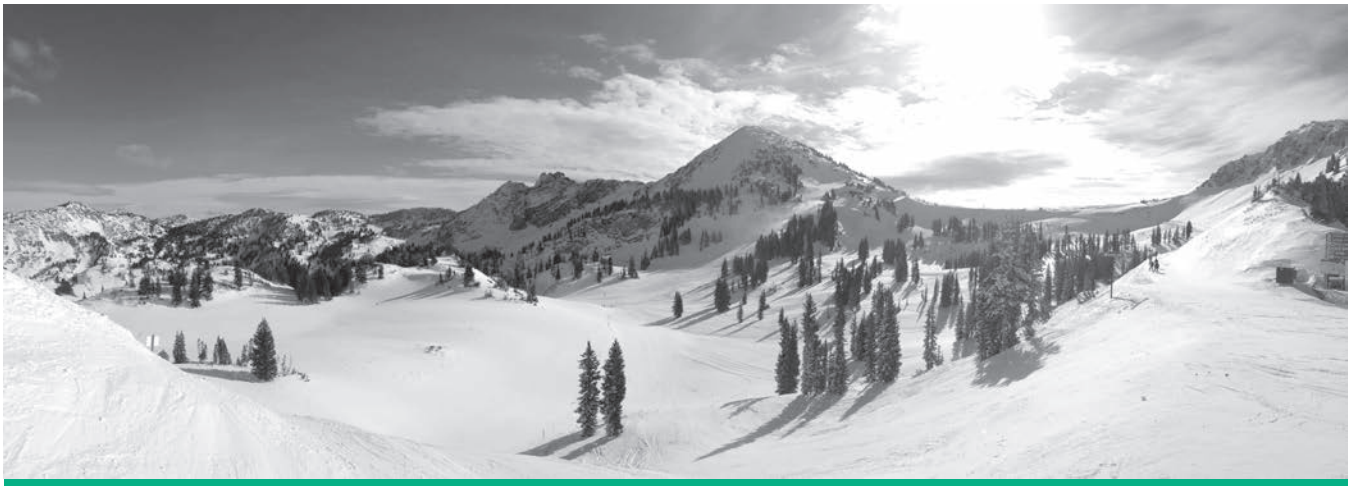
Colorado Measures of Academic Success



Grade 8

Science

Paper Practice Resource for Students

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Paper Practice Resource for Students

The Colorado Measures of Academic Success (CMAS) is Colorado's standards-based assessment program designed to measure the Colorado Academic Standards (CAS) in the content areas of science, social studies, English language arts, and mathematics. The sample items included in this resource provide students with an opportunity to become familiar with the format of test items that appear in the paper-based test books.

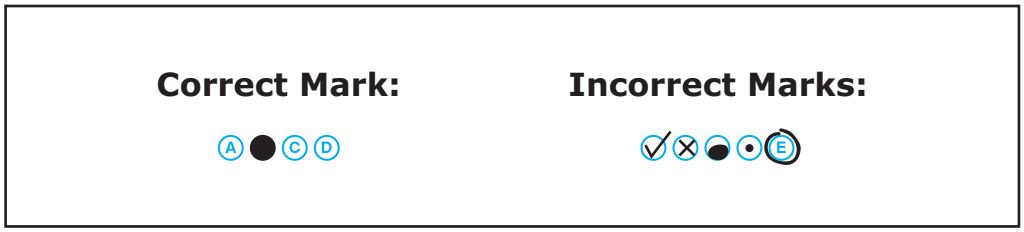
While the use of the sample items is not required, it is strongly encouraged to help ensure students are familiar with the types of items they may encounter while taking the paper-based test.

The sample item sets in the CMAS Practice Resources are not intended to be representative of a complete unit or test, nor are they intended to cover all assessed content or item types. To view assessment frameworks, high level blueprints, scoring rubrics, evidence statements and standards for the CMAS assessments, visit: https://www.cde.state.co.us/assessment/cmas_testdesign.

Item Types:

Selected Response Items

Selected response items are multiple choice questions. To respond, the student indicates their response by filling in the circle(s) next to their answer choice.



Constructed Response Items

Constructed response items are questions or prompts that require an independent, written response. To respond, the student writes his or her answer in the response box in the test book.

Converted Online Technology-Enhanced Item Types

Online technology-enhanced items converted to the paper testing format may ask students to:

- Circle the correct answer
- Complete a table with checkmarks, Xs, or letters from a list of answer choices
- Fill in the blank
- Draw lines from boxes to correct answers
- Complete a bar graph or histogram

Clusters

Clusters include groups of items that relate to a scientific topic. The information needed to respond appears before the associated items.

ITEM SET 1

1. Two students notice how quickly their cups of hot chocolate cool off. The students ask an adult to boil water. The water is 100 degrees Celsius (°C) when the adult pours it into a cup. The air temperature in the room is 20°C. After 10 minutes, the students note that the water temperature is 30°C. Explain the students' observations.

Circle one correct response from each box to complete the sentence.

Over time, the _____ energy of the water _____

chemical
thermal

stays the same
decreases
increases

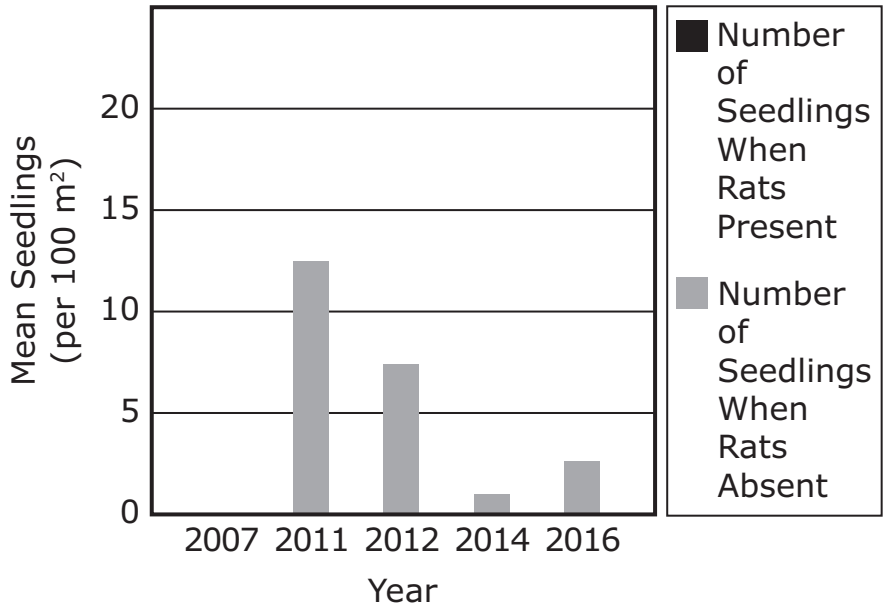
because energy flows from _____ matter.

warmer to cooler
cooler to warmer

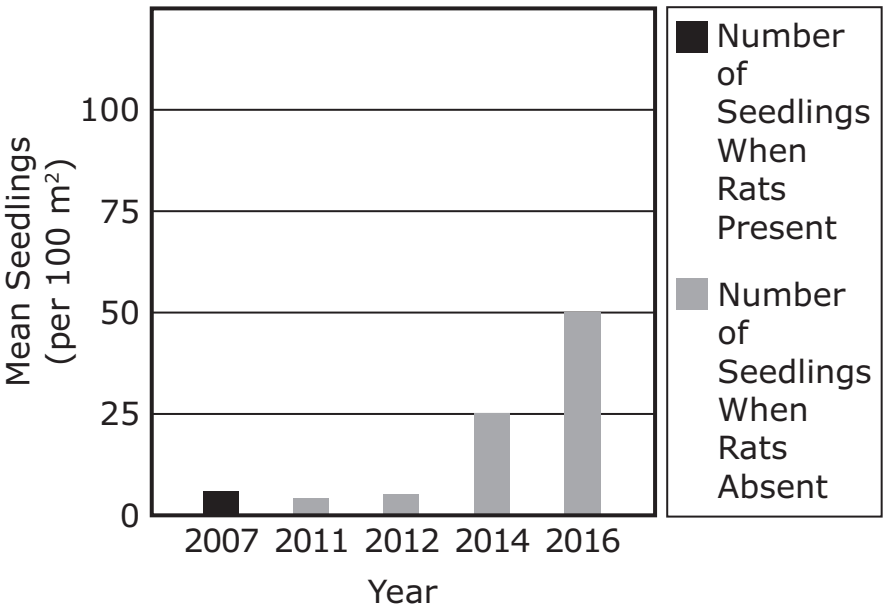
TURN THE PAGE AND CONTINUE WORKING

2. Rats were accidentally introduced onto an island in the Pacific Ocean in the 1940s. The rat population grew rapidly as the rats fed on eggs and small animals, as well as seeds and tree seedlings. In 2011, wildlife workers removed all rats from the island. The graphs show data for two tree species, before and after the removal of the rats.

Native Tree Species



Non-Native Tree Species



How can these data **best** be evaluated to compare solutions to the problems faced by native tree species?

Ⓐ Putting both graphs on the same scale would show that removing rats has aided population growth of native trees more than of non-native trees.

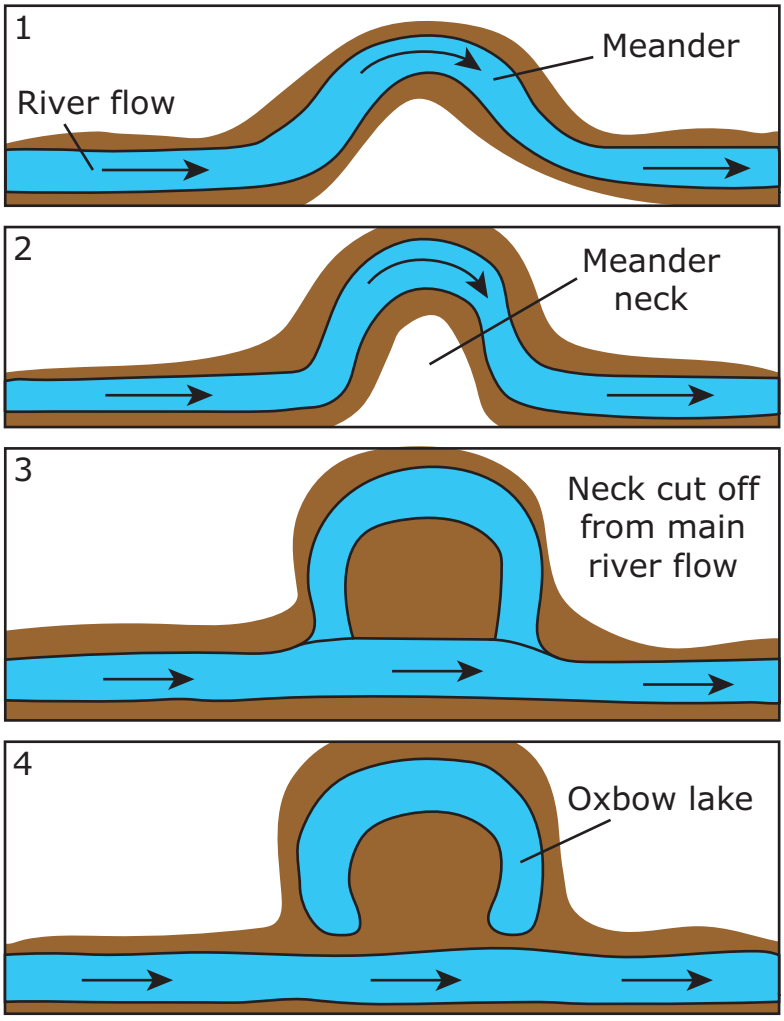
Ⓑ Comparing the data and graphs shows that removing rats has had a negative effect on small animals because rat removal decreased food sources.

