Science

Forward Exam Practice Test Grade 4

Wisconsin Forward Exam

WISCONSIN DEPARTMENT OF Public Instruction

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SCIENCE ITEMS—SESSION 1

Read the following information, and then answer questions 1–4.

Farming and Solar Energy

Some farmers in Wisconsin have allowed energy companies to install solar panels on their farm fields. Crops and livestock, such as sheep, share the fields with the solar panels. The table shows some of the advantages and disadvantages of this practice.

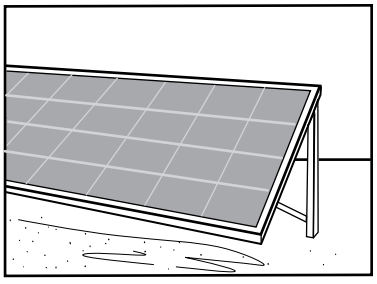
Advantages and Disadvantages of Adding Solar Panels to a Farm Field

Advantages	• Electricity produced by panels adds income for farmers. • Panels can keep the soil cool during the day. • Plants that help pollinators can grow under panels.
Disadvantages	• Some valuable farmland can be lost. • Tractors and other large machines cannot fit beneath panels. • Panels require additional electrical wires and stations.

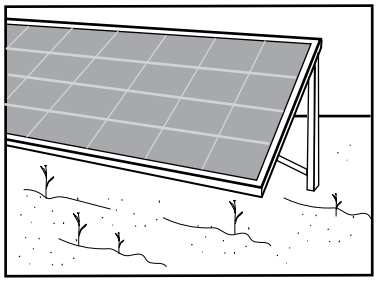
Pollinator-Friendly Solar Energy

Certain plants can be grown under solar panels. These plants can attract birds, bees, and butterflies. The plants are sometimes called pollinator-friendly plants. The farmland can generate renewable electricity while supporting the pollination of important crops. The plants can also reduce erosion of soil and improve water quality in the area. The model below shows this process.

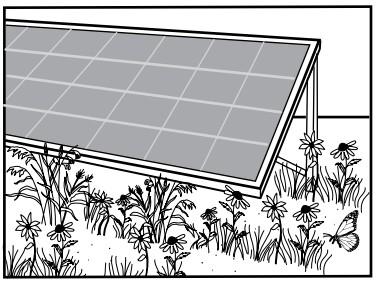
Solar Energy and Pollinators



1. Solar panels are installed in a field.



2. Seeds for plants that attract pollinators are planted under solar panels.



3. The plants attract pollinators and the solar panels provide energy.

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SCIENCE ITEMS—SESSION 1

1. A farmer wants to be sure that pollinator-friendly plants will be able to grow under an area of solar panels. Which two of these questions should the farmer ask before deciding whether to add solar panels to a field?

A. What color are the solar panels?

B. Where will the solar panels come from?

C. What type of energy will the solar panels use to produce electricity?

D. What height should the solar panels be placed off the ground?

E. How does the shade from the solar panels affect the soil underneath?

2. A farmer is considering using solar panels, but the area experiences a certain natural hazard every few years. The farmer requests that the solar panels be installed higher off the ground than normal.

Which natural hazard would be most likely to have its effects reduced by installing solar panels that are higher off the ground, and why?

A. an earthquake, because higher solar panels are less likely to fall

B. a flood, because higher solar panels are less likely to be underwater

C. a hurricane, because higher solar panels are less likely to be damaged by wind and rain

D. a tornado, because higher solar panels are less likely to be removed from the ground by high winds

3. Which statement describes a way in which the nonliving parts of a field are affected by plants or animals in the field?

A. Roots of plants can reduce the erosion of soil.

B. The farmland can generate renewable electricity.

C. Solar panels can help keep the soil cool during the day.

D. Plants under solar panels can attract pollinators.

Go on to the next page.

4. Which set of statements correctly compares how plants and solar panels interact with sunlight?

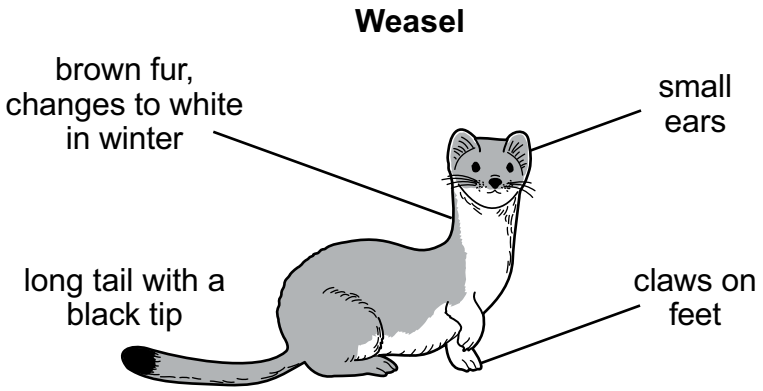
A. Solar panels collect sunlight and convert it into electricity. Plants collect sunlight and convert it into electricity. In this way, both solar panels and plants change energy into different forms.

B. Solar panels collect sunlight and convert it into food. Plants collect sunlight and convert it into food. In this way, neither solar panels nor plants change energy into different forms.

C. Solar panels collect sunlight and convert it into electricity. Plants collect sunlight and convert it into food. In this way, both solar panels and plants change energy into different forms.

D. Solar panels collect sunlight and convert it into food. Plants collect sunlight and convert it into electricity. In this way, neither solar panels nor plants change energy into different forms.

5. The drawing shows a weasel, an animal that lives in Wisconsin.



Which <u>two</u> parts of the weasel <u>most likely</u> help it hunt its prey?

A. brown fur, changes to white in winter; and small ears

B. small ears; and long tail with a black tip

C. claws on feet; and brown fur, changes to white in winter

D. long tail with a black tip; and claws on feet

Go on to the next page.

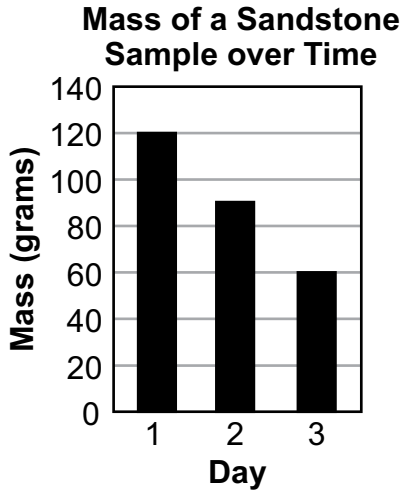
Read the following information, and then answer questions 6–8.

Weathering Rocks

Students learn that igneous, sedimentary, and metamorphic rocks can be observed in Wisconsin. These rocks weather at different rates.

The students study data from an experiment that used a rock tumbler, which is a machine used to weather rocks. A rock tumbler spins and tumbles rocks similar to how a washing machine spins and tumbles clothes. A rock tumbler is filled with sand and water to help weather the rocks inside. The data from the experiment suggest that certain igneous rocks weather at a slower rate than some sedimentary and metamorphic rocks exposed to the same conditions.

The students decided to conduct a similar experiment with one type of rock in a rock tumbler half-filled with sand and water. The students selected a rock sample of sandstone, which is a sedimentary rock. Over three days, the students measured the mass of the sandstone. The students recorded the data in the graph below.



6. The students decide to leave the rocks in the rock tumbler for a fourth day. One student claims that the mass of the sandstone sample on day 4 can be predicted since weathering conditions remained the same throughout the investigation.

What is the most likely mass of the sandstone sample on day 4 of the investigation?

A. 120 grams

B. 60 grams

C. 30 grams

D. 10 grams

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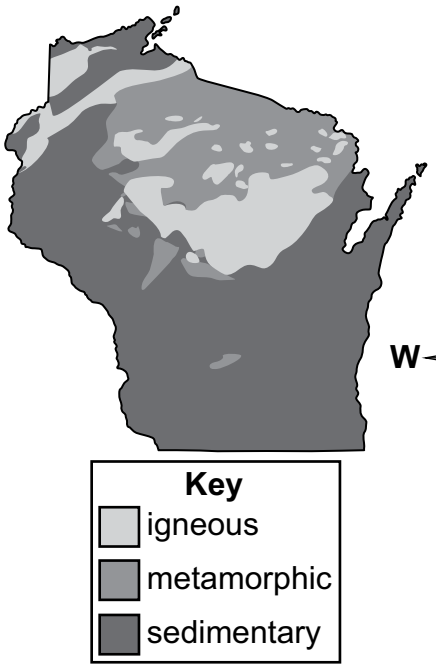
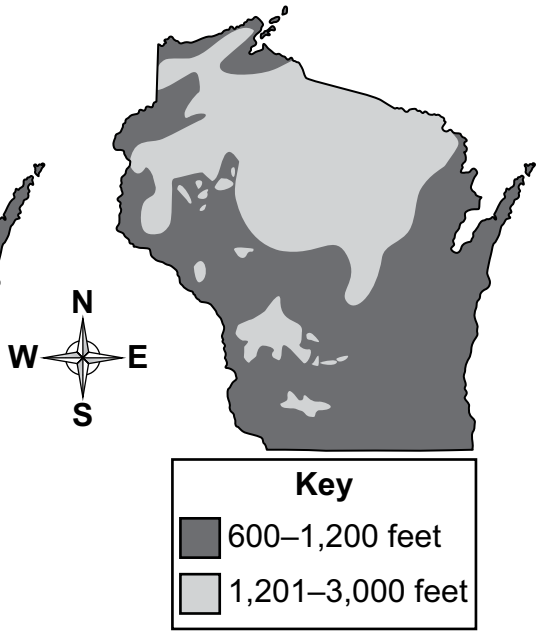
7. Students are studying characteristic rocks in Wisconsin. The students study two maps comparing the types of rocks in Wisconsin and the elevation across the state. One student observes a pattern between the rock type and elevation.

Rock Types of Wisconsin



Elevation Map of Wisconsin



Which chart shows the pattern the student observed?

A.

Elevation (feet)	Rock Types
600–1,200	metamorphic and sedimentary
1,201–3,000	igneous

B.

Elevation (feet)	Rock Types
600–1,200	sedimentary
1,201–3,000	igneous and metamorphic

C.

Elevation (feet)	Rock Types
600–1,200	igneous
1,201–3,000	metamorphic and sedimentary

D.

Elevation (feet)	Rock Types
600–1,200	igneous and metamorphic
1,201–3,000	sedimentary

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8. Engineers are exploring locations to construct a new building. They study a chart showing factors that affect rates of weathering.

Factors That Affect Rates of Weathering

Factor	weathering rate fast → slow		
precipitation	high	medium	low
thickness of soil layer	thin	medium	thick
hills	steep	medium	gentle

Next, the engineers study a chart showing characteristics of four locations in Wisconsin.

Location	Average Yearly Precipitation (inches)	Thickness of Soil Layer	Hills
1	31–32	thick	gentle
2	37–38	thin	gentle
3	32–33	medium	steep
4	34–35	thin	medium

Which location most likely has the slowest rate of rock weathering?

A. location 1

B. location 2

C. location 3

D. location 4

STOP.

STOP.

SCIENCE ITEMS—SESSION 2

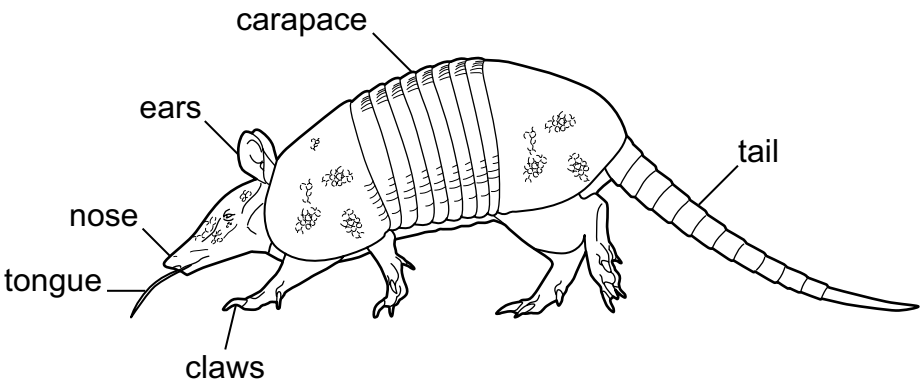
Read the following information, and then answer questions 1–5.

Armadillos

Armadillos are mammals that live in deserts, grasslands, and rainforests. They have many features to help them survive.

All types of armadillos have a shell, called a carapace. The shell is made up of hard pieces of bone that are connected to each other. The carapace can bend where the bones connect to each other, so it is hard and also flexible.

Armadillo



Armadillos have weak eyesight, so they must use their other senses to help them survive. Armadillos must use their sense of smell and hearing to learn what other types of animals are in the area. An armadillo can remember the scent of other armadillos and recognize them. Armadillos eat insects and worms that live in the ground. They find their food by smelling it.

Armadillos use their nose and front feet to dig large holes in the ground. These shelters are called burrows. One armadillo may make up to ten burrows. They are connected by underground tunnels. Armadillos use their burrows for many things.

How Armadillos Use Their Burrows

- sleeping
- raising their young
- protection from other animals
- protection from hot or cold weather

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SCIENCE ITEMS—SESSION 2

1. Which statement best describes the feature that is most useful when an armadillo is defending itself from predators?

A. The carapace protects the sensitive areas of the armadillo from harm.

B. The sense of smell protects the armadillo from other armadillos.

C. The long sticky tongue protects the armadillo from insects.

D. The claws protect the armadillo from other animals.

2. A student is describing how the armadillo detects and responds to a predator such as a coyote.

Based on the information in the passage, select two processes that most likely occur when an armadillo detects and responds to a predator.

A. The armadillo sees the predator.

B. The armadillo smells the predator.

C. The armadillo calls to other armadillos.

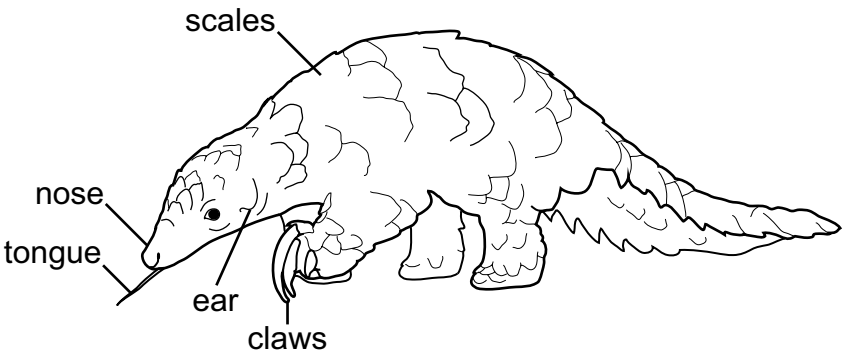
D. The armadillo makes a sharp, loud cry.

E. The armadillo runs into its hole in the ground.

Go on to the next page.

3. Pangolins are mammals that have similar body structures to armadillos. They use these body structures in the same way as armadillos do for survival. Instead of a carapace, they have hard scales on their bodies.

Pangolin



Based on the information about armadillos in the passage, draw a line to correctly match each pangolin structure with one function.

Structures	Functions
sticky tongue	digging for prey
claws	protection from predators
scales	retrieving prey from underground

Go on to the next page.

4. An armadillo is identifying another armadillo it has already met.

Draw a line from each event to a box in the flow chart to model the order they would occur.

The armadillo realizes it is encountering another armadillo.

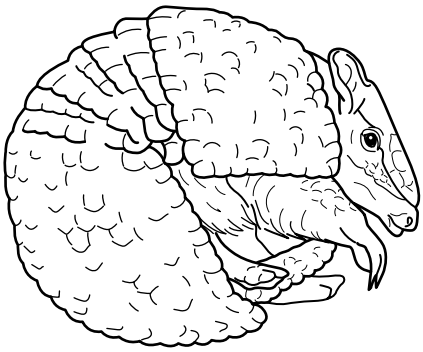
The armadillo smells something.

The armadillo's brain identifies the scent from a previous experience.

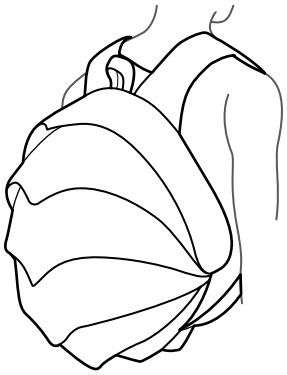
Go on to the next page.

5. The three-banded armadillo has overlapping bones in its carapace that allow it to curl into a ball, tucking its face, legs, and tail inside the carapace. The picture on the left is a three-banded armadillo and the picture on the right is a backpack made of rubber tire pieces.

Armadillo Curled Into a Ball



Backpack Design



The backpack was designed based on the armadillo's body features. Which <u>two</u> features of the three-banded armadillo did engineers <u>most likely</u> use to help develop this backpack?

A. being flexible, so it can change shape

B. being hard, so it protects items inside

C. being dark, so it can absorb heat

D. being rubber, so it is comfortable

E. being made of many pieces, so it can come apart

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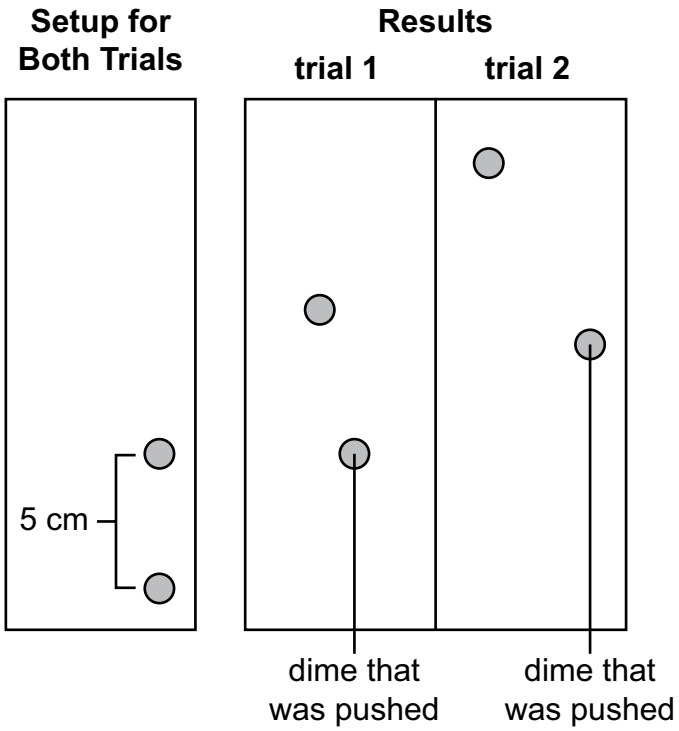
Read the following information, and then answer questions 6–8.

Moving Dimes

Science students are using dimes to learn about energy transfer between objects. The students placed four dimes on a smooth table. A student pushed one dime into another dime placed 5 centimeters away—causing a collision.

In trial 1, the student's push was gentle. In trial 2, the student's push was stronger than in trial 1. The setup of the investigation and the results are shown in the model below.



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6. A student suggests that there are several ways to observe energy transfer during a collision.

Which statement describes the best prediction about the results of this experiment if a student were collecting data about sound?

A. The collision in trial 1 would produce a sound that lasts for a longer time than the sound produced by the collision in trial 2.

B. The collisions in trial 1 and trial 2 would produce sounds that cannot be heard by the human ear.

C. The collisions in trial 1 and trial 2 would produce identical sounds.

D. The collision in trial 2 would produce a louder sound than the sound produced by the collision in trial 1.

E. The collision in trial 1 would produce a louder sound than the sound produced by the collision in trial 2.

7. A student claims that the dime that was pushed in trial 2 had more energy than the dime that was pushed in trial 1.

Which explanation provides the best evidence from this investigation to support the claim?

A. The pushed dime in trial 2 had more energy because it moved forward in a straighter line than the pushed dime in trial 1.

B. The pushed dime in trial 2 had more energy because it received a gentler push than the dime in trial 1 did.

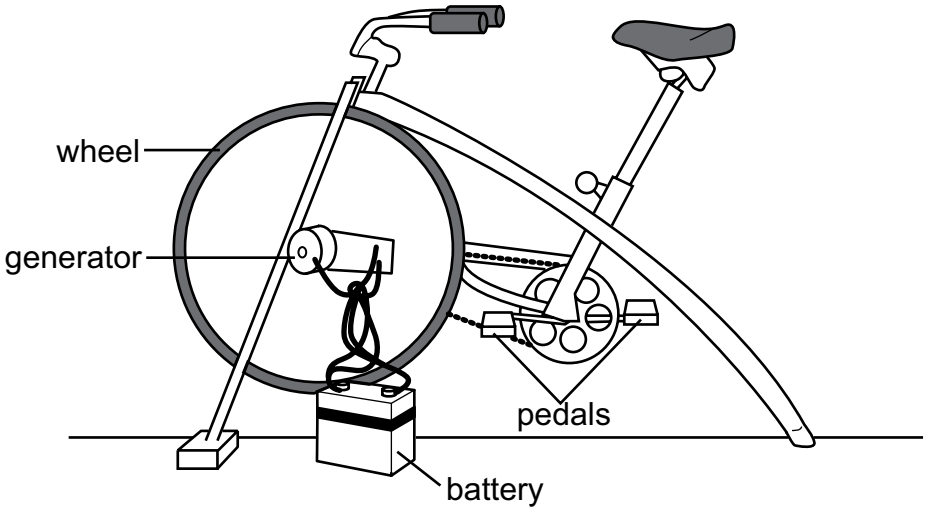
C. The pushed dime in trial 2 had more energy because it was pushed harder, and its faster motion caused the other dime to move farther after they collided than the pushed dime in trial 1 did.

D. The pushed dime in trial 2 had more energy because it moved more slowly than the pushed dime in trial 1 did, so it transferred more energy to the other dime when they collided.

Go on to the next page.

8. After observing the dimes collide, a student considers how energy transfer occurs in other objects. The student learns about a bicycle that is used to provide electricity. The diagram below shows the bicycle.

Bicycle Electricity Generator



Next, the student studies the flowchart below about how the bicycle works.

pedals → wheel → generator → battery

Which option identifies an input and output in this system?

A. input: stored energy in the battery
output: motion energy from the body

B. input: motion energy from the body
output: stored energy in the battery

C. input: stored energy in the battery
output: sunlight energy

D. input: sunlight energy
output: motion energy from the body

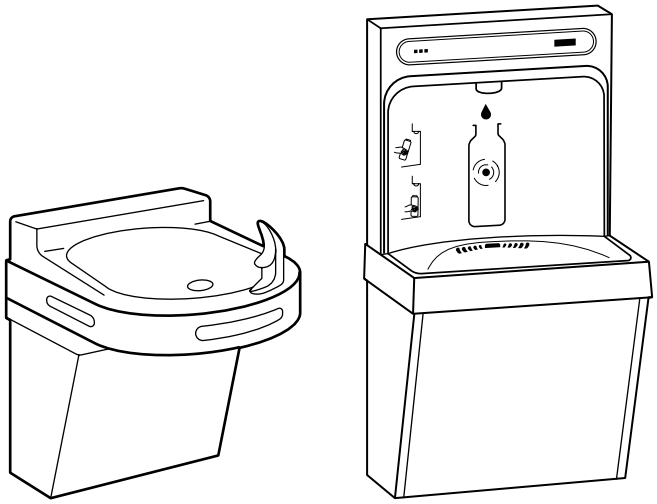
STOP.

STOP.

SCIENCE ITEMS—SESSION 3

1. Two students asked their school principal if the school could replace their drinking fountains with water bottle filling stations as shown in the drawing.

Drinking Fountain and Filling Station



drinking fountain filling station

The principal agreed to install one filling station and asked the students to design a way to predict whether the students at the school would use more filling stations.

Which table best identifies how the students could measure the success of the filling station and an action needed for filling stations to be used throughout the school?

A.

Measure of Success	Action Needed
Record how much water students get from each drinking fountain and the filling station.	Allow students to carry water bottles to classrooms.

B.

Measure of Success	Action Needed
Add a light and a step to each drinking fountain.	Record the temperature of the water from each filling station.

C.

Measure of Success	Action Needed
Add a light and a step to each drinking fountain.	Record how much water students get from each drinking fountain and the filling station.

D.

Measure of Success	Action Needed
Record the temperature of the water from each filling station.	Allow students to carry water bottles to classrooms.

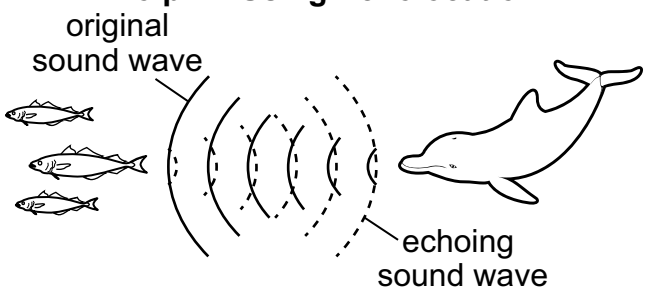
Go on to the next page.

Read the following information, and then answer questions 2–6.

Seeing with Sounds Underwater

It is difficult to see underwater where it is dark. Some ocean animals, such as dolphins, use sounds to help them understand their water environment. Dolphins produce high-pitched sounds. These sound waves travel through the water until they bump into an object. Then, the sound waves bounce off the object. The echoes of the sound waves return to the dolphin—specifically to the dolphin's jaw. The sounds travel through the dolphin's jaw to its inner ear, where the sounds are translated into nerve impulses that travel to the brain. The way dolphins "see" with sounds is called echolocation.

Dolphin Using Echolocation



From echoing sound waves, dolphins can learn a lot about an object: its shape, its size, its distance from the dolphin, and whether it is moving toward or away from the dolphin. Dolphins use echolocation to find their way around, to find prey, and to communicate with each other.

Scientists realized that the way dolphins can gather information from sounds could be used for human-made technology. Sonar is one example of this type of technology. Sonar is used by submarines and ships to find their way underwater and locate objects. Similar to echolocation, sonar sends out sound waves and interprets the echoing waves.

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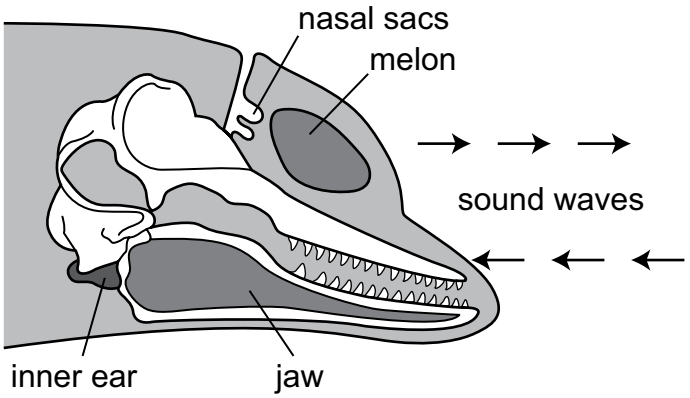
2. The diagram below shows how dolphins produce and receive sounds.

Dolphin Echolocation System



Dolphins make sounds by blowing air through their nasal sacs. These sounds travel into the water through the melon, an organ in the forehead. Returning sound waves are received through the jaw and then sent to the inner ear. In the inner ear, sound waves are translated into nerve impulses and sent to the brain.

Draw a line from each part of the system to a blank to correctly model how dolphins use incoming sound waves.

How Dolphins Use Incoming Sound Waves

incoming sound waves → _____ → _____ → _____ → brain

Parts

nerve impulses

inner ear

jaw

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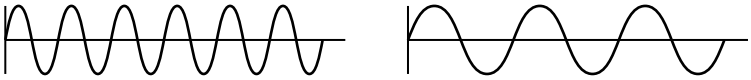
3. A student studies models of waves with different pitches.

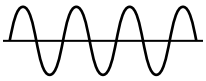
Sounds Produced by a Dolphin



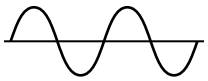
higher pitch lower pitch

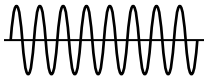
Echoing waves with a lower pitch than the original sound wave suggest the object is moving away from the source. A dolphin produces the sound wave shown below.

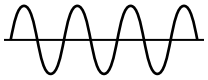
Dolphin Sound Wave

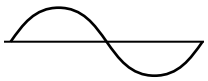


Which model best shows an echoing wave for an object moving toward the dolphin?

A. 

B. 

C. 

D. 

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4. Dolphins cannot detect fishing nets using echolocation. Sometimes dolphins get caught in these nets. A student listed two possible solutions to improve the design of the nets.

Possible Design Solutions
Solution 1: increase the size of the openings in the net so dolphins can swim out Solution 2: attach a device to the net that reflects echolocation sounds from dolphins

The goals for the new nets are listed below.

Goals for the Nets

Goal A: prevent dolphins from getting trapped

Goal B: help dolphins to locate fishing nets

Check boxes in the table below to identify the goal(s) that each solution meets.

	Goal A	Goal B
Solution 1		
Solution 2		

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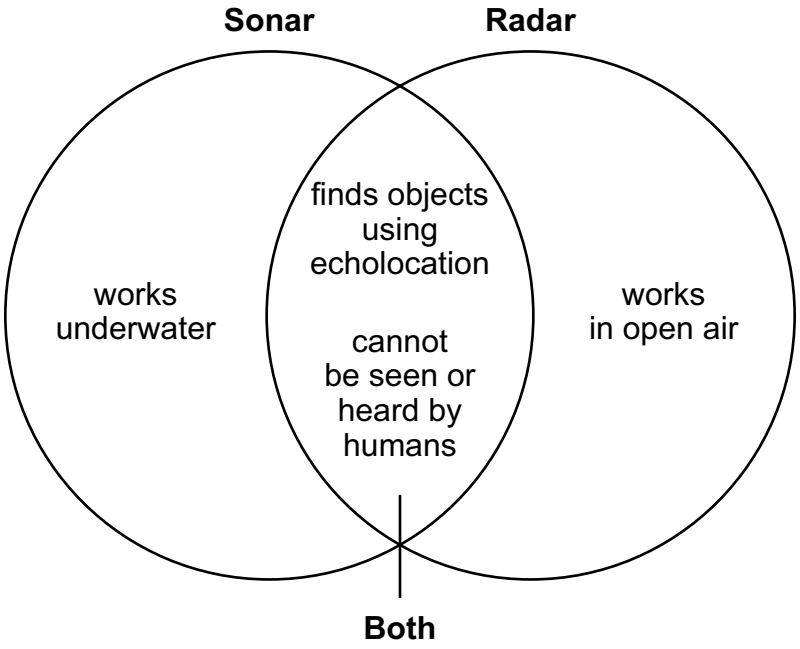
5. The Venn diagram below compares two applications of wave energy by humans.

1. sonar (sound navigation and ranging)
2. radar (radio detection and ranging)



A scientist wants to track the movement of songbirds as they migrate through Wisconsin.

Which explanation best describes the technology the scientist should use to track songbird migration?

