DC Science

The District of Columbia Assessment of the Next Generation Science Standards

PERFORMANCE LEVEL DESCRIPTORS

DC Science Assessment

Biology

Biology Level 2: Approaching Expectations

A Biology student demonstrates a basic understanding and draws connections between and among science dimensions when applying high school life science Disciplinary Core Ideas, using high school Science and Engineering Practices, and using high school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

A student performing at Level 2 can do things like:

- make a hypothesis and identify tools needed to collect, record, analyze, and evaluate data to support a claim related to the ways that feedback is important for stabilization of a living system (HS-LS1-3)
- explain that energy cannot be created or destroyed and clearly describe how cellular respiration is important to the cell; identify models that correctly illustrate the relationships between systems or components of systems (HS-LS1-7)
- use orders of magnitude and apply algebraic techniques and functions to represent models (a graph is one example) that show that the complex interactions in ecosystems keep the numbers and types of organisms relatively constant over long periods of time (HS-LS2-2)
- apply scientific ideas, principles, and/or evidence, together with knowledge of the basic process of photosynthesis and the fact that changes in matter in a system can be described in terms of the flow of matter into that system, to provide an explanation of a phenomenon (HS-LS2-3)
- describe the fact that cells have chromosomes made of DNA that code for traits and all cells in an organism have the same genetic content; use this information to ask questions that are important in the explanation of a phenomenon; the questions arise from examining models or a theory to clarify relationships (HS-LS3-1)
- use claims, evidence, and reasoning to support currently accepted explanations or solutions; determine the merits of arguments related to the effect of genetic and environmental factors on the distribution of traits (HS-LS3-2)
- read scientific literature critically to determine the central ideas or conclusions and/or to obtain scientific and/or technical information related to the patterns in genetic information as evidence of evolution (HS-LS4-1)
- apply basic math processes to the explanation of patterns in a phenomenon related to variation of genetic information in a population (HS-LS4-3)
- apply scientific ideas, principles, and/or evidence to solve a design problem, identify appropriate constraints in the process, and demonstrate understanding of the ways in which the solution impacts society and the environment (HS-ETS1-3)

Biology Level 3: Meets Expectations

A Biology student performing at Level 3 demonstrates a substantial understanding and relevant reasoning when applying high school life science Disciplinary Core Ideas, using high school Science and Engineering Practices, and using high school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

In addition to the scientific knowledge and practices demonstrated at Level 2, a student performing at Level 3 can do things like:

- describe the design of an experimental investigation and make directional hypotheses to support a claim that predicts the ways in which feedback can stabilize or destabilize a system; describe the type, amount, and accuracy of data needed to quantify the change and rates of change over very short or very long periods of time (HS-LS1-3)
- use evidence to explain that chemical elements are recombined in different ways to form different products, and use models based on evidence to generate data and to illustrate and/or predict the relationships between systems or between components of systems through which matter and energy move from one place to another (HS-LS1-7)
- use mathematical representations at one scale to relate to a model at another scale that show extreme fluctuations in conditions or the size of any population can challenge the functioning of ecosystems in terms of resources and habitat availability (HS-LS2-2)
- make a quantitative and/or qualitative claim regarding dependent and independent variables and use valid evidence, together with knowledge of the basic process of cellular respiration and changes in matter and energy in a system, to construct or revise an explanation related to a phenomenon (HS-LS2-3)
- use empirical evidence and models or theories—together with knowledge of chromosomes, gene expression, and/or regulation—to ask questions and/or develop hypotheses to determine relationships, including quantitative relationships between independent and dependent variables, and/or to evaluate a question related to a phenomenon to determine if it is testable and relevant (HS-LS3-1)
- evaluate and compare claims related to an explanation of a phenomenon that involves the process of meiosis, the sources of genetic variation, and/or the influence of environmental factors on expression of traits; claims are based on empirical evidence and allows for differentiation of cause and correlation (HS-LS3-2)
- compare, integrate, and/or evaluate information related to the use of patterns in DNA sequences of different organisms in order to analyze lines of descent; use changes in patterns of DNA sequences as evidence for causality in explanations of phenomena (HS-LS4-1)
- apply concepts of statistics and probability to scientific questions related to patterns observed at each of the scales at which a system is studied; the patterns relate to an explanation of a phenomenon that involves variation in the expression of genetic information, traits that affect survival, and changes in the proportion of individuals with or without the trait over time (HS-LS4-3)