Ⓒ Putting both graphs on the same scale would show that controlling non-native tree population growth is needed in addition to rat removal.

Ⓓ Comparing the data and graphs shows that controlling the number of small animals is needed in addition to rat removal.

3. Rivers that flow along crooked paths sometimes form extreme U-shaped bends called meanders. Through erosion and deposition of river soil and silt, these meanders can become oxbow lakes, as shown in the diagram.

Oxbow Lake Formation



Explain the processes that change river paths to form oxbow lakes. Your response should include an explanation of:

- how erosion and deposition can change the path of the river to form the oxbow lake
- how flooding could change the timeline of an oxbow lake's formation

Directions: Use the information to answer questions 4 through 8.

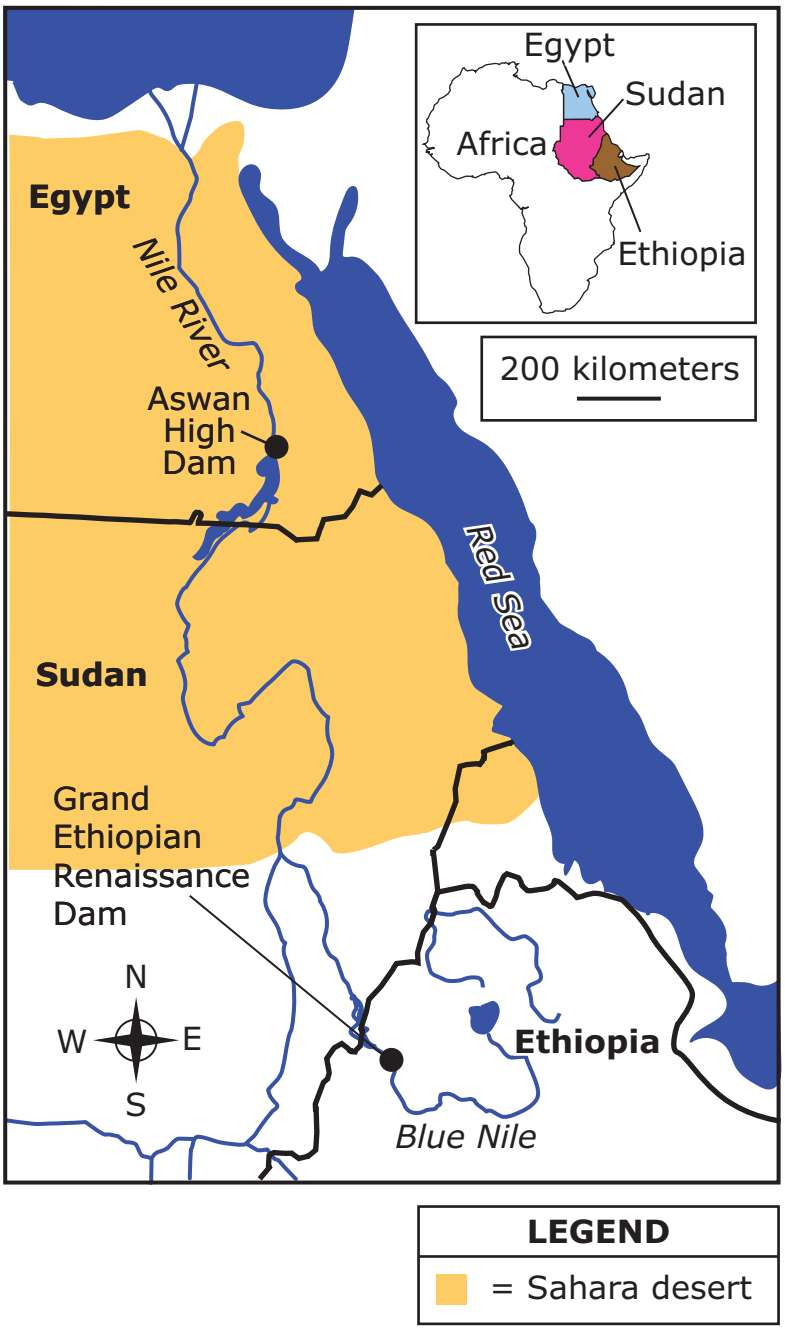
Part 1

The Nile River floods every year. Most of the river passes through the Sahara desert, where there is little rain, resulting in seasonal periods of drought and flooding. One section of the river, called the Blue Nile, gets water from heavy summer rains that cause flooding in the area. This water flows north and causes floods along the rest of the river.

When a dam is built on a river, a large body of water called a reservoir forms. Reservoirs can hold a lot of water to prevent floods, but they can also supply water in times of drought. Dams significantly change the way water and sediment flow down a river.

Dams control the flow of water down a river and can be used to generate electricity. The Aswan High Dam in Egypt was completed in 1970. In 2011, work began on the Grand Ethiopian Renaissance Dam.

Figure 1: Sections of the Nile River



Part 2

Flooding along the Nile River depends strongly on rainfall in Ethiopia. This rainfall varies from year to year and from month to month.

Figure 2: Yearly Rainfall in Ethiopia, 1980–2015

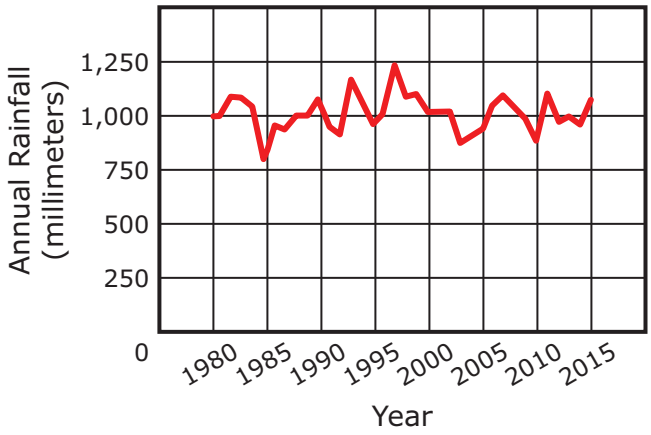
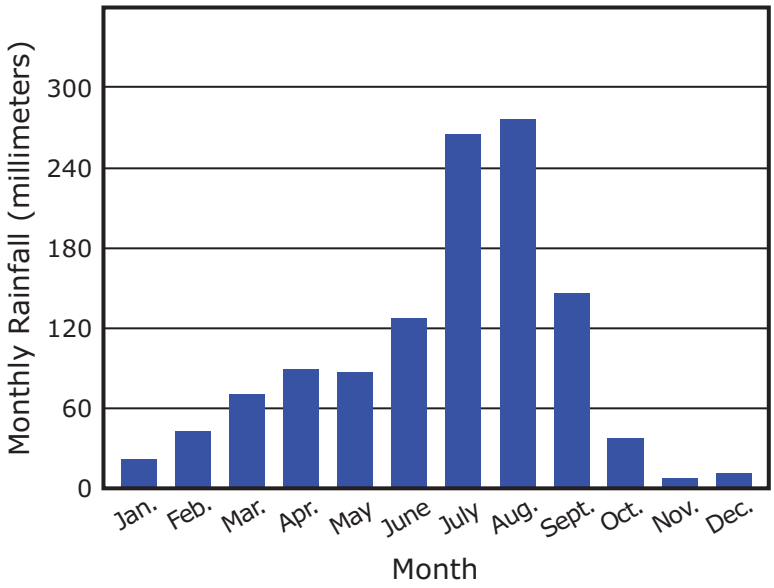


Figure 3: Monthly Average Rainfall in Addis Ababa, Ethiopia



4. The location of the Grand Ethiopian Renaissance Dam is shown in Figure 1. Operation of this dam may change geologic processes in the area. Which change will **most likely** occur as a result of the operation of the dam?

Ⓐ Water released from the dam will flood the area to the north with water and sediment.

Ⓑ The area to the south of the dam that holds the water will contain more sediment.

Ⓒ Water released from the dam will cause erosion of land to the south.

Ⓓ Eroded material from south of the dam will be carried to the north.

5. Based on the data in Part 2, during which months should people living along the Blue Nile expect potential flooding events?

Ⓐ October and November

Ⓑ January and February

Ⓒ July and August

Ⓓ April and May

6. The table shows population data for Egypt, Ethiopia, and Sudan.

Population Data

Country	Population in 2020 (millions)	Projected Population in 2060 (millions)
Egypt	104	190
Ethiopia	108	225
Sudan	46	104

Based on the information provided and the Population Data table, select the statement that **best** supports the claim that these changes in population will negatively affect ecosystems in Egypt.

Ⓐ More flooding and soil erosion will occur as the volume of water in the Nile River increases.

Ⓑ Less water will flow through the Nile River in winter months than in summer months.

Ⓒ The volume of water in the Nile River will increase as humans use more water.

Ⓓ Soil will become less fertile as the Nile River transports less sediment.

7. Based on the data in Part 2, in which month and year would a dam with a large reservoir **most likely** benefit Ethiopian water supply?

Ⓐ November 1985

Ⓑ November 2003

Ⓒ August 1992

Ⓓ August 2010

8. Prior to construction of dams along the Nile River, rainfall patterns had a larger effect on local agriculture. Use the information provided to explain how rainfall patterns affected soil availability and fertility:

- in the Nile River valley in Ethiopia
- in the Nile River valley in Egypt

Directions: Use the information to answer questions 9 through 13.

The train cars of magnetic toy trains have a magnet on each end. Students notice that if a train car is placed with its rear magnet facing the rear magnet of the engine, the magnets push away from each other. Not all train cars push away the engine the same distance. The students test the strength of the different magnets using multiple investigations. The images shown are not to scale with your ruler.

Part 1

The students follow this procedure.

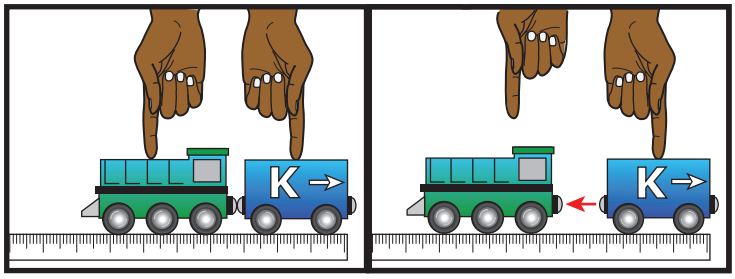
1. Place Car K at the end of a ruler, and put the train engine next to it so that the magnets are in contact.

2. Release the engine and observe the results.

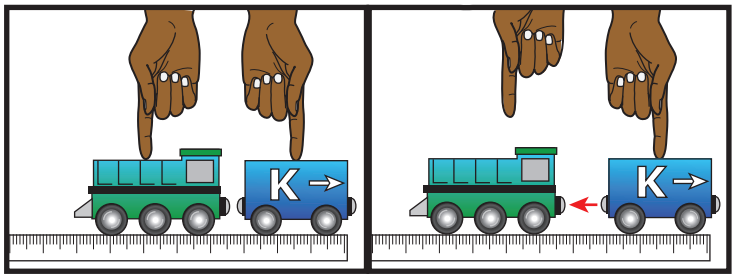
3. In a data table, record the distance the engine moved.

4. Repeat steps 2 and 3 for Car K at a distance of 2 millimeters (mm) from the engine, and then for Car K at a starting distance of 5 mm from the engine.

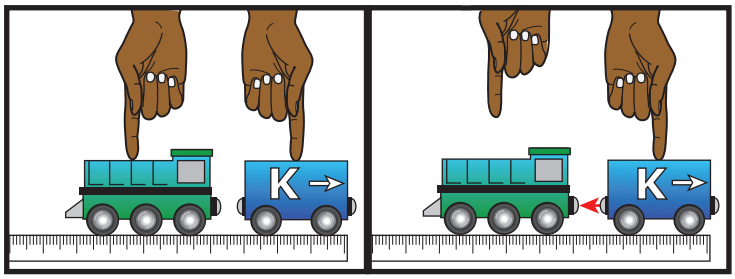
5. Repeat steps 1–4 for Car O and Car T.



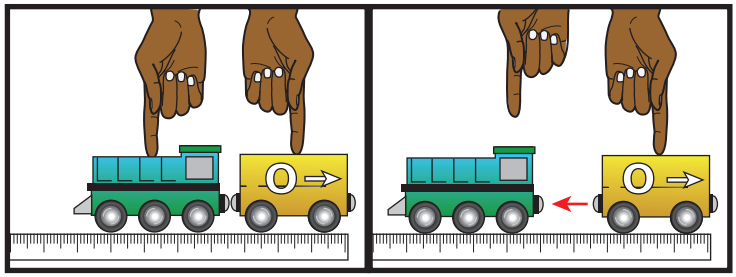
In contact



2 mm



5 mm



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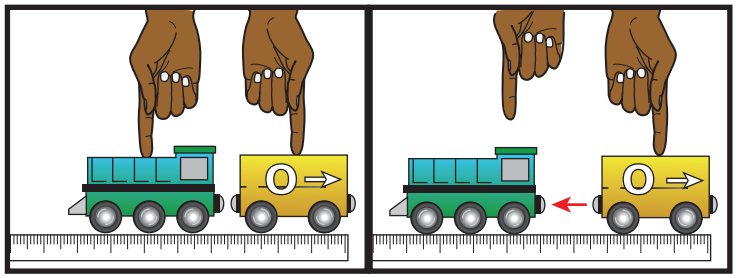
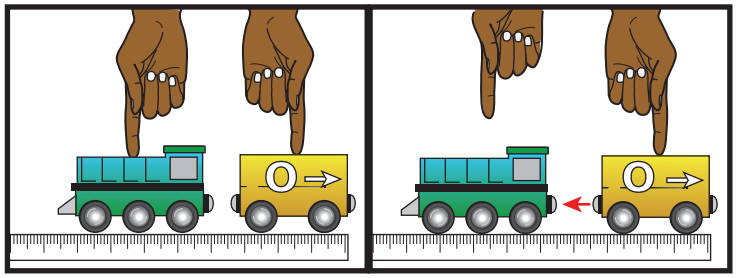
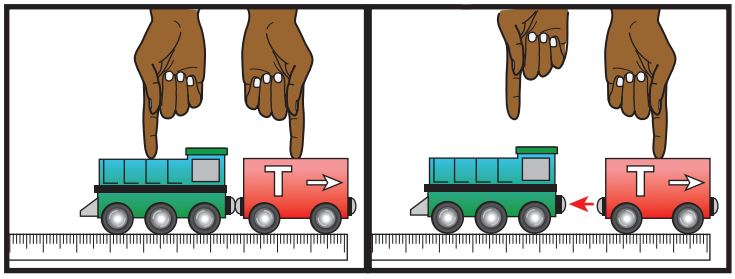


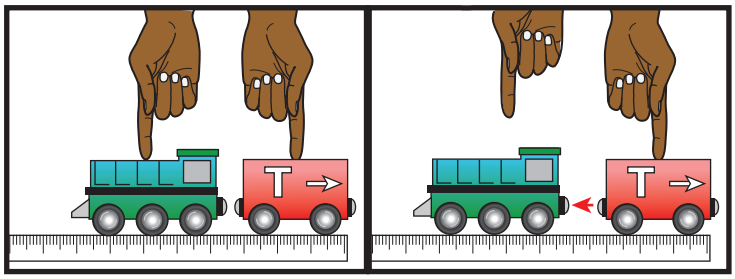
2 mm



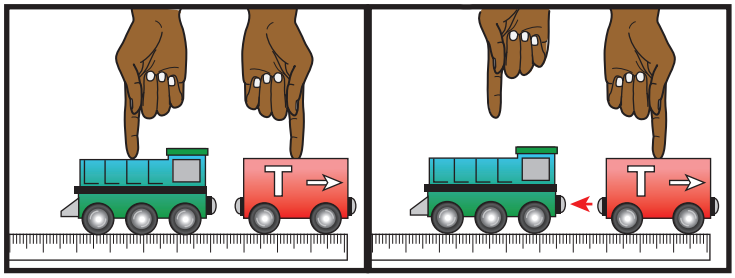
5 mm



In contact



2 mm



5 mm

Car	Distance (mm) Engine Moved When Released		
	In Contact	**2 mm**	**5 mm**
K	10.6	7.8	3.6
O	12.8	11.7	4.1
T	9.0	6.0	3.5

Part 2

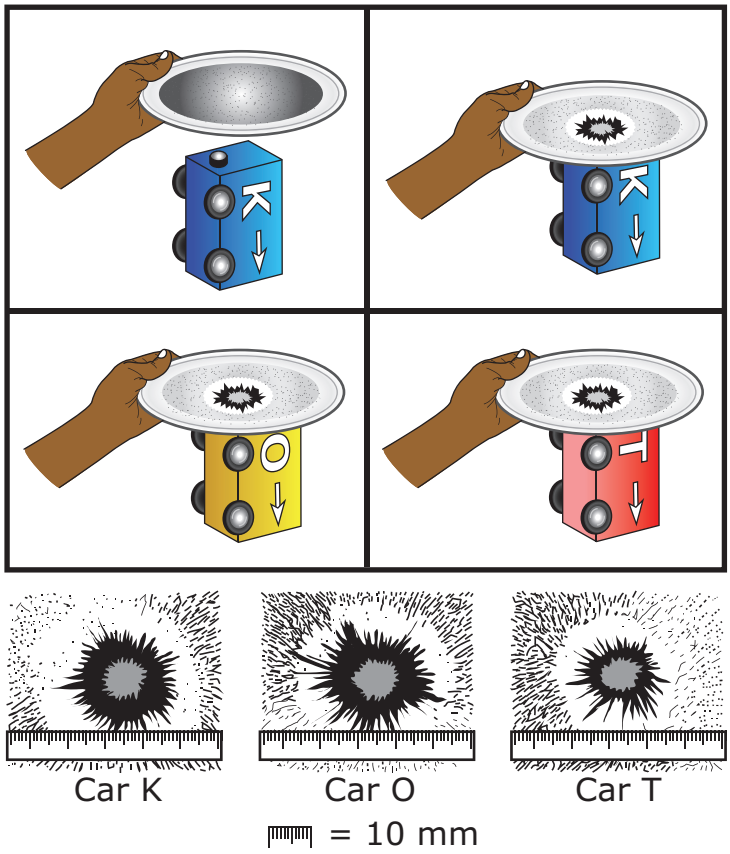
The students notice that if the magnet at the end of a train car is brought close to a paper plate with iron filings, the filings move around so that there is a circular pattern that forms directly above the magnet. The students investigate the size of the iron-filing circle each train car magnet forms.

The students follow this procedure.

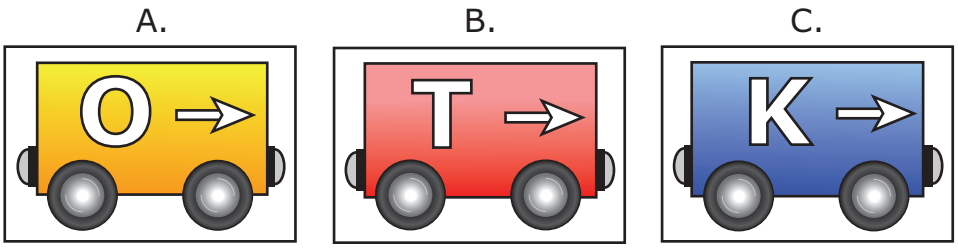
1. Hold a paper plate covered with iron filings over Car K, and bring the plate down so that the plate comes in contact with the magnet.

2. Repeat Step 1 for Car O and for Car T.

3. Compare the three circular patterns.



9. Based on the results of the investigation, place the train cars in order from least to greatest magnetic strength. Write the letter for each train car in the correct box to show its magnetic strength. Each letter may be used once.



Least magnetic strength

_____

_____

Greatest magnetic strength

_____

10. Use the investigation in Part 1 to ask testable questions.

Circle one correct response in each box to complete the sentences.

How does the _____

distance between the train cars
magnet size
color of train car

affect the distance the engine travels?

Do different _____ have the same

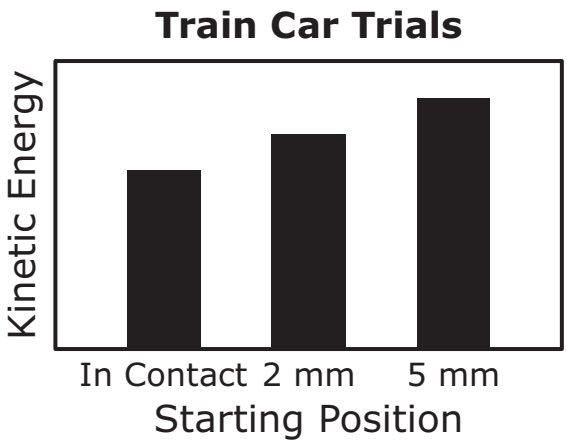
ends of a train car
train car magnets

magnetic force?

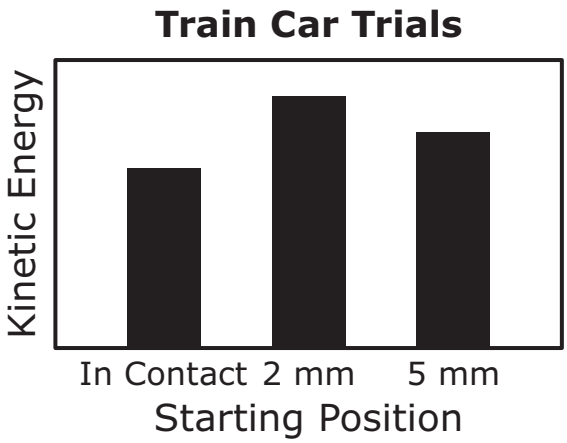
TURN THE PAGE AND CONTINUE WORKING

11. Which graph shows the correct comparison of the kinetic energy that resulted from each starting position during the train car trials in Part 1?