A. The scientist should use radar to track songbird migration because it works in open air.

B. The scientist should use sonar to track songbird migration because it works in open air.

C. The scientist should use radar to track songbird migration because it works underwater.

D. The scientist should use sonar to track songbird migration because it works underwater.

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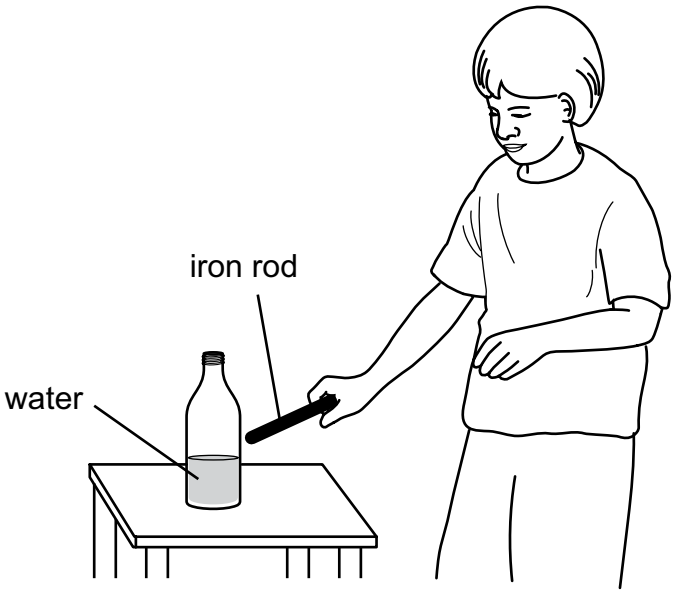
6. A student pours water into a glass bottle. Next, the student gently taps the outside of the bottle with an iron rod.



Part A

Which idea is most likely being investigated by the student?

A. energy transfer through materials

B. heat conduction through materials

C. magnetic properties of materials

D. reflective properties of materials

Part B

Which observations best support the answer to Part A?

A. The temperature of the water remains the same after the student taps the bottle with the iron rod.
The iron rod and the glass bottle are made of different materials.

B. A sound is produced when the student taps the bottle with the iron rod.
The temperature of the water remains the same after the student taps the bottle with the iron rod.

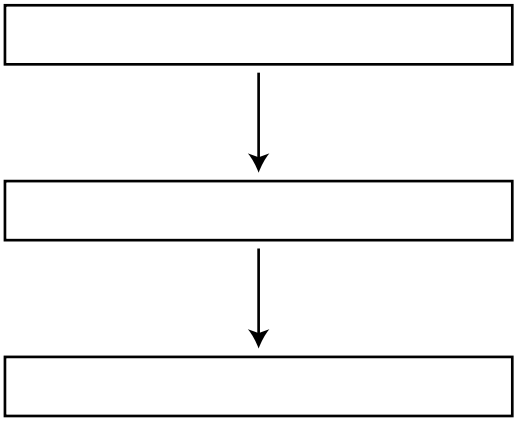
C. A sound is produced when the student taps the bottle with the iron rod.
Waves are produced in the water, showing vibration.

D. Waves are produced in the water, showing vibration.
The iron rod and the glass bottle are made of different materials.

Go on to the next page.

7. When a dog hears a doorbell, it moves toward the door. Draw a line from three of the sentences to the boxes to model how a dog responds to a ringing doorbell.

How a Dog Responds to a Doorbell



The information is processed in the dog's brain.

The information is processed in the dog's ears.

The dog uses its legs to move toward the door.

The dog uses its brain to move toward the door.

The dog's ears detect the sound from the doorbell.

The dog's eyes detect the sound from the doorbell.

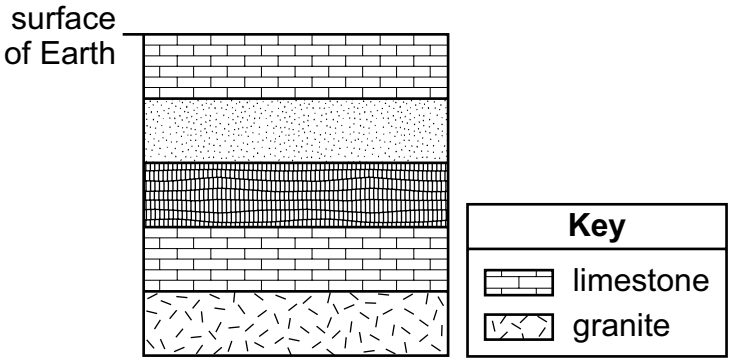
Go on to the next page.

8. A student is looking at the diagram below, which uses symbols to represent layers of rock in an area. Each type of rock has a unique symbol.

Limestone, a type of rock that is usually deposited when a surface is covered by an ocean, is shown by a brick-like pattern.

Granite, a rock that is commonly found in areas that have had volcanic eruptions, is shown by a pattern that looks like very short lines arranged in different directions.

Rock Layers



Which set of labels completes the following statements to provide the best description of this area?

Granite is the deepest layer, which means it is the __1__ layer in the area. This layer was formed through the release of __2__ onto Earth's surface. If scientists want to explore for fossils, they should investigate the __3__ layers.

A. 1. youngest
   2. water
   3. granite

B. 1. youngest
   2. soil
   3. limestone

C. 1. oldest
   2. water
   3. granite

D. 1. oldest
   2. lava
   3. limestone

STOP.

STOP.

