

# Nebraska State Accountability - Science (NeSA-S) Table of Specifications

## Grade 11

### Inquiry, The Nature of Science, and Technology

Grade 11 Abilities to do Scientific Inquiry	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.1.1 Students will design and conduct investigations that lead to the use of logic and evidence in the formulation of scientific explanations and models.</b>					<b>8-13</b>
<i>SC 12.1.1.a Formulate a testable hypothesis supported by prior knowledge to guide an investigation</i>	2				
<i>SC 12.1.1.b Design and conduct logical and sequential scientific investigations with repeated trials and apply findings to new investigations</i>	3				
<i>SC 12.1.1.c Identify and manage variables and constraints</i>	3				
<i>SC 12.1.1.d Select and use lab equipment and technology appropriately and accurately</i>	1				
<i>SC 12.1.1.e Use tools and technology to make detailed qualitative and quantitative observations</i>	1				
<i>SC 12.1.1.f Represent and review collected data in a systematic, accurate, and objective manner</i>	3				
<i>SC 12.1.1.g Analyze and interpret data, synthesize ideas, formulate and evaluate models, and clarify concepts and explanations</i>	3				
<i>SC 12.1.1.h Use results to verify or refute a hypothesis</i>	2				
<i>SC 12.1.1.i Propose and/or evaluate possible revisions and alternate explanations</i>	3				
<i>SC 12.1.1.j Share information, procedures, results, conclusions, and defend findings to a scientific community (peers, science fair audience, policy makers)</i>	3				
<i>SC 12.1.1.k Evaluate scientific investigations and offer revisions and new ideas as appropriate</i>	3				
<i>SC 12.1.1.l Use appropriate mathematics in all aspects of scientific inquiry</i>	2				
Grade 11 Nature of Science	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.1.2 Students will apply the nature of scientific knowledge to their own investigations and in the evaluation of scientific explanations.</b>	<b>Assessed at the local level</b>				

<i>SC 12.1.2.a Recognize that scientific explanations must be open to questions, possible modifications, and must be based upon historical and current scientific knowledge</i>					
<i>SC 12.1.2.b Describe how society influences the work of scientists and how science, technology, and current scientific discoveries influence and change society</i>					
<i>SC 12.1.2.c Recognize that the work of science results in incremental advances, almost always building on prior knowledge, in our understanding of the world</i>					
<i>SC 12.1.2.d Research and describe the difficulties experienced by scientific innovators who had to overcome commonly held beliefs of their times to reach conclusions that we now take for granted</i>					
<b>Grade 11 Technology</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.1.3 Students will solve a complex design problem.</b>	<b>Assessed at the local level</b>				
<i>SC 12.1.3.a Propose designs and choose between alternative solutions of a problem</i>					
<i>SC 12.1.3.b Assess the limits of a technological design</i>					
<i>SC 12.1.3.c Implement the selected solution</i>					
<i>SC 12.1.3.d Evaluate the solution and its consequences</i>					
<i>SC 12.1.3.e Communicate the problem, process, and solution</i>					
<i>SC 12.1.3.f Compare and contrast the reasons for the pursuit of science and the pursuit of technology</i>					
<i>SC 12.1.3.g Explain how science advances with the introduction of new technology</i>					
<i>SC 12.1.3.h Recognize creativity, imagination, and a good knowledge base are all needed to advance the work of science and engineering</i>					
<b>PHYSICAL SCIENCE</b>					
<b>Grade 11 Matter</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.2.1 Students will investigate and describe matter in terms of its structure, composition and conservation.</b>					<b>4-7</b>
<i>SC 12.2.1.a Recognize bonding occurs when outer electrons are transferred (ionic) or shared (covalent)</i>	1				
<i>SC 12.2.1.b Describe the energy transfer associated with phase changes between solids, liquids, and gasses</i>	1				

