

2010 Nevada Science Assessment Matrix High School Proficiency Examination (HSPE)

HSPE Matrix:

	Physical Science -C1	Life Science – C2	Earth/Space Science – C3	Nature of Science –C4	Totals
DOK 1	7	6	4	3	20 – 33%
DOK 2	10	9	8	7	34 – 57%
DOK3	1	3	1	1	6 - 10%
Totals	18	18	13	11	60
	30%	30%	22%	18%	

Expanded matrix:

C 1- Physical Science (18 items)

- Matter: items for this standard emphasize properties of matter including characteristics used to organize known elements in the periodic table; chemical reactions and the properties of elements, molecules, and mixtures; and the atomic structure of elements.
- Force and Motion: items for this standard require students to use the laws of motion to predict and determine the effects of forces on objects; items also require students to understand gravitational force, and the interaction of electrical and magnetic forces.
- Energy: items for this standard emphasize the relationship between the various forms of energy; waves as a mechanism for transfer of energy, and how nuclear reactions can convert matter to energy.

C 2 – Life Science (18 items)

- Heredity: items for this standard measure student understanding of the structure and role of DNA in the reproduction and development of organisms; items also address student’s understanding of how changes in genetic information are passed from generation to generation.

- Structure of Life: items in this area emphasize student's knowledge of cells and cell structures; the hierarchy of differentiated cells, tissues and organs in the human body; and the impact of disease and infection on healthy organisms.
- Organisms and Their environment: items for this standard focus on the patterns of organization, change, and stability in ecosystems that are a result of the interactions and interdependencies among the living and non-living components. There is a special focus on the contribution of biodiversity to the overall stability of ecosystems, and on the unique characteristics of Nevada's bioregions.
- Diversity of Life: items for this standard emphasize the classification of organisms based on morphology and behavior, as well as similarity of DNA sequences. Items will also focus on the mechanisms and evidence for biological evolution, including population variability, natural selection, and extinction.

C 3 – Earth/Space Science (13 items)

- Atmospheric Processes and the Water Cycle: items for this standard focus on the role of the Sun's energy and the rotation of the Earth in providing the energy for driving the weather and climate. Items will also emphasize the role of the atmosphere and the gasses that control the amount of heat energy in the Earth system, including the greenhouse effect.
- Solar System and Universe: items for this standard focus on the components of the universe outside our solar system and the ways that technology has increased our understanding of stars, star formation and destruction, and provided evidence to support scientific theories of the origins and evolution of the universe.
- Earth's Composition and Structure: items for this standard focus on the geologic processes that have resulted in the surface structures of Earth. Items will also emphasize biogeochemical cycles, plate tectonics, and the structure, composition, and evolution of soils.

C 4 – Nature of Science (11 items)

- Scientific Inquiry: items for this standard will focus on the student's ability to use inquiry processes to formulate and test explanations of nature through observations, experiments, and theoretical or mathematical models. Students will demonstrate the ability to use data in various forms to make and support claims and unbiased conclusions.
- Science, Technology, and Society: items for this standard emphasize the student's ability to evaluate risks and benefits of science and technology in a variety of social contexts. Items will also focus on the variable impacts of consumption patterns, conservation efforts and application of technology in different cultural situations

Depth of Knowledge

DOK Level 1: Recall

Items at the DOK 1 Level require the **recall** of information, such as a fact, definition, term, or a simple procedure, as well as performing a **simple** science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. DOK 1 items may also require that students employ a simple procedure or formula to **reproduce** a previously learned result. It is not left to the student to come up with an original method or solution. A “simple” procedure is well-defined and typically involves only **one-step**. Verbs such as “identify,” “recall,” “recognize,” “use,” “calculate,” and “measure” generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as “describe” and “explain” could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not: that is, the answer does not need to be “figured out” or “solved.” In other words, if the knowledge necessary to answer an item automatically provides the answer to the item, then the item is at Level 1. If the knowledge necessary to answer the item does not automatically provide the answer, the item is at least at Level 2.

DOK Level 2: Use of Concepts and skills

Items at the DOK 2 level require the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is **more complex** than in level 1. DOK 2 Items require students decide what to do, using methods of reasoning and problem solving skills, and to bring together concepts and skills from various domains. Keywords that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Some action verbs, such as “explain,” “describe,” or “interpret,” could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3.

DOK Level 3: Strategic Thinking and Problem Solving

Items at the DOK 3 level require students to employ a higher level of thinking than the previous two levels. **Strategic Thinking** requires deep knowledge using **reasoning, planning, and using evidence to support results**. The cognitive demands at

Level 3 are **complex** and **abstract**. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems.