DISTRICT OF COLUMBIA
OFFICE OF THE STATE SUPERINTENDENT OF
EDUCATION

DC Science

The District of Columbia Assessment of the Next Generation Science Standards

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Assessment Design and Blueprints
High School Biology

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DC Science

The District of Columbia Assessment of the Next Generation Science Standards

What is DC Science?

DC Science is the District of Columbia's statewide assessment of the Next Generation Science Standards (NGSS). It is an online assessment that focuses on sense-making and problem solving in science.

As students explore the NGSS learning standards, called Performance Expectations (PEs), they learn to make sense of natural phenomena and solve problems using approaches that scientists use. During the test, students use scientific principles, skills, and behaviors to observe phenomena, generate questions, conduct investigations, create models, predict outcomes, analyze results, and engage in argumentation and communication. The DC Science assessment presents students with tasks that are built around scientific phenomena as well as engineering design challenges. Tasks are arranged into clusters of item clusters designed to address NGSS's three-dimensional approach to the application of knowledge and practice -- an approach that integrates Disciplinary Core Ideas (DCI), Science and Engineering Practices (SEP), and Crosscutting Concepts (CCC). As students work through these multidimensional clusters of items, they use scientific principles, skills, and behaviors to make sense of scientific phenomena and propose solutions to engineering design problems.

How is DC Science Administered?

DC Science assessments is administered through Pearson TestNav, the same online platform that students use for the Partnership for Assessment of Readiness for College and Careers (PARCC) assessments in English Language Arts and Mathematics. Much like PARCC, DC Science offers a suite of testing accommodations and features to make the assessment accessible for all students.

Who Takes DC Science?

The DC Science is administered to students in grades five and eight and to students enrolled in high school biology.

DC Science Assessment Claims Structure

Biology Assessment: *High School Life Science NGSS Content*

Master Claim

Students will use *Life Science* principles, skills, and behaviors to make sense of phenomena and address real-world problems.

Biology Assessment Blueprint: *High School Life Science NGSS Content*

NGSS Life Science Topics *(scientific principles, skills, and behaviors for each)*	**Percentage of PEs per Topic in the NGSS**	**Percentage of PEs per Topic on the DC Science Assessment**	**Number of Item Clusters***	**Total Raw Score Points ****
From Molecules to Organisms: *Structures and Processes*	29%	25% - 35%	9	81
Ecosystems: *Interactions, Energy & Dynamics*	33%	30% - 35%		
Heredity: *Inheritance and Variation and Traits*	13%	10% - 15%		
Biological Evolution: *Unity & Diversity*	25%	20% - 30%		

**Each item cluster is composed of 6 items. Each test form will include item clusters that target content from all four Life Science Topics and Engineering Design.*
***Items have a range of scores from 1 to 3 raw score points.*

Assessment Standards

Biology Assessment: Assessed Performance Expectations from High School NGSS

The NGSS Performance Expectations are learning goals that describe what students should be able to do by the end of instruction. Each performance expectation describes how students purposely engage in the practices, apply the crosscutting concepts and use their understanding of core ideas to make sense of the world and address real-world problems. The table shows the NGSS Performance Expectations that are assessed in the DC Science Biology assessment.

Life Science		**Engineering, Technology, & Applications of Science**
HS-LS1-1	HS-LS2-6	HS-ETS1-1
HS-LS1-2	HS-LS2-7	HS-ETS1-3
HS-LS1-3	HS-LS2-8	HS-ETS1-4
HS-LS1-4	HS-LS3-1	HS-ETS1-2
HS-LS1-5	HS-LS3-2	
HS-LS1-6	HS-LS3-3	
HS-LS1-7	HS-LS4-1	
HS-LS2-1	HS-LS4-2	
HS-LS2-2	HS-LS4-3	
HS-LS2-3	HS-LS4-4	
HS-LS2-4	HS-LS4-5	
HS-LS2-5	HS-LS4-6	

Please refer to pages 8-9 for details on how the DC Science addresses the NGSS dimensions.

