

Science Performance Standards (Grade Level Expectations) for Grade 11

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

		Grade 3	Grade 4	Grade 5
<p>A1-Science as Inquiry And Process</p> <p>SA Students develop an understanding of the processes and applications of scientific inquiry.</p> <p>SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.</p> <p>SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.</p> <p>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.</p>	<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>	

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.

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.

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.

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 11
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 11

<p>The student develops an understanding of the processes of science by:</p> <p>[11] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring and communicating. *</p> <p>[11] SA1.2 recognizing and analyzing multiple explanations and models, using this information to revise their own explanation or model if necessary. (L)</p>	<p>The student will demonstrate an understanding of the attitudes and approaches to scientific inquiry by:</p> <p>[11] SA2.1 evaluating the credibility of cited sources when conducting the student's own scientific investigation. (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:</p> <p>[11] SA3.1 conducting research and communicating results to solve a problem (e.g., fish and game management, building permits, mineral rights, land use policies). (L)</p>
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*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<p>The student demonstrates an understanding of the structure and properties of matter by:</p> <p>[11] SB1.1 predicting the properties of an element (i.e., reactivity, metal, non-metal) using the periodic table and verifying the predictions through experimentation. (L)</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by:</p> <p>[11] SB2.1 <u>demonstrating</u> energy (e.g., nuclear, electromagnetic, chemical, mechanical, thermal) transfers and transformations by comparing useful energy to total energy (entropy). (L)</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>[11] SB3.1 predicting how an atom can interact with other atoms based on its electron configuration and verifying the results. (L)</p> <p>[11] SB3.2 researching applications of nuclear reactions in which a small amount of matter is converted directly into a huge amount of energy (i.e., $E=MC^2$). (L)</p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by:</p> <p>[11] SB4.1 <u>conducting an experiment to demonstrate</u> that when one thing exerts a force on another, an equal amount of force is exerted back on it. (L)</p> <p>[11] SB4.2 conducting an experiment to explore the relationship between magnetic forces and electric forces to show that they can be thought of as different aspects of a single electromagnetic force (e.g., generators and motors). (L)</p>
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*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<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>[11] SC1.1 relating the structure of DNA to characteristics of an organism.</p> <p>[11] SC1.2 researching how the processes of natural selection cause changes in species over time. * (L)</p>	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by:</p> <p>[11] SC2.1 describing the structure-function relationship *</p> <p>[11] SC2.2 describing the learned behaviors (e.g., classical conditioning, imprinting, trial and error) that are utilized by living organisms to meet the requirements of life.*</p> <p>[11] SC2.3 describing the functions and interdependencies of the organs within the immune system and within the endocrine system.</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>[11] SC3.1 relating the carbon cycle to global climate change. *</p> <p>[11] SC3.2 analyze the potential impacts of changes (e.g., climate change, habitat loss/gain, cataclysms, human activities) within an ecosystem. *</p>
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*Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<p>The student demonstrates an understanding of geochemical cycles by:</p> <p>[11] SD1.1 creating a model to demonstrate the rock cycle. (L)</p> <p>[11] SD1.2 integrating knowledge of the water cycle and biogeochemical cycling to explain changes in the Earth's surface. (L)</p>	<p>The student demonstrates an understanding of the forces that shape Earth by:</p> <p>[11] SD2.1 recognizing the dynamic interaction of erosion and deposition including human causes. *</p> <p>[11] 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>[11] SD3.1 describing causes, effects, preventions, and mitigations of human impact on climate. *</p> <p>[11] SD3.2 exploring causes and effects related to phenomena (e.g., the aurora, solar winds, Coriolis effect). (L)</p>	<p>The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by:</p> <p>[11] SD4.1 <u>describing</u> phenomena in the universe (i.e., black holes, nebula)</p> <p>[11] SD4.2 <u>using evidence to explain how the position of stars changes in the expanding universe.</u></p> <p>[11] SD4.4 <u>describing the Big Bang Theory and exploring the evidence that supports it.</u> (L)</p>
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SD4.3 is not continued in 9-11.
 *Same concept at a higher level

**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:</p> <p>[11] SE1.1 researching how social, economic, and political forces strongly influence which technology will be developed and used. (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by:</p> <p>[11] SE2.1 questioning, researching, modeling, simulating, and testing multiple solutions 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>[11] SE3.1 researching a current problem, identifying possible solutions, and evaluating the impact of each solution. * (L)</p>
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*Same concept at a higher level.

**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by:</p> <p>[11] SF1.1-SF3.1 investigating the influences of societal and/or cultural beliefs on science. (L), Cross referenced with SA3.1, grades 8 and 11</p>		
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**Science Performance Standards (Grade Level Expectations) Grade 11
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 11

<p>Students demonstrate an understanding of the bases of the advancement of scientific knowledge by:</p> <p>[11] SG2.1 describing the importance of logical arguments (i.e., thought experiments by Einstein, Hawking, Newton)</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by:</p> <p>[11] SG3.1 investigating instances when scientists' observations were not in accord with prevailing ideas of the time. (L)</p>	
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