SC 12.2.1.c Describe the three normal states of matter (solid, liquid, gas) in terms of energy, particle arrangement, particle motion, and strength of bond between molecules	1				
SC 12.2.1.d Recognize a large number of chemical reactions involve the transfer of either electrons (oxidation/reduction) or hydrogen ions (acid/base) between reacting ions, molecules, or atoms	1				
SC 12.2.1.e Identify factors affecting rates of chemical reactions (temperature, particle size, surface area)	1				
SC 12.2.1.f Recognize the charges and relative locations of subatomic particles (neutrons, protons, electrons)	1				
SC 12.2.1.g Describe properties of atoms, ions, and isotopes	1				
SC 12.2.1.h Describe the organization of the periodic table of elements with respect to patterns of physical and chemical properties	1				
<b>Grade 11 Force and Motion</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.2.2 Students will investigate and describe the nature of field forces and their interactions with matter.</b>					<b>4-8</b>
SC 12.2.2.a Describe motion with respect to displacement and acceleration	2				
SC 12.2.2.b Describe how the law of inertia (Newton's 1st law) is evident in a real-world event	2				
SC 12.2.2.c Make predictions based on relationships among net force, mass, and acceleration (Newton's 2nd law)	2				
SC 12.2.2.d Recognize that all forces occur in equal and opposite pairs (Newton's 3rd law)	1				
SC 12.2.2.e Describe how Newton's 3rd law of motion is evident in a real-world event	2				
SC 12.2.2.f Describe gravity as a force that each mass exerts on another mass, which is proportional to the masses and the distance between them	2				
SC 12.2.2.g Recognize that an attractive or repulsive electric force exists between two charged particles and that this force is proportional to the magnitude of the charges and the distance between them	1				
<b>Grade 11 Energy</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.2.3 Students will describe and investigate energy systems relating to the conservation and interaction of energy and matter.</b>					<b>4-8</b>
SC 12.2.3.a Describe mechanical wave properties (speed, wavelength, frequency, amplitude) and how waves travel through a medium	1				

SC 12.2.3.b. Recognize that the energy in waves can be changed into other forms of energy	1				
SC 12.2.3.c Recognize that light can behave as a wave (diffraction and interference)	1				
SC 12.2.3.d Distinguish between temperature (a measure of the average kinetic energy of atomic or molecular motion) and heat (the quantity of thermal energy that transfers due to a change in temperature)	2				
SC 12.2.3.e Compare and contrast methods of heat transfer and the interaction of heat with matter via conduction, convection, and radiation	2				
SC 12.2.3.f Recognize that the production of electromagnetic waves is a result of changes in the motion of charges or by a changing magnetic field	1				
SC 12.2.3.g Compare and contrast segments of the electromagnetic spectrum (radio, micro, infrared, visible, ultraviolet, x-rays, gamma) based on frequency and wavelength	2				
SC 12.2.3.h Recognize that nuclear reactions (fission, fusion, radioactive decay) convert a fraction of the mass of interacting particles into energy, and this amount of energy is much greater than the energy in chemical interactions	1				
SC 12.2.3.i Interpret the law of conservation of energy to make predictions for the outcome of an event	2				
SC 12.2.3.j Identify that all energy can be considered to be either kinetic, potential, or energy contained by a field (e.g. electromagnetic waves)	1				
SC 12.2.3.k Identify endothermic and exothermic reactions	1				
<b>LIFE SCIENCE</b>					
<b>Grade 11 Structure and Function of Living Systems</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.3.1 Students will investigate and describe the chemical basis of the growth, development, and maintenance of cells.</b>					<b>4-7</b>
SC 12.3.1.a Identify the complex molecules (carbohydrates, lipids, proteins, nucleic acids) that make up living organisms	1				
SC 12.3.1.b Identify the form and function of sub-cellular structures that regulate cellular activities	1				
SC 12.3.1.c Describe the cellular functions of photosynthesis, respiration, cell division, protein synthesis, transport of materials, and energy capture/release	2				
SC 12.3.1.d Describe how an organism senses changes in its internal or external environment and responds to ensure survival	2				
<b>Grade 11 Heredity</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>

