Wisconsin Forward Exam

WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION

Science
Item Sampler Grade 8

TABLE OF CONTENTS

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SCIENCE ITEM SAMPLER OVERVIEW

OVERVIEW

This document contains samples of scenarios and test items similar to those on the Wisconsin Forward Science Exam. Each sample test item has been through a rigorous review process by DRC, Wisconsin Educators, and a third party, to ensure alignment with the Wisconsin Academic Standards. These items will not be used on the state assessment and may, therefore, be used in Wisconsin for professional development and student practice. The items in this document illustrate a sample of the content and types of items that students will encounter on the Forward Exam. A Summary Data table in the Appendix section identifies the alignment (standard measured), answer key, depth of knowledge, and annotations for each item.

CONNECTION TO THE STANDARDS

Wisconsin Academic Standards for Science are available on the DPI webpage. Test items require students to prove their knowledge and abilities as stated in the standards.

HOW DO I USE THIS BOOK?

Professional Development

Sample items are useful as educators engage in conversations about what students are expected to know and be able to do to demonstrate proficiency on the state assessments relative to the Wisconsin Academic Standards. Sample items can inform discussions about state and local standards, curriculum, instruction, and assessment.

Improving Instruction

Teachers may use sample items in classroom activities that help students understand how to

- solve problems;
- determine which answer choices are correct, which are incorrect, and why;
- approach long and/or multistep tasks;
- use good test-taking strategies.

Student Practice

Students may perform better and with less anxiety if they are familiar with the format of the test and with the types of items they will be required to answer. The Forward Exam is an online assessment; students will benefit from the use of the Online Tools Training in order to work within the system interface to answer items as they will appear on the assessment, as well as utilize the tools available to them in the online system.

Note: A student's score on the practice test cannot be converted to a scale score, used to predict performance on the Forward Exam, or used to make inferences about the student's learning.

Test Preparation

While using the Item Sampler for test preparation, care should be taken that this is done in a balanced manner and one that helps to enhance student knowledge of subject matter as well as test performance. Please note that test preparation is only useful to the extent that it is also teaching content area knowledge and skills. Therefore, the use of this resource for test preparation is of limited value to students due to the narrow opportunity for content learning. It is very important to ensure that teachers are teaching to the curriculum and not to the test, as teaching to the test narrows the focus of instruction to only that content covered by the test.

Hess' Cognitive Rigor Matrix & Curricular Examples: Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions- *M-Sci*

Revised Bloom's Taxonomy	Webb's DOK Level1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/ Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	O Recall, observe, & recognize facts, principles, properties O Recall/ identify conversions among representations or numbers (e.g., customary and metric measures)			
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as from examples given), predict, compare/contrast, match like ideas, explain, construct models	O Evaluate an expression O Locate points on a grid or number line O Solve a one-step problem O Represent math relationships in words, pictures or symbols O Read, write, compare decimals in scientific notation	O Specify and explain relationships (e.g., non-examples/examples; cause-effect) O Make and record observations O Explain steps followed O Summarize results or concepts O Make basic inferences or logical predictions from data/observations O Use models /diagrams to represent or explain mathematical concepts O Make and explain estimates	O Use concepts to solve non-routine problems O Explain, generalize, or connect ideas using supporting evidence O Make and justify conjectures O Explain thinking when more than one response is possible O Explain phenomena in terms of concepts	O Relate mathematical or scientific concepts to other content areas, other domains, or other concepts O Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	O Follow simple procedures (recipe-type directions) O Calculate, measure, apply a rule (e.g., rounding) O Apply algorithm or formula (e.g., area, perimeter) O Solve linear equations O Make conversions among representations or numbers, or within and between customary and metric measures	O Select a procedure according to criteria and perform it O Solve routine problem applying multiple concepts or decision points O Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps O Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table) O Construct models given criteria	O Design investigation for a specific purpose or research question O Conduct a designed investigation O Use concepts to solve non-routine problems O Use & show reasoning, planning, and evidence O Translate between problem & symbolic notation when not a direct translation	O Select or devise approach among many alternatives to solve a problem O Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	O Retrieve information from a table or graph to answer a question O Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram) O Identify a pattern/trend	O Categorize, classify materials, data, figures based on characteristics O Organize or order data O Compare/ contrast figures or data O Select appropriate graph and organize & display data O Interpret data from a simple graph O Extend a pattern	O Compare information within or across data sets or texts O Analyze and draw conclusions from data citing evidence O Generalize a pattern O Interpret data from complex graph O Analyze similarities/differences between procedures or solutions	O Analyze multiple sources of evidence O Analyze complex/abstract themes O Gather, analyze, and evaluate information
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique			O Cite evidence and develop a logical argument for concepts or solutions O Describe, compare, and contrast solution methods O Verify reasonableness of results	O Gather, analyze, & evaluate information to draw conclusions O Apply understanding in a novel way, provide argument or justification for the application
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce	O Brainstorm ideas, concepts, or perspectives related to a topic	O Generate conjectures or hypotheses based on observations or prior knowledge and experience	O Synthesize information within one data set, source, or text O Formulate an original problem given a situation O Develop a scientific/mathematical model for a complex situation	O Synthesize information across multiple sources or texts O Design a mathematical model to inform and solve a practical or abstract situation

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ITEM TYPES

The Wisconsin Forward Exam has multiple types of test items. However, because this item sampler is in a format that can be printed, the majority of its items are multiple-choice. In the Forward Exam, there will be a more diverse array of item types, including the ones described below.

Selected-Response (SR) Items

Selected-Response (SR) items are an efficient method for measuring a broad range of content, and can be used to assess a variety of skills. Three types of SR items are used on the online assessments: Multiple-Choice (MC), Enhanced Selected-Response (ESR), and Evidence-Based Selected-Response (EBSR). In all cases, SR items require that a student determines the correct answer(s) to the item posed from a provided list. While it is still possible for a student to perform some work directly related to determining the correct answer, the student is not required to generate the content of the answer when responding to a Selected-Response item. An exception to this requirement is Mathematics Short-Response/Gridded- Response items where students will be required to enter a short alphanumeric response.

Multiple-Choice (MC) Items

Multiple-Choice (MC) items on Wisconsin's assessments have four answer choices, including three distractors and one correct answer. Distractors for Mathematics represent common misconceptions, incorrect logic, incorrect application of an algorithm, computational errors, etc. Distractors for English Language Arts (ELA) are written to represent a common misinterpretation, predisposition, unsound reasoning, casual reading, etc. A correct response to an MC item is worth one raw point. The process skills, directives, and action statements within an MC item also specifically align with the Wisconsin Academic Standards. Multiple-Choice items are present in all grades and are used with all content areas.

Multiple-Choice items can be further defined by being linked to, or independent from, a stimulus source. Items that operate independent of a stimulus are also known as "stand-alone MC." Stand-alone items may still have tables, graphs, or other information used in support of the stem. English Language Arts uses a mixture of MC items linked to a stimulus passage and some that are stand-alone. For Mathematics, all MC items are considered stand-alone.

