New York State Testing Program

Educator Guide to the 2024 Elementary-level (Grade 5) and Intermediate-level (Grade 8) Science Tests

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University

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Foreword

The information contained in this Educator Guide is designed to raise educator awareness of the structur of the 2024 New York State Elementary-level (Grade 5) Science (ELS) and the Intermediate-level (Grade 8) Science (ILS) Tests measuring the New York State P-12 Science Learning Standards (https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p12-science-learning-standards.pdf).

The guide provides educators with pertinent information about the test development process, the learning standards that the tests are designed to measure, the test specifications used to create the tests, and the test design, which includes what types of questions will be asked and the estimated length of the testing session. Links to additional resources are provided to further enhance educators' understanding of the structure o the science tests. Educators are encouraged to review the guide prior to the test administration to gain familiarity with the test format. The information presented can also be used as a platform for educator discussion on how student assessment results can guide instruction.

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Purpose of State Testing

The federal Every Student Succeeds Act (ESSA) 2001

Computer-Based Test (CBT) Administration

Schools will be required to administer the Elementary-level and Intermediate-level Science Tests on computer. Potential advantages of CBT include faster turnaround of student results, additional flexibility in administration windows, reduced administrative preparation, reduction or elimination of standalone field testing, an exploration of adaptive testing models, and fiscal savings for districts. Please refer to the Statewide Implementation of Computer-based Testing memo (https://www.nysed.gov/sites/default/files/programs/state-assessment/memo-statewide-implementation-of-computer-based-testing.pdf) for details and the implementation timeline. More information regarding computer-based test administration is available at the NYSED Computer-Based Testing (CBT) Support tegc -0. Tw 162 (he)-1 (i)-0.001 Tw -w 6.274 ( )]Tu (tTJ 3

The New York State P-12 Science Learning Standards

The New York State P-12 Science Learning Standards (NYSP-12SLS) are a series of Performance Expectations (PEs) that define what students should know and be able to do as a result of their study of science. The New York State P-12 Science Learning Standards are based on the Framework for K-12 Science Education (the Framework) developed by the National Research Council and the Next Generation Science Standards. The Framework outlines three dimensions that are needed to provide students with a high-quality science education. The integration of these three dimensions provides students with a context for the content of science, how science knowledge is acquired and understood, and how the sciences are connected through concepts that have universal meaning across the disciplines. These content-rich standards will serve as a platform for advancing children's 21st-century science skills, which include abstract reasoning, collaboration skills, the ability to learn from peers and through technology, and flexibility as learners in a dynamic learning environment. The implementation of these standards will provoke dialogue and learning experiences that allow complex topics and ideas to be explored from many angles and perspectives. Students are expected to learn how to think and how to solve problems for which there is no one solution while learning science skills along the way. The integration of the three dimensions is provided throughout the New York State P-12 Science Learning Standards (https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p12-science-learning-standards.pdf) and are described below.

Dimension 1: Science and Engineering Practices (SEP)

The Science and Engineering Practices (SEPs) describe (a) the major practices that scientists employ as they investigate and build models and theories about the world and (b) a key set of engineering practices that engineers use as they design and build systems. The term "practices" is used instead of a term such "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice.

The eight Science and Engineering

Test Specifications

The Elementary-level and Intermediate-level Science Tests are rooted in a research-based approach to constructing assessments called Principled Assessment Design. This approach ensures that evidence gleaned from the assessment, as well as the interpretations of that evidence, align with and support the intended claims, purposes, and uses of the assessment. This method helps ensure that all aspects of the assessment are connected and that the results inform the initial questions/claims. Additionally, Principled Assessment Design allows for consistent development and administration of tests that are comparable and focus on conceptual and applied student understanding. This is achieved through the use of Assessment-based Claims and Assessment-based Evidence. Another essential step of Principled Assessment Design is provided through the Performance-Level Descriptions (PLDs). PLDs provide a structure in which to build tasks that allow students to provide/produce evidence to exemplify knowledge and skills across the range of performance.