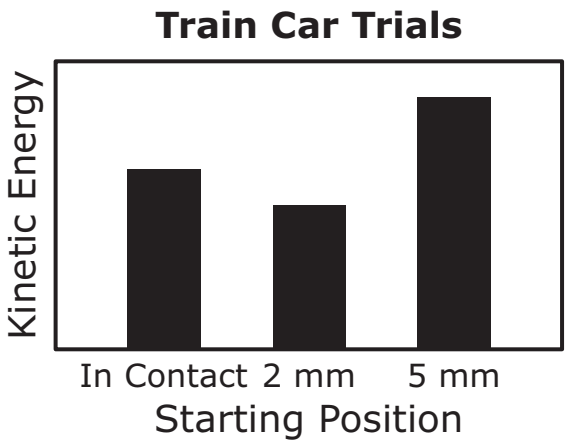
Ⓐ



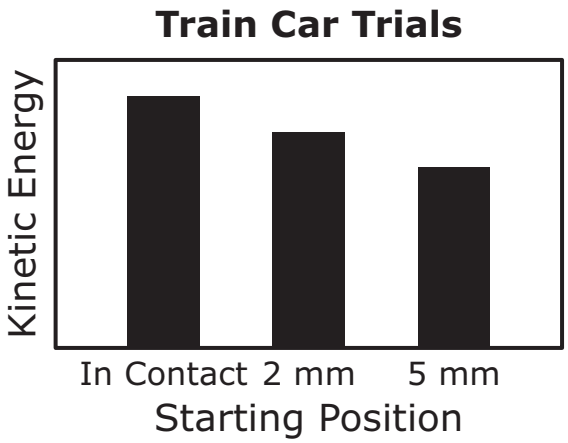
Ⓑ



Ⓒ


Train Car Trials
Kinetic Energy
In Contact
2 mm
5 mm
Starting Position

Ⓓ


Train Car Trials
Kinetic Energy
In Contact
2 mm
5 mm
Starting Position

12. Write a question about the strength of the train car magnets that is answered by the iron filings investigation in Part 2. Your response should include:

- a question about the strength of the magnet as it relates to the iron filings investigation
- an explanation of how the results in Part 2 answer the question

13. Use the investigations in Part 1 and Part 2 to consider whether the two investigations are designed well enough to show that fields exist and exert forces even when the objects are not in contact. Then choose one investigation and explain why it is designed well enough to show evidence about fields that exert forces. Your response should include:

- an explanation of how the design of the investigation tests for the presence of a magnetic field
- evidence from the investigation that shows the magnetic field produces a force at a distance

This is the end of Item Set 1.

ITEM SET 2

1. The skunk cabbage is a plant that usually grows in wet areas.

Characteristics of this plant include:

- blooms in early spring
- produces heat in flower buds to protect against freezing temperatures
- smells like rotting meat
- has leaves that decompose quickly

Certain characteristics of the skunk cabbage increase its chances for successful reproduction. Which statement **best** identifies those characteristics?

Ⓐ The leaves decompose quickly so that there is less plant matter on the ground.

Ⓑ Deer and other herbivores eat the flowers and leaves in early spring.

Ⓒ The smell of the plant attracts insects that can pollinate the flowers.

Ⓓ The flower structure provides a hiding place for spiders.

2. When a student bites into a slice of lemon, muscles in the student's face begin to contract. The student learns that the muscles contract after acid in the lemon activates sensory receptors on the tongue. A week later, the student sees a lemon and notices that the same face muscles contract, even though the student did not bite into the lemon. Explain how a similar response occurs when the student bites into the lemon slice and when the student sees a lemon. Your response should include an explanation of:

- how information is transferred as the student bites into the lemon slice
- why the muscles in the student's face contract after seeing a lemon

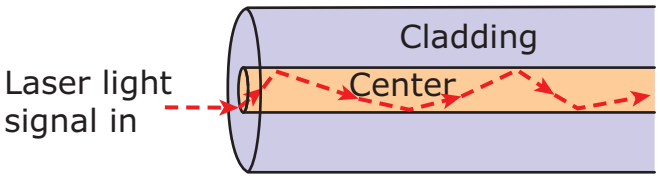
Directions: Use the information to answer questions 3 through 7.

Part 1

A seismograph is used to measure seismic waves traveling through Earth. Seismographs are difficult to use in deep water, so scientists have discovered how to use fiber-optic cables along the ocean floor as earthquake sensors.

A laser produces a light signal that moves through a central part of the cable, which is made of pure glass. A different type of glass, called cladding, surrounds the pure glass and keeps the light signal moving through the center, as shown in Figure 1.

Figure 1: Transmission End of Cable



When a seismic wave disturbs the cable, the light is distorted and scattered, as shown in Figure 2 and Figure 3. By comparing how the laser light signal changes as it moves through the cable, the scientists can determine the approximate location and identify the magnitude of the earthquake.

Figure 2: Cable along the Ocean Floor

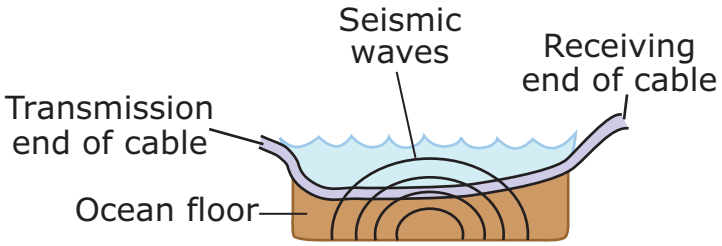
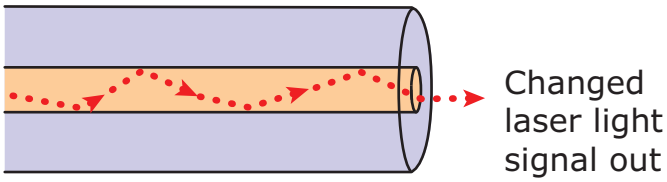


Figure 3: Receiving End of Cable



Part 2

Seismic waves are recorded by a network of seismographs. By comparing the arrival times of the seismic waves at the different seismographs, scientists can identify the magnitude and location of the earthquake's epicenter.

Figure 4 shows the epicenter of an earthquake and two seismograph locations that record the seismic waves from that earthquake. Seismograph 1 records a maximum amplitude of 75 microns, while a maximum amplitude of 37 microns is recorded at Seismograph 2.

Figure 4: Earthquake Epicenter and Seismograph Locations

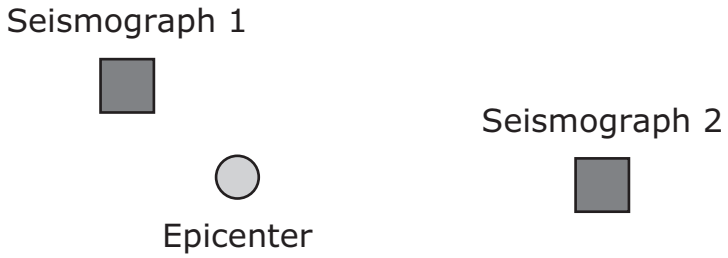


Figure 5 shows an analog seismograph. Ground movement causes the base of the seismograph to move while a pen attached to a weight remains still. A rotating paper drum beneath the pen captures the relative motion between the pen and the base.

Figure 5: Analog Seismograph

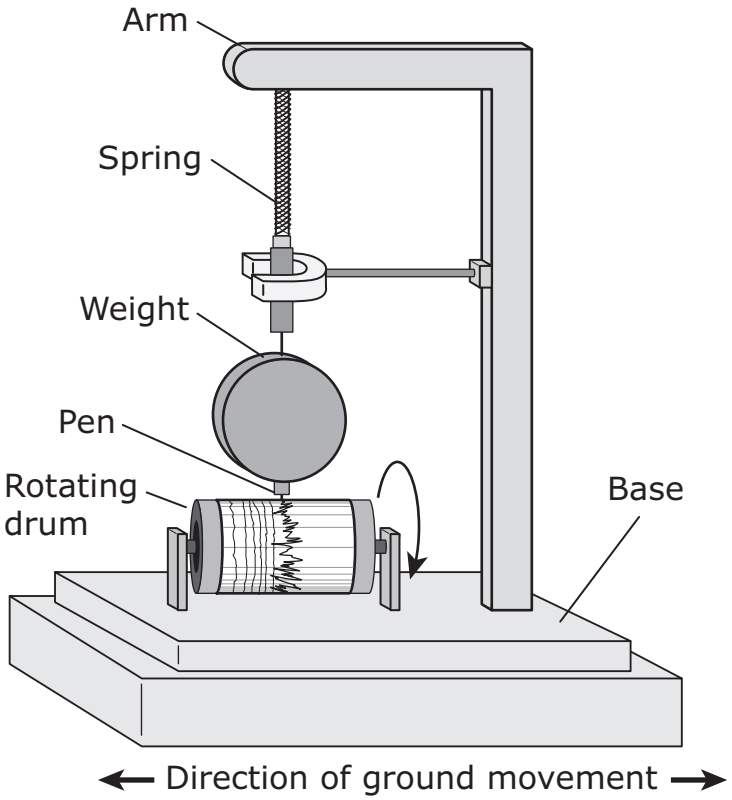


Figure 6 shows the output of the analog seismograph, called a seismogram. Lines with small disturbances result from strong winds or nearby cars vibrating the ground. Lines with much larger disturbances are caused by stronger ground movement or seismic waves.

Figure 6: Analog Seismogram

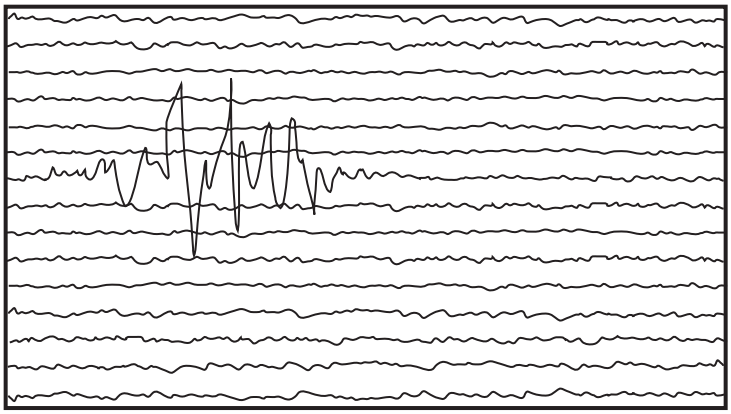
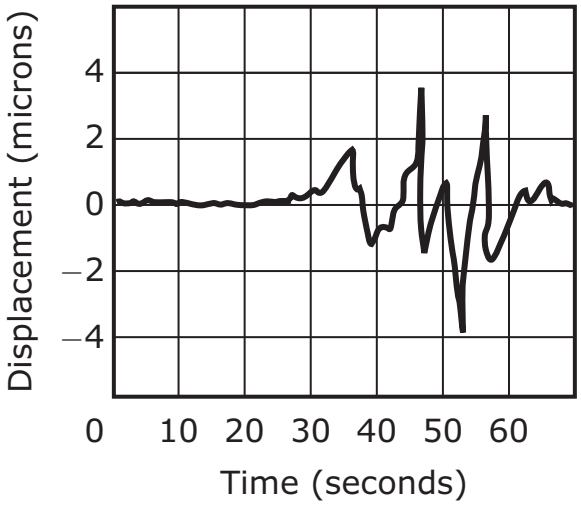


Figure 7 shows a digital seismogram, captured with electronic equipment and displayed by a computer. The displacement is how far the ground around the seismogram is moved by the seismic wave. A micron is equal to 0.001 millimeters.