Enhanced Selected-Response (ESR) Items

The Enhanced Selected-Response (ESR) items are multi-part autoscored items that may consist of varying combinations of Multiple-Choice, Multiple-Response, Gridded-Response, Completion or Short-Answer, and Technology-Enhanced items that explore in greater depth and cognitive complexity the knowledge, skills, and abilities specified by the standards of each content area. Typically, this item type has a common focus and explores authentic problem-solving skills. An example of a Statistics and Probability Mathematics ESR item would utilize a data-table stimulus with Part A using a Technology-Enhanced (TE) graphing tool to create a bar graph of the data presented and Part B asking students to calculate the mean of the data using a Short-Response item.

Two-Part Evidence-Based Selected-Response (EBSR) Items

The Evidence-Based Selected-Response (EBSR) items have two parts and are designed to elicit a response based on what a student has read from a stimulus passage. EBSR items may be linked to a stimulus passage or to a stimulus passage set. There are several variations of two-part EBSR items, but all two-part EBSR items have an Accuracy piece and an Evidence piece.

The Accuracy piece of the item is Part A. Part A of a typical EBSR item will be similar to a standard MC test item. A student analyzes a passage and chooses a single, best (correct) answer from four answer choices. Part B of a typical EBSR item will elicit evidence from the stimulus passage and will require that the student selects one or more correct answers based on the response the student provided to Part A. Part B is also different from Part A in that it may have five or six answer options rather than just four answer options typical of an MC item and more than one option may be correct.

Technology-Enhanced (TE) Items

Technology-Enhanced (TE) item types share the same functional structure as traditional paper and pencil test items; however, the expansive features and functions of a computer-based medium allow for the incorporation of technical enhancements into traditional elements of a test item, such as the item stem, the stimulus (if any), the response area, or a combination of all three. TE items are used in the content areas of ELA, Mathematics, and Science.

Item types such as drag-and-drop, hot spot, and in-line selection of multiple answers from drop-down menus broaden item presentation with engaging, interactive open-ended items.

A wide variety of TE item types will be present on the Wisconsin Forward Exam, including, but not limited to:

- **Clock Input,** where a student is able to add an hour hand and a minute hand to the clock;
- **Angle Draw Input,** where given a base line, the student can represent an angle;
- **Short Input,** where there are many types of short inputs that can be used (The number of characters is usually limited to a relatively small number in order to facilitate auto-scoring. The types of characters allowed can also be limited to text only, numbers only, or a mix. An equation editor can be utilized to assist the student in creating something as basic as a fraction or something more complex. The available symbols and templates in the equation builder can be customized for a testing program. Certain Short Input items can also be used in a paper-based test (PBT) as a Gridded-Response item.);
- **Bar Graph Input,** where students can produce bar graphs with prepopulated titles, labels, and scales, or the system can allow the student to populate them (The number of bars and the color of the bars is predetermined by the system. A reset feature is available that allows the student to start over from the original configuration.);
- **Number Line Input,** where students can create a graph that might involve plotting points only or points and lines (Both solid and open “dots” are available as well as line segments and rays. Number line graphs can have prepopulated titles, labels, and scales or can allow the student to populate them.);
- **Coordinate Graph Input,** which allows for the graphing and labeling of points and lines (Regions, determined by plotted lines, can be shaded. Solid and open “dots” as well as solid and dashed lines are available to the student. Coordinate graphs can have prepopulated titles, labels, and scales or can allow the student to populate them.);
- **Line Plot Input,** which is used as another way to graphically represent data (The basic structure is provided for the student. Certain labeling on the line plot can be done by the student. A reset feature is available that allows the student to start over from the original configuration.);
- **List Input,** a combination of the short input described earlier that allows the student to add input boxes (For example, it can be used for describing the steps in a process without revealing to the student the number of steps needed. The added input boxes can be rearranged and/or deleted.);
- **Drag-and-Drop Input,** a wide variety of ways are available to utilize a drag-and-drop input (The main difference between it and a drag-and-paste is that each dragable entity can be used only once with a drag-and-drop input. A reset feature is available that allows the student to start over from the original configuration.);

- **Drag-and-Paste Input,** a wide variety of ways are available to utilize drag-and-paste input (The main difference between it and a drag-and-drop is that each dragable entity can be used more than once with a drag-and-paste input. A reset feature is available that allows the student to start over from the original configuration.);
- **Drop-Down List Input,** allows for the creation of a situation where a great deal of information about a student's grasp of a concept can be determined with a single item (Students can be asked to choose from three function types, four number of real zero responses, and two inverse function responses. For one function alone, this provides 24 possible answer combinations. With the three functions, a considerable amount of information can be gained, making this almost an open-ended item type.);
- **Pictograph using Drag-and-Paste,** actually another example of drag-and-paste, but is worth mentioning on its own as it is a type of graphing often used at lower grade levels;
- **Circle Graph,** a graph that allows the student to create and label the "wedges" that represent the data (Circle graphs can have a prepopulated title or can allow the student to populate it. The color of the "wedges" is predetermined by the system.);
- **Matching,** allows for the use of text or graphics as the matching objects (The student clicks on one object and then clicks on a second object to connect them.);
- **Highlighting Text,** allows for designated text to be highlighted in a word, phrase, sentence, or paragraph; and the
- **Graphic Modification Hot Spot,** allows for one image to replace another image when a hot spot is clicked.

Text-Dependent Analysis (TDA) Items

The English Language Arts (ELA) section of the Forward Exam presents students with a Text-Dependent Analysis (TDA) item. A TDA is a text-based analysis based on a single passage or a multiple passage set that each student has read during the assessment. The passage or passage set will consist of either literary or informational text. In order to successfully answer a TDA, students must analyze and use information from the passage(s) to plan a comprehensive, holistic response. Students will then write their response including supporting evidence from the passage(s). Students will have up to 5,000 characters to formulate their response. Students' responses are scored using a rubric that takes into account both the composition and the conventions of the student's writing.

The TDA portion of the Forward Exam requires students to read the text and then respond in writing in one of two ways:

- identifying and explaining a theme or central idea, using textual evidence to support the claim about what that theme or central idea is, or
- analyzing the development of an event, character, central ideas, or theme, using textual evidence to support the explanation and analysis.

TDA Item Samplers are available at https://dpi.wi.gov/assessment/forward/sample-items.

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SCENARIO 1

Read the following scenario. Then answer items 1 through 5. You may look back at the scenario to help you answer the items.

Safeguarding Wisconsin's Streams

After the quiet of a Wisconsin winter, being streamside in spring sounds like a festival. The chorus of frogs, calls of songbirds and waterbirds, and buzzing of insects are evidence of the life teeming along these waterways. The wildlife depends upon these streams and their bankside vegetation for food, cover, and shelter. At dusk, certain mammals like raccoons and foxes emerge from their forested shelter to find food in shallow pools of water or in nearby fields.

Wisconsin has a wealth of freshwater streams. Beyond their rich ecological value, they provide recreational opportunities for humans who enjoy fishing, canoeing, or kayaking. Farmers value streams for irrigating fields. Residential developers recognize the appeal of streams for property owners. Land along streams is in high demand.

