

New Mexico Expanded Grade Band Expectations

Science: Grades 9–12

Strand I: SCIENTIFIC THINKING AND PRACTICE

Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically

	9–12 Benchmark 1: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results		9–12 Benchmark 2: Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected		9–12 Benchmark 3: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions	
ENGAGEMENT	The student	GLPS		GLPS		GLPS
	<i>1-a distinguishes between self and others while participating in scientific investigations</i>	9-12.1	<i>1-a responds to routine events within the context of scientific investigations</i>	9-12.2	<i>1-a attends to interesting scientific data, models, and patterns for at least a few seconds at a time on a regular basis</i>	9-12.5
	<i>2-a maintains and shifts attention between one or more objects, activities, or social partners during scientific investigations</i>	9-12.1	<i>2-a recognizes that actions have consequences in sequenced scientific activities</i>	9-12.2	<i>2-a indicates understanding of routine events occurring in sequenced science activities</i>	9-12.5
			<i>2-b maintains and shifts attention between one or more objects, activities, or social partners during science activities</i>	9-12.2		

	9–12 Benchmark 1: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results		9–12 Benchmark 2: Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected		9–12 Benchmark 3: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions	
PRE-SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>3-a indicates awareness of observed changes within the environment</i>	9-12.1 9-12.2	<i>3-a anticipates an action resulting from specific conditions (cause and effect)</i>	9-12.1	<i>3-a anticipates next event in a routine sequence</i>	9-12.2
	<i>4-a recognizes that investigation can be used as a process to gather information</i>	9-12.2	<i>4-a recognizes that questions worthy of investigation exist in the physical world</i>	9-12.5	<i>4-a recognizes relationships and patterns in the physical world</i>	9-12.2
SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>5-a identifies the essential components of an investigation (e.g., methodology, equipment, safety)</i>	9-12.1	<i>5-a predicts effects that result from specific causes (e.g., if, then statements)</i>	9-12.1	<i>5-a predicts the next logical event in a sequence</i>	9-12.2
	<i>5-b collects scientific data and information from the physical world</i>	9-12.4	<i>5-b communicates observations about observed changes in the world</i>	9-12.1 9.12.5	<i>5-b communicates observed relationships and patterns in the physical world</i>	9-12.2
	<i>6-a follows instructions to implement a given scientific investigation</i>	9-12.2	<i>5-c investigates an accepted explanation by reviewing scientific knowledge with a peer</i>	9-12.4	<i>5-c uses mathematical models to investigate natural phenomena</i>	9-12.2

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	6-b <i>demonstrates appropriate use of scientific technologies (e.g., computers, calculators, balances, microscopes)</i>	9-12.3	6-a <i>demonstrates that new scientific findings change our understanding of phenomena</i>	9-12.3	6-a <i>uses mathematical models to express scientific relationships (e.g., vectors, ratios, dimensions)</i>	9-12.5
	6-c <i>demonstrates appropriate safety practices with equipment within the classroom</i>	9-12.1	6-b <i>describes multi-step, or more complex, cause and effect situations</i>	9-12.2	6-b uses appropriate measurement techniques to collect data	9-12.4
EXTENDED SYMBOLIC	The student	GLPS		GLPS		GLPS
	7-a <i>demonstrates that scientific theories are used to explain and predict phenomena</i>	9-12.5	7-a <i>analyzes an accepted explanation by reviewing current scientific knowledge</i>	9-12.4	7-a <i>creates multiple displays of data to analyze and explain the relationships in scientific investigations</i>	9-12.1
	7-b <i>uses appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes)</i>	9-12.3	7-b <i>uses scientific reasoning to recognize cause and effect, faulty logic, potential bias, objective and subjective information</i>	9-12.2	8-a <i>uses calculators, computer spreadsheets, graphing software, simulations, and modeling to quantify relationships</i>	9-12.3