- evaluate a design solution analyzing costs and benefits, taking into account 2 or more constraints, including cost, safety, reliability, and aesthetics, and considering social, cultural, and environmental impacts (HS-ETS1-3)

Biology Level 4: Exceeds Expectations

A Biology student performing at Level 4 demonstrates thorough understanding and sophisticated reasoning when applying high school life science Disciplinary Core Ideas, using high school Science and Engineering Practices, and using high school Crosscutting Concepts to make sense of phenomena or address solutions in the natural or designed world. A complete list of Science and Engineering Practices and Crosscutting Concepts is provided in Table 1.

In addition to the scientific knowledge and practices demonstrated at Level 3, a student performing at Level 4 can do things like:

- analyze data intended to support a claim in relation to the effects of a change in external conditions on a living system; evaluate the limitations on the precision of the data (e.g., number of trials, cost, risk, time), identifies confounding variables or effects, and propose refinements to the investigation design to fully support the claim. (HS-LS1-3)
- predict the flow of matter and energy through the various organizational levels of living systems. As the products of photosynthesis are used as reactants in cellular respiration and as matter is cycled, there is a net transfer of energy. The student uses evidence to evaluate the merits, limitations, and reliability of two different models of the relationships between systems or between components of a system through which energy and matter flow in order to select or revise a model that best fits the evidence or design criteria. (HS-LS1-7)
- test, evaluate, and/or revise mathematical and/or computational representations of models at two different scales, describe the relationship between the two models, and use these comparisons to predict whether a given disturbance to an ecosystem will challenge the functioning of the ecosystem in terms of resources and habitat availability (HS-LS2-2)
- apply scientific reasoning, theory, and/or models and use the relationship between photosynthesis and cellular respiration, together with the knowledge that changes in matter and energy in a system result from changes in matter and energy that flows into or out of that system, in relation to an explanation of a phenomenon (HS-LS2-3)
- describe empirical evidence and models or theories that, when taken together with knowledge of chromosomes, gene expression, or regulation, would allow the student to ask, evaluate, compare, and/or revise questions or hypotheses related to a phenomenon (HS-LS3-1)
- evaluate, revise, and/or compare competing explanations based on claims related to an explanation of a phenomenon that requires the student to predict the effects of swapping of chromosomes during meiosis, errors that occur during DNA replication, and/or changes in environmental factors; describe empirical evidence and reasoning that could be used for differentiation of cause and correlation (HS-LS3-2)
- evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or design in relation to similarities and differences in amino acid sequences, along with anatomical and embryological evidence, in order to make predictions of causality and infer evolutionary relationships (HS-LS4-1)

- consider the limitations of data analysis and compare and contrast various types of data sets to examine consistency of measurements and observations related to the effects of changing environmental conditions on the relative proportion of genetic information, genetic expression, the link between a trait and reproductive success, and/or organism and population survival (HS-LS4-3)
- refines a design solution analyzing costs and benefits, taking into account 3 or more constraints including cost, safety, reliability, and aesthetics, considering social, cultural, and environmental impacts, and predicting the ways in which the design solution impacts society and the environment (HS-ETS1-3)

Table 1. NGSS Science and Engineering Practices and Crosscutting Concepts

Science and Engineering Practices	Crosscutting Concepts
Analyzing and Interpreting Data	Cause and Effect
Asking Questions and Defining Problems	Energy and Matter
Constructing Explanations and Designing Solutions	Patterns
Developing and Using Models	Scale, Proportion, and Quantity
Engaging in Argument from Evidence	Stability and Change
Planning and Carrying Out Investigations	Structure and Function
Obtaining, Evaluating, and Communicating Information	Systems and System Models
Using Mathematics and Computational Thinking	