

## Science Performance Standards (Grade Level Expectations) for Grade 4

The Science Content Standards are grouped into seven strands, A-1 through G-1.

### A1-Science as Inquiry And Process

- SA** Students develop an understanding of the processes and applications of scientific inquiry.
- SA1** Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- SA2** Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- SA3** Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

PSGLEs repeated with no changes across grade levels are marked with asterisks to indicate that the PSGLE assumes increasing complexity to indicate the growth in the PSGLE.

Each PSGLE includes a bolded statement called the "stem." Each stem is the same or similar across the grades for a given PSGLE and is meant to communicate the main curriculum and instructional focus of the PSGLE across the grades.

Grade 3	Grade 4	Grade 5
<p><b>The student develops an understanding of the processes of science by:</b></p> <p>[3] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.</p> <hr/> <p>[3] SA1.2 observing and describing their world to answer simple questions.</p> <p><b>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <hr/> <p>[3] SA2.1 answering, "how do you know?" questions with reasonable answers.</p> <p><b>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</b></p> <p>[3] SA3.1 observing local conditions that determine which plants and/or animals survive. (L)</p>	<p><b>The student develops an understanding of the processes of science by:</b></p> <p>[4] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating. *</p> <hr/> <p>[4] SA1.2 observing, measuring and collecting data from explorations and using this information to classify, predict, and communicate.</p> <p><b>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <hr/> <p>[4] SA2.1 supporting their ideas with observations and peer review. (L)</p> <p><b>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</b></p> <p>[4] SA3.1 identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive. (L)</p>	<p><b>The student demonstrates an understanding of the processes of science by:</b></p> <p>[5] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating. *</p> <hr/> <p>[5] SA1.2 using quantitative and qualitative observations to create their own inferences and predictions.</p> <p><b>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <hr/> <p>[5] SA2.1 supporting their statements with facts from a variety of resources and by identifying their sources. (L)</p> <p><b>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</b></p> <p>[5] SA3.1 <u>identifying the limiting factors</u> (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive.</p>

The number in brackets indicates the grade level

**Note:** Items differentiated with an "i.e." indicate that statewide assessment items may only be written to the content contained within the statement in the parentheses. Items differentiated with an "e.g." do not limit assessment items to that content, but indicate examples of content that may be used in statewide assessment items.

Some PSGLEs have been identified as Local. They are for local assessments and will not be on a state assessment.

The number indicates the Science Content Standard and the Grade Level Expectation number. Thus PSGLE [4] SA3.1 represents Science Content Standard SA3, and the first PSGLE for that Content Standard for grade 4.

Differences between grade levels are underlined.

Participants in the development of the GLEs actively researched the concepts and skills contained within this document.

### References

National Research Council (U.S.). (1996). *National Science Education Standards : observe, interact, change, learn*. Washington, DC: National Academy Press.

Project 2061 (American Association for the Advancement of Science). (2001). *Atlas of Science Literacy*. Washington, DC: American Association for the Advancement of Science: National Science Teachers Association

**Science Performance Standards (Grade Level Expectations) Grade 4  
A1—Science as Inquiry and Process**

- SA** Students develop an understanding of the processes and applications of scientific inquiry.
- SA1** Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- SA2** Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- SA3** Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

**Grade 4**

<p><b>The student develops an understanding of the processes of science by:</b></p> <p>[4] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating. *</p> <p>[4] SA1.2 observing, measuring and collecting data from explorations and using this information to classify, predict, and communicate.</p>	<p><b>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <p>[4] SA2.1 supporting their ideas with observations and peer review. (L)</p>	<p><b>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</b></p> <p>[4] SA3.1 identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive. (L)</p>
--	--	--

\* Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 4  
B1— Concepts of Physical Science**

- SB** Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world.
- SB1** Students develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior.
- SB2** Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved.
- SB3** Students develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems.
- SB4** Students develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

**Grade 4**

<p><b>The student demonstrates an understanding of the structure and properties of matter by:</b></p> <p>[4] SB1.1 identifying and comparing the characteristics of gases, liquids, and solids.</p>	<p><b>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by:</b></p> <p>[4] SB2.1 investigating the effectiveness of different insulating and conducting materials with respect to heat flow and record the results. (L)</p>	<p><b>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by:</b></p> <p>[4] SB3.1 explaining that temperature changes cause changes in phases of substances (e.g., ice changing to liquid water and liquid water to water vapor).</p>	<p><b>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by:</b></p> <p>[4] SB4.1 simulating that changes in speed or direction of motion are caused by forces. (L)</p>
---	--	---	--

**Science Performance Standards (Grade Level Expectations) Grade 4  
C1—Concepts of Life Science**

- SC** Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.
- SC1** Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution.
- SC2** Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.
- SC3** Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