However, these demands can put Wisconsin streams at risk. Ecologists use the following landscape characteristics to help evaluate stream health:

- percentage of wetlands remaining
- percentage of natural land cover remaining
- number of hubs (patches of unbroken natural areas) and corridors (undisturbed areas between hubs used for migration or local movement of organisms)

Areas with high percentages of these characteristics support healthy streams -and, consequently, entire ecosystems. Preserving streamside vegetation areas (called buffer zones) helps prevent erosion and provides wildlife habitat. Maintaining streamside forests and wetlands also provides habitat for mammals, birds, and insects. Preventing livestock access to streams limits erosion and reduces bacterial pollution. Each of these land-use actions can have a meaningful impact on stream health and help safeguard Wisconsin's streams.

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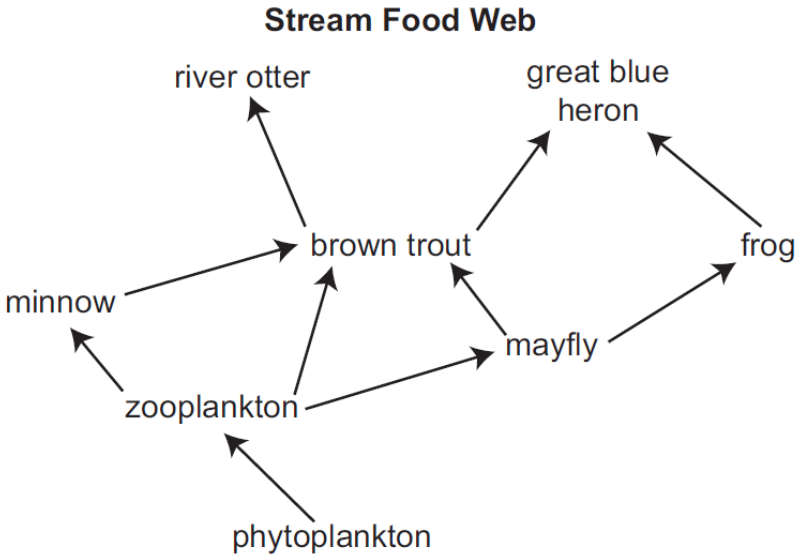
1. The food web below shows some of the ecosystem interactions in a Wisconsin stream. Some of the organisms compete for the same food sources.



How many other organisms from the stream food web does the great blue heron compete with for brown trout?

A. one

B. two

C. three

D. five

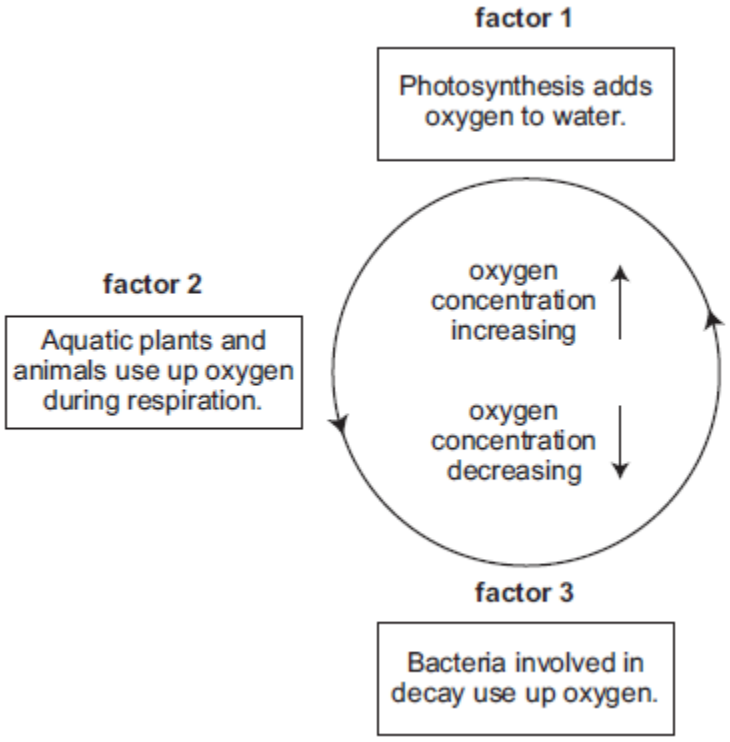
Go on to the next page.

2. Scientists monitor a stream and determine that the population of brown trout has declined. The scientists study the data below to investigate the role of dissolved oxygen in this population change. Brown trout require at least 6 milligrams per liter (mg/L) of dissolved oxygen to support normal bodily functions.

Dissolved Oxygen Concentrations and Stream Water Quality

Dissolved Oxygen Concentrations	Milligrams per Liter (mg/L) Stream Water	Water Quality
high	7.0–11.0	excellent
medium	4.0–6.9	good
low	2.0–3.9	poor
very low	0–1.9	very poor

The model below shows factors that can affect dissolved oxygen concentration in streams.



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How has the dissolved oxygen concentration in the stream most likely changed, and which factors in the model are most likely contributing to the decline in the brown trout population?

A. change in dissolved oxygen concentration in stream: increased factors contributing to population decline: 1 and 2

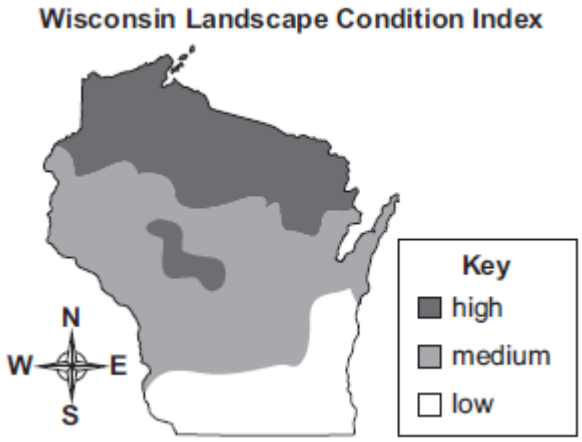
B. change in dissolved oxygen concentration in stream: increased factors contributing to population decline: 2 and 3

C. change in dissolved oxygen concentration in stream: decreased factors contributing to population decline: 1 and 2

D. change in dissolved oxygen concentration in stream: decreased factors contributing to population decline: 2 and 3

Go on to the next page.

3. The map below shows results of landscape research in Wisconsin, which is used to help evaluate stream health. The map shows an index of landscape condition, which is based on the percentage of wetlands and natural land cover remaining and the number of hubs and corridors. "High" indicates the best landscape condition.



Which argument about stream health in Wisconsin is best supported by evidence?

A. Stream health in northern Wisconsin is most likely better than that in southern Wisconsin because the landscape in northern Wisconsin has more buffer-zone areas around streams and more acres of fragmented landscape.

B. Stream health in northern Wisconsin is most likely better than that in southern Wisconsin because the landscape in northern Wisconsin has more buffer-zone areas around streams and more acres of undisturbed landscape.

C. Stream health in northern Wisconsin is most likely worse than that in southern Wisconsin because the landscape in northern Wisconsin has fewer buffer-zone areas around streams and more acres of fragmented landscape.