Item Cluster Structure: Item Types and Number of Raw Score Points

This table contains information about the item types included in each item cluster:

Item Type		Number of Items in a Cluster	Number of Raw Score Points for Each Item	Total Number of Raw Score Points
Selected-Response Items	Multiple Choice / Multiple Select* Students select one correct answer from among several options.	2	1	2
	Technology Enhanced* Students taking the computer-based tests respond to items using technology such as drag-and-drop, hot spot, and drop-down menus.	2	1	2
		1	2	2
Constructed-Response Items	Constructed Response** Students write a response to a multi-part item.	1	3	3
Total for each Cluster		6		9

**These item types are machine-scored.*
***Constructed-response items are hand-scored.*

Test Form Structure: Units, Item Clusters, and Number of Raw Score Points

This tables shows the point structure of the DC Science assessment forms:

Unit	Number of Item Clusters	Number of Items	Number of Raw Score Points	Purpose
A	3	18	27	Individual Reporting
B	3	18	27	
C	3	18	27	
D*	3	18		Field Testing

** The field-test unit will be randomly placed.*

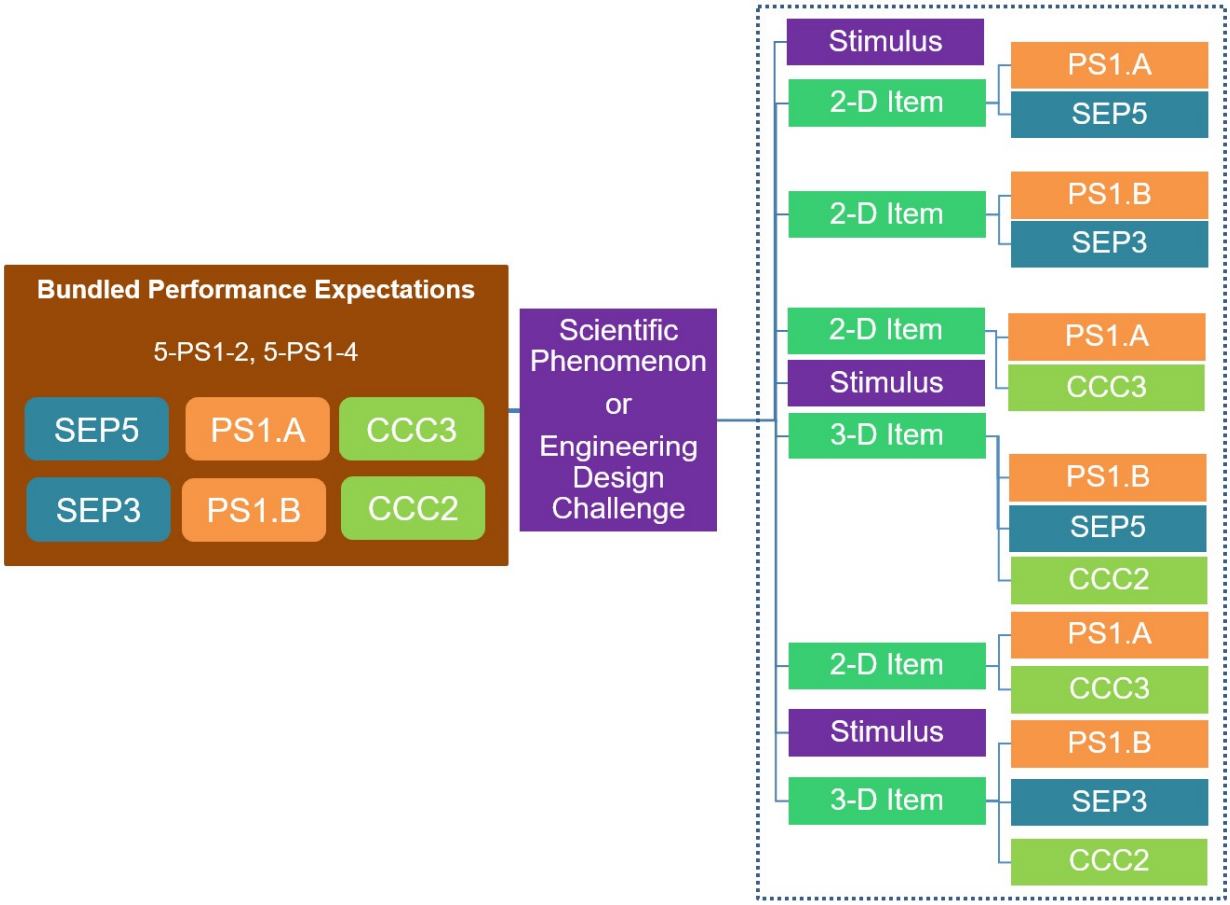
Item Clusters Design

Item clusters are designed to assess a NGSS Performance Expectation (PE) bundles and constitute the building blocks of the DC Science assessment. A PE bundle is usually made of two or three related PEs that are used to explain or make sense of a scientific phenomenon or to design a solution to a problem presented in the stimulus. The six items in an item cluster are designed around the ideas presented in the stimulus. Although the items are independent from each, they are structured to support a student's progression through the item cluster.

Students are asked to make sense of phenomena by using the science and engineering practices (SEP), disciplinary core ideas (DCI), and crosscutting concepts (CCC) represented in the PE bundle. PEs are bundled within the Life Science domain. PE bundles sometimes share a similar practice or crosscutting concept or may include multiple practices or crosscutting concepts. Each item within the cluster will align to two or three dimensions (2-D, 3-D).

This Sample Item Cluster Map shows how the items in a sample cluster work together to achieve a full representation of dimensionalities in a two-PE bundle.

Sample Item Cluster Map



Test Form Design: Operational and Field Test Units

The DC Science assessment uses a fixed-form design. Each operational test form will contain the same item clusters in a given year.

Test Units

The DC Science assessment will be composed of four units. In each unit, students will encounter three item clusters. Three of the four units will contribute to the individual student score. Each unit can yield up to 27 raw score points.

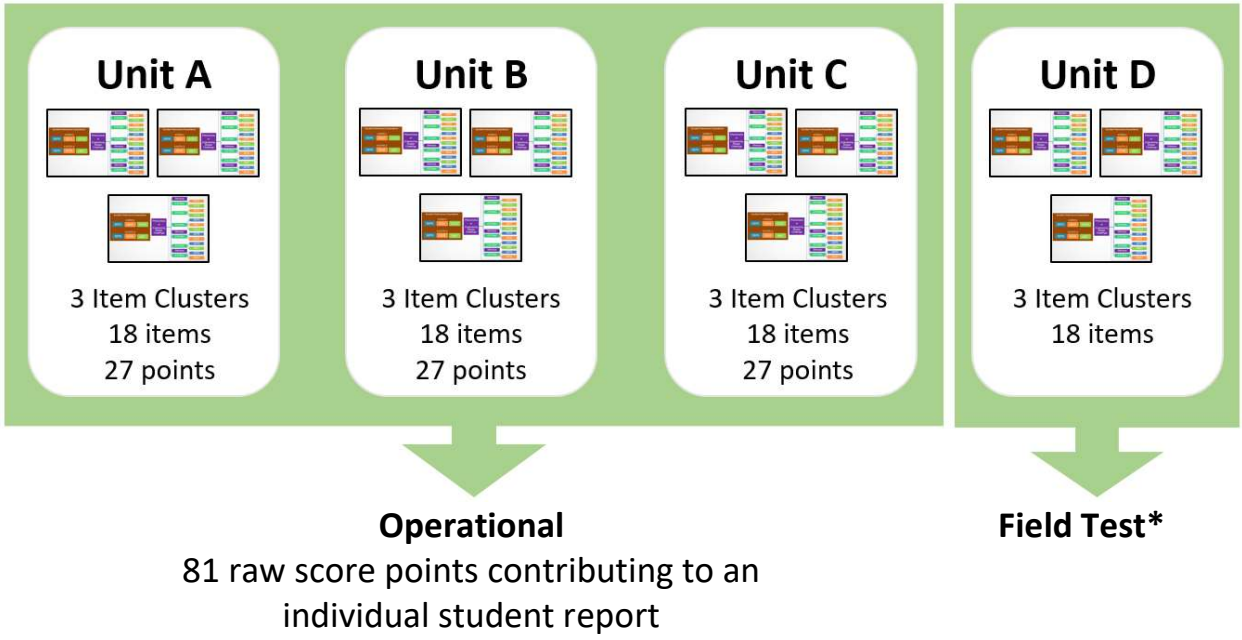
Field Test Items

Operational test forms will contain one unit of embedded field test items. As in the other units of the assessment, the field test unit will have 3 item clusters. The field test items will not contribute to the student's score. The field-test unit will be randomly placed in the test.

Testing Times

The DC Science assessment is intended to be administered online in four sessions. The 180-minute administration time allows 45 minutes for each unit of the test. Contact your district testing coordinator for further information on the specific test schedule for your district or building.

Operational Test Form



** The field-test unit will be randomly placed.*

NGSS Performance Expectations and Three-Dimensional Performance

The DC Science assessment is composed of sets of items that are related to a stimulus (phenomenon or engineering design challenge) and are aligned to two or more of the NGSS performance expectations (PE) and use them to elicit evidence of student achievement with respect to the NGSS standards.

PEs provide descriptions of what students should be able to do by the end of instruction for a given grade level or grade band, and are designed "to gather evidence of students' ability to apply the Science and Engineering Practices (SEP) and their understanding of the Crosscutting Concepts (CCC) in the contexts of specific applications in multiple disciplinary areas." (National Research Council, 2012, p. 218).

NGSS performance expectations, appendices, evidence statements, and supporting documents are used to guide the development of the DC Science assessment and add to the framework of reporting results for students, teachers, and others.

The following tables show the learning targets of this assessment including Science and Engineering Practices (SEP), Crosscutting Concepts (CCC), and Disciplinary Core Ideas (DCI). Additionally, the NGSS Tasks Analysis Guide that is used to determine the cognitive demand of the DC Science assessment tasks, is also provided.

Science and Engineering Practices (SEP)

The practices are what students do to make sense of phenomena. They are both a set of skills and a set of knowledge to be internalized. The SEPs reflect the major practices that scientists and engineers use to investigate the world and design and build systems.

Science and Engineering Practices	
1	Asking Questions and Defining Problems
2	Developing and Using Models
3	Planning and Carrying out Investigations
4	Analyzing and Interpreting Data
5	Using Mathematics and Computational Thinking
6	Constructing Explanations and Designing Solutions
7	Engaging in Argument from Evidence
8	Obtaining, Evaluating, and Communicating Information

For more information on the Science and Engineering Practices, see Appendix F of the NGSS (nextgenscience.org/sites/default/files/resource/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf).

Disciplinary Core Ideas (DCI)

The fundamental ideas that are necessary for understanding a given science discipline. The core ideas all have broad importance within or across science or engineering disciplines, provide a key tool for understanding or investigating complex ideas and solving problems, relate to societal or personal concerns, and can be taught over multiple grade levels at progressive levels of depth and complexity.

Disciplinary Core Ideas	
Life Sciences	
LS1	From molecules to organisms: Structures and processes
LS2	Ecosystems: Interactions and variation of traits
LS3	Heredity: Inheritance and variation of traits
LS4	Biological evolution: Unity and diversity
Engineering, Technology, and Applications of Science	
ETS1	Engineering design
ETS2	Links among engineering, technology, science, and society

For more information on the Disciplinary Core Ideas, see the Framework (https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts) or Appendix E of the NGSS (nextgenscience.org/sites/default/files/resource/files/AppendixE-ProgressionswithinNGSS-061617.pdf).

Crosscutting Concepts (CCC)

These are concepts that hold true across the natural and engineered world. Students can use them to make connections across seemingly disparate disciplines or situations, connect new learning to prior experiences, and more deeply engage with material across the other dimensions. The NGSS requires that students explicitly use their understanding of the CCCs to make sense of phenomena or solve problems.

Crosscutting Concepts	
1	Patterns
2	Cause and Effect
3	Scale, Proportion, and Quantity
4	Systems and System Models
5	Energy and Matter
6	Structure and Function
7	Stability and Change

For more information on the Crosscutting Concepts, see Appendix G of the NGSS (nextgenscience.org/sites/default/files/resource/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf).

NGSS Tasks Analysis Guide

This framework is used to demine the cognitive demand of NGSS tasks that focus on sense-making and problem solving.

Cognitive Demand Levels	Task Description	Number of NGSSS Dimensions Used in Completing the Task	Definitions
5*	Task involves Doing Science	3	**Doing Science:** Students use scientific principles, skills, and behaviors to independently make sense of relevant phenomena and/or address real-world problems building rich and elaborated content knowledge.
4	Task involves Integrated Understanding	3	**Integrated Understanding**: Students are engaged in higher-level thinking with less reliance on scaffolds. Students are required to integrate their understanding of practice with their understanding of content to make sense of phenomena and/or solve engineering problems. The task may ask students to conduct investigations, create models, make predictions, generate interpretations, and propose solutions.
3	Task involves Guided Understanding	2 or 3	**Guided Understanding**: Students are engaged in higher-level thinking using scaffolds. These may include USING a model, USING data, and USING information to develop an explanation, USING science content to construct an argument or to formulate a solution to a problem. The tasks provide scaffolds by TELLING or PROVIDING the students something and asking for the REST OF IT.
2	Task involves Scripted Understanding	2	**Scripted Understanding:** Students are provided, well-defined set of actions or procedures that they need to take, usually in a given order, to complete a given task. A student can follow those actions and reach the desired answer without really knowing how or why the script leads to that answer.
1*	Task involves Memorization and Recall	1	**Memorization and Recall:** Students are asked to reproduce definitions, formulas, explanations of practices, and principles about particular content they have previously seen.

Based on: Tekkumru-Kisa, Miray & Stein, Mary & Schunn, Christian. (2015). A framework for analyzing cognitive demand and content-practices integration: Task analysis guide in science: TASK ANALYSIS GUIDE IN SCIENCE. Journal of Research in Science Teaching. 52. 10.1002/tea.21208.

** This type of task is not used in NGSS large scale assessments*

Testing Accommodations, Accessibility Features, and Administrative Considerations

This table shows the accommodations that are available for the DC Science assessment. For more information about each accommodation and its eligibility criteria, including instructions for IEP teams in selecting appropriate accommodations, please access resources on the OSSE Testing Accommodations website: https://osse.dc.gov/service/testing-accommodations.

Accessibility Features Available to All Students

Presentation
▪ Answer masking ▪ Student reads assessment aloud to self ▪ Color contrast ▪ Audio amplification and audio speed control ▪ Magnifier ▪ General masking ▪ Answer eliminator ▪ Bookmark tool ▪ Highlight tool ▪ Line reader tool ▪ Redirect student to test

Administrative Considerations

Setting	Timing and Scheduling	Presentation
▪ Separate /alternate location ▪ Small group testing ▪ Specialized equipment or furniture ▪ Specified area or setting ▪ Headphones or noise buffer	▪ Time of day ▪ Each unit may be administered on a separate day ▪ Frequent breaks	▪ Directions clarified by test administrator ▪ Human reader or human signer ▪ Redirect student to test

Accommodations for Students with Disabilities (IEP or 504) and English Language Learners (ELs) with EL Plans

Setting	Timing and Scheduling	Presentation	Response	English Language Learners
▪ Unique accommoda-tion request	▪ Extended time ▪ Unique accommoda-tion request	▪ Directions not available in ASL: Use human signer for test directions ▪ Screen reader available as text-to-speech ▪ Paper-based edition ▪ Large print edition ▪ Hard-copy Braille edition with tactile graphics ▪ Directions read-aloud and repeated as needed by test administrator ▪ Unique accommoda-tion request	▪ Use of calculator on non-calculator sections ▪ Answers recorded in test book: Must be transcribed into online form ▪ Braille writer or note-taker device not available: Use human scribe ▪ Word prediction external device ▪ Unique accommoda-tion request	▪ Spanish online ▪ Spanish paper edition ▪ Extended time ▪ General administration directions clarified in student's native language (by test administrator) ▪ General administration directions read aloud and repeated as needed in student's native language (by test administrator) ▪ Human reader in Spanish