**Grade 4**

<p><b>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by:</b></p> <p>[4] SC1.1 showing the relationship between physical characteristics of Alaskan organisms and the environment in which they live.</p> <p>[4] SC1.2 describing fossil evidence (e.g., casts, track ways, imprints, etc.) of extinct organisms.</p>	<p><b>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by:</b></p> <p>[4] SC2.1 choosing appropriate tools (i.e., hand lens, microscopes, ruler, balance) to examine the basic structural components (e.g., stems, leaves, fish scales, wings) of living things.</p> <p>[4] SC2.2 describing the basic characteristics and requirements of living things.</p>	<p><b>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by:</b></p> <p>[4] SC3.1 identifying examples of living and non-living things <u>and the relationship between them</u> (e.g., living things need water, herbivores need plants).</p> <p>[4] SC3.2 Identifying a simple food chain, diagramming how energy flows through it, and describing the effects of removing one link.</p>
--	--	---

**Science Performance Standards (Grade Level Expectations) Grade 4  
D1—Concepts of Earth Science**

**SD** Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.  
**SD1** Students develop an understanding of Earth’s geochemical cycles.  
**SD2** Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.  
**SD3** Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system.  
**SD4** Students develop an understanding of the theories regarding the **evolution** of the universe.

**Grade 4**

<p><b>The student demonstrates an understanding of geochemical cycles by:</b></p> <p>[4] SD1.1 describing that most smaller rocks come from the breaking and weathering of larger rocks as part of the rock cycle.</p> <p>[4] SD1.2 recognizing the physical properties of water as they relate to the rock cycle.</p>	<p><b>The student demonstrates an understanding of the forces that shape Earth by:</b></p> <p>[4] SD2.1 observing models of how waves, wind, water, and ice shape and reshape the Earth’s surface by eroding rock and soil. (L)</p> <p>[4] SD2.2 identifying causes (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, and avalanches) of rapid changes on the surface.</p>	<p><b>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by:</b></p> <p>[4] SD3.1 recognizing changes to length of daylight over time and its relationship to seasons.</p> <p>[4] SD3.2 observing that heat flows from one object to another. (L)</p>	<p><b>The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by:</b></p> <p>[4] SD4.1 recognizing that stars are like the sun but are so far away that they look like points of light.</p> <p>[4] SD4.2 recognizing that objects have properties, locations, and movements that can be observed and described. *</p> <p>[4] SD4.3 recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes). * (L)</p>
--	---	---	---

\* Same concept at a higher level.

**Science Performance Standards (Grade Level Expectations) Grades 3-5  
E1—Science and Technology**

- SE** Students develop an understanding of the relationships among science, technology, and society.  
**SE1** Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.  
**SE2** Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.  
**SE3** Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

**Grade 4**

<p><b>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:</b></p> <p>[4] SE1.1 recognizing that tools (e.g., spear, hammer, hand lens, kayak, computer) and processes (e.g., drying fish, sewing, photography) are an important part of human cultures.</p>	<p><b>The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by:</b></p> <p>[4] SE2.1 identifying the function of a variety of tools (e.g., spear, hammer, hand lens, kayak, computer).          [4] SE2.2 identifying multiple explanations (e.g., oral traditions, folklore, scientific theory) of everyday events (e.g., weather, seasonal changes). (L)</p>	<p><b>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by:</b></p> <p>[4] SE3.1 listing the positive and negative effects of a <u>scientific</u> discovery.</p>
---	---	---

**Science Performance Standards (Grade Level Expectations) Grades 3-5  
F1—Cultural, Social, Personal Perspectives, and Science**

- SF** Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives.  
**SF1** Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.  
**SF2** Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.  
**SF3** Students develop an understanding of the importance of recording and validating cultural knowledge.

**Grade 4**

<p><b>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by:</b></p> <p>[4] SF1.1-SF3.1 <u>connecting observations of nature to a local or traditional story</u> that explains a natural event (e.g., animal adaptation, weather, rapid changes to Earth's surface). (L) Cross referenced with SA3.1, grades 3 and 6, 4.</p>		
--	--	--

**Science Performance Standards (Grade Level Expectations) Grade 4  
G1—History and Nature of Science**

- SG** Students develop an understanding of the history and nature of science.
- SG1** Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge.
- SG2** Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world.
- SG3** Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s).
- SG4** Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

**Grade 4**

[4] SG 1.1**	<p><b>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by:</b></p> <p>[4] SG2.1 recognizing the need for repeated measurements.</p>	[4] SG 3.1**	<p><b>The student will demonstrate an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by:</b></p> <p>[4] SG4.1 using an account of a discovery to recognize that an individual's (e.g., George Washington Carver, Marie Curie) curiosity led to advancements in science.</p>
--------------	--	--------------	--

\*\*"Most of the historical benchmarks do not appear until high school." (Project 2061 (American Association for the Advancement of Science), 2001, p. 129)

Project 2061 (American Association for the Advancement of Science). (2001). *Atlas of science literacy*. Washington, DC: American Association for the Advancement of Science : National Science Teachers Association.