D. Stream health in northern Wisconsin is most likely worse than that in southern Wisconsin because the landscape in northern Wisconsin has fewer buffer-zone areas around streams and more acres of undisturbed landscape.

Go on to the next page.

4. Livestock can harm streams when their hooves erode soil, which ends up in the stream. The soil reduces water clarity, harming plants and animals that live in the water. Several farmers are designing a process to minimize the impact of their livestock on a local stream.

Which table shows checked boxes next to two actions the farmers can take to reduce streambank erosion?

A.

layer rocks along path to the stream	✓
select a steep area for cattle to access the stream	✓
provide access along the entire length of the stream	
install a livestock watering system away from the stream	

B.

layer rocks along path to the stream	
select a steep area for cattle to access the stream	✓
provide access along the entire length of the stream	✓
install a livestock watering system away from the stream	

C.

layer rocks along path to the stream	✓
select a steep area for cattle to access the stream	
provide access along the entire length of the stream	
install a livestock watering system away from the stream	✓

D.

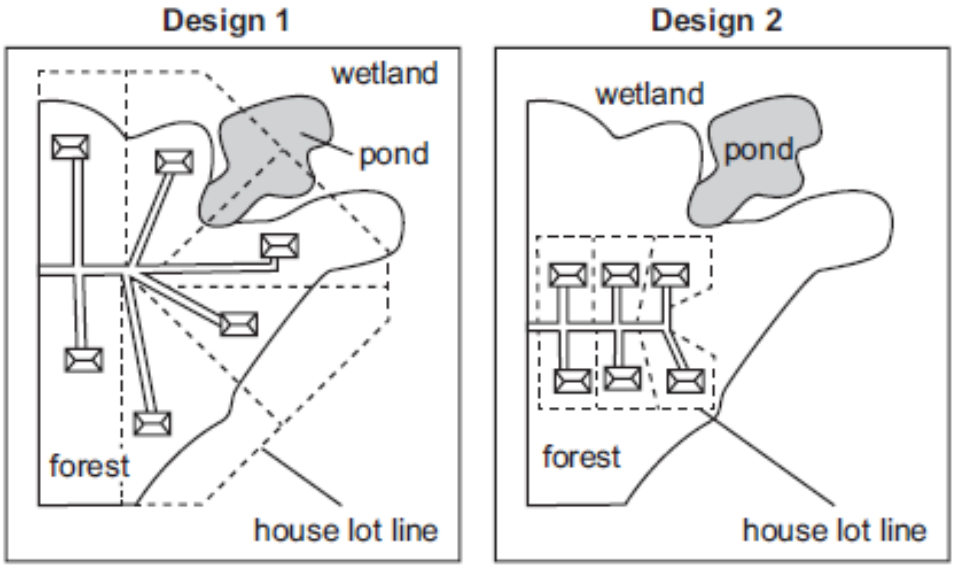
layer rocks along path to the stream	
select a steep area for cattle to access the stream	✓
provide access along the entire length of the stream	
install a livestock watering system away from the stream	✓

Go on to the next page.

5. A residential developer is planning to build some houses on a property next to a wetland with a pond and a stream. The criteria for the project are listed below:

- six lots for houses
- intact forested areas
- forested area between wetland and lots for houses

The diagrams below show two designs for the project.



Which statement best explains why one of the designs is more appropriate for the project?

A. Design 1 is more appropriate because it provides each house with access to the wetland.

B. Design 1 is more appropriate because it provides larger lot sizes with more forest areas.

C. Design 2 is more appropriate because it provides each house with privacy on all sides.

D. Design 2 is more appropriate because it provides wetland protection with uninterrupted forest areas.

Go on to the next page.

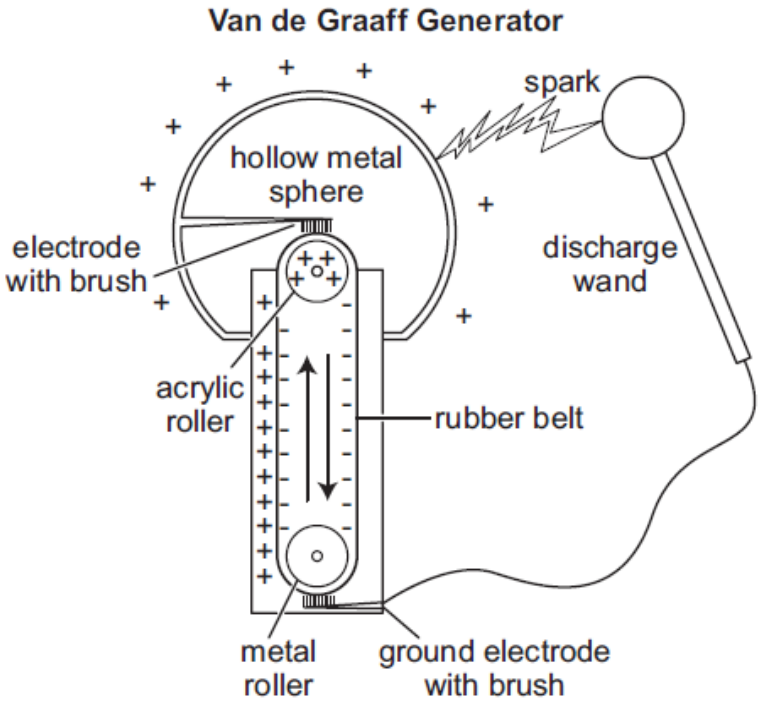
SCENARIO 2

Read the following scenario. Then answer items 6 through 8. You may look back at the scenario to help you answer the items.

It's Electric!

Have you ever shuffled your feet along a carpeted floor and then touched another person-giving him or her a small electric shock? The shock is caused by static electricity. The production of static electricity can be magnified in a classroom or laboratory with a machine called a Van de Graaff generator.

A Van de Graaff generator has moving parts that transfer electrons (electrically charged particles) and other parts that remove and store those charges. The diagram below shows parts and charges in a Van de Graaff generator.

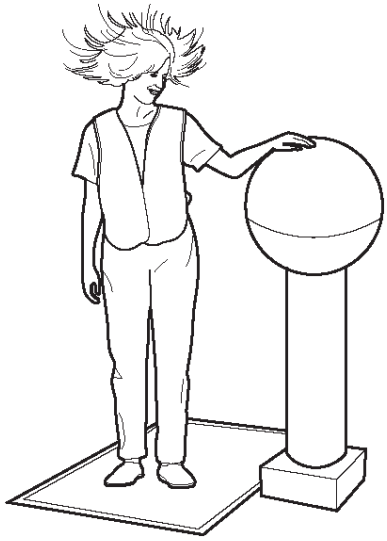


Each side of the rubber belt is charged differently. Positive charges are picked off the belt by the brush along the acrylic roller. These charges are transferred along the electrode and stored in the hollow metal sphere until discharge. The negative charges on the belt return to the metal roller at the bottom of the generator where they are picked off by the brush attached to the ground electrode. Discharge occurs when the negatively charged wand is brought close to the sphere and a spark is produced.

Go on to the next page.

