Next Generation Science Standards (NGSS)

2017 Assessment Overview

Grades 5 and 8

Maryland's Vision for NGSS

The ever-changing world of the 21st century demands increased proficiency in science, technology, engineering, and mathematics (STEM) for all. Maryland's vision is to continue to be an international leader in science literacy and STEM education and to produce a college- and career-ready citizenry. Implementation of the *Next Generation Science Standards* will ensure that all Maryland students have the essential knowledge and understanding of science and engineering necessary to engage in public discussions on science-related issues, to be critical consumers of scientific information related to their everyday lives, and to become lifelong learners and global leaders.

What Does This Mean For Instruction?

In our classrooms we are shifting from “learning about” to “figuring out.”

We start with a phenomenon that sparks a question within the student, such as, “How or why did this happen?”

Then, through a series of investigations, we help a student construct explanations and argue from evidence to answer the question.

Reiser, Brian. “Designing Coherent Storylines Aligned with NGSS for the K-12 Classroom,” 2014.

What Does This Mean For Assessment?

Underlying this philosophical shift are the Next Generation Science Standards which improve not only science education but also student achievement.

Within the domains of science, the Maryland Next Generation Standards outline the performance expectations which describe what students should know and be able to do to demonstrate understanding.

To do this, students must engage in three dimensions of the disciplinary core ideas, science and engineering practices and crosscutting concepts.

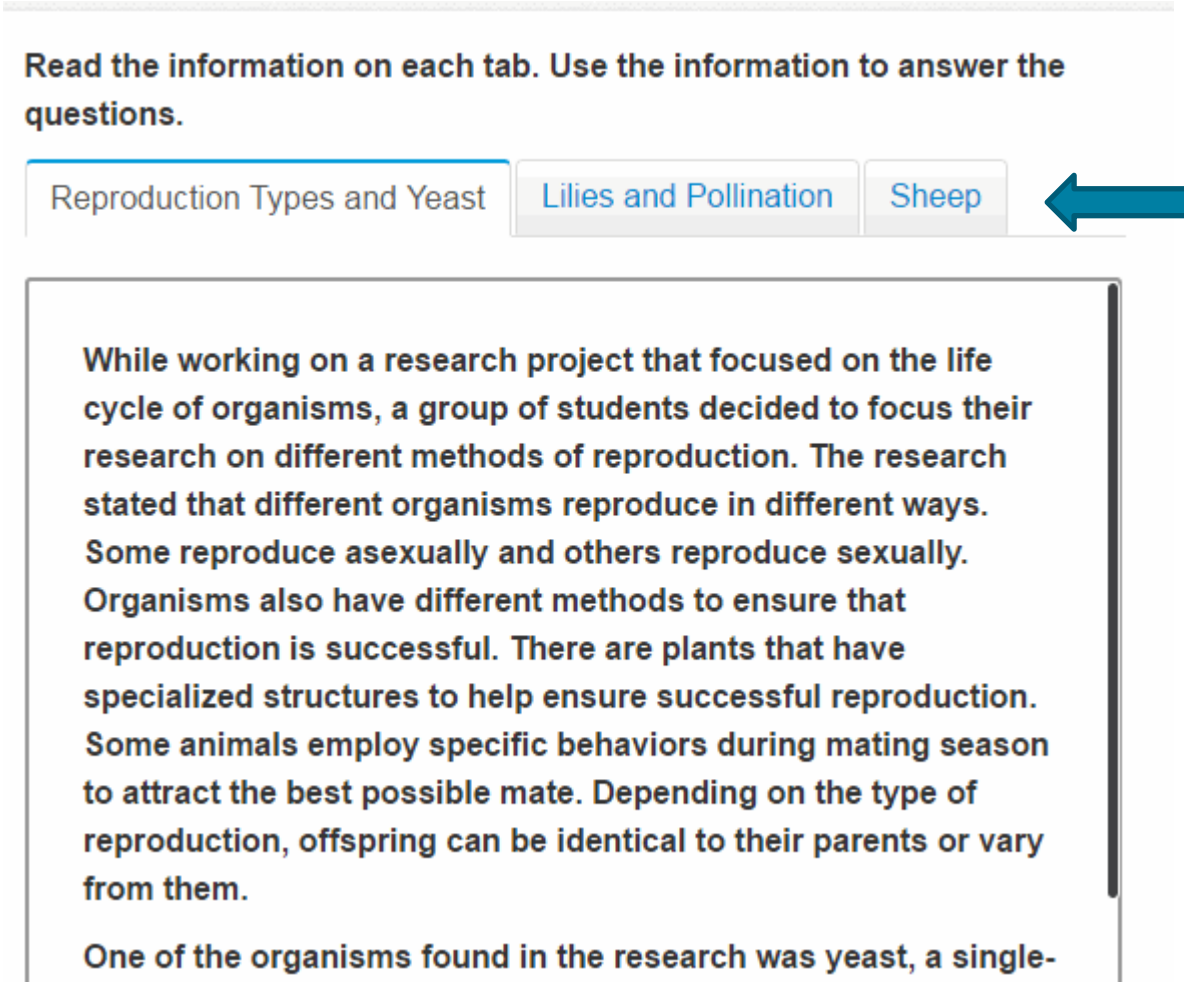
Next Generation Science Standards, Appendix A, p.1