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	<i>8-b designs and conducts scientific investigations that include testable hypotheses, appropriate methodologies, results, predictions based on results, and summary of findings</i>	9-12.2	<i>8-a investigates a current topic of interest in science</i>	9-12.5	<i>8-b considers possible sources of measurement error</i>	9-12.4
	<i>8-c convey results of investigations using scientific concepts, methodologies, and expressions, including relevant language and symbols; diagrams, charts, and other data displays; relevant mathematical expressions; and arguments that are supported by reason</i>	9-12.4	<i>8-b demonstrates understanding that scientific processes produce valid, reliable results, including study consistency, openness to peer review, full disclosure, testability of hypotheses, reproducible results</i>	9-12.1		

S Strand II: CONTENT OF SCIENCE

Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy

	9–12 Benchmark 1: Understand the properties, underlying structure, and reactions of matter		9–12 Benchmark 2: Understand the transformation and transmission of energy and how energy and matter interact		9–12 Benchmark 3: Understand the motion of objects and waves and the forces that cause them	
ENGAGEMENT	The student	GLPS		GLPS		GLPS
	<i>1-a responds to changes in textures while investigating the properties of matter</i>	9-12.3	<i>1-a responds to changes in environmental conditions (e.g., light, temperature)</i>	9-12.1 9-12.3	1-a responds to changes in movement and touch	9-12.1 9-12.9
	<i>2-a responds selectively to tactile stimuli while investigating the properties of matter</i>	9-12.3	<i>2-a responds selectively to environmental conditions (e.g., hot/cold, light/dark)</i>	9-12.1 9-12.3	2-a shows a preference for different types of movement (e.g., rocking, bouncing) and touch (e.g., heavy/light)	9-12.1 9-12.9
PRE-SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>3-a distinguishes between different states of matter (e.g., solid, liquid, gas)</i>	9-12.1 9-12.10	<i>3-a distinguishes between different environmental conditions (light/dark, hot/cold) in a variety of contexts</i>	9-12.2	3-a recognizes that a variety of forces produce motion	9-12.1
	<i>4-a matches like graphic representations of elements, compounds, and mixtures</i>	9-12.1	<i>4-a recognizes that heat moves from hotter objects to cooler objects</i>	9-12.5	<i>4-a identifies direction of resultant action of a given force</i>	9-12.6

	9–12 Benchmark 1: Understand the properties, underlying structure, and reactions of matter		9–12 Benchmark 2: Understand the transformation and transmission of energy and how energy and matter interact		9–12 Benchmark 3: Understand the motion of objects and waves and the forces that cause them	
SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>5-a investigates models of atoms to determine atomic structure (e.g., nucleus - protons and neutrons, and electrons) of more complex atoms (e.g., C, N, O)</i>	9-12.6	<i>5-a demonstrates how insulators can be used to contain thermal energy (heat), while conductors simply transfer the thermal energy</i>	9-12.4	<i>5-a demonstrates understanding that every object exerts gravitational force on every other object</i>	9-12.2
	<i>6-a demonstrates understanding of atomic structure of more complex atoms (e.g., C, N, O)</i>	9-12.6	<i>6-a identifies different forms of energy (e.g., kinetic, potential, chemical, thermal, nuclear, and electromagnetic)</i>	9-12.1	<i>5-b demonstrates understanding that materials can be electrically neutral or positively or negatively charged</i>	9-12.3
	<i>6-b demonstrates understanding that simple chemical reactions involve the rearrangement of atoms</i>	9-12.12	<i>6-b demonstrates understanding that energy can change from one form to another (e.g., potential to kinetic)</i>	9-12.3	<i>6-a identifies four fundamental forces in nature (e.g., gravitation, electromagnetism, weak nuclear force, and strong nuclear force)</i>	9-12.1
					<i>6-b demonstrates wave propagation (e.g., in a wave pool)</i>	9-12.10