Similarly, a person can discharge the generator. But safety is critical-the person must stand on an electrical insulator when discharging the metal sphere to avoid receiving an electric shock. The picture below shows a teacher demonstrating how discharging the Van de Graaff generator can make hair stand on end. That is hair-raising fun!

Teacher Demonstrating
Van de Graaff Generator



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6. A student observes that getting shocked after shuffling across carpet occurs more often in winter than in summer. The student researches some factors that can affect static electricity, and the findings are shown below.

Fact: Humidity (measure of moisture in the air) affects electron flow between objects.
Fact: Moisture in the air creates a path for electron flow between objects.

Winter	Summer
lower humidity	higher humidity

The student wants to investigate the relationship between humidity and static electricity using a Van de Graaff generator and a discharge wand. Which question can the student investigate using a Van de Graaff generator and a discharge wand?

A. Does humidity affect the distance from one end of a spark produced by the Van de Graaff generator to the other end of the spark?

B. Does humidity affect the number of electrons produced by a Van de Graaff generator?

C. Does the humidity change based on the distance of the wand from the Van de Graaff generator?

D. Does the humidity change based on the size of the Van de Graaff generator?

Go on to the next page.

7. A student conducts an investigation to understand a particular type of force. The student moves a discharge wand toward the metal sphere of a Van de Graaff generator while it is operating.

Part A

Which type of force is the student investigating?

A. electric
B. frictional
C. gravitational
D. magnetic

Part B

Which piece of evidence best supports the idea that the discharge wand and metal sphere can exert forces on each other without being in contact?

A. The discharge wand is connected to the generator by a wire.

B. The distance is reduced from the discharge wand to the metal sphere.

C. A spark is released when the discharge wand moves toward the metal sphere.

D. A sound is produced when the generator is turned on and the rubber belt moves.

Go on to the next page.

8. A student develops an experiment to demonstrate the interaction of forces by using a Van de Graaff generator.

Which observation from this experiment best shows evidence of forces interacting?

A. The insulating base is made of rubber.

B. The metal sphere on the Van de Graaff generator feels cold.

C. The discharge wand is connected to the Van de Graaff generator.

D. The student's hair rises and stands on end.

STOP.

STOP.

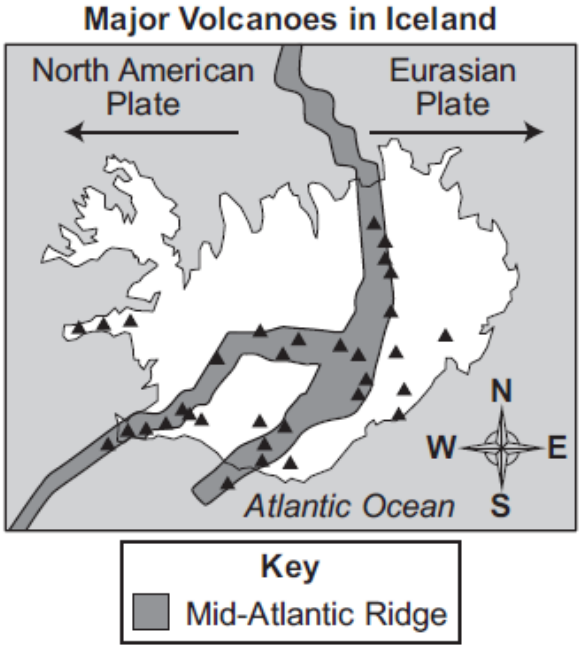
STOP.

SCENARIO 1

Read the following scenario. Then answer items 1 through 3. You may look back at the scenario to help you answer the items.

Iceland

Iceland provides an amazing geologic laboratory for scientists. It is one of the few places on Earth where scientists can study seafloor spreading-above sea level. This is because Iceland is a product of volcanic activity along the Mid-Atlantic Ridge. The map below shows the path of the Mid-Atlantic Ridge through Iceland and the location of the country's major volcanoes.



Iceland is positioned along a divergent boundary where the North American and Eurasian Plates are moving away from one another. This divergence occurs as a result of convection in Earth's mantle. New, hot magma rises through Earth's mantle and escapes through cracks in Earth's crust. When the magma cools, it forms new crust.

Go on to the next page.

1. Compare the two locations on the map of Iceland below with the Major Volcanoes in Iceland map in the scenario.

Which statement best compares the locations on the map?

A. Location 1 is more likely than location 2 to experience a volcanic eruption because it is surrounded by water.

B. Location 1 is more likely than location 2 to experience an earthquake because it is on a plate moving to the west.

C. Location 2 is more likely than location 1 to experience a volcanic eruption because it is closer to the Mid-Atlantic Ridge.

D. Location 2 is more likely than location 1 to experience an earthquake because it has a larger surrounding landmass.

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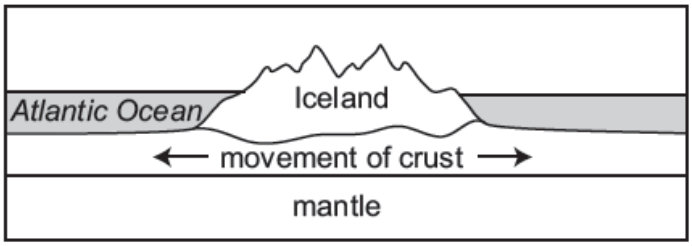
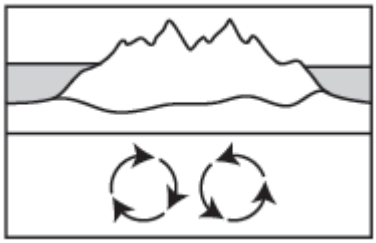
2. The model below shows a cross section of Earth layers beneath Iceland.



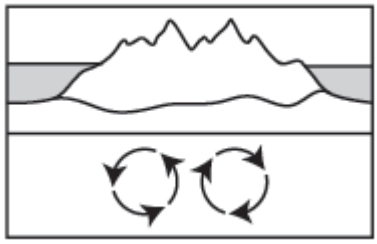
Part A

Which cross section with arrows <u>best</u> shows the cycling of matter within the mantle beneath Iceland?

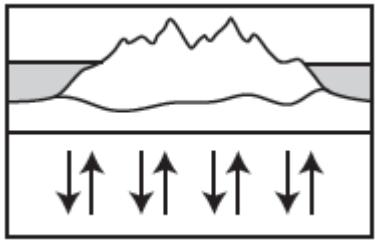
A.



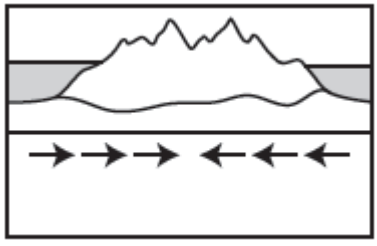
B.



C.



D.



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Part B

Heat energy from Earth's core is transferred to the mantle and causes rock in the mantle to 1. Molten rock rises, during which its temperature 2 from contact with Earth's crust. This temperature change causes the molten rock to become more dense.

Which terms best complete the explanation for the process shown in the model from Part A?