Maryland Integrated Science Assessment (MISA)

Each student will be given sets of items with an associated stimulus.

The stimulus may include technical passages to read, a video, charts/diagrams, or a simulation with which the student interacts. The stimulus may include multiple tabs for student interaction.

Maryland Integrated Science Assessment (MISA) – Stimulus Example



Multiple StimulusTabs

Maryland Integrated Science Assessment (MISA)

After the student interacts with the stimulus they will be given six questions that are supported by the stimulus.

The questions will be a variety of selected response(s), constructed response, or technology enhanced items such as drag and drop or hot spots.

For all items, the stimulus will always appear on the left side of the screen so the students can refer to the content.

MISA – Selected Response

Read the information on each tab. Use the information to answer the questions.

Reproduction Types and Yeast | Lilies and Pollination | Sheep

While working on a research project that focused on the life cycle of organisms, a group of students decided to focus their research on different methods of reproduction. The research stated that different organisms reproduce in different ways. Some reproduce asexually and others reproduce sexually. Organisms also have different methods to ensure that reproduction is successful. There are plants that have specialized structures to help ensure successful reproduction. Some animals employ specific behaviors during mating season to attract the best possible mate. Depending on the type of reproduction, offspring can be identical to their parents or vary from them.

One of the organisms found in the research was yeast, a single-celled fungi of which there are many different species. Some yeasts are used to make fuel; others are used in food production and scientific research. Yeast reproduce asexually and very quickly, resulting in many offspring. A model of the

In the model, the yeast originates as a single cell and

A. reduces parent DNA by half to share with the offspring

B. grows an offspring that is identical to the parent cell

C. recombines its DNA before producing the offspring

D. produces an offspring after absorbing other yeast

Student selects the best response.

Student reads the stimulus first.

MISA – Multiple Select

Read the information on each tab. Use the information to answer the questions.

Reproduction Types and Yeast | Lilies and Pollination | Sheep

As part of their project, the students also completed research on sheep and found that sheep are animals that form herds and are often raised on farms around the world. There are many different breeds of sheep that vary in size and coat color. During mating season, female sheep chase the male sheep and sniff them; the male sheep curl their lips up at the female sheep. Male sheep will also fight with one another for the opportunity to mate with a selected female. When offspring are produced, they can have several different types of coat patterns and colors. Some coat patterns and colors are more likely to appear than others. Black and brown are coat colors that along with white produce a type of pattern that results in spotting. Sheep coat colors follow rules of simple dominance. The students constructed the table, shown below, of two generations of sheep and the offspring they produced.

OFFSPRING FROM TWO GENERATIONS OF SHEEP

Generation	Parent 1	Parent 2	Offspring
1	solid black	solid brown	4 solid black

The research indicates that specific animal behaviors increase the probability of reproduction.

How do sheep mating behaviors increase the likelihood of successful reproduction?

Select all that apply.

- [ ] A. They show that the female sheep can care for offspring successfully.
- [x] B. They communicate that a sheep is looking for a potential mate.
- [ ] C. They confirm that a potential mate has access to resources.
- [x] D. They demonstrate the strength of the male sheep.
- [ ] E. They indicate that a sheep is already pregnant.

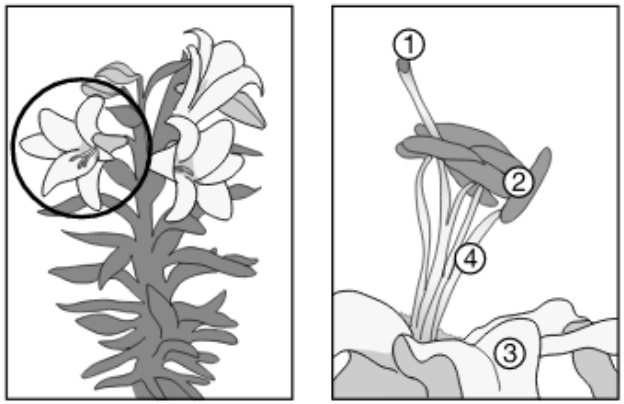
Student may select more than one answer.

