

Science Performance Standards (Grade Level Expectations) for Grade 10

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>The student develops an understanding of the processes of science by:</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>The student develops an understanding of the processes of science by:</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>The student demonstrates an understanding of the processes of science by:</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>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</p> <p>[3] SA2.1 answering, "how do you know?" questions with reasonable answers.</p>	<p>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</p> <p>[4] SA2.1 supporting their ideas with observations and peer review. (L)</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by:</p> <p>[5] SA2.1 supporting their statements with facts from a variety of resources and by identifying their sources. (L)</p>
<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</p> <p>[3] SA3.1 observing local conditions that determine which plants and/or animals survive. (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</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>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</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 10
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 10

<p>The student develops an understanding of the processes of science by:</p> <p>[10] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, <u>analyzing data</u>, <u>developing models</u>, inferring and communicating.</p> <p>[10] SA1.2 reviewing pertinent literature, hypothesizing, making qualitative and quantitative observations, controlling experimental variables, analyzing data statistically (i.e., mean, median, mode), and using this information to draw conclusions, compare results to others, suggest further experimentation, and apply their conclusions to other problems. (L)</p>	<p>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</p> <p>[10] SA2.1 examining methodology and conclusions to identify bias and determining if evidence logically supports the conclusions.</p>	
---	--	--

*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>The student demonstrates an understanding of the structure and properties of matter by:</p> <p>[10] SB1.1 using the periodic table to describe atoms in terms of their base components (i.e., protons, neutrons, electrons).</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by:</p> <p>[10] SB2.1 examining energy (i.e., nuclear, electromagnetic, chemical, mechanical, thermal) transfers, transformations, and efficiencies by comparing useful energy to total energy.</p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by:</p> <p>[10] SB3.1 describing the behavior of electrons in chemical bonding.</p> <p>[10] SB3.2 recognizing that radioactivity is a result of the decay of unstable nuclei.</p> <p>[10] SB3.3 comparing the relative wavelengths and applications of different forms of electromagnetic radiation (i.e., x-ray, visible, infrared, microwaves, radio).</p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by:</p> <p>[10] SB4.1 recognizing that when one thing exerts a force on another, an equal amount of force is exerted back on it.</p> <p>[10] SB4.2 explaining that different kinds of materials respond to electric and magnetic forces (i.e., conductors, insulators, magnetic and non-magnetic materials).</p>
--	--	---	--

*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>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:</p> <p>[10] SC1.2 explaining how the processes of natural selection can cause speciation and extinction.</p> <p>[10] SC1.3 examining issues related to genetics (L).</p>	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by:</p> <p>[10] SC2.1 describing the structure-function relationship (e.g., joints, lungs).</p> <p>[10] SC2.2 explaining that cells have specialized structures in which chemical reactions occur.</p> <p>[10] SC2.3 explaining the functions of organs of major systems (i.e., respiratory, digestive, circulatory, reproductive, nervous, musculoskeletal, and excretory).</p> <p>[10] SC2.4 tracing the pathways of the digestive, circulatory, and excretory systems.</p>	<p>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:</p> <p>[10] SC3.1 relating the carbon cycle to global climate change.</p> <p>[10] SC3. 2 exploring ecological relationships (e.g., competition, niche, feeding relationships, symbiosis). (L)</p>
---	---	--

*Same concept at a higher level

Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>The student demonstrates an understanding of geochemical cycles by:</p> <p>[10] SD1.1 using a model to <u>explain</u> the processes (i.e., formation, sedimentation, erosion, reformation) of the rock cycle.</p> <p>[10] SD1.2 describing their interrelationships (i.e., water cycle, carbon cycle, oxygen cycle).</p>	<p>The student demonstrates an understanding of the forces that shape Earth by:</p> <p>[10] SD2.1 recognizing the dynamic interaction of erosion and deposition including human causes. *</p> <p>[10] SD2.2 describing how the theory of plate tectonics explains the dynamic nature of its surface. *</p>	<p>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:</p> <p>[10] SD3.1 describing causes, effects, preventions, and mitigations of human impact on climate.</p>	<p>The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by:</p> <p>[10] SD 4.1 recognizing phenomena in the universe (i.e., black holes, nebula)</p> <p>[10] SD 4.2 <u>explaining</u> that the position of stars changes in the expanding universe. *</p> <p>[10] SD 4.4 <u>describing</u> the Big Bang Theory.</p>
--	---	---	--

SD4.3 is not continued in 9-11.
 Same concept at a higher level.

**Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:</p> <p>[10] SE1.1 identifying that progress in science and invention is highly interrelated to what else is happening in society</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by:</p> <p>[10] SE2.1 questioning, researching, modeling, simulating, and testing <u>multiple solutions</u> to a problem. (L)</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by:</p> <p>[10] SE3.1 researching a current problem, identifying possible solutions, and evaluating the impact of each solution. (L)</p>
--	---	---

**Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by:</p> <p>[10] SF1.1-SF3.1 analyzing the competition for resources by various user groups to describe these interrelationships. Cross referenced with SA3.1, grades 8 and 11</p>		
--	--	--

**Science Performance Standards (Grade Level Expectations) Grade 10
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 10

<p>The student demonstrates an understanding of changes in historical perspectives of science by:</p> <p>[10] SG1.1 <u>describing how</u> those perspectives (i.e., cultural, political, religious, philosophical) have impacted the advancement of science.</p>	<p>Students demonstrate an understanding of the bases of the advancement of scientific knowledge by:</p> <p>[10] SG2.1 using an account of an event to recognize the processes of science used by historically significant scientists (e.g., Goodall, Watson & Crick, Newton).</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by:</p> <p>[10] SG3.1 using experimental or observational data to evaluate a hypothesis.</p>	<p>The student will demonstrate an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by:</p> <p>[10] SG4.1 recognizing the role of these factors on scientific advancements.</p>
---	---	---	---