A. 1. melt
   2. increases

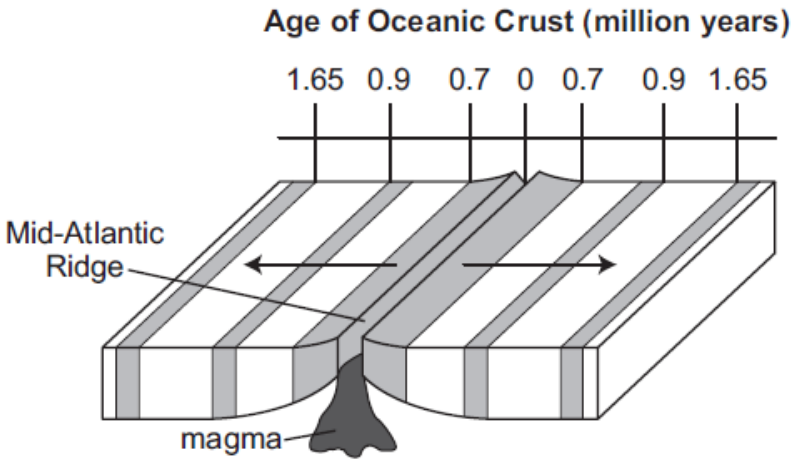
B. 1. crystallize
   2. increases

C. 1. melt
   2. decreases

D. 1. crystallize
   2. decreases

Go on to the next page.

3. A student observes the model of the Mid-Atlantic Ridge below.



Which statement provides evidence for the process shown in the model?

A. As the plates move apart, the oceanic crust gets older as the distance from the Mid-Atlantic Ridge increases.

B. As the plates move apart, the oceanic crust gets younger as the distance from the Mid-Atlantic Ridge increases.

C. As the plates move apart, the oceanic crust melts as the distance from the Mid-Atlantic Ridge increases.

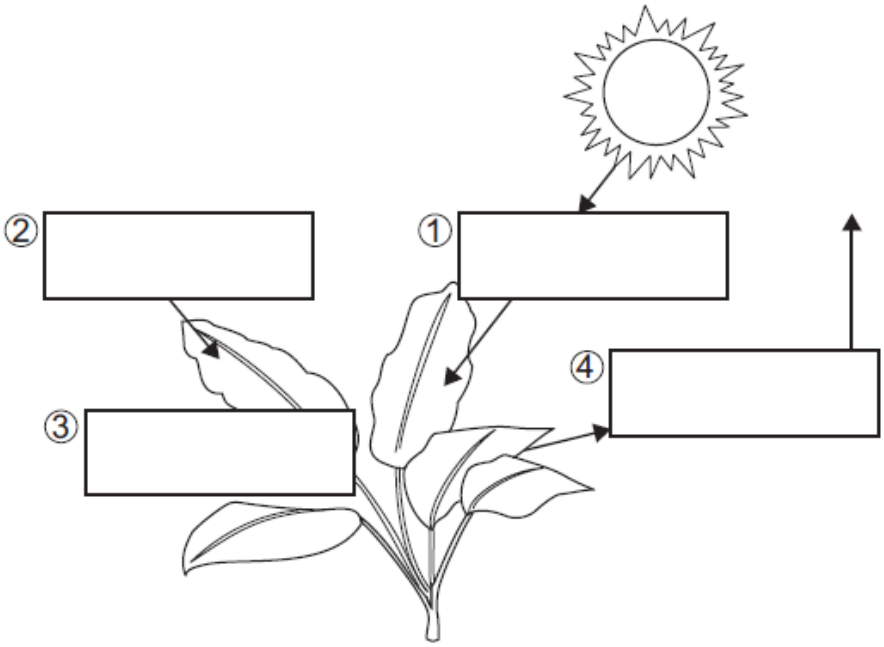
D. As the plates move apart, the oceanic crust erodes as the distance from the Mid-Atlantic Ridge increases.

Go on to the next page.

STANDALONE ITEMS

4. In a population of plants, a mutation allows one plant to grow taller than usual. As a result, the plant receives more sunlight than other plants in the area.

Which list correctly shows the terms that should be added to the model to show the energy transfer process in which this plant's height gives it an advantage?



E. 1. electromagnetic waves
2. carbon dioxide
3. sugars
4. oxygen

F. 1. oxygen
2. sugars
3. carbon dioxide
4. electromagnetic waves

G. 1. electromagnetic waves
2. sugars
3. carbon dioxide
4. oxygen

H. 1. oxygen
2. carbon dioxide
3. sugars
4. electromagnetic waves

Go on to the next page.

5. A student examines the data table shown.

Planet	Distance from the Sun (x 1,000,000 km)
Jupiter	778.6
Saturn	1,433.5
Uranus	2,872.5

These data allow the student to produce which type of diagram?

A. a diagram comparing the compositions of planets

B. a diagram comparing the surface features and temperatures of planets

C. a diagram comparing the locations of planets in the solar system

D. a diagram comparing the sizes of planets

STOP.

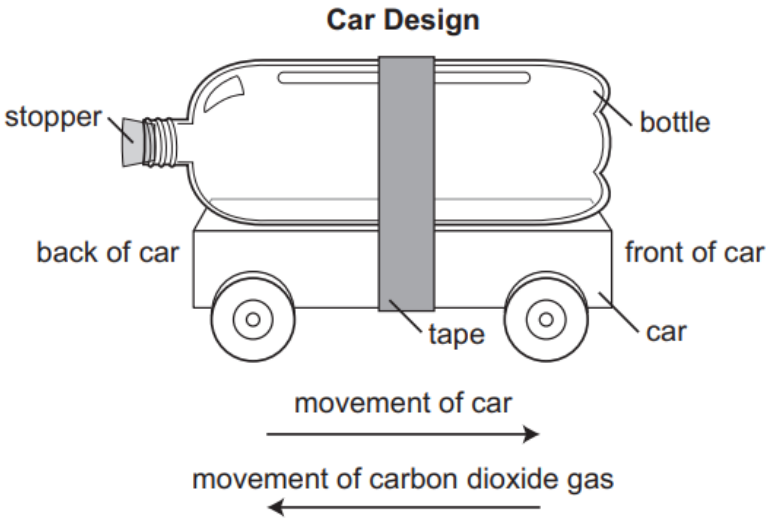
STOP.

STOP.

SCENARIO 1

Chemically Powered

A teacher assigned a project to students in which they had to build a toy car that was powered by the combination of baking soda (sodium bicarbonate) and citric acid. When both reactants are combined in a bottle, carbon dioxide gas is produced, which powers the car.



Carbon dioxide gas exerts pressure on the walls of the reaction vessel. Eventually the pressure increases enough to force the stopper out of the opening. Carbon dioxide escapes from the back of the car, propelling the car forward.

The students measured the speed of their cars and the distance they traveled. The students then modified various aspects of their designs to improve the overall function of the cars.

Go on to the next page.

1. Students combined two reactants (baking soda and citric acid) to determine if a chemical reaction takes place. The steps in the investigation are described.