MISA – Inline Choice

Read the information on each tab. Use the information to answer the questions.

Reproduction Types and Yeast | Lilies and Pollination | Sheep

The students found through their research that lilies are flowering plants that can be found in most climates. There are also many species of lilies that exist in a variety of colors and sizes. All lilies have similar physical structures. An enlarged diagram of the structures of a lily flower and a table describing the structures are shown below.



In the model of the lily plant, structure 1 Choose... **, which**

Choose... **the likelihood of successful reproduction.**

Plant breeders sometimes remove structure 2 to prevent

Choose... .

Choose...
pollen loss
attracting pests
self-fertilization

Student selects best option from drop down box.

MISA – Constructed Response

Read the information on each tab. Use the information to answer the questions.

Reproduction Types and Yeast | Lilies and Pollination | Sheep

While working on a research project that focused on the life cycle of organisms, a group of students decided to focus their research on different methods of reproduction. The research stated that different organisms reproduce in different ways. Some reproduce asexually and others reproduce sexually. Organisms also have different methods to ensure that reproduction is successful. There are plants that have specialized structures to help ensure successful reproduction. Some animals employ specific behaviors during mating season to attract the best possible mate. Depending on the type of reproduction, offspring can be identical to their parents or vary from them.

One of the organisms found in the research was yeast, a single-celled fungi of which there are many different species. Some yeasts are used to make fuel; others are used in food production and scientific research. Yeast reproduce asexually and very quickly, resulting in many offspring. A model of the

The student research provides examples of organisms that reproduce asexually and organisms that reproduce sexually.

Use evidence from the models to explain the effect of sexual reproduction and asexual reproduction on genetic variation.

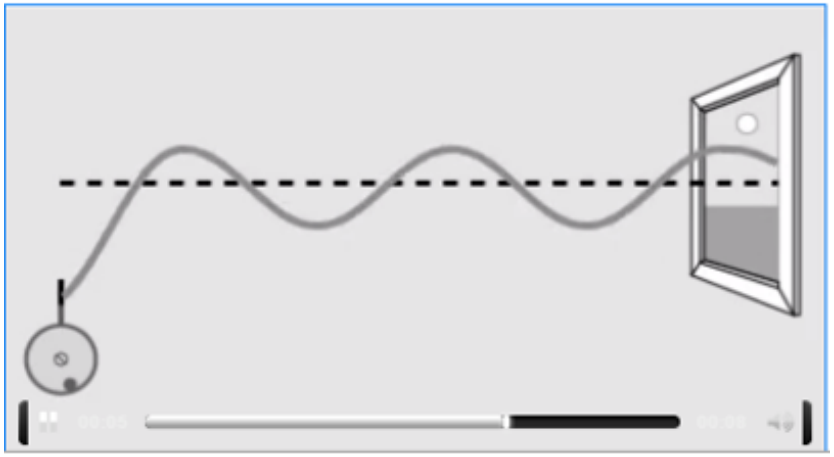
Student provides a written response.

MISA – Constructed Response (CR)

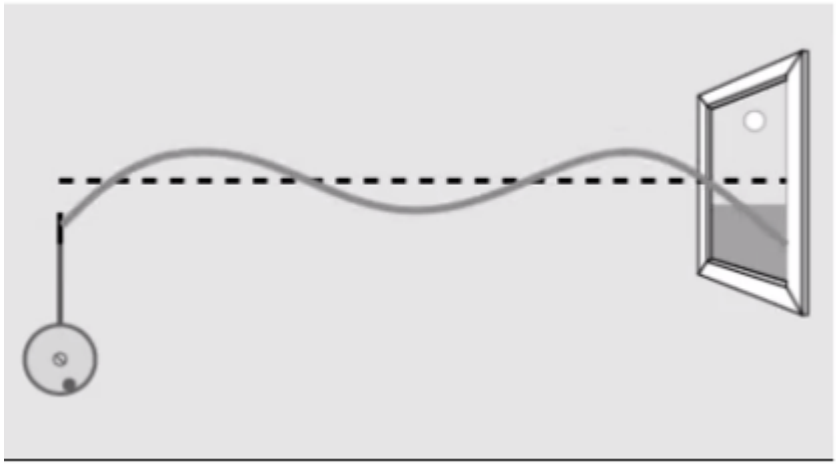
- Each CR item will either have a value of 2, 3, or 4 points
- Character counts will vary depending on number of points
- A generic rubric will be used for each different point value
- Rubric levels include responses that are full and complete, general/partial, and minimal understanding of problem solving

