

## Science Performance Standards (Grade Level Expectations) for Grade 8

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.

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> <p>[3] SA1.2 observing and describing their world to answer simple questions.</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> <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 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> <p>[5] SA1.2 using quantitative and qualitative observations to create their own inferences and predictions.</p>
<p><b>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <p>[3] SA2.1 answering, "how do you know?" questions with reasonable answers.</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 of the attitudes and approaches to scientific inquiry by:</b></p> <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>[3] SA3.1 observing local conditions that determine which plants and/or animals survive. (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 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>

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.

**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.

The number in brackets indicates the grade level

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 8**  
**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 that local applications provide opportunity for understanding scientific concepts and global issues.

**Grade 8**

<p><b>The student demonstrates an understanding of the processes of science by:</b></p> <p>[8] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating. *</p> <p>[8] SA1.2 collaborating to design and conduct repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings. (L)</p>	<p><b>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by:</b></p> <p>[8] SA2.1 recognizing and analyzing differing scientific explanations and models.</p>	<p><b>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</b></p> <p>[8] SA3.1 conducting research to learn how the local environment is used by a variety of competing interests (e.g., competition for habitat/resources, tourism, oil and mining companies, hunting groups). (L)</p>
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\*Same concept at a higher level.

**Science Performance Standards (Grade Level Expectations) Grade 8**  
**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 8**

<p><b>The student demonstrates an understanding of the structure and properties of matter by:</b></p> <p>[8] SB1.1 using physical and <u>chemical</u> properties (i.e., density, boiling point, freezing point, conductivity, flammability) to differentiate among materials (i.e., elements, compounds, and mixtures).</p>	<p><b>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by:</b></p> <p>[8] SB2.1 identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat).</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>[8] SB3.1 exploring changes of state with increase or decrease of particle speed associated with heat transfer. (L)</p> <p>[8] SB3.2 exploring through a variety of models (e.g., gumdrops and toothpicks) how atoms may bond together into well defined molecules or bond together in large arrays. (L)</p>	<p><b>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by:</b></p> <p>[8] SB4.1 demonstrating (L) and explaining circular motion.</p> <p>[8] SB4.2 describing the interactions between charges.</p>
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**Science Performance Standards (Grade Level Expectations) Grade 8  
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 8**

<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>[8] SC1.1 describing the role of genes in sexual reproduction (i.e., traits of the offspring).</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>[8] SC2.1 placing vertebrates into correct classes of taxonomy based on external, observable features.</p> <p>[8] SC2.2 explaining that most organisms utilize inherited and learned behaviors to meet the basic requirements of life.</p> <p>[8] SC2.3 describing the functions and interdependence of human body systems (i.e., circulatory, respiratory, nervous).</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>[8] SC3.1 stating that energy flows and that matter cycles but is conserved within an ecosystem.</p> <p>[8] SC3.2 organizing a food web that shows the cycling of matter.</p>
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**Science Performance Standards (Grade Level Expectations) Grade 8  
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 8**

<p><b>The student demonstrates an understanding of geochemical cycles by:</b></p> <p>[8] SD1.1 making connections between components of the locally observable geologic environment and the rock cycle. (L)</p> <p>[8] SD1.2 applying knowledge of the water cycle to explain changes in the Earth’s surface.</p>	<p><b>The student demonstrates an understanding of the forces that shape Earth by:</b></p> <p>[8] SD2.1 interpreting topographical maps to identify features (i.e., rivers, lakes, mountains, valleys, islands, and tundra).</p> <p>[8] SD2.2 using models to show the relationship between convection currents within the mantle and the large-scale movement of the surface. (L)</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>[8] SD3.1 recognizing the relationship between the seasons and Earth’s tilt relative to the sun and describing the day/night cycle as caused by the rotation of the Earth every 24 hrs.</p> <p>[8] SD3.2 recognizing types of energy transfer (convection, conduction, and radiation) and how they affect weather.</p>	<p><b>The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by:</b></p> <p>[8] SD4.1 creating models of the solar system illustrating size, location/position, composition, moons/rings, and conditions. (L)</p> <p>[8] SD4.2 comparing the brightness of a star to its distance and size.</p>
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**Science Performance Standards (Grade Level Expectations) Grade 8  
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 8**

<p><b>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:</b></p> <p>[8] SE1.1 describing how public policy affects their lives and participating diplomatically in evidence-based discussions relating to their community. (L)</p>	<p><b>The student demonstrates an understanding that solving problems involves different ways of thinking by:</b></p> <p>[8] SE2.1 identifying, designing, testing, and revising solutions to a local problem. * (L)</p> <p>[8] SE2.2 comparing the student's work to the work of peers in order to identify multiple paths that can be used to investigate <u>and evaluate potential solutions</u> to a question or problem. (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>[8] SE3.1 <u>predicting the possible effects of a recent</u> scientific discovery, invention, or scientific breakthrough. (L)</p>
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\*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 8  
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 8**

<p><b>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by:</b></p> <p>[8] SF1.1-SF3.1 describing how local knowledge, culture, and the technologies of various activities (e.g., hunting, fishing, subsistence) influence the development of scientific knowledge. (L) Cross referenced with SA3.1, grade 8</p>		
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\*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 8  
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 8**

<p><b>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by:</b></p> <p>[8] SG2.1 describing how repeating experiments improves the likelihood of accurate results.</p>	<p><b>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by:</b></p> <p>[8] SG3.1 revising a personal idea when presented with experimental/observational data inconsistent with that personal idea (e.g., the rates of falling bodies of different masses). * (L)</p>	
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\*Same concept at a higher level

\*\* "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.