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EXTENDED SYMBOLIC	The student	GLPS		GLPS		GLPS
	7-a uses properties of matter to separate mixtures into pure substances (e.g., distillation, solubility, chromatography)	9-12.3	<i>7-a demonstrates how heat can be transferred by conduction, radiation, and convection</i>	9-12.4	<i>7-a demonstrates circular and centripetal force</i>	9-12.8
	7-b recognizes scientific terms for classifying matter (element, compound, mixture; solid, liquid, gas; acidic, basic, neutral)	9-12.1 9-12.10	<i>7-b describes the characteristics of different types of waves (e.g., electromagnetic, sound, seismic, water)</i>	9-12.8	<i>7-b demonstrates how electric currents cause magnetism</i>	9-12.5
	<i>8-a describes categories of elements (e.g., noble gases, metals, non-metals, transition metals, halogens)</i>	9-12 4	<i>8-a demonstrates understanding that electromagnetic waves carry energy</i>	9-12.7	8-a represents the direction of forces by simple vector diagrams	9-12.6
	8-b describes properties of simple elements (e.g., name, atomic number, atomic mass, boiling point, melting point)	9-12.2 9-12.8 9-12.9	<i>8-b demonstrates understanding of equilibrium (e.g., thermal, mechanical, and chemical)</i>	9-12.11	8-b demonstrates understanding that every action has an equal and opposite reaction	9-12.7

Strand II: CONTENT OF SCIENCE

Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments

	9–12 Benchmark 1: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy		9–12 Benchmark 2: Understand the genetic basis for inheritance and the basic concepts of biological evolution		9–12 Benchmark 3: Understand the characteristics, structures, and functions of cells	
ENGAGEMENT	The student	GLPS		GLPS		GLPS
	1-a attends to others in the environment for at least a few seconds at a time on a regular basis as demonstrated by physical orientation, when possible, toward others and a change in previous activity or behavior	9-12.1 9-12.9	1-a attends to others in the environment for at least a few seconds at a time on a regular basis as demonstrated by physical orientation, when possible, toward others and a change in previous activity or behavior	9-12.4	<i>1-a responds to a variety of sensory information or stimuli (e.g., smell, visual, taste, touch, sound, movement) that represent cell characteristics and functions</i>	9-12.2
	<i>2-a distinguishes between self and others during discussions about species survival</i>	9-12.1 9-12.9	2-a distinguishes between self and others while participating in discussions about inheritance	9-12.4	<i>2-a distinguishes between self-directed movement and being moved by others</i>	9-12.2
					<i>2-b distinguishes between people</i>	9-12.2

	9–12 Benchmark 1: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy		9–12 Benchmark 2: Understand the genetic basis for inheritance and the basic concepts of biological evolution		9–12 Benchmark 3: Understand the characteristics, structures, and functions of cells	
PRE-SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>3-a distinguishes between different environments</i>	9-12.1	<i>3-a recognizes differences between plants and animals</i>	9-12.4	<i>3-a recognizes that plants and animals are made of parts (e.g., head, appendages, organs, leaves, stems)</i>	9-12.1 9-12.2
	3-b understands that organisms have needs for survival	9-12.3	3-b matches graphic representations of like organisms	9-12.1	<i>4-a describes simple body functions (e.g., respiration, digestion, excretion)</i>	9-12.3
	<i>4-a recognizes that humans modify and change ecosystems</i>	9-12.4	<i>4-a recognizes that organisms reproduce</i>	9-12.6		
	<i>4-b identifies organisms by characteristics and behavior</i>	9-12.2	4-b recognizes that organisms need resources to survive	9-12.11 9-12.12		

	9–12 Benchmark 1: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy		9–12 Benchmark 2: Understand the genetic basis for inheritance and the basic concepts of biological evolution		9–12 Benchmark 3: Understand the characteristics, structures, and functions of cells	
SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>5-a describes how the sun is the source of energy for the Earth’s organisms</i>	9-12.6	<i>5-a describes the activities and resources that species need to evolve (e.g., live in an environment that can sustain its needs, reproduce, pass along traits to fertile offspring that allow for ongoing survival)</i>	9-12.11	<i>5-a describes functions of animal systems (e.g., digestive, respiratory, circulatory)</i>	9-12.3
	<i>5-b describes specific resources that organisms need to survive (e.g., sunlight, nutrients, food, oxygen, shelter)</i>	9-12.3 9-12.5	<i>5-b describes how species become extinct if they do not adapt to their environment over the course of generations</i>	9-12.12	5-b identifies functions of plant systems (leaf, stem, root)	9-12.2 9-12.3
	<i>6-a describes the basic principles of photosynthesis (e.g., light energy is converted into chemical energy)</i>	9-12.7	<i>6-a describes how living things evolve over generations</i>	9-12.8	<i>5-c describes how plants and animals are composed of cells</i>	9-12.1