MISA – Two Part Question

Wave 1

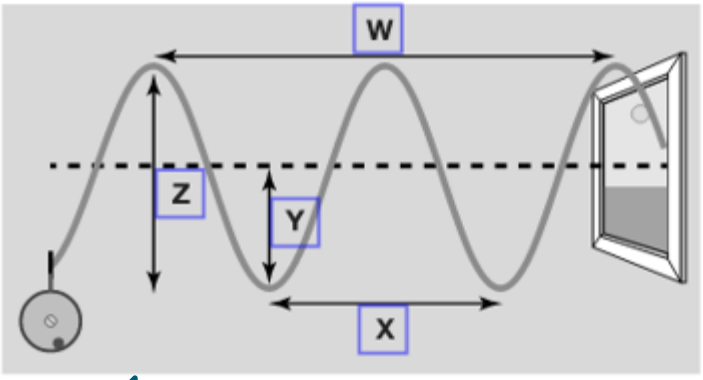


Wave 2



Part 1

Select the wave characteristic that Wave 1 and Wave 2 have most in common.



Part 2

The characteristic Wave 1 and Wave 2 have most in common is evidence that both waves have Choose... **Wave 3 and Wave 4.**

- Choose...
- less energy than
- more energy than
- the same amount of energy as

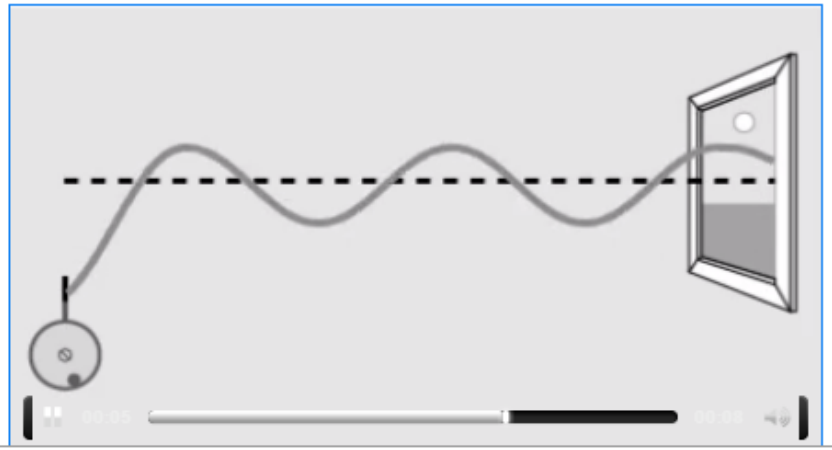
Student selects responses for both part 1 and part 2.

MISA – Drag and Drop

Read the information. Use the information to answer the questions.

While performing an activity in gym class, a group of students moved a rope up and down, causing the rope to make a wave motion. The faster the students moved the rope, the larger the wave motion appeared. To further investigate the motion of waves using a rope, the students observed a computer model of a machine moving a rope. The machine moved the rope at four different speeds, shown below.

Wave 1



Observe each of the four waves and then place the waves in order from shortest wavelength to longest wavelength.

Wave 1 | Wave 3 | Wave 4 ← Drag Tiles

Shortest Wavelength	→	→	Longest Wavelength
Wave 2			

↑ Drop Zones

Students drag tiles into the appropriate drop zone.

MISA - Graph

Read the information. Use the information to answer the questions.

After a trip to a national park, a student observed many rock structures that had been shaped by Earth's natural processes. To learn more about Earth's natural processes, the student researched some of the processes and how they affect Earth.

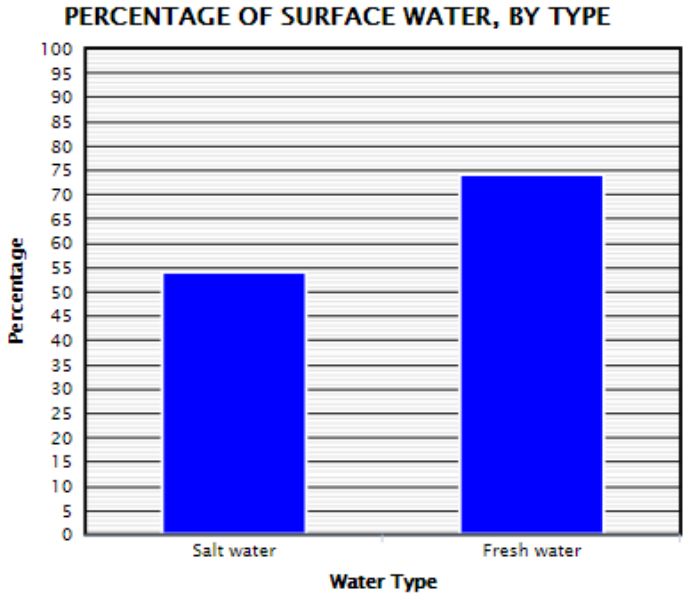
The student started with the hydrosphere, where Earth's water is located. Surface water is found in oceans, lakes, reservoirs, streams, rivers, and glaciers. Lakes, rivers, and reservoirs are where humans obtain most of the surface water they use. Aquifers are an underground source of water that humans also use. The table below displays data on the percentages of fresh water and ocean water found on Earth.

