Next Generation Science Standards and Science Content

Rhode Island Interim Assessment Workshop
September 18, 2013

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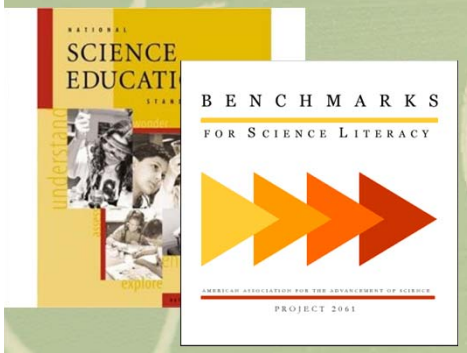
Rhode Island Department of Education

Agenda

- Brief overview on how the standards were developed.
- What makes these standards so different?
- What does a standard look like?
- Activity - Looking at NGSS aligned interim items
- Resources

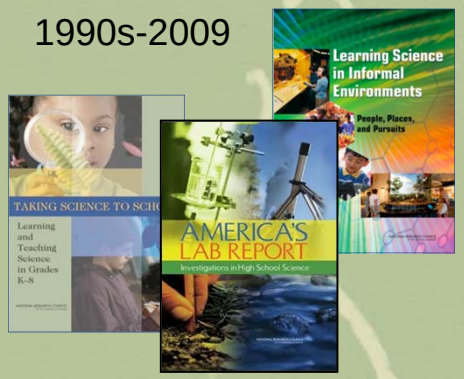
Next Generation Science Standards:

Building on the Past; Preparing for the Future

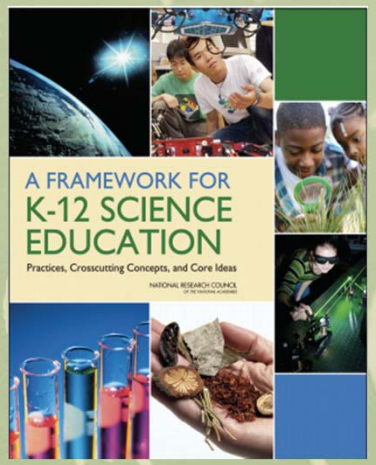


1990s

1990s-2009



Step I



1/2010 - 7/2011

Step II

NEXT GENERATION SCIENCE STANDARDS

For States, By States

7/2011 – April, 2013

RHODE ISLAND BOARD OF REGENTS ELEMENTARY AND SECONDARY EDUCATION

New Definition of Competence

- The NRC Science Framework & NGSS have proposed descriptions of student competence as being the intersection of knowledge involving:
  - **important science and engineering practices**
  - **core disciplinary ideas,**
  - **and crosscutting concepts** with
  - **performance expectations** representing the intersection of the three.
- Both the Framework and the NGSS view competence as something that develops over time & increases in sophistication and power as the product of coherent curriculum & instruction

Goals for Teaching & Learning

- **Coherent investigations of core ideas across multiple years of schooling**
- **More seamless blending of practices with core ideas**
- **Performance expectations that require reasoning with core disciplinary ideas**
  - explain, justify, predict, model, describe, prove, solve, illustrate, argue, etc.

Dimension 1: Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
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 (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Dimension 2: Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change

Dimension 3: Disciplinary Core Ideas

Life Science	Physical Science
LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity and Diversity	PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves and Their Applications in Technologies for Information Transfer
Earth & Space Science	**Engineering & Technology**
ESS1: Earth's Place in the Universe ESS2: Earth's Systems ESS3: Earth and Human Activity	ETS1: Engineering Design ETS2: Links Among Engineering, Technology, Science, and Society

MS.Structure and Properties of Matter

MS.Structure and Properties of Matter

Students who ~~demonstrate understanding can:~~

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)

~~Obtaining, Evaluating, and Communicating~~ Information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit ~~and validity of ideas and methods.~~

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2.)*
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)

PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-3) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2 and MS-PS1-5.)*

PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. *(secondary to MS-PS1-4)*
- The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. *(secondary to MS-PS1-4)*

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

Scale, Proportion, and Quantity

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

Structure and Function

- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

What does an NGSS standard look like?

- **The Performance Expectation**
  - The Clarification Statement within the PE and the
  - The Assessment Boundary
- **Along with the associated:**
  - Practice(s)
  - Disciplinary Core Idea(s)
  - Crosscutting Concepts

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
[Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include water, carbon dioxide, and helium.]

PRACTICE:	DCI:	Crosscutting Concept:
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • → Develop a model to predict and/or describe phenomena. (MS-PS1-4)	**PS1.A: Structure and Properties of Matter** • → Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) • → In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)	**Cause and Effect** • → Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

What is Assessed With the GSEs

PS1 (5-8) SAE+MAS – 4

Represent or explain the relationship between or among energy, molecular motion, temperature, and states of matter.

Grade Span Expectations (5-8)	
PS1 (5-6) – 4 **Students demonstrate an understanding of states of matter by …** **4a** differentiating among the characteristics of solids, liquids, and gases. **4b** predicting the effects of heating and cooling on the physical state, volume and mass of a substance.	**PS1 (7-8) – 4** **Students demonstrate an understanding of states of matter by …** **4a** creating diagrams or models that represent the states of matter at the molecular level. **4b** explaining the effect of increased and decreased heat energy on the motion and arrangement of molecules. **4c** observing the physical processes of evaporation and condensation, or freezing and melting, and describe these changes in terms of molecular motion and conservation of mass.

A look at NGSS aligned items

Contexts and Purposes for Interim Assessment

- Educational assessment typically occurs in multiple contexts:
  - Small scale: individual classrooms
  - Intermediate-scale: districts
  - Large-scale: states, nations

- Within and across contexts it can be used to accomplish differing purposes:
  - Assist learning (formative)
  - Measure individual achievement (summative)
  - Evaluate programs (accountability)

Interim Assessment in Science

Purpose

- **Develop NGSS-Aligned assessment items that**
  - will support an NGSS aligned curriculum but
  - target concepts and skills defined in curricula aligned to the RI GSEs
  - will <u>inform</u> teachers of student understanding of concepts and skills
  - provide rapid turnaround in results
  - pinpoint areas where students need support

Let's look at an item

measured progress

Asset #117049A - RIIA Test Construction Tool Items, Science, Grade 6-8 Physical Science, SEQ #: 6 On Scale: N, Equating Eligible: N

Asset Type: Constructed Response 4 Point(s) / Calculator: N/A
MS-PS2-1 (NGSS Performance Expectations): Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]
CCC4.6-8.b (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), PS2.A.6-8.a (NGSS Physical Sciences DCI), SEP6.6-8.d (NGSS Science and Engineering Practices), DOK3 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

6. In a football game, one player carrying the football is tackled by another player. The two players had equal masses and were running toward each other at the same speed.

   a. Predict what will happen when the two players meet. Explain your answer.

   b. Explain why padding helps to protect players from injury during collisions such as this.

Constructing Explanations and Designing Solutions

- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)

PS2.A: Forces and Motion

For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)

5th Grade Example

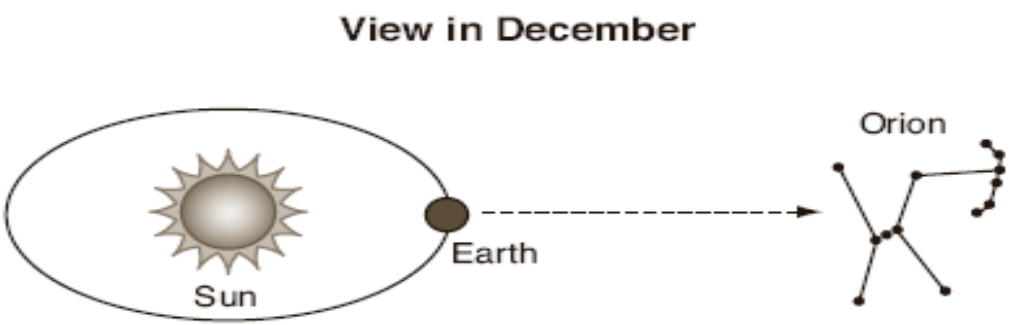
measured progress

Asset #115756A - RIIA Test Construction Tool Items, Science, Grade 5, SEQ #: 3 On Scale: N, Equating Eligible: N

Asset Type: Constructed Response 4 Point(s) / Calculator: N/A
5-ESS1-2 (NGSS Performance Expectations): Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]
CCC1.3-5.a (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), ESS1.B.3-5.a (NGSS Earth and Space Sciences DCI), SEP7.3-5.a (NGSS Science and Engineering Practices), DOK3 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

3. A student drew this diagram to show Earth in its orbit around the Sun and how the constellation Orion is seen from Earth in December. The student researched how many hours Orion is visible in one night in different months. She recorded her results in the table.



Month	Hours Orion Visible
January	11.6
March	6.9
May	1.7
July	0
September	5.3
November	9.4

a. Make a bar graph of the student's data. Include a label for each of the six months in the data.

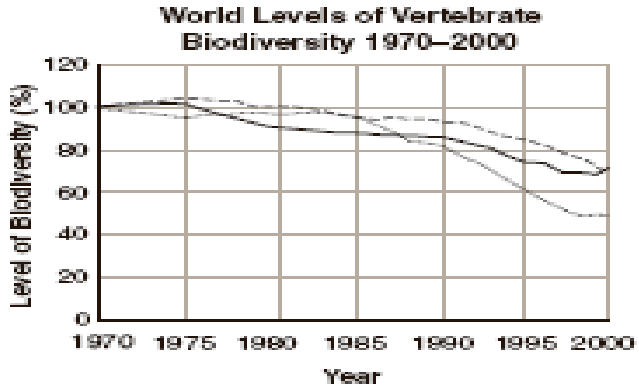
b. Describe the pattern in the bar graph and use it to estimate how many hours Orion is visible on a night in October.

High School Example

Asset Type: Multiple Choice 1 Point(s) / Key(s): C / Calculator: N/A
HS-LS2-2 (NGSS Performance Expectations): Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]
CCC3.9-12.b (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), LS2.C.9-12.a (NGSS Life Sciences DCI), SEP5.9-12.b (NGSS Science and Engineering Practices), DOK3 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

9. This graph below shows changes in levels of biodiversity of three groups of vertebrate species. Levels of biodiversity were based on population sizes.



Key
Marine vertebrate species
Fresh water vertebrate species
Terrestrial vertebrate species

Which statement is **best** supported by the data in the graph?

A. The biodiversity is increasing, because biodiversity for all groups leveled at around 70% from 1970 to 2000.

B. The biodiversity is stable, because biodiversity for terrestrial vertebrates held relatively steady from 1970 to 2000.

C. The biodiversity is decreasing, because biodiversity for all vertebrates declined at increasing rates from 1970 to 2000.

D. The biodiversity only changed in marine vertebrates, because biodiversity for marine vertebrates decreased more than the others from 1970 to 2000.

Now...you try

Use the standards to answer the following

Key questions:

- Does the item align with the practice?
- Does the item align with the disciplinary core idea?
- Does the item follow the clarification statement?
- Is the item within the assessment boundary?
- Do the graphics (tables, charts, diagrams) provide context?
- Does the item provide useful information on student learning?
- Is the DOK appropriate?

Use the Standard (4-LS1-1) to Review the Grade 4 Item

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]		
PRACTICE: Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • → Construct an argument with evidence, data, and/or a model. (4-LS1-1)	DCI: LS1.A: Structure and Function • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)	Crosscutting Concept: Systems and System Models • A system can be described in terms of its components and their interactions. (4-LS1-1)

Use the Standard (MS-LS4-4) to Review the Middle School Item

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

PRACTICE:	DCI:	Crosscutting Concept:
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • → Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)	**LS4.B: Natural Selection** • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)	**Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4)

Use the Standard (HS-PS4-1) to Review the High School Item

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

PRACTICE:	DCI:	Crosscutting Concept:
Using Mathematics and Computational Thinking Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • → Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-PS4-1)	**PS4.A: Wave Properties** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PS4-1)	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS4-1)

Here are the assessment items for review…

Grade 4 – Review using the questions and standard 4-LS1-1

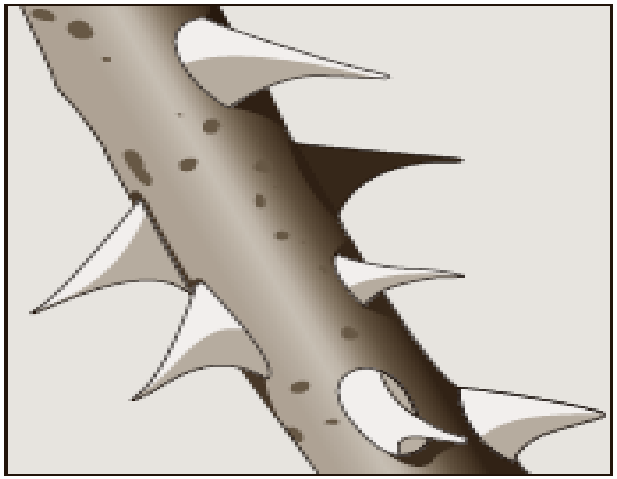
measured progress

Asset #315772A - RIIA Test Construction Tool Items, Science, Grade 4, SBQ #: 9 On Scale: N, Equating Eligible: N

Asset Type: Multiple Choice 1 Point(s) / Key(s): D / Calculator: N/A
4-LS1-1 (NGSS Performance Expectations): Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
CCC4.3-5.a (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), LS1.A.3-5.a (NGSS Life Sciences DCI), SEP7.3-5.a (NGSS Science and Engineering Practices), DOK2 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

9. The diagram below shows the thorns on a rose.



A student thinks that the thorns could be used for reproduction, support, growth, or protection. The student plans an investigation to determine the purpose for thorns. The student observes two groups of wild roses. One group that has thorns and one group with out thorns. At the end of the summer, the student observes that the roses with thorns are taller, had more flowers, and have more branches than the roses with out thorns.

Which argument is best supported by the investigation?

A. reproduction—by helping the plant spread the seeds
B. support—by making the plant grow towards the sun
C. growth—by helping the plant to grow larger and taller
D. protection—by making it less likely the plant will be eaten

Middle School LS – Review using the questions and standard MS-LS4-4

measured progress

Asset #117002A - RIIA Test Construction Tool Items, Science, Grade 6-8 Life Sciences, SEQ #: 23 On Scale: N, Equating Eligible: N

Asset Type: Multiple Choice 1 Point(s) / Key(s): C / Calculator: N/A
MS-LS4-4 (NGSS Performance Expectations): Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]
CCC2.6-8.c (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), LS4.B.6-8.a (NGSS Life Sciences DCI), SEP6.6-8.a (NGSS Science and Engineering Practices), DOK3 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

23. A population of seabirds built nests on an island with no predators. The birds build their nests on the ground. Due to human activity, rats were introduced to the island. The rats started to prey on the chicks when both parents left the nests to feed. There are two behavioral changes in the birds after the introduction of rats.

- One variation caused a behavioral change in adults such that the parents will only leave the nest to feed one at a time.
- Another variation caused a behavioral change in baby birds such that they will agressively squawk and peck at the heads of rats.

Which statement **best** supports that one survival strategy is better than the other?

A. A larger percentage of aggressive chicks rather than guarded chicks survived after reaching two weeks of age.

B. A larger percentage of aggressive chicks rather than guarded chicks survived until they could fly on their own.

C. A larger percentage of chicks from guarded nests rather than aggressive chicks survived until they reproduced.

D. A larger percentage of chicks from guarded nests rather than aggressive chicks survived the first week after hatching.

High School LS – Review using the questions and standard HS-PS4-1

measured progress

Asset #117890A - RIIA Test Construction Tool Items, Science, High School Physical Sciences, SEQ #: 23 On Scale: N, Equating Eligible: N

Asset Type: Multiple Choice 1 Point(s) / Key(s): A / Calculator: N/A
HS-PS4-1 (NGSS Performance Expectations): Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]
CCC2.9-12.a (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), PS4.A.9-12.a (NGSS Physical Sciences DCI), SEP5.9-12.b (NGSS Science and Engineering Practices), DOK3 (DOK - Science)
Batch #: 0

Sample Type	Released
In Development	No

23. A light ray travels through a vacuum at a velocity of 3.00×10^8 m/s and has a wavelength of 5.20×10^{-7} m. When it passes into a certain type of glass it slows to 1.82×10^8 m/s, but its frequency remains the same.

The frequency and wavelength of light are related by the equation: $v = f \cdot \lambda$ where v is the velocity of light, f is the frequency, and λ is the wavelength.

What is the wavelength of the light in the glass?

A. 3.16×10^{-7} m

B. 5.20×10^{-7} m

C. 1.92×10^{6} m

D. 3.16×106 m

Ready to see how your review compares with RIDE's review?

4-LS1-1

measured progress

Asset #115772A - RIIA Test Construction Tool Items, Science, Grade 4, SEQ #: 9 On Scale: N, Equating Eligible: N