SCIENCE ITEMS—APPENDIX

SUMMARY DATA

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
Session 1				
1	SCI.ESS3.A.4: Disciplinary Core Idea; SCI.SEP1.A.3-5: Asking Questions; SCI.CC2.3-5: Cause & Effect	D, E	2	A. Incorrect. The color of the solar panels would not affect whether pollinator-friendly plants would be able to grow under an area of solar panels. B. Incorrect. The place the solar panels came from would not affect whether pollinator-friendly plants would be able to grow under an area of solar panels. C. Incorrect. The type of energy the solar panels use to produce electricity would not affect whether pollinator-friendly plants would be able to grow under an area of solar panels. D. Correct. The height that the solar panels are placed off the ground would affect whether pollinator-friendly plants would be able to grow under an area of solar panels. E. Correct. The shade from the solar panels would affect the soil underneath and whether pollinator-friendly plants would be able to grow under an area of solar panels.
2	SCI.ESS3.B.4: Disciplinary Core Idea; SCI.SEP6.B.3-5: Designing Solutions; SCI.CC2.3-5: Cause & Effect	B	2	A. Incorrect. Lower solar panels would be more likely to survive an earthquake with less damage. B. Correct. Higher solar panels would keep the solar panels out of floodwater and allow water to flow beneath the panels. C. Incorrect. Higher solar panels are more likely to be damaged by wind and rain. D. Incorrect. Lower solar panels would be more likely to survive a tornado since higher solar panels would allow for more motion and more potential damage.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
3	SCI.ESS2.E.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing an Explanation; SCI.CC2.3-5: Cause & Effect	A	2	A. Correct. The plants are living things that affect the nonliving parts of a field. B. Incorrect. The farmland generating renewable electricity is not an interaction between nonliving and living parts of a field. C. Incorrect. This is an example of two nonliving components interacting in a field. D. Incorrect. This idea does not demonstrate an effect of plants or animals on the nonliving parts of a field.
4	SCI.PS3.D.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing an Explanation; SCI.CC5.3-5: Energy and Matter	C	2	A. Incorrect. Plants convert sunlight into food, not electricity. B. Incorrect. Solar panels convert sunlight into electricity, not food. Both solar panels and plants change energy into different forms. C. Correct. Solar panels collect sunlight and convert it into electricity. Plants collect sunlight and convert it into food. In this way, both solar panels and plants change energy into different forms. D. Incorrect. Solar panels collect sunlight and convert it into electricity and plants convert it into food. Both solar panels and plants change energy into different forms.
5	SCI.LS1.A.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing an Explanation; SCI.CC6.3-5: Structure and Function	C	2	A. Incorrect. Small ears are not a part of a weasel that most likely helps it hunt its prey. B. Incorrect. A long tail with a black tip is not a part of a weasel that most likely helps it hunt its prey. C. Correct. The claws on a weasel's feet and its brown fur, which changes to white in winter, most likely help it hunt its prey. D. Incorrect. A long tail with a black tip is not a part of a weasel that most likely helps it hunt its prey.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
6	SCI.ESS2.A.4: Disciplinary Core Idea; SCI.SEP4.A.3-5: Analyzing and Interpreting Data; SCI.CC2.3-5: Cause and Effect	C	2	A. Incorrect. The mass of the rock sample on day 4 will be less than the mass of the rock sample on day 1. B. Incorrect. The mass of the rock sample on day 4 will be less than the mass of the rock sample on day 3. C. Correct. Based on the pattern shown in the graph, the mass of the rock sample and on day 4 will be about 30 grams less than the mass of the rock sample on day 3. D. Incorrect. The mass of the rock sample on day 4 will more likely be about 30 grams less than the mass of the rock sample on day 3.
7	SCI.ESS2.B.4: Disciplinary Core Idea; SCI.SEP4.A.3-5: Analyzing and Interpreting Data; SCI.CC1.3-5: Patterns	B	3	A. Incorrect. The maps indicate that metamorphic rocks are mostly found at higher elevations. B. Correct. The maps indicate that lower elevations have mostly sedimentary rocks and higher elevations have mostly igneous and metamorphic rocks. C. Incorrect. The chart shows the reverse of the trend from the maps for igneous and sedimentary rocks. D. Incorrect. The maps indicate the opposite pattern to what is shown in the chart.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
8	SCI.ESS3.B.4: Disciplinary Core Idea; SCI.SEP6.B.3-5: Designing Solutions SCI.CC2.3-5: Cause and Effect	A	3	A. Correct. Location 1 most likely has the slowest rate of rock weathering due to the relatively low yearly precipitation, the thick soil layer, and the gentle slopes. B. Incorrect. The higher amount of yearly precipitation and the thin soil layer indicate that location 2 likely does not have the slowest rate of rock weathering. C. Incorrect. The steep hills indicate that location 3 likely does not have the slowest rate of rock weathering. D. Incorrect. The thin soil layer indicates that location 4 likely does not have the slowest rate of rock weathering.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
Session 2				
1	SCI.LS1.A.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing Explanations; SCI.CC4.3-5: Systems and System Models	A	2	A. Correct. The hard carapace protects the armadillo from predators. B. Incorrect. The sense of smell protects the armadillo from predators, not from other armadillos. C. Incorrect. The long sticky tongue catches insects, which are its prey; it does not protect the armadillo from predators. D. Incorrect. The claws are used to dig holes in the ground for shelter and to find food.
2	SCI.LS1.D.4: Disciplinary Core Idea; SCI.SEP8.A.3-5: Obtain, Evaluate, and Communicate Information	B, E	3	A. Incorrect. The armadillo has poor eyesight, so this is not the most likely response. B. Correct. The armadillo uses its sense of smell to detect other animals around it. C. Incorrect. No information is presented in the passage about this ability. D. Incorrect. No information is presented in the passage about this ability. E. Correct. The armadillo is described as having a hole in the ground in which it lives and sleeps.
3	SCI.LS1.A.4: Disciplinary Core Idea; SCI.SEP8.A.3-5: Obtain, Evaluate, and Communicate Information; SCI.CC6.3-5: Structure and Function	sticky tongue – retrieving prey from underground claws – digging for prey scales – protection from predators	2	The student matches pangolin structures and functions. Pangolins, like armadillos, use the sticky tongue for retrieving prey from underground; use the claws to dig for prey; and use the scales for protection from predators.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
4	SCI.LS1.D.4: Disciplinary Core Idea; SCI.SEP2.A.3-5: Developing Models	The armadillo smells something. The armadillo's brain identifies the scent from a previous experience. The armadillo realizes it is encountering another armadillo.	2	The student draws lines from each event to a box in the flow chart to model the order in which an armadillo would identify another armadillo it has already met. The armadillo first smells the scent, then the brain identifies the scent, then the armadillo remembers the scent of another armadillo.