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	<i>6-b describes how organisms cooperate and compete in ecosystems (e.g., producers, herbivores, carnivores, omnivores, predator-prey, decomposers, symbiosis, mutualism)</i>	9-12.2	<i>6-b identifies specific traits of organisms that have increased the organism's chances of survival</i>	9-12.12	<i>6-a describes main components of both plant and animal cells (e.g., nucleus, chromosomes, plasma, mitochondria)</i>	9-12.2
					<i>6-b identifies cell processes and functions (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules)</i>	9-12.3
					<i>6-c identifies similarities and differences between plant and animal cells</i>	9-12.2

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EXTENDED SYMBOLIC	The student	GLPS		GLPS		GLPS
	<i>7-a demonstrates an understanding of how available resources limit the amount of life that ecosystems can support (e.g., energy, water, oxygen, nutrients)</i>	9-12.3	<i>7-a analyzes how evolution explains many phenomena, including the fossil record</i>	9-12.13	<i>7-a describes how DNA stores genetic information</i>	9-12.2 9-12.6
	<i>7-b categorizes organisms into appropriate categories (e.g., domain, kingdom)</i>	9-12.	<i>7-b identifies traits that can and cannot be inherited</i>	9-12.4	<i>7-b describes differences between plant and animal cells</i>	9-12.2
	<i>8-a demonstrates understanding of variation within and among species (e.g., mutation, environmental factors)</i>	9-12.9	<i>8-a describes inheritable traits</i>	9-12.2	<i>8-a describes basic functions that cell membranes serve (e.g., osmosis, diffusion)</i>	9-12.4
	<i>8-b analyzes how humans modify and change ecosystems (e.g., harvesting, pollution, population growth, technology, energy production)</i>	9-12.4	<i>8-b describes how species today are related by descent to ancestors</i>	9-12.8 9-12.9	<i>8-b describes the characteristics of specialized cells (e.g., nerve cells, sense organ cells, red blood cells, plant cells)</i>	9-12.5

	9–12 Benchmark 1: Understand how the survival of species depends on biodiversity and on complex interactions, including the cycling of matter and the flow of energy		9–12 Benchmark 2: Understand the genetic basis for inheritance and the basic concepts of biological evolution		9–12 Benchmark 3: Understand the characteristics, structures, and functions of cells	
	<i>8-c demonstrates understanding that the total amount of matter and energy within a system is conserved</i>	9-12.5	<i>8-c demonstrates understanding of how organisms reproduce (e.g., asexual and sexual)</i>	9-12.6		

Strand II: CONTENT OF SCIENCE

Standard III (Earth and Space Science): Understand the structure of Earth, the solar system, and the universe, the interconnections among them, and the processes and interactions of Earth’s systems

