

SUMMARY OF NEW YORK CITY SCIENCE PERFORMANCE STANDARDS

S1 PHYSICAL SCIENCES CONCEPTS

The student produces evidence that demonstrates understanding of:

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
S1a	Properties of objects and materials, such as similarities and differences in the size, weight, and color of objects; the ability of materials to react with other substances; and different states of materials	S1a	Properties and changes of properties in matter, such as density and boiling point; chemical reactivity; and conservation of matter	S1a	Structure of atoms, such as atomic composition, nuclear forces, and radioactivity
S1b	Position and motion of objects, such as how the motion of an object can be described by tracing and measuring its position over time; and how sound is produced by vibrating objects	S1b	Motions and forces, such as inertia and the net effects of balanced and unbalanced forces	S1b	Structure and properties of matter, such as elements and compounds; bonding and molecular interaction; and characteristics of phase changes.
S1c	Light, heat, electricity, and magnetism, such as the variation of heat and temperature; how light travels in a straight line until it strikes an object or how electrical circuits work	S1c	Transfer of energy, such as transformation of energy as heat; light, mechanical motion, and sound; and the nature of a chemical reaction.	S1c	Chemical reactions, such as everyday examples of chemical reactions; electrons, protons, and energy transfer; and factors that affect reaction rates such as catalysts.
				S1d	Motions and forces, such as gravitational and electrical; net forces and magnetism
				S1e	Conservation of energy and increase in disorder, such as kinetic and potential energy; energy conduction, convection, and radiation; random motion; and effects of heat and pressure
				S1f	Interactions of energy and matter, such as waves, absorption and emission of light, and conductivity.

S3 Earth and Space Sciences Concepts

The student produces evidence that demonstrates understanding of:

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
S3a	Properties of Earth materials, such as water and gases; and the properties of rocks and soils, such as texture, color, and ability to retain water	S3a	Structure of the Earth System, such as crustal plates and land forms; water and rock cycles; oceans, weather and climate	S3a	Energy in the Earth system, such as radioactive decay, gravity, the Sun’s energy, convection, and changes in global climate.q
S3b	Objects in the sky, such as Sun, Moon, planets, and other objects that can be observed and described; and the importance of the Sun to provide the light and heat necessary for survival	S3b	Earth’s history, such as Earth processes, including erosion and movement of plates; change over time and fossil evidence	S3b	Geochemical cycles, such as conservation of matter; chemical resources and movement of matter between chemical reservoirs.
S3c	Changes in Earth and sky, such as changes caused by weathering, volcanism, and earthquakes; and the patterns of movement of objects in the sky	S3c	Earth in the Solar System, such as the predictable motion of planets , moons, and other objects in the Solar System, including days, years, moon phases, and eclipses; and the role of the Sun as the major source of energy for phenomena on the Earth’s surface.	S3c	Origin and evolution of the Earth system, such as geologic time and the age of life forms; origin of life, and evolution of the Solar System
		S3d	Natural resource management	S3d	Origin and evolution of the universe, such as the “big bang” theory; formation of stars and elements; and nuclear reactions.
				S3e	Natural resource management

S4 Scientific Connections and Applications

The student produces evidence that demonstrates understanding of

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
S4a	Big ideas and unifying concepts, such as order and organization; models, forms, and function; change and constancy; and cause and effect	S4a	Big ideas and unifying concepts, such as order and organization; models, forms, and function; change and constancy; and cause and effect	S4a	Big ideas and unifying concepts, such as order and organization; models, forms, and function; change and constancy; and cause and effect
S4b	The designed world, such as development of agricultural techniques and the viability of technological designs	S4b	The designed world, such as development of agricultural techniques and the viability of technological designs	S4b	The designed world, such as development of agricultural techniques and the viability of technological designs
S4c	Personal health, such as nutrition, substance abuse, and exercise; germs and toxic substances; personal and environmental safety	S4c	Health, such as nutrition, exercise, and disease; effects of drugs and toxic substances; personal and environmental safety; and resources and environmental stress	S4c	Health, such as nutrition and exercise; disease and epidemiology; personal and environmental safety; and resources, environmental stress, and population growth.
S4d	Science as a human endeavor, such as communication, cooperation, and diverse input in scientific research; and the importance of reason, intellectual honesty, and skepticism	S4d	Impact of technology, such as constraints and trade-offs; feedback; benefits and risks; and problems and solutions.	S4d	Impact of technology, such as constraints and trade-offs; feedback; benefits and risks; and problems and solutions.
		S4e	Impact of science, such as historical and contemporary contributions; and interactions between science and society.	S4e	Impact of science, such as historical and contemporary contributions; and interactions between science and society.