Asset Type: Multiple Choice 1 Point(s) / Key(s): D / Calculator: N/A
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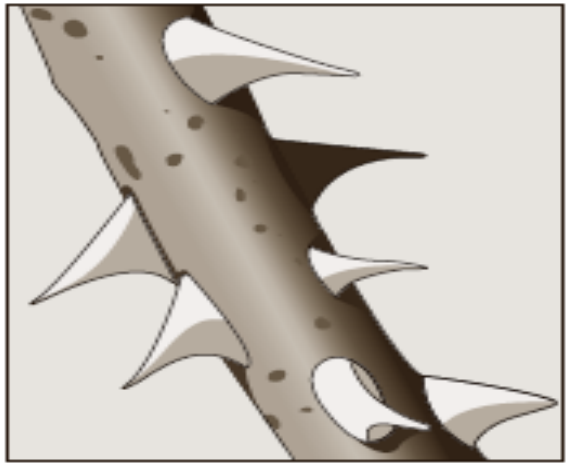
CCC4.3-5.a (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), LS1.A.3-5.a (NGSS Life Sciences DCI), SEP7.3-5.a (NGSS Science and Engineering Practices), DOK2 (DOK - Science)
Batch #: 0

Engaging in argument from evidence in 3 -5 builds on K -2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Construct an argument with evidence, data, and/or a model. (4-LS1-1)

9. The diagram below shows the thorns on a rose.

• Incorporate a bit more evidence on the non-thorn roses. This would be a basic DOK 1, low information item if they know what purpose thorns play.



Suggest adding another picture. These items should have models for the students to use so that they have evidence to support their arguments. 4th graders still need visuals, the reading needs to be supported with some visuals in science.

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MS-LS4-4

measured progress

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Asset Type: Multiple Choice 1 Point(s) / Key(s): C / Calculator: N/A
MS-LS4-4 (NGSS Performance Expectations): Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]
CCC2.6-8.c (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), LS4.B.6-8.a (NGSS Life Sciences
D
B

REWRITE:
The DCI is about natural selection: Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4). The item as written is describing adaptation.

The information is totally disconnected with huge jumps in between. Either add more clarifying language or put this into a visual of some sort (a table or graph). Where is the evidence upon which the explanation can be constructed?

23. A population of seabirds built nests on an island with no predators. The birds build their nests on the ground. Due to human activity, rats were introduced to the island. The rats started to prey on the chicks when both parents left the nests to feed. There are two behavioral changes in the birds after the introduction of rats.

- One variation caused a behavioral change in adults such that the parents will only leave the nest to feed one at a time.
- Another variation caused a behavioral change in baby birds such that they will agressively squawk and peck at the heads of rats.

Which statement **best** supports that one survival strategy is better than the other?

A. A larger percentage of aggressive chicks rather than guarded chicks survived after reaching two weeks of age.

B. A larger percentage of aggressive chicks rather than guarded chicks survived until they could fly on their own.

C. A larger percentage of chicks from guarded nests rather than aggressive chicks survived until they reproduced.

D. A larger percentage of chicks from guarded nests rather than aggressive chicks survived the first week after hatching.

HS-PS4-1

measured progress

Asset #117890A - RIIA Test Construction Tool Items, Science, High School Physical Sciences, SEQ #: 23 On Scale: N, Equating Eligible: N

Asset Type: Multiple Choice 1 Point(s) / Key(s): A / Calculator: N/A
HS-PS4-1 (NGSS Performance Expectations): Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]
CCC2.9-12.a (NGSS Crosscutting Concepts and Engineering, Technology, and Applications of Science), PS4.A.9-12.a (NGSS Physical

REWRITE
The intent of this PE is to support a claim regarding relationships among frequency, wavelength, and speed. This item is a typical formula manipulation problem. This would be better represented by the practice as a constructed response.

23. A light ray travels through a vacuum at a velocity of 3.00×10^8 m/s and has a wavelength of 5.20×10^{-7} m. When it passes into a certain type of glass it slows to 1.82×10^8 m/s, but its frequency remains the same.

The frequency and wavelength of light are related by the equation: $v = f \cdot \lambda$ where v is the velocity of light, f is the frequency, and λ is the wavelength.

What is the wavelength of the light in the glass?

A. 3.16×10^{-7} m

B. 5.20×10^{-7} m

C. 1.92×10^{6} m

D. 3.16×106 m

Discussion

Resources

Interim Assessment Website

- http://www.ride.ri.gov/InstructionAssessment/Assessment/InterimAssessment.aspx

NGSS Resources

- **RIDE NGSS Website**
  - http://www.ride.ri.gov/InstructionAssessment/Science/NextGenerationScienceStandards.aspx
- **Next Generation Science Standards**
  - http://www.nextgenscience.org/
- **NGSS@NSTA**
  - http://ngss.nsta.org/
  - http://ngss.nsta.org/access-standards/
- **Council of State Science Supervisors**
  - http://www.csss-science.org/bcsse/
- **RI Science Teachers Association**
  - www.rista.us

Thank You!

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