	9–12 Benchmark 1: Examine the scientific theories of the origin, structure, contents, and evolution of the solar system and the universe, and their interconnections		9–12 Benchmark 2: Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections	
ENGAGEMENT	The student	GLPS		GLPS
	1-a attends to objects in the sky (e.g., planets, stars, galaxies)	9-12.1 9-12.2	<i>1-a responds to changes in the environment (e.g., air circulation, radiant energy)</i>	9-12.8
	2-a shifts attention to objects in the sky (e.g., moon, sun, stars)	9-12.1 9-12.2	<i>2-a shifts attention to changes in the environment (e.g., air circulation, radiant energy)</i>	9-12.8
PRE-SYMBOLIC	The student	GLPS		GLPS
	3-a associates objects in the sky with time of day (e.g., sun with day, moon with night)	9-12	<i>3-a associates changes in environmental conditions (e.g., air circulation, radiant energy, temperature, precipitation) with the seasons</i>	9-12.8
	<i>4-a identifies sun, Earth, moon, and planets</i>	9-12	<i>4-a identifies major rock types (e.g., sedimentary, igneous, metamorphic)</i>	9-12.10
SYMBOLIC	The student	GLPS		GLPS
	<i>5-a identifies basic star constellations (e.g., Ursa Major, Orion, Cassiopeia)</i>	9-12.1	<i>5-a describes the basic structure of the Earth (e.g., core, mantle, crust)</i>	9-12.3
	<i>6-a predicts changes in the position of objects in the sky (e.g., sun, moon)</i>	9-12.2	<i>6-a demonstrates understanding that the Earth has evolved over the course of time</i>	9-12.1
	<i>6-b describes the lunar cycle (e.g., 28 days, same face toward Earth)</i>	9-12.2	<i>6-b describes how layers of the atmosphere (e.g., troposphere, ozone) change naturally and artificially</i>	9-12.11

	9–12 Benchmark 1: Examine the scientific theories of the origin, structure, contents, and evolution of the solar system and the universe, and their interconnections		9–12 Benchmark 2: Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections	
EXTENDED SYMBOLIC	The student	GLPS		GLPS
	<i>7-a demonstrates understanding of both the magnitude and the age of the universe</i>	9-12.1 9-12.4	<i>7-a demonstrates understanding of plate tectonics and its geological manifestations (e.g., earthquakes, volcanoes, mountain building)</i>	9-12.7
	<i>8-a examines the role that New Mexico research facilities play in current space exploration (e.g., Very Large Array, Goddard Space Center)</i>	9-12.7	<i>8-a demonstrates understanding of changes in the Earth’s past based on fossil record, rock sequences, and radiometric dating</i>	9-12.4
	<i>8-b describes tools used to study the solar system (e.g., telescopes, satellites, images, computer models)</i>	9-12.3	<i>8-b demonstrates understanding of the fixed nature of the Earth’s natural resources (e.g., air, fresh water, land)</i>	9-12.9
	<i>8-c describes how stars are powered (e.g., burning gas)</i>	9-12.6		

Strand III: SCIENCE AND SOCIETY

Standard I: Understand how scientific discoveries, inventions, practices, and knowledge influence, and are influenced by, individuals and societies

	9–12 Benchmark 1: Examine and analyze how scientific discoveries and their applications affect the world, and explain how societies influence scientific investigations and applications	
ENGAGEMENT	The student	GLPS
	<i>1-a attends to science stimuli and materials during activities that address how scientific discoveries have affected the world</i>	9-12.3
	<i>2-a maintains and shifts attention between two or more scientific objects or classroom partners when participating in activities that address how scientific discoveries have affected the world</i>	9-12.3
PRE-SYMBOLIC	The student	GLPS
	<i>3-a interacts with different types of technology (e.g., assistive technology, computers, telephones, kitchen appliances, radio, television, transportation, microscopes, telescopes)</i>	9-12.3 9-12.4
	<i>4-b uses different types of technology (e.g., assistive technology, computers, telephones, kitchen appliances, radio, television, transportation, microscopes, telescopes)</i>	9-12.3 9-12.4
SYMBOLIC	The student	GLPS
	<i>5-a identifies different types technology (e.g., assistive technology, computers, telephones, kitchen appliances, radio, television, aircraft, X-rays, fertilizer, transportation, microscopes, telescopes)</i>	9-12.3 9-12.4
	<i>6-a describes functions of various types of technology (e.g., assistive technology, computers, telephones, kitchen appliances, radio, television, aircraft, X-rays, fertilizer, transportation, microscopes, telescopes)</i>	9-12.3 9-12.4
EXTENDED SYMBOLIC	The student	GLPS
	7-a describes how science has produced knowledge that is relevant to individual health and prosperity	9-12.15
	<i>8-a describes how human activities have affected the ozone layer</i>	9-12.7
	8-b explores New Mexico’s role in nuclear science (e.g., Manhattan Project, WIPP, national laboratories)	9-12.9 9-12.14