1. Solid baking soda was dissolved in water.
2. Solid citric acid was dissolved in water.
3. The solutions of baking soda and citric acid were combined in an open flask, producing a gas.
4. The temperature of the flask's contents decreased, and the mass decreased.

How can the information from the investigation be used to support the claim that a chemical reaction took place?

A. A chemical reaction took place because the temperature of the system decreased and a gas was produced.

B. A chemical reaction took place because the temperature of the system decreased and the solid reactants dissolved in water.

C. A chemical reaction took place because a gas was produced, which resulted in an increase in mass.

D. A chemical reaction took place because the baking soda dissolved and there was an increase in mass.

2. A team of students wants to investigate the relationship between force, mass, and acceleration.

Which set of changes to the experiment will <u>all</u> lead to an <u>increase</u> the acceleration of the car?

A. 1. increase the mass of the car
2. increase the amount of carbon dioxide released
3. increase the friction between the car and the ground

B. 1. decrease the mass of the car
2. decrease the amount of carbon dioxide released
3. decrease the friction between the car and the ground

C. 1. increase the mass of the car
2. decrease the amount of carbon dioxide released
3. increase the friction between the car and the ground

D. 1. decrease the mass of the car
2. increase the amount of carbon dioxide released
3. decrease the friction between the car and the ground

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3. Carbon dioxide gas is generated when baking soda and citric acid are combined. The carbon dioxide gas escapes from the bottle, which is the action force. According to Newton's third law, a reaction force will follow. Students want their car to move farther across the floor.

Solutions for Moving the Car Farther

Solutions	Descriptions
W	Form openings on the top of the bottle so the gas escapes from the top instead of the back.
X	Add more baking soda and citric acid so more gas is generated inside the bottle.
Y	Secure the stopper to the back of the bottle with a piece of tape so gas pressure increases.
Z	Remove the stopper from the back of the bottle so the gas produced can escape more easily.

Which pair of solutions apply Newton's third law to this goal?

A. W and X

B. X and Y

C. Y and Z

D. W and Z

Go on to the next page.

4. Carbon dioxide (CO_2) gas is produced when baking soda and citric acid are combined. Solid CO_2 can be created from gaseous CO_2 when enough thermal energy is removed. A student wants to create a model of solid CO_2 using a computer simulation.

Select the three characteristics accurate model of solid CO_2 that should be included in the computer simulation.

1. Molecules are moving randomly and in straight lines.
2. Molecules are vibrating in fixed positions.
3. Molecules are moving slowly with low average kinetic energy.
4. Molecules are moving rapidly with high average kinetic energy.
5. Molecules occupy the entire container and are spread far apart from each other.
6. Molecules occupy only a portion of the container and are arranged very close to each other.

STOP.

STOP.

STOP.

SUMMARY DATA

Grade 8

Sample Number	Alignment	Answer Key	Depth of Knowledge	Annotations
Session 1				
1	SCI.LS2.A.m: Disciplinary Core Idea; SCI.SEP2.A.m: Developing Models; SCI.CC1.m: Patterns	A	2	A. Correct. The great blue heron competes with the river otter for brown trout. B. The brown trout has two predators shown in the food web. C. The brown trout consumes three organisms shown in the food web. D. The brown trout has interactions with five other organisms shown in the food web.
2	SCI.LS2.A.m: Disciplinary Core Idea; SCI.SEP4.A.m: Analyze and Interpret Data; SCI.CC2.m: Cause and Effect	D	2	A. The dissolved oxygen concentration most likely decreased, not increased, in the stream; and photosynthesis adds oxygen to water, which would not cause the brown trout population to decline. B. The dissolved oxygen concentration most likely decreased, not increased, in the stream. C. Photosynthesis adds oxygen to water, which would not cause the brown trout population to decline. D. Correct. The dissolved oxygen concentration most likely decreased in the stream; and the factors that use up oxygen in streams most likely contributed to the decline in the brown trout population.
3	SCI.LS2.C.m: Disciplinary Core Idea; SCI.SEP7.A.m: Argue from Evidence; SCI.CC7.m: Stability and Change	B	3	A. Northern Wisconsin has a high landscape condition as shown on the map, which means more acres of undisturbed landscape, not fragmented landscape. B. Correct. Northern Wisconsin has a high landscape condition as shown on the map, which means more buffer-zone areas around streams and more acres of undisturbed landscape. C. Northern Wisconsin has a high landscape condition as shown on the map, which means it most likely has better stream health and more buffer-zone areas, not fewer buffer-zone areas, and more acres of undisturbed landscape, not fragmented landscape. D. Northern Wisconsin has a high landscape condition as shown on the map, which means it most likely has better stream health and more buffer-zone areas, not fewer buffer-zone areas.

Grade 8

Sample Number	Alignment	Answer Key	Depth of Knowledge	Annotations
4	SCI.ESS3.C.m: Disciplinary Core Idea; SCI.SEP6.A.m: Construct Explanation SCI.CC2.m: Cause and Effect	C	2	A. Selecting a steep area for cattle to access the stream may increase streambank erosion when hooves erode soil on the hill, which ends up in the stream. B. Providing livestock with access along the entire length of the stream may increase erosion when hooves erode soil along the streambank, which ends up in the stream. C. Correct. Layering rocks along the path to the stream and installing a livestock watering system away from the stream are actions that can reduce streambank erosion by minimizing the impact of livestock. D. Selecting a steep area for cattle to access the stream may increase streambank erosion when hooves erode soil on the hill, which ends up in the stream.
5	SCI.ETS1.B.m: Disciplinary Core Idea; SCI.SEP7.A.3-5: Argue from Evidence	D	2	A. Design 2 is more appropriate; providing each house with access to the wetland is not a criterion for the project. B. Design 2 is more appropriate; providing from larger lot sizes with more forested areas is not a criterion for the project. C. Providing each house with privacy on all sides is not a criterion for the project. D. Correct. Design 2 keeps more forested areas intact and provides forested area between the wetland and the house lots.
6	SCI.ETS1.B.m: Disciplinary Core Idea; SCI.SEP1.A.m: Asking Questions; SCI.CC2.m: Cause and Effect	A	2	A. Correct. The student can measure the distance between the Van de Graaff generator and the end of a spark at different humidity levels. B. Humidity affects the flow of electrons, which is related to discharge, not the number of electrons produced by the generator. C. This question suggests a misconception about the relationship. D. This question suggests a misconception about the relationship.

Grade 8

Sample Number	Alignment	Answer Key	Depth of Knowledge	Annotations
7	SCI.PS2.B.m: Disciplinary Core Idea; SCI.SEP3.A.m: Planning and Conducting Investigations; SCI.CC2.m: Cause and Effect	Part A: A Part B: C	2	**Part A** A. Correct. The student is investigating electric force using a Van de Graaff generator. B. The student is not investigating frictional force using a Van de Graatf generator. C. The student is not investigating gravitational force using a Van de Graatf generator. D. The student is not investigating magnetic force using a Van de Graatf generator. **Part B** A. The discharge wand wire is connected to the ground electrode. B. Reducing the distance between the wand and the sphere does not provide evidence that the wand and sphere can exert force on each other without touching. C. Correct. The release of a spark indicates that the wand and the sphere can exert force on each other without touching. D. The sound produced when the Van de Graaff generator is operating does not provide evidence that the wand and sphere can exert force on each other without touching.
8	SCI.PS3.C.m: Disciplinary Core Idea; SCI.SEP3.A.m: Planning and Constructing Investigations; SCI.CC2.m: Cause and Effect	D	2	A. Rubber is an insulating material, but the type of material used for the base does not provide evidence of forces interacting. B. The metal sphere may feel cold, but that observation does not provide evidence of forces interacting. C. The discharge wand is connected to the ground electrode for safety; that observation does not provide evidence of forces interacting. D. Correct. The student's hair rising and standing on end provides evidence that the person is discharging the Van de Graaff generator.