Claims and Evidence

Assessment-based Claims are overarching statements that identify the key things a student should be able to do at the end of instruction, while Assessment-based Evidence are statements that identify what a student needs to do/say/produce in order to support the acquisition of a claim. Evidence will operationalize the claim by merging concepts and skills to help define the specific language choices within the claim. It is important to recognize that not all combinations of concept and skill will be appropriate given the time and format constraints of the test, the intended purpose, audience, and complexity (i.e., some PEs will not be able to be assessed at every level of proficiency).[1]

Elementary-level Claims and Evidence (3-5 Grade Band)

Claim #1 (Physical Science):
A student can analyze and apply scientific ideas related to forces and motion, energy changes and energy conservation, patterns, wave properties and their application to transfer information, and the structures, properties, and interactions of matter within and between systems in the physical and biological world.
Evidence: A student demonstrates understanding of Physical Science through application, evaluation, analysis, and/or synthesis using Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts related to: x investigating the effects of forces on the motion of objects, and predicting future motion of objects based on observable patterns [3-PS2-1, 3-PS2-2] x investigating electromagnetic interactions between objects not in contact and applying these findings to a problem that can be solved using magnets [3-PS2-3, 3-PS2-4] x using evidence to describe the relationship between the speed and energy of an object [4-PS3-1] x providing evidence of the transfer, conversion, and conservation of energy and applying these

[1] Although similar in name, the Next Generation Science Standards (NGSS) Evidence Statements do not serve the same functio as the Claims and Evidence produced for Elementary- and Intermediate-

Claim #3 (Earth and Space Sciences):

A student can analyze scientific evidence of patterns and cause and effect relationships between Earth and its place in the solar system and between the interconnected processes across large-scale system interactions that operate among Earth's spheres on different scales, including how these processes impact humans and how humans affect natural resources.

Evidence: A student demonstrates understanding of Earth and Space Sciences through application, evaluation, analysis, and/or synthesis using Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts related to:

- using Earth system data to describe weather and climate conditions across various temporal and spatial scales; [3-ESS2-1, 3-ESS2-2]
- investigating the relationship between the movement of water among Earth's spheres and weather; [3-ESS2-3]
- utilizing scientific evidence to mitigate meteorological hazards; [3-ESS3-1]
- synthesizing information about the impacts of using natural resources for energy; [4-ESS3-1]
- utilizing geologic data to determine past environments and landform characteristics; [4-ESS1-1]
- investigating the effects of weathering and erosion on Earth; [4-ESS2-1]
- using scientific evidence to identify patterns associated with large-scale system interactions; [4-ESS2-2]
- investigating design solutions to mitigate geologic hazards; [3-ESS3-2]
- illustrating the various connections between Earth's spheres; [5-ESS2-1]
- describing the distribution of water on Earth; [5-ESS2-2]
- identifying conservation efforts related to Earth's systems; [5-ESS3-1]
- describing the effect of spatial scale on the appearance of stars; [5-ESS1-1]
- identifying patterns that occur as a result of celestial motion; [5-ESS1-2]

Claim #4 (Engineering, Technology, and Applications of Science):

A student can identify problems and design and test solutions that fulfill human needs and wants using the relationships between engineering, technology, and applications of science.

Evidence: A student demonstrates understanding of Engineering, Technology, and Applications of

Intermediate-level Claims and Evidence (6-8 Grade Band)

Claim #1 (Physical Science)
A student can apply scientific practices, principles, and technologies to the structure and properties of matter, chemical reactions between substances, forces and their different types of interactions, the type and transfer of energy, and the properties of waves and their interaction with different inte substances.
Evidence: A student demonstrates understanding of Physical Science through application, evaluation, analysis, and/or synthesis using Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts related to: x identifying substances based on their chemical and physical properties, and investigating if a chemical reaction or physical change occurs when substances are mixed; [MS-PS1-7, MS-PS1-8, MS-PS1-2] x describing the changes that occur to a substance when thermal energy is added or removed, a developing a device that optimizes either the absorption or release of thermal energy; [MS-PS1-4, MS-PS1-6, MS-PS3-3] x modeling the atomic structure of substances, and investigating the conservation of mass in chemical reactions; [MS-PS1-1, MS-PS1-5] x describing the societal impacts of developing and using synthetic materials; [MS-PS1-3] x investigating the effects of forces on objects by applying Newton's Laws of Motion; [MS-PS2-1, MS-PS2-2] x investigating magnetic and electric forces and providing evidence that fields exist between objects exerting these forces; [MS-PS2-3, MS-PS2-5] x providing evidence for the factors that affect attractive gravitational interactions; [MS-PS2-4] x analyzing empirical data pertaining to the factors that affect kinetic energy; [MS-PS3-1] x modeling how distance between objects affects the potential energy of a system; [MS-PS3-2] x investigating the factors that affect thermal energy transfer in a sample of matter; [MS-PS3-4] x providing empirical evidence that when work is done on or by a system, the energy in that system changes; [MS-PS3-5] x investigating electric currents and energy transfer; [MS-PS3-6] x quantitatively and qualitatively modeling the characteristics and energy of waves; [MS-PS4-1] x modeling the interactions between waves and matter; [MS-PS4-2] x comparing digital and analog signals using qualitative information; [MS-PS4-3]