<b>SC 12.3.2 Students will describe the molecular basis of reproduction and heredity.</b>					<b>3-6</b>
<i>SC 12.3.2.a Identify that information passed from parents to offspring is coded in DNA molecules</i>	1				
<i>SC 12.3.2.b Describe the basic structure of DNA and its function in genetic inheritance</i>	1				
<i>SC 12.3.2.c Recognize how mutations could help, harm, or have no effect on individual organisms</i>	1				
<i>SC 12.3.2.d Describe that sexual reproduction results in a largely predictable, variety of possible gene combinations in the offspring of any two parents</i>	2				
<b>Grade 11 Flow of Matter and Energy in Ecosystems</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.3.3 Students will describe, on a molecular level, the cycling of matter and the flow of energy between organisms and their environment.</b>					<b>1-3</b>
<i>SC 12.3.3.a Explain how the stability of an ecosystem is increased by biological diversity</i>	2				
<i>SC 12.3.3.b Recognize that atoms and molecules cycle among living and nonliving components of the biosphere</i>	1				
<i>SC 12.3.3.c Explain how distribution and abundance of different organisms in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials</i>	2				
<i>SC 12.3.3.d Analyze factors which may influence environmental quality</i>	2				
<b>Grade 11 Biodiversity</b>	<b>Highest DOK Level Tested</b>	<b>DOK 1</b>	<b>DOK 2</b>	<b>DOK 3</b>	<b>Item Total</b>
<b>SC 12.3.4 Students will describe the theory of biological evolution.</b>					<b>2-5</b>
<i>SC 12.3.4.a Identify different types of adaptations necessary for survival (morphological, physiological, behavioral)</i>	1				
<i>SC 12.3.4.b Recognize that the concept of biological evolution is a theory which explains the consequence of the interactions of: (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring</i>	1				
<i>SC 12.3.4.c Explain how natural selection provides a scientific explanation of the fossil record and the molecular similarities among the diverse species of living organisms</i>	2				
<i>SC 12.3.4.d Apply the theory of biological evolution to explain diversity of life over time</i>	2				

## EARTH AND SPACE SCIENCE

Grade 11 Earth in Space	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.4.1 Students will investigate and describe the known universe.</b>					2-4
<i>SC 12.4.1.a Describe the formation of the universe using the Big Bang Theory</i>	1				
<i>SC 12.4.1.b Recognize that stars, like the Sun, transform matter into energy by nuclear reactions which leads to the formation of other elements</i>	1				
<i>SC 12.4.1.c Describe stellar evolution</i>	1				
Grade 11 Earth Structures and Processes	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.4.2 Students will investigate the relationships among Earth's structure, systems, and processes.</b>					3-5
<i>SC 12.4.2.a Recognize how Earth materials move through geochemical cycles (carbon, nitrogen, oxygen) resulting in chemical and physical changes in matter</i>	1				
<i>SC 12.4.2.b Describe how heat convection in the mantle propels the plates comprising Earth's surface across the face of the globe (plate tectonics)</i>	2				
<i>SC 12.4.2.c Evaluate the impact of human activity and natural causes on Earth's resources (groundwater, rivers, land, fossil fuels)</i>	2				
Grade 11 Energy in Earth's Systems	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.4.3 Students will investigate and describe the relationships among the sources of energy and their efforts on Earth's systems.</b>					3-5
<i>SC 12.4.3.a Describe how radiation, conduction, and convection transfer heat in Earth's systems</i>	1				
<i>SC 12.4.3.b Identify internal and external sources of heat energy in Earth's systems</i>	2				
<i>SC 12.4.3.c Compare and contrast benefits of renewable and nonrenewable energy sources</i>	2				
<i>SC 12.4.3.d Describe natural influences (Earth's rotation, mountain ranges, oceans, differential heating) on global climate</i>	2				
Grade 11 Earth's History	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
<b>SC 12.4.4 Students will explain the history and evolution of Earth.</b>					2-5

<p><i>SC 12.4.4.a Recognize that in any sequence of sediments or rocks that has not been overturned, the youngest sediments or rocks are at the top of the sequence and the oldest are at the bottom (law of superposition)</i></p>	1				
<p><i>SC 12.4.4.b Interpret Earth's history by observing rock sequences, using fossils to correlate the sequences at various locations, and using data from radioactive dating methods</i></p>	2				
<p><i>SC 12.4.4.c Compare and contrast the physical and biological differences of the early Earth with the planet we live on today</i></p>	2				