Interdependence**

**Life science teachers have a broad and comprehensive understanding of ecological principles, the interactions between living and nonliving components of ecosystems, and the relationships between organisms, including:**

- 5.1** abiotic and biotic factors and their effects on organisms in an ecosystem
- 5.2** characteristics of populations and factors that affect population growth and size
- 5.3** the types of relationships and interactions between organisms in an ecosystem
- 5.4** the flow of energy and the cycling of matter through ecosystems
- 5.5** the characteristics of food webs; the roles of producers, consumers, and decomposers; and the interdependence of organisms within a food web
- 5.6** factors that affect the stability of an ecosystem
- 5.7** changes in ecosystems over time
- 5.8** the impact of human activities and natural phenomena on ecosystems and the effects of such changes on biodiversity

### **Standard 6: Heredity and Genetics**

**Life science teachers have a broad and comprehensive understanding of the molecular basis of heredity, the processes of cell division, and the principles of genetics, including:**

- 6.1** the structure of DNA and RNA and the processes of replication, transcription, translation, and protein synthesis
- 6.2** the characteristics and functions of genes, mechanisms of gene regulation, and the control of gene expression
- 6.3** the relationships among DNA, chromosomes, and genes
- 6.4** types of mutations and chromosomal abnormalities and their common causes and effects
- 6.5** the processes and outcomes of mitosis, meiosis, and binary fission
- 6.6** the behavior of chromosomes during cell division and the relationship to hereditary patterns
- 6.7** sources of genetic variation in populations
- 6.8** the principles of genetics, patterns of inheritance, and their application to genetics problems
- 6.9** the basic principles, methods, and applications of genetic engineering

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## **Standard 7: Evolution**

**Life science teachers have a broad and comprehensive understanding of evolution, the history of life on Earth, and modern taxonomic classification, including:**

- 7.1** modern evolutionary theory and its historical development and supporting evidence
- 7.2** the process of natural selection, conditions necessary for natural selection to occur, and factors that affect natural selection and the development of adaptations in a population
- 7.3** the use of evolutionary theory in explaining the unity and diversity of life
- 7.4** scientific theories of the origins and history of life on Earth and supporting evidence
- 7.5** the use of biochemical, fossil, anatomical, developmental, and genetic evidence to establish evolutionary relationships between organisms
- 7.6** similarities and differences in organisms from various taxonomic groups
- 7.7** modern methods and systems of taxonomic classification

## **Standard 8: Science Instruction and Assessment**

**Life science teachers have a broad and comprehensive understanding of content-specific instruction and assessment in science, including:**

- 8.1** the Indiana Revised Academic Standards for Science
- 8.2** the National Science Education Standards, the NCATE/NSTA Standards for Science Teacher Preparation, the Common Core State Standards for Literacy: Science and Technical Subjects, and the ISTE National Educational Technology Standards
- 8.3** instructional strategies and resources for promoting students' development of conceptual understanding, inquiry skills, and scientific habits of mind
- 8.4** strategies and skills for planning and designing science instruction, including the use of techniques and approaches that meet the needs of diverse learners
- 8.5** instructional strategies and communication methods that encourage active inquiry, supportive interaction, and collaboration in the science classroom
- 8.6** strategies and resources for promoting students' reading, writing, and mathematics skills in science
- 8.7** strategies and skills for selecting, adapting, and using technological resources to enhance teaching and learning in science
- 8.8** procedures, resources, and guidelines for maintaining a safe science learning environment and ensuring the humane and ethical treatment of living organisms
- 8.9** strategies and skills for effectively assessing student understanding and mastery of essential science concepts and skills