Water on Earth	Percentage
Oceans	97
Solid fresh water	2
Liquid fresh water	1

The student also constructed a diagram to demonstrate the movement of water on Earth, shown below.

Use the student's research to graph the amounts of fresh water and salt water on Earth.

Drag the top of each bar to the proper location on the graph.



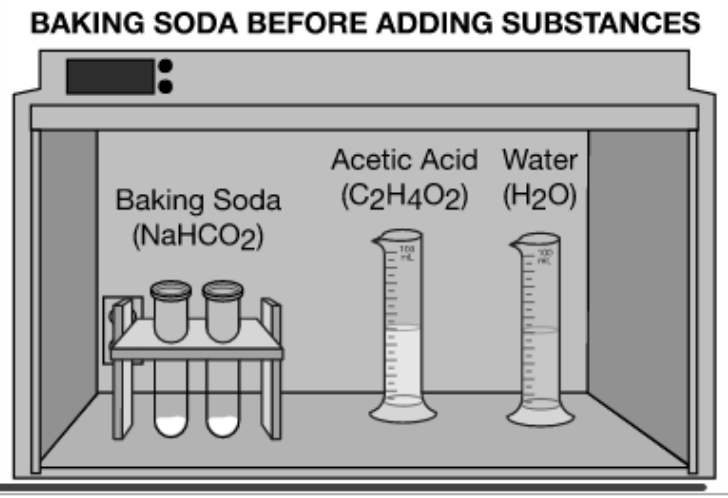
Student drags the top of each bar to the proper location.

MISA- Hot Spot

Read the information on each tab. Use the information to answer the questions.

Station 1 | Station 2 | Station 3

At station 3, the students observed how one substance, baking soda ($NaHCO_3$), changes when exposed to the substances, Acetic Acid ($C_2H_4O_2$) and Water (H_2O). A diagram and animations of the results of the students' investigation at station 3 are shown below



Part 1

At station 3, the students observed the effect two different liquid substances had on the solid substance.

Which observable properties are evidence that a chemical reaction occurred at station 3?

Select all that apply.

Boiling Point	Melting Point
Density	Odor
Flammability	Solubility

Student selects the appropriate hot spots.

Part 2

The students stated a chemical reaction occurred at station 2.

The best evidence to support this statement is

- A. the mass of the zinc
- B. the volume of hydrochloric acid
- C. the splint igniting over the test tube
- D. the water remaining clear in appearance

Maryland Integrated Science Assessment (MISA)

The test will be constructed with a total of four units:

- Units 1–3
  - 3 tasks in each unit, which are based on a different scientific phenomena
    - 1 constructed response question for each task
    - 5 other types of questions for each task
- Unit 4
  - 1 task similar to those in units 1–3
  - 1 extended task that may include a simulation

Maryland Integrated Science Assessment (MISA) continued

Three of the units will each include up to 3 stimuli (not all items sets have 3 stimuli) and their associated items.

- Each stimulus will support 6 test items.
- Each unit with have up to 3 stimuli and 18 total test items.

The fourth unit will include at least 2 stimuli and 6 test items per stimuli. However, the final stimuli will be longer and delve deeper into student knowledge and achievement.

Maryland Integrated Science Assessment (MISA)

The test will include 4 units that can each be administered during one class period.

- Units can be taken one per day, two per day or in any combination deemed most suitable to the school.

Maryland Integrated Science Assessment (MISA)

"Although the intrinsic beauty of science and a fascination with how the world works have driven exploration and discovery for centuries, many of the challenges that face humanity now and in the future – related, for example, to the environment, energy, and health – require social, political, and economic solutions that must be informed deeply by knowledge of the underlying science and engineering."

A Framework for K-12 Science Education, Washington D.C: National Research Council. p. 7.