S5 Scientific Thinking

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
The student demonstrates scientific inquiry and problem solving by using thoughtful questioning and reasoning strategies, common sense, and conceptual understanding from Science Standards 1 to 4, and appropriate methods to investigate the natural world; that is, the student:		The student demonstrates scientific inquiry and problem solving by using thoughtful questioning and reasoning strategies, common sense, and conceptual understanding from Science Standards 1 to 4, and appropriate methods to investigate the natural world; that is, the student:		The student demonstrates skill in scientific inquiry and problem solving by using thoughtful questioning and reasoning strategies, common sense and diverse conceptual understanding, and appropriate ideas and methods to investigate science; that is, the student	
S5a	Asks questions about natural phenomena; objects and organisms; and events and discoveries	S5a	Frames questions to distinguish cause and effect; and identifies or controls variables in experimental and non-experimental research settings	S5a	Frames questions to distinguish cause and effect; and identifies or controls variables in experimental and non-experimental research settings
S5b	Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena	S5b	Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena	S5b	Uses concepts from Science Standards 1 to 4 to explain a variety of observations and phenomena
S5c	Uses evidence from reliable sources to construct explanations	S5c	Uses evidence from reliable sources to develop descriptions, explanations, and models	S5c	Uses evidence from reliable sources to develop descriptions, explanations, and models; and makes appropriate adjustments and improvements based on additional data or logical arguments
S5d	Evaluates different points of view using relevant experiences, observations, and knowledge; and distinguishes between fact and opinion	S5d	Proposes, recognizes, analyzes, considers, and critiques alternative explanations; and distinguishes between fact and opinion	S5d	Proposes, recognizes, analyzes, considers, and critiques alternative explanations; and distinguishes between fact and opinion
S5e	Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations	S5e	Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations	S5e	Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations
S5f	Works individually and in teams to collect and share information and ideas	S5f	Works individually and in teams to collect and share information and ideas	S5f	Works individually and in teams to collect and share information and ideas

S6 Scientific Tools and Technologies

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
The student demonstrates competence with the tools and technologies of science by using them to collect data, make observations, analyze results, and accomplish tasks effectively; that is, the student:		The student demonstrates competence with the tools and technologies of science by using them to collect data, make observations, analyze results, and accomplish tasks effectively; that is, the student:		The student demonstrates competence with the tools and technologies of science by using them to collect data, make observations, analyze results, and accomplish tasks effectively; that is, the student:	
S6a	Uses technology and tools (such as rulers, computers, balances, thermometers, watches, magnifiers, and microscopes) to gather data and extend the senses	S6a	Uses technology and tools (such as traditional laboratory equipment, video, and computer aids) to observe and measure objects, organisms, and phenomena, directly, indirectly, and remotely	S6a	Uses technology and tools (such as traditional laboratory equipment, video, and computer aids) to observe and measure objects, organisms, and phenomena, directly, indirectly, and remotely, with appropriate consideration of accuracy and precision
S6b	Collects and analyzes data using concepts and techniques in Mathematics Standard 4, such as average, data displays, graphing, variability, and sampling	S6b	Records and stores data using a variety of formats, such as data bases, audiotapes, and videotapes	S6b	Records and stores data using a variety of formats, such as data bases, audiotapes, and videotapes
S6c	Acquires information from multiple sources, such as experimentation and print and non-print sources	S6c	Collects and analyzes data using concepts and techniques in Mathematics Standard 4, such as mean, median, and mode; outcome probability and reliability; and appropriate data displays.	S6c	Collects and analyzes data using concepts and techniques in Mathematics Standard 4, such as mean, median, and mode; outcome probability and reliability; and appropriate data displays.
		S6d	Acquires information from multiple sources, such as print, the Internet, computer data bases, and experimentation.	S6d	Acquires information from multiple sources, such as print, the Internet, computer data bases, and experimentation.
		S6e	Recognizes sources of bias in data, such as observer and sampling biases	S6e	Recognizes and limits sources of bias in data, such as observer and sample biases.