Figure 7: Digital Seismogram



3. Based on the information in Part 2, identify the type of seismogram, analog or digital, that is more reliable and explain why.

Circle one correct response from each box to complete the sentence.

The _____ seismogram is easier to store, move, and compare

analog
digital

because it exists as _____.

electronically sampled data
a fixed physical structure

4. Based on the seismogram in Figure 7, compare the energy of the wave when it peaks at 47 seconds to the energy of the wave when it peaks at 36 seconds.

Circle one correct response from each box to complete the sentence.

The energy at 47 seconds will be _____ as great because

four times
twice

the _____ is _____ as great.

amplitude
wavelength

four times
twice

5. Figure 5 shows that a spring is included between the weight and the arm of the seismograph, which allows the pen to remain stationary as the drum moves beneath it. Which property of waves **best** explains why this spring is included?

Ⓐ Waves can be absorbed, and the spring stretches so that the vibrations move everything but the weight and pen.

Ⓑ Waves can be reflected, and the spring reverses vibrations from the arm before they reach the pen.

Ⓒ Waves can be amplified, and the spring increases the vibrations as they reach the weight and pen.

Ⓓ Waves can be transmitted, and the spring transfers the wave energy from the weight to the pen.

6. Some seismic waves are pressure waves. Pressure waves can cause the density of the substance they are passing through to change. Based on this information and the information in Part 1, which statement **best** explains why light from the laser is distorted and scattered when a seismic wave disturbs the cable?

Ⓐ The change in density of the glass changes the way light is transmitted through it.

Ⓑ Light responds to the change in pressure by traveling in the opposite direction.

Ⓒ The change in density of the cable changes the amplitude of the light.

Ⓓ Light responds to the change in pressure by changing frequencies.

7. Explain why the two seismographs in Figure 4 would record different amplitudes for the earthquake. Your response should include an explanation of:

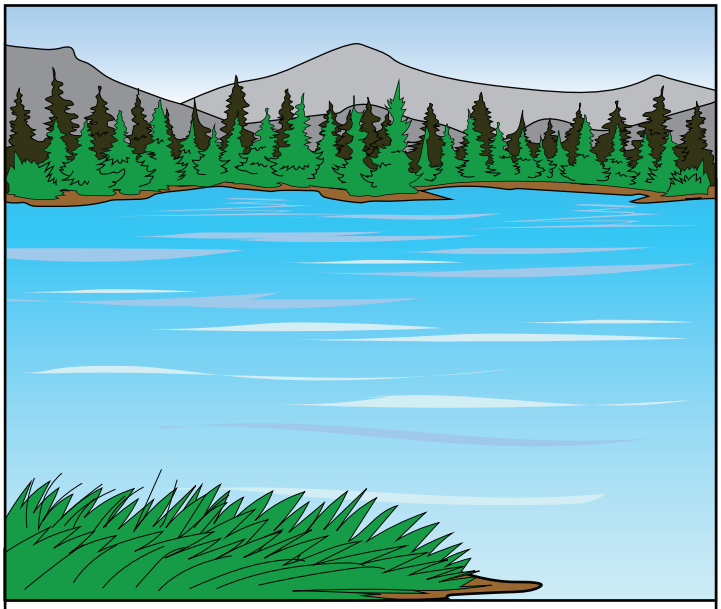
- why distance from the epicenter affects the amplitude of the seismic waves
- which seismograph would record a higher amplitude and how that amplitude is related to the energy in the wave

Directions: Use the information to answer questions 8 through 13.

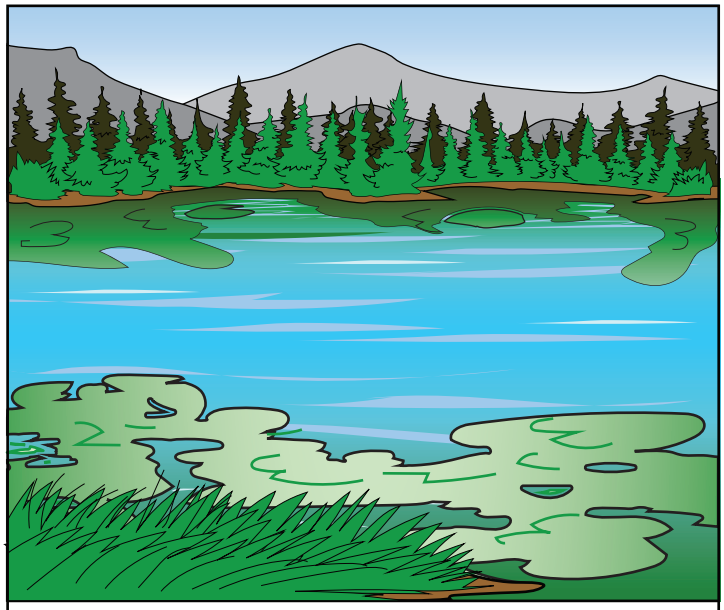
Two students visit a nearby park and notice more and more algae covering a pond with every visit. The students wonder what is causing the growth of algae. They observe a worker applying fertilizer to plants near the pond and wonder whether the fertilizer causes the growth of algae.

Part 1

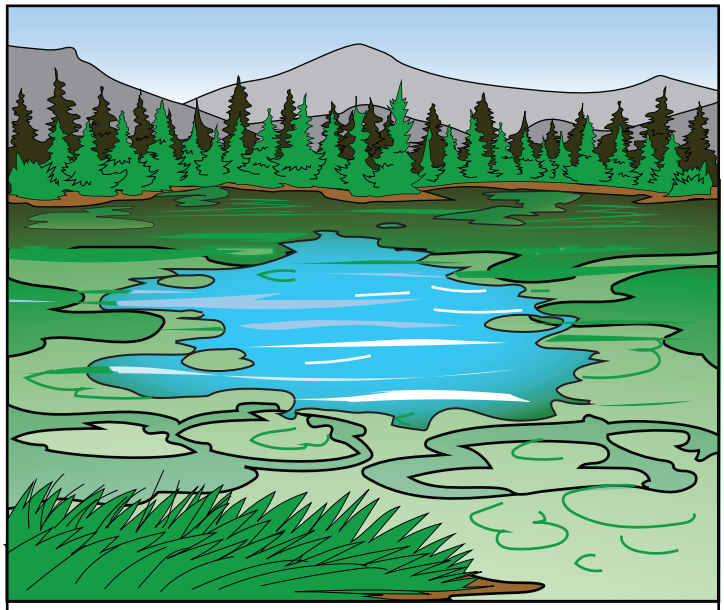
The students look at three pictures of the pond at different times of the year: late August, early September, and late September.



Late August



Early September



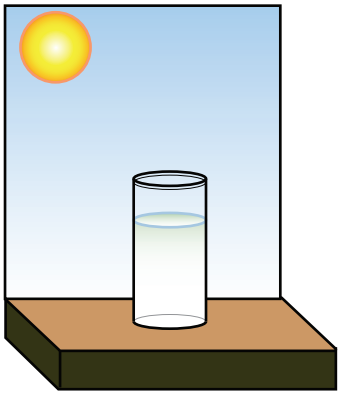
Late September

Part 2

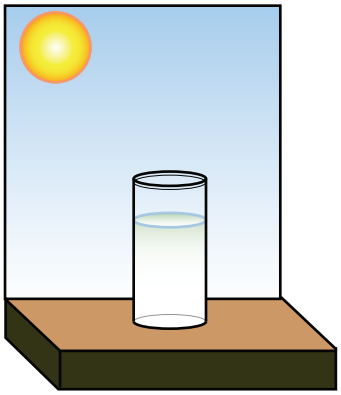
The students investigate how different amounts of fertilizer affect pond water. They add the same volume of pond water to three containers. They do not add any fertilizer to the first container. They add 2 milliliters (mL) of fertilizer to the second container and 4 mL of fertilizer to the third container. Then, they set all three containers on a windowsill for 14 days.

The pictures show the setup and results for three trials in the students' investigation.

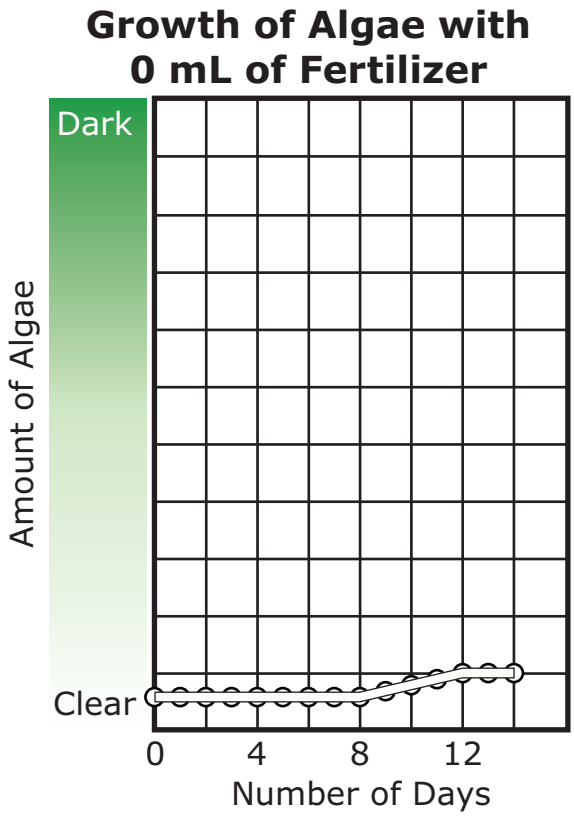
Pond Water with 0 mL of Fertilizer Added



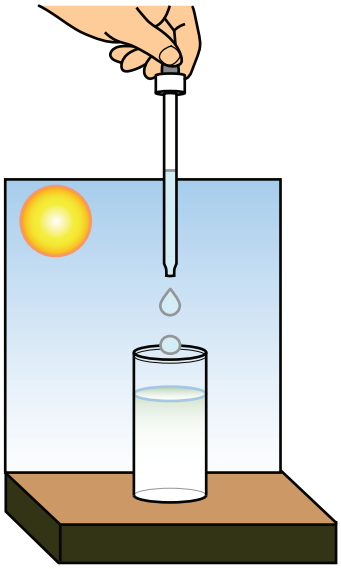
Day 0



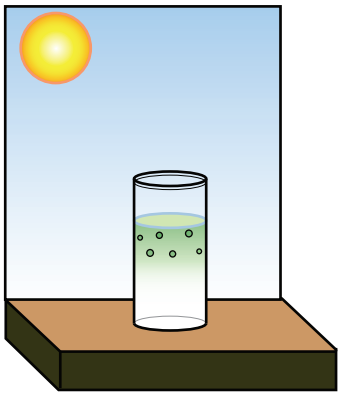
Day 14



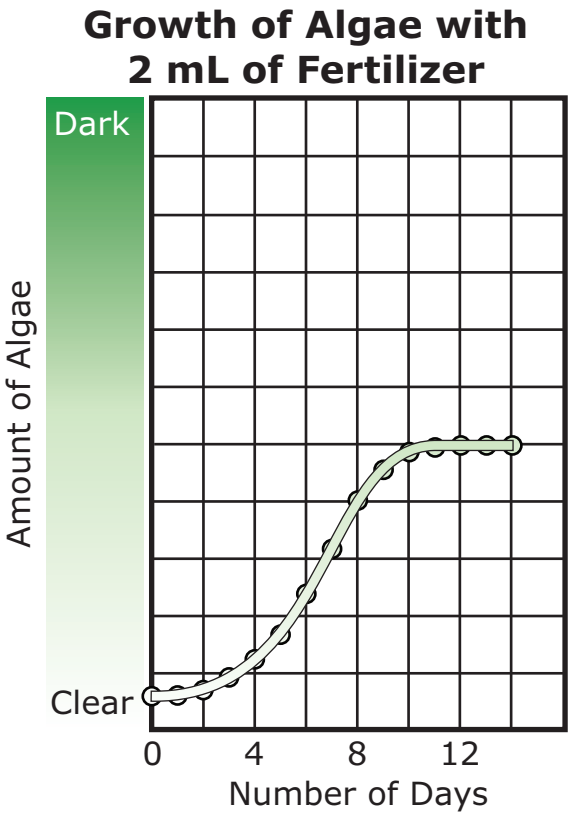
Pond Water with 2 mL of Fertilizer Added



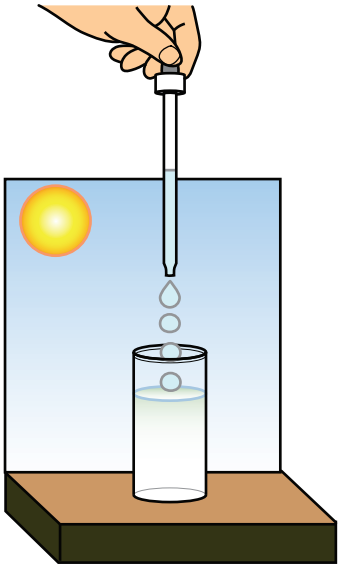
Day 0



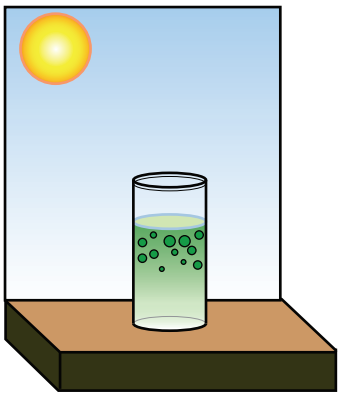
Day 14



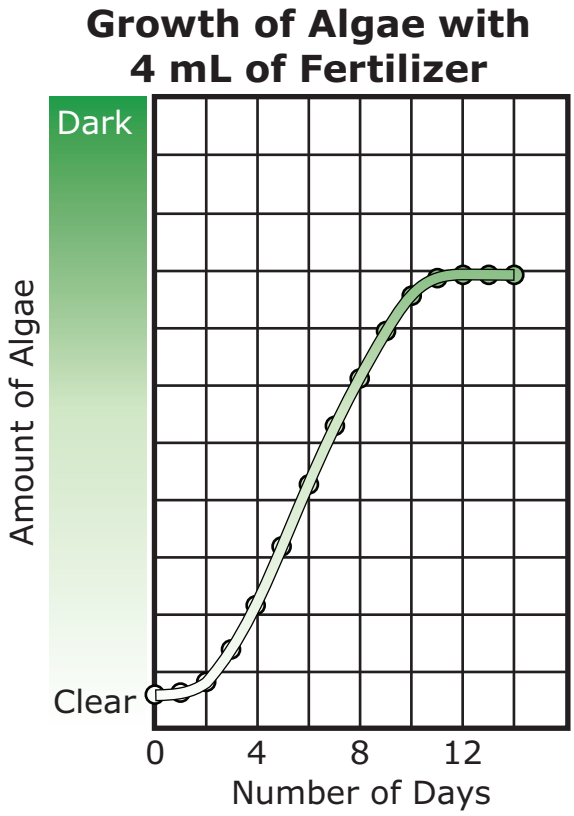
Pond Water with 4 mL of Fertilizer Added



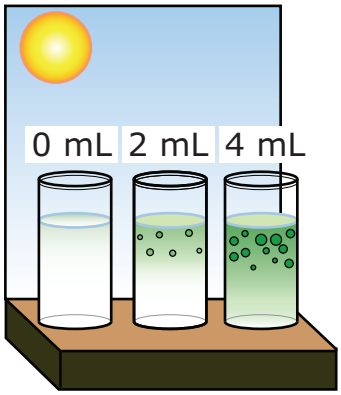
Day 0



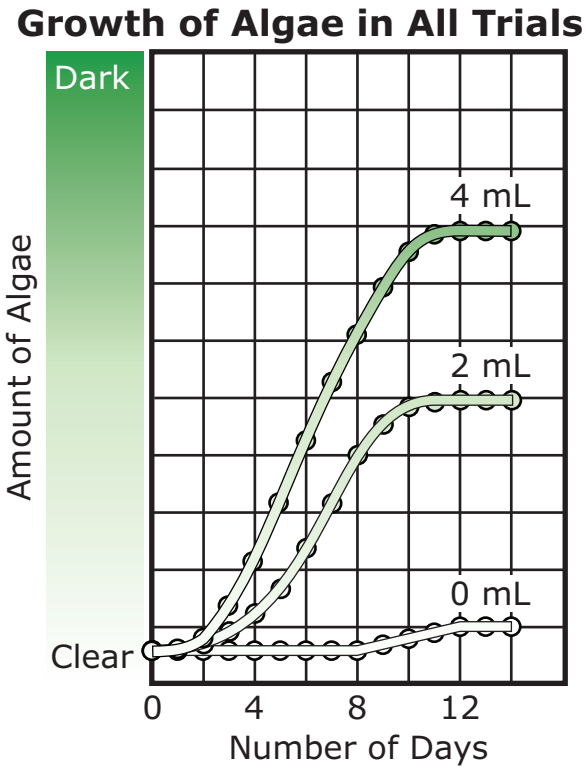
Day 14



Comparison of All Trials



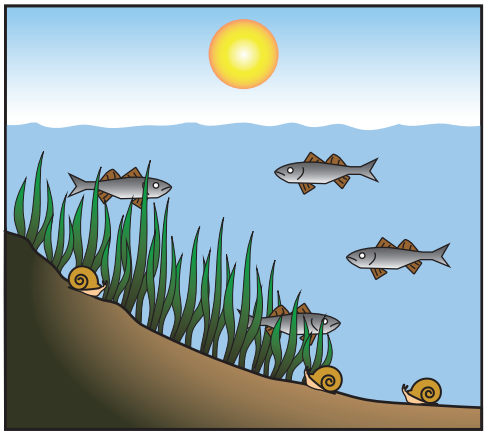
Day 14



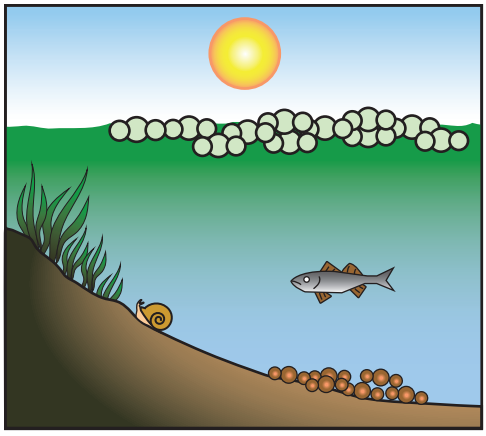
Part 3

The students create a model of the pond showing the ecosystem in late August and late September.

Underwater Ecosystem



Late August



Late September

KEY	
= living algae	= fish
= decaying algae	= aquatic plants
= freshwater snail	

8. A student claims that less algae would grow in the pond if people living near the pond stopped using fertilizer. Based on the information in Part 2, which statement **best** provides evidence to support the student's claim?

Ⓐ The growth of algae stopped after eight days in the sample with 2 mL of fertilizer.

Ⓑ The sample with 0 mL of fertilizer showed an increase in algae after eight days.

Ⓒ The smallest amount of algae was found in the sample with the darkest water.

Ⓓ The samples with less fertilizer resulted in less growth of algae.

9. Based on the information, which statement **best** describes how the aquatic plants were affected by the algae bloom?

Ⓐ Photosynthesis by the aquatic plants increased because the algae on the surface allowed sunlight to pass through the water.

Ⓑ Respiration by the aquatic plants increased because the algae on the surface allowed sunlight to pass through the water.

Ⓒ Photosynthesis by the underwater aquatic plants decreased because the algae on the surface blocked the sunlight.

Ⓓ Respiration by the aquatic plants decreased because the algae on the surface blocked the sunlight.

10. Based on the information in parts 2 and 3, determine how each component of the pond ecosystem changed between late August and late September.

Place a check mark (✔) to select an answer in each row. Select **one** box per row.

Component	Increased	Decreased	Remained the Same
amount of carbon dioxide released by the fish	☐	☐	☐
amount of oxygen released by the algae	☐	☐	☐
amount of energy stored in sugars by the plants	☐	☐	☐

11. Based on the information in Part 2, explain why the water samples were placed next to the window. Your response should include an explanation of:

- why the water samples were placed next to the window
- how the water samples would look different if placed in a dark room throughout the investigation

12. Based on the information, explain how resource availability affects populations in the pond between late August and late September. Your response should include an explanation of how during each of the two time periods:

- the plant population is affected by resource availability
- the fish population is affected by resource availability

13. Based on the information, explain how populations in the pond could change during the following winter and spring. Your response should include an explanation of:

- how the amount of sunlight reaching the pond during the winter could change the algae population
- how this change in the algae population could affect the plant population during the spring

14. A student learns that total lunar eclipses occur in some years and not in others. The student remembers that there was no total lunar eclipse in the year 2020.

Circle one correct response from each box to complete the sentences.

During 2020, _____ was never positioned directly between the

the Moon
the Sun
Earth

two other celestial bodies. As a result, the shadow

of _____.

Earth never covered the Moon
the Moon never fell on Earth

This is the end of Item Set 2.

ITEM SET 3

1. Curtains in theaters prevent sound waves from being reflected as echoes. Which model best explains why curtains prevent echoes?

Ⓐ A ball thrown toward a surface will come in contact faster with a soft surface than with a hard surface.

Ⓑ A ball thrown at a surface will hit with a greater force on a soft surface than on a hard surface.

Ⓒ A ball rolled across a surface will roll more quickly on a hard surface than on a soft surface.

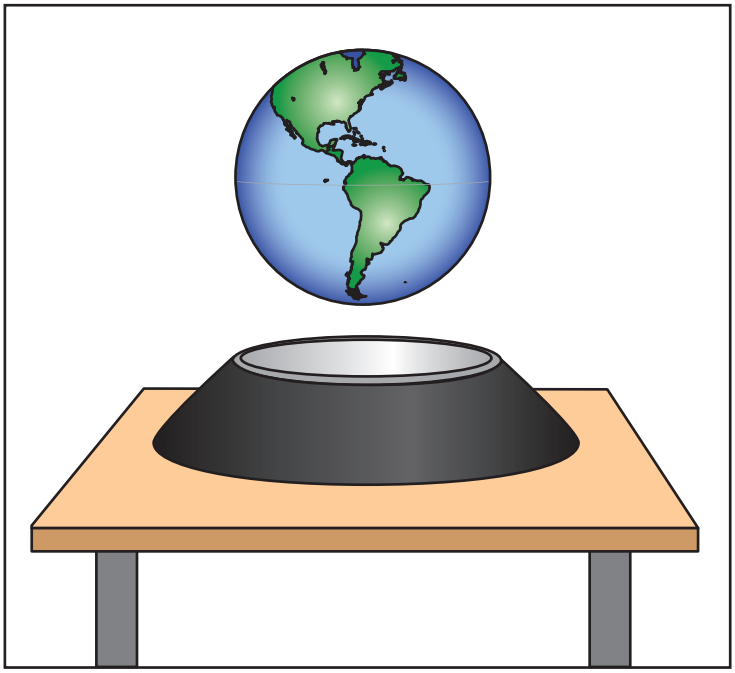
Ⓓ A ball dropped on a surface will bounce more on a hard surface than on a soft surface.

Directions: Use the information to answer questions 2 through 6.

Part 1

A student is curious about a toy in the classroom. The toy is a small globe that floats in place over a special base. The globe does not rise, fall, or move from side to side. The student wonders what forces are needed to cause this effect.

Figure 1: Toy Globe



Part 2

The student investigates the forces that make the toy globe float. The student uses ring magnets and places a wooden rod through the hole in the magnets. The student drops different numbers of ring magnets down the rod from different heights, in centimeters (cm). The magnets fall close to another set of magnets at the bottom of the rod. Then the bottom magnets push the falling magnets back up.

Figure 2: Ring Magnets and Wooden Rod

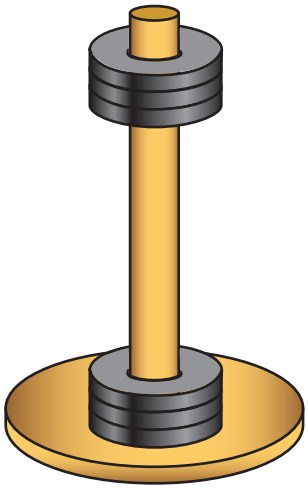
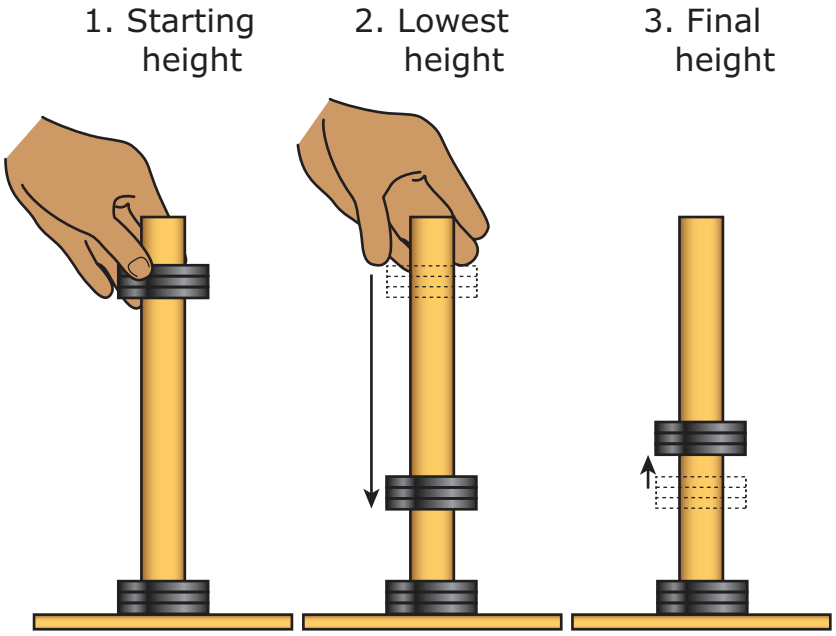


Figure 3: Movement of Dropped Magnets



The table shows the data the student collects.

Trial	Magnets Dropped	Height (cm)		
		Start	Lowest	Final
1	1	14.0	4.4	6.6
2	1	11.9	4.9	6.2
3	1	9.8	5.5	6.5
4	2	13.9	3.8	6.1
5	2	11.0	4.6	6.1
6	2	10.0	4.7	6.4
7	3	13.8	3.5	5.9
8	3	12.1	3.9	5.9
9	3	10.1	4.6	5.9

2. In the scenario described in Part 1, the student pushes down on the globe and lets it go. Then the globe returns to its original stable position.

Circle one correct response in each box to complete the sentence.

After the globe is let go, it will return to a stable position when the _____ force equals the _____ force.

frictional	electrical
magnetic	gravitational

3. The student completed the ring magnet investigation to help explain the interaction between the two sets of magnets described in Part 2.

Circle one correct response in each box to complete the sentences.

The investigation was designed to show that _____ exist

electrical currents
magnetic fields

between the upper and lower sets of magnets. The results provide evidence that the magnets exert forces on each other because the upper magnet set _____ the lower set when it is dropped.

does not touch
collides with

4. The data from the investigation in Part 2 show that the final height of three magnets dropped is lower than when one magnet or two magnets are dropped.

Circle one correct response from each box to complete the sentences.

The purpose of the investigation is to show that even when downward force is increased, the magnets continue to _____.

pull each other together
push each other away

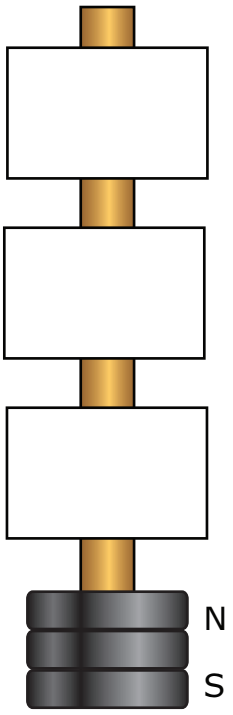
This shows that there is a field coming from _____.

the bottom set of magnets
the top set of magnets
both sets of magnets

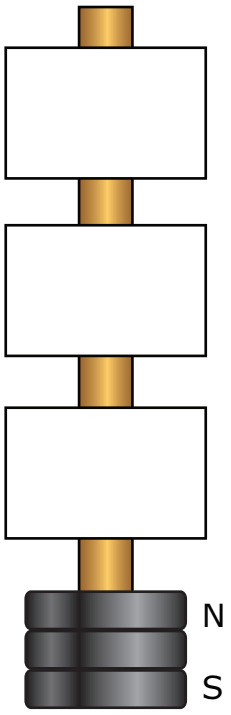
5. The sets of magnets described in the investigation in Part 2 demonstrate two kinds of potential energy, magnetic and gravitational. Based on the investigation, show where each kind of potential energy is greatest. The north (N) pole and south (S) pole of each magnet set are specified.

Draw an X in the box that shows the location of the greatest amount of each kind of potential energy. Draw only one X in the location for the greatest amount of magnetic potential energy, and draw another X in the location for the greatest amount of gravitational potential energy. Only one X should be drawn for each type of potential energy.

Greatest Magnetic Potential Energy



Greatest Gravitational Potential Energy



6. In the scenario described in Part 1, the student plans to change the setup by adding mass to make the globe heavier. Explain what effect the additional mass will have on the globe. Your response should include:

- an explanation of the changed position of the heavier globe
- a description of two different forces acting on the heavier globe

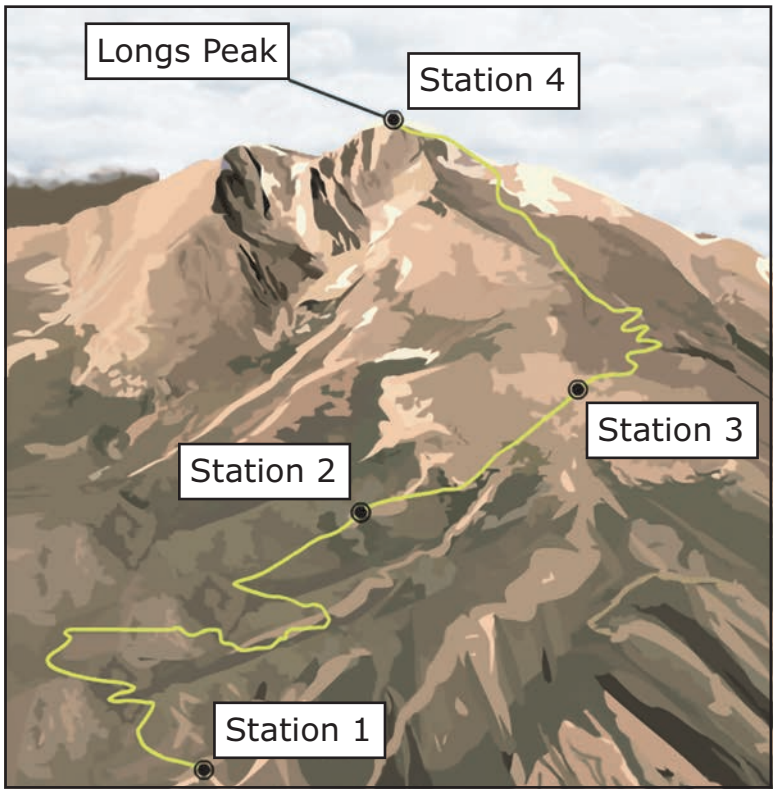
Directions: Use the information to answer questions 7 through 10.

People hiking changed outfits as they climbed Longs Peak, a mountain in Allenspark, Colorado.

Part 1

The weather conditions at the four different stations where the hikers stopped on Longs Peak are shown.

Longs Peak



Compare the weather conditions and elevation with the pictures of how the hikers dressed at each station. The temperature is measured in degrees Celsius (°C). The wind speed is measured in kilometers per hour (kph). The air pressure is measured in millibars (mbar).