5	SCI.ETS2.B.3-5: Disciplinary Core Idea; SCI.SEP1.B.3-5: Defining Problems; SCI.CC6.3-5: Structure and Function	A, B	2	A. Correct. The flexibility of the backpack allows it to change shape, like the carapace of a three-banded armadillo. B. Correct. The hardness of the backpack material protects the items inside, like the carapace of a three-banded armadillo protects its internal organs. C. Incorrect. The backpack was not designed to have the same color as a three-banded armadillo. D. Incorrect. The comfort of the rubber backpack is not analogous to a structure-function relationship in the three-banded armadillo. E. Incorrect. The backpack is not designed to come apart, and this is not analogous to a structure-function relationship in the three-banded armadillo.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
6	SCI.PS3.C.4: Disciplinary Core Idea; SEP3.A.3-5: Planning and Conducting Investigations; SCI.CC5.3-5: Energy and Matter	D	3	A. Incorrect. There is no evidence that the collision in trial 1 would produce a sound that lasted longer than the collision in trial 2. B. Incorrect. There is no evidence that the collisions would produce sounds that cannot be heard by the human ear; the student is collecting data about sound. C. Incorrect. The collision in trial 2 would produce a slightly louder sound than, not an identical sound to, the collision in trial 1. D. Correct. The collision in trial 2 would produce a slightly louder sound; the dime in trial 2 was pushed harder, which means it transferred more energy to the other dime. E. Incorrect. The collision in trial 1 would be quieter than the collision in trial 2.
7	SCI.PS3.A.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing Explanations; SCI.CC5.3-5: Energy and Matter	C	2	A. Incorrect. Moving in a straighter line does not indicate that the dime had more energy. B. Incorrect. The pushed dime in trial 2 received a stronger push than the pushed dime in trial 1. C. Correct. The harder push in trial 2 means that the pushed dime had more energy of motion that was transferred to the other dime, causing it to move farther. D. Incorrect. The pushed dime in trial 2 received a stronger push, so it moved faster than the pushed dime in trial 1.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
8	SCI.PS3.B.4: Disciplinary Core Idea; SCI.CC5.3-5: Energy and Matter	B	2	A. Incorrect. This is the reverse of the input and output for the system. B. Correct. Motion energy from the body is the input into the bike system, and it is transferred to stored energy in the battery. C. Incorrect. Stored energy in the battery is the output in the system, and the bike system output is not sunlight energy. D. Incorrect. Motion energy from the body is the input into the bike system, not the output; and the input is motion energy from the body, not sunlight energy.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
Session 3				
1	SCI.ETS2.B.3-5: Disciplinary Core Idea; SCI.SEP3.3-5: Planning and Conducting Investigations	A	3	A. Correct. The measure of success is to record how much water students get from each drinking fountain and the filling station. The action needed is to allow students to carry water bottles to classrooms. B. Incorrect. The measure of success and action needed are incorrectly identified. C. Incorrect. The measure of success and action needed are incorrectly identified. D. Incorrect. The measure of success is incorrectly identified.
2	SCI.LS1.D.4: Disciplinary Core Idea; SCI.SEP2.A.3-5: Developing Models; SCI.CC4.3-5: Systems and System Models	jaw, inner ear, nerve impulses	2	The student draws a line from each part of the system to a blank to correctly model how dolphins use incoming sound waves. Incoming sounds are received in a dolphin's jaw, then sent to the inner ear, and then they are transferred to nerve impulses and sent to the brain.
3	SCI.PS4.A.4: Disciplinary Core Idea; SCI.SEP2.A.3-5: Developing Models; SCI.CC1.3-5: Patterns	B	2	A. Incorrect. The wave model has a lower pitch than the object is moving away from the dolphin. B. Correct. An object moving toward the dolphin will have a higher pitch (frequency) than an object moving away from the dolphin. C. Incorrect. The wave model has the same pitch as the dolphin sound wave, which means the object is not moving. D. Incorrect. The wave model has a lower pitch than the dolphin sound wave, which means the object is moving away from the dolphin.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
4	SCI.ETS1.A.3-5: Disciplinary Core Idea; SCI.SEP6.B.3-5: Designing Solutions	Solution 1: Goal A Solution 2: Goal A, Goal B	2	The student checks boxes in the table to indicate which goal(s) are met by each solution. Solution 1 can prevent dolphins from getting trapped. Solution 2 can help dolphins to locate fishing nets and hence also prevent dolphins from getting trapped.
5	SCI.ETS1.A.3-5: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing Explanations	A	3	A. Correct. Radar would work best to track songbird migrations since birds fly in the open air and the Venn diagram shows that radar works in open air. B. Incorrect. The Venn diagram shows that sonar works underwater but not in open air. C. Incorrect. The Venn diagram shows that radar works in open air and not underwater. D. Incorrect. The Venn diagram shows that sonar works underwater, but songbirds travel in open air and not underwater. Their migration would be better tracked by radar due to its ability to track in open air.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
6	SCI.PS3.B.4: Disciplinary Core Idea; SCI.SEP3.A.3-5: Planning and Conducting Investigations; SCI.CC5.3-5: Energy and Matter	Part A: A Part B: C	3	Part A A. Correct. The student is investigating energy transfer from the iron rod through the bottle and water. B. Incorrect. Although some heat energy will be transferred in the system, the student is not investigating heat conduction. C. Incorrect. The student is not testing magnetic properties of materials. D. Incorrect. The student is not testing reflective properties of materials. Part B A. Incorrect. Observations about temperature and the types of materials do not indicate that the student is investigating energy transfer through materials. B. Incorrect. The observation about temperature does not indicate that the student is investigating energy transfer through materials. C. Correct. Observations about sound and waves indicate that the student is investigating energy transfer through materials. D. Incorrect. The observation about the types of materials does not indicate that the student is investigating energy transfer through materials.
7	SCI.LS1.D.4: Disciplinary Core Idea; SCI.CC4.3–5: Systems and System Models	The dog's ears detect the sound from the doorbell. The information is processed in the dog's brain. The dog uses its legs to move toward the door.	2	The student draws a line from three of the sentences to the boxes to model how a dog responds to a ringing doorbell. The dog's ears detect the sound from the doorbell. The information is processed in the dog's brain. The dog uses its legs to move toward the door.

Grade 4

Sample Number	Alignment	Key(s)	Depth of Knowledge	Annotations
8	SCI.ESS1.C.4: Disciplinary Core Idea; SCI.SEP6.A.3-5: Constructing Explanations SCI.CC1.3-5: Patterns	D	3	A. Incorrect. Granite is the oldest layer. The granite layer was formed through the release of lava onto Earth's surface. Scientists should investigate the limestone layers to explore for fossils. B. Incorrect. Granite is the oldest layer. The granite layer was formed through the release of lava onto Earth's surface. C. Incorrect. The granite layer was formed through the release of lava onto Earth's surface. Scientists should investigate the limestone layers to explore for fossils. D. Correct. The student is asked to interpret the symbols for the granite and limestone rock layers and to identify what is indicated by their presence.

Science
Practice Test
Grade 4