S7 Scientific Communication

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
The student demonstrates effective scientific communication by clearly describing aspects of the natural world using accurate data, graphs, or other appropriate media to convey depth of conceptual understanding in science; that is, the student:		The student demonstrates effective scientific communication by clearly describing aspects of the natural world using accurate data, graphs, or other appropriate media to convey depth of conceptual understanding in science; that is, the student:		The student demonstrates effective scientific communication by clearly describing aspects of the natural world using accurate data, graphs, or other appropriate media to convey depth of conceptual understanding in science; that is, the student:	
S7a	Represents data and results in multiple ways, such as numbers, tables, and graphs; drawings, diagrams, and artwork; and technical and creative writing	S7a	Represents data and results in multiple ways, such as numbers, tables, and graphs; drawings, diagrams, and artwork; and technical and creative writing	S7a	Represents data and results in multiple ways, such as numbers, tables, and graphs; drawings, diagrams, and artwork; and technical and creative writing; and selects the most effective way to convey the scientific information
S7b	Uses facts to support conclusions	S7b	Argues from evidence, such as data produced through his or her own experimentation or by others	S7b	Argues from evidence, such as data produced through his or her own experimentation or data produced by others
S7c	Communicates in a form suited to the purpose and the audience, such as writing instructions that others can follow	S7c	Critiques published materials	S7c	Critiques published materials, such as popular magazines and academic journals
S7d	Critiques written and oral explanations, and uses data to resolve disagreements	S7d	Explains a scientific concept or procedure to other students	S7d	Explains a scientific concept or procedure to other students
		S7e	Communicates in a form suited to the purpose and the audience, such as by writing instructions that others can follow; critiquing written and oral explanations; and using data to resolve disagreements	S7e	Communicates in a form suited to the purpose and the audience, such as by writing instructions that others can follow; critiquing written and oral explanations; and using data to resolve disagreements

S8 Scientific Investigation

ELEMENTARY SCHOOL		MIDDLE SCHOOL		HIGH SCHOOL	
The student demonstrates scientific competence by completing projects drawn from the following kinds of investigations, including a least one full investigation each year and, over the course of elementary school, investigations that integrate several aspects of Science Standards 1 to 7 and represent all four of the kinds of investigation:		The student demonstrates scientific competence by completing projects drawn from the following kinds of investigations, including a least one full investigation each year and, over the course of elementary school, investigations that integrate several aspects of Science Standards 1 to 7 and represent all four of the kinds of investigation:		The student demonstrates scientific competence by completing projects drawn from the following kinds of investigations, including a least one full investigation each year and, over the course of elementary school, investigations that integrate several aspects of Science Standards 1 to 7 and represent all four of the kinds of investigation:	
S8a	An experiment, such as conducting a fair test	S8a	Controlled experiment	S8a	Controlled experiment
S8b	A systematic observation, such as a field study	S8b	Fieldwork	S8b	Fieldwork
S8c	A design, such as building a model or scientific apparatus	S8c	Design	S8c	Design
S8d	Non-experimental research using print and electronic information, such as journals, video, or computers	S8d	Secondary research, such as use of others' data	S8d	Secondary research
<p>A single project may draw on more than one kind of investigation. A full investigation includes:</p> <ul style="list-style-type: none"> • Questions that can be studied using the resources available • Procedures that are safe, humane, and ethical; and that respect privacy and property rights • Data that have been collected and recorded (see also Science Standard 6) in ways that others can verify and analyze using skills expected at this grade level (see also Mathematics Standard 4) • Data and results that have been represented (see also Science Standard 7) in ways that fit the context • Recommendations, decisions, and conclusions based on evidence • Acknowledgment of references and contributions of others • Results that are communicated appropriately to audiences • Reflection and defense of conclusions and recommendations from other sources and peer review. 					