Station 1
Temperature: 13°C
Wind speed: 16 kph
Air pressure: 711 mbar
Elevation: 2,865 meters

Station 2
Temperature: 10.5°C
Wind speed: 32 kph
Air pressure: 679 mbar
Elevation: 3,200 meters

Station 3
Temperature: 10°C
Wind speed: 40 kph
Air pressure: 652 mbar
Elevation: 3,500 meters

Lightning hazard when
electrical storms approach

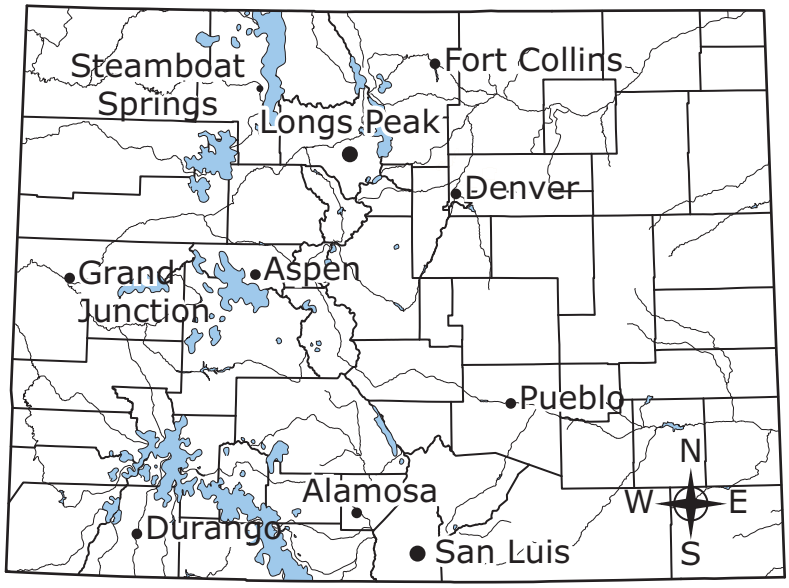
Station 4
Temperature: 4°C
Wind speed: 48 kph
Air pressure: 576 mbar
Summit elevation:
4,345 meters

High winds
Lightning hazard

Part 2

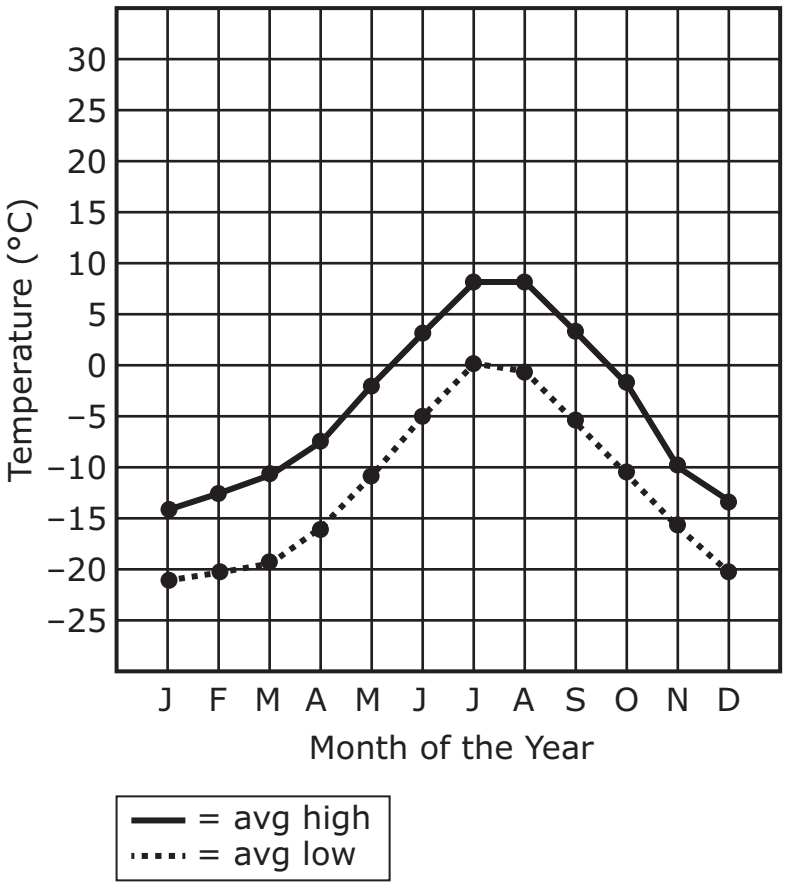
A student compares the climate differences between Longs Peak and her hometown of San Luis, Colorado, shown on the map. The elevation of Longs Peak is 2,865 meters (m) at the base of the mountain and 4,345 m at the top. The elevation of the town of San Luis is 2,432 m.

Map of Longs Peak and San Luis



The climate conditions for each location are shown. The precipitation and snowfall are measured in millimeters (mm).

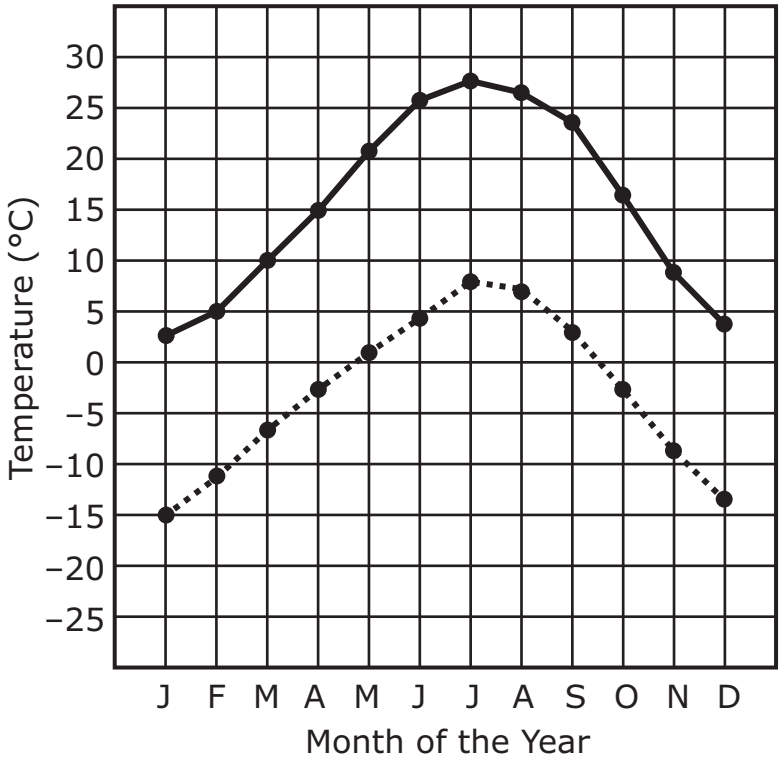
Average Temperatures for Longs Peak



Average Total Precipitation: 353 mm

Average Total Snowfall: 1,961 mm

Average Temperatures for San Luis



Average Total
Precipitation: 243 mm

Average Total
Snowfall: 508 mm

Part 3

The student compared weather conditions for several dates between Longs Peak and San Luis, Colorado. The weather conditions are shown in the data tables.

Table 1 and Table 2 show high and low weather data for Longs Peak and San Luis over three days: 4/3, 4/4, and 4/5.

Table 1: Longs Peak Weather Data 4/3–4/5

Temperature Range (°C) High / Low	Wind Speed Range (kph) Low / High	Air Pressure Range (mbar) Low / High	Humidity Range (%) Low / High
−2 / −14	3 / 18	1,019 / 1,025	69 / 92
10 / −9	8 / 33	1,007 / 1,019	27 / 92
13 / −4	9 / 33	1,002 / 1,007	21 / 90

Table 2: San Luis Weather Data 4/3–4/5

Temperature Range (°C) High / Low	Wind Speed Range (kph) Low / High	Air Pressure Range (mbar) Low / High	Humidity Range (%) Low / High
3 / −7	8 / 19	1,023 / 1,027	58 / 96
14 / −8	2 / 19	1,014 / 1,022	30 / 59
21 / −2	10 / 26	1,006 / 1,013	14 / 76

Table 3 and Table 4 show high and low weather data for Longs Peak and San Luis over three days: 5/22, 5/23, and 5/24.

Table 3: Longs Peak Weather Data 5/22–5/24

Temperature Range (°C) High / Low	Wind Speed Range (kph) Low / High	Air Pressure Range (mbar) Low / High	Humidity Range (%) Low / High
20 / 0	9 / 35	996 / 1,001	15 / 67
14 / 2	4 / 24	1,000 / 1,015	44 / 94
10 / –1	4 / 22	1,010 / 1,014	34 / 82

Table 4: San Luis Weather Data 5/22–5/24

Temperature Range (°C) High / Low	Wind Speed Range (kph) Low / High	Air Pressure Range (mbar) Low / High	Humidity Range (%) Low / High
27 / 7	6 / 23	1,003 / 1,011	14 / 67
28 / 7	14 / 23	1,002 / 1,005	11 / 78
18 / 5	16 / 35	1,008 / 1,016	51 / 89

Table 5 and Table 6 show weather data for a severe weather event that occurred from the evening of 6/4 to the morning of 6/5.

Table 5: Longs Peak Severe Weather Event Data 6/4–6/5

Temperature Range (°C) a.m. / p.m.	Wind Speed Range (kph) a.m. / p.m.	Air Pressure Range (mbar) a.m. / p.m.	Humidity Range (%) a.m. / p.m.
24 to 6	5 to 28	1,008 to 1,003	11 to 92
17 to 5	31 to 3	1,006 to 1,014	89 to 53

Table 6: San Luis Severe Weather Event Data 6/4–6/5

Temperature Range (°C) a.m. / p.m.	Wind Speed Range (kph) a.m. / p.m.	Air Pressure Range (mbar) a.m. / p.m.	Humidity Range (%) a.m. / p.m.
27 to 15	6 to 19	1,015 to 1,014	67 to 80
16 to 23	25 to 13	1,011 to 1,017	82 to 78

7. Based on the information in Part 1, which statement **best** describes a pattern in natural hazards at Longs Peak?

Ⓐ Thunderstorms are more dangerous at Station 4 than at Station 2.

Ⓑ High temperatures are more likely at Station 3 than at Station 2.

Ⓒ High winds are more dangerous at Station 1 than at Station 4.

Ⓓ Snowstorms are more likely at Station 1 than at Station 3.

TURN THE PAGE AND CONTINUE WORKING

8. Pico de Orizaba is a mountain in Mexico that is taller than Longs Peak. The average low temperature at the summit of Pico de Orizaba is about −2°C. The map shows its location compared to Longs Peak as well as the direction of prevailing winds at each location.

Map of Longs Peak and Pico de Orizaba

Based on this information and the information in Part 2, compare the climate around Pico de Orizaba to that around Longs Peak. Your response should include an explanation of:

- how the prevailing winds affect the climate around each mountain
- why the average low temperatures are different

9. Describe what is happening in each area based on the data in Table 2 and Table 3. Your response should include a description of:

- the type of front that is moving into the San Luis area, using evidence from Table 2
- the type of front that is moving into the Longs Peak area, using evidence from Table 3

10. Using the data in Table 5, describe the weather data that indicates a thunderstorm passed through the area overnight. Your response should include:

- identification of the type of front that passed through the area, using evidence from Table 5
- an explanation of how the weather data indicates a thunderstorm most likely occurred

Directions: Use the information to answer questions 11 through 15.

Part 1

The ecosystems of western Canada include mountainous terrain covered in forests that usually receive snowfall five to eight months a year. Two animals that live in these forests are the Canada lynx and the snowshoe hare.

Information about Canada Lynx and Snowshoe Hares

Animal	Main Food Source	Other Food Sources	Adaptations for Cold Weather Conditions
Canada lynx	snowshoe hares	small mammals, birds, caribou	large, furry paws to walk on snow
snowshoe hare	plants with soft stems, grasses	tree seedlings, leaves from shrubs	fur turns white in winter

Part 2

Scientists gathered data about the populations of Canada lynx and snowshoe hares. These graphs show how populations of lynx and hares changed over time.

Figure 1: Lynx Population over Time

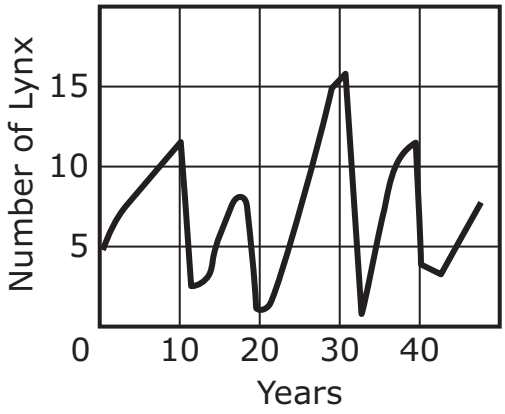


Figure 2: Hare Population over Time