Grade 8

Session 2				
Sample Number	**Alignment**	**Answer Key**	**Depth of Knowledge**	**Annotations**
1	SCI.ESS3.B.m: Disciplinary Core Idea; SCI.SEP4.A.m: Analyze and Interpret Data SCI.CC1.m: Patterns	C	3	A. Proximity to a plate boundary, not water, is a factor affecting volcanic activity. B. Proximity to a plate boundary, not direction of plate motion, is a major factor related to the effects of an earthquake. C. Correct. The closer proximity of location 2 to the Mid-Atlantic Ridge makes it more likely to experience a volcanic eruption. D. Proximity to a plate boundary, not necessarily the size of the surrounding landmass, is a major factor related to the effects of an earthquake.
2	SCI.ESS2.A.m: Disciplinary Core Idea; SCI.SEP2.A.m: Developing Models	Part A: B Part B: C	2	**Part A** A. This model of convection within the mantle indicates a convergent plate boundary. B. Correct. This model of convection within the mantle indicates a divergent plate boundary. C. This model incorrectly represents the cycling of matter within the mantle beneath Iceland; matter does cycle up and down in relation to the crust, but it moves in a rising convection current. D. This model incorrectly represents the cycling of matter within the mantle beneath Iceland; matter moves in a rising convection current, not laterally beneath the crust. **Part B** A. When rising molten rock contacts Earth's crust, its temperature decreases, not increases. B. Heat energy from Earth's core causes rock in the mantle to melt, not crystallize; when rising molten rock contacts Earth's crust, its temperature decreases, not increases. C. Correct. Heat energy from Earth's core causes rock in the mantle to melt and flow; when rising molten rock contacts Earth's crust, its temperature decreases. D. Heat energy from Earth's core causes rock in the mantle to melt, not crystallize.

Grade 8

Sample Number	Alignment	Answer Key	Depth of Knowledge	Annotations
3	SCI.ESS2.B.m: Disciplinary Core Idea; SCI.SEP4.A.m: Analyze and Interpret Data	A	2	A. Correct. According to the theory of sea floor spreading, oceanic crust that is formed at the Mid-Atlantic Ridge spreads away from the ridge in both and Interpret Data directions over time. B. The youngest crust is located closest to the Mid-Atlantic Ridge, not farthest from it. C. Magma that rises through the crust at the Mid-Atlantic Ridge cools and solidifies when it reaches the sea floor. D. This statement does not provide evidence for the age of oceanic crust in relation to distance from the Mid- Atlantic Ridge as shown in the model.
4	SCI.LS2.B.m: Disciplinary Core Idea; SCI.SEP2.A.m: Developing Models; SCI.CC5.m: Energy and Matter	A	2	A. Correct. The model is correctly labeled to show electromagnetic waves from the sun to the plant, carbon dioxide entering the leaves, sugars produced during photosynthesis, and oxygen released from the plant to the surrounding environment. B. None of the labels correctly indicate the energy transfer process for the plant shown in the model. C. Only electromagnetic waves and oxygen are correctly labeled to indicate the energy transfer process for the plant shown in the model. D. Only carbon dioxide and sugars are correctly labeled to indicate the energy transfer process for the plant shown in the model.
5	SCI.ESS1.B.m: Disciplinary Core Idea; SCI.SEP4.A.m: Analyze and Interpret Data; SCI.CC3.m: Scale, Proportion, and Quantity	C	2	A. The data table does not provide data about the compositions of the planets. B. The data table does not provide data about the surface features or temperatures of the planets. C. Correct. The data table provides data about distance from the sun, which could be used to produce a diagram showing relative locations of planets in the solar system. D. The data table does not provide data about the sizes of the planets.

Grade 8

Session 3				
Sample Number	**Alignment**	**Answer Key**	**Depth of Knowledge**	**Annotations**
1	SCI.PS1.B.m: Disciplinary Core Idea SCI.SEP4.A.m: Analyze and Interpret Data SCI.CC2.m: Cause and Effect	A	3	A. Correct. A chemical reaction took place, as indicated by the temperature change and production of a gas. B. Dissolving is a physical change. C. Mass was not shown to be conserved because the gas escaped the open container. D. Dissolving is a physical change. Mass was not shown to be conserved because the gas escaped the open container.
2	SCI.PS2.A.m: Disciplinary Core Idea SCI.SEP3.A.m: Planning and Conducting Investigations SCI.CC2.m: Cause and Effect	D	2	A. Increasing the mass of the car would decrease the acceleration of the car. Increasing the friction between the car and the ground would decrease the acceleration of the car. B. Decreasing the amount of carbon dioxide released would decrease the acceleration of the car. C. Increasing the mass of the car would decrease the acceleration of the car. Decreasing the amount of carbon dioxide released would decrease the acceleration of the car. Increasing the friction between the car and the ground would decrease the acceleration of the car. D. Correct. Decreasing the mass of the car would increase the acceleration of the car. Increasing the amount of carbon dioxide released would increase the acceleration of the car. Decreasing the friction between the car and the ground would increase the acceleration of the car.

Grade 8

Sample Number	Alignment	Answer Key	Depth of Knowledge	Annotations
3	SCI.PS2.A.m: Disciplinary Core Idea SCI.SEP6.A.m: Construct an Explanation SCI.CC2.m: Cause and Effect	B	3	A. Solution W will not help the car move farther in a horizontal direction, because the action force would be upward. B. Correct. Solution X increases the action force by generating more gas inside the bottle. Solution Y increases the action force by increasing the gas pressure. C. Solution Z decreases the action force and decreases the reaction force; by removing the stopper, the gas pressure inside the reaction vessel decreases. D. Solution W will not help the car move farther in a horizontal direction, because the action force would be upward. Solution Z decreases the action force and decreases the reaction force; by removing the stopper, the gas pressure inside the reaction vessel decreases.
4	SCI.PS1.A.m: Disciplinary Core Idea SCI.SEP2.A.m: Developing Models SCI.CC4.m: Systems and System Models	B,C,F	2	A. This statement describes the motion of gas molecules. B. Correct. This statement describes the motion of molecules in a solid. C. Correct. This statement describes the motion and kinetic energy of molecules in a solid. D. This statement describes the motion and kinetic energy of gas molecules. E. This statement describes the positioning of gas molecules in a container. F. Correct. This statement describes the positioning of solid molecules in a container.

Science
Item Sampler
Grade 8