Claim #2 (Life Science):

A student can apply scientific practices, principles, and technologies to the basic structure, function, and organization of living things, which allows for the synthesis of information and homeostasis, the cycling of matter and flow of energy through organisms and ecosystems, the interactions between living things that maintain biodiversity and ecosystem stability, the factors that affect and influence growth, development, and reproduction of organisms, and the evolutionary relationships between organisms and how natural selection and adaptation has led to changes in life on Earth.

Evidence: A student demonstrates understanding of Life Science through application, evaluation, analysis, and/or synthesis using Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts related to:

- investigating and modeling the structure and function of cells and cell parts; [MS-LS1-1, MS-LS1-2]
- describing the evidence for how interacting body systems maintain homeostasis; [MS-LS1-3]
- synthesizing information about organisms' responses to stimuli; [MS-LS1-8]
- explaining and modeling the flow of energy and the cycling of matter within organisms and within their ecosystems; [MS-LS1-6, MS-LS1-7, MS-LS2-3]
- providing evidence for how populations are affected by changes to their ecosystem and resource availability; [MS-LS2-1, MS-LS2-4]
- predicting patterns of interactions among organisms in ecosystems; [MS-LS2-2]
- evaluating solutions to environmental problems based on their ability to maintain a healthy, stable ecosystem; [MS-LS2-5]
- using evidence to explain how specific behaviors and structures lead to successful reproduction in organisms; [MS-LS1-4]
- explaining how the growth of organisms is affected by various factors; [MS-LS1-5]
- modeling why changes to genes can affect the structure and function of organisms; [MS-LS3-1]
- modeling the genetic outcomes of sexual and asexual reproduction; [MS-LS3-2]
- describing technologies that influence the inheritance of genetic traits; [MS-LS3-2]
- identifying structural patterns in fossils as evidence for change in life forms throughout Earth's history; [MS-LS4-1]
- comparing anatomical patterns in organisms in order to explain evolutionary relationships among organisms; [MS-LS4-1, MS-LS-4-3]
- using evidence to explain natural selection and adaptation in populations. [MS-LS4-4, MS-LS4-6]

Claim #4 (Engineering, Technology, and Applications of Science):

A student, using the relationships between engineering, technology, and applications of science, can identify criteria and constraints of a design problem to generate, evaluate, and test competing design solutions in order to develop a new solution such that an optimal design is achieved based on iterative testing and modification.

Evidence: A student demonstrates understanding of Engineering, Technology, and Applications of Science through evaluation, analysis, and/or synthesis using Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts related to:

- identifying a problem to solve, and specifying clear criteria and limitations in order to develop

Performance Level Definitions

For each subject area, students perform along a continuum of the knowledge and skills necessary to me the demands of the New York State Learning Standards. New York State Elementary-level and Intermediate-level Science assessments are designed to classify student performance into one of four levels based on the knowledge and skills the student has demonstrated. Due to the need to identify stude proficiency, the state tests must provide students at each performance level opportunities to demonstra their knowledge and skills in the Learning Standards.

These performance levels are defined as:

NYS Level 4

Students performing at this level excel in standards for their grade. They demonstrate knowledge, skills, and practices embodied by the Learning Standards that are considered more than sufficient for the expectations at this grade.

NYS Level 3

Students performing at this level are proficient in standards for their grade. They demonstrate knowledge, skills, and practices embodied by the Learning Standards that are considered sufficient

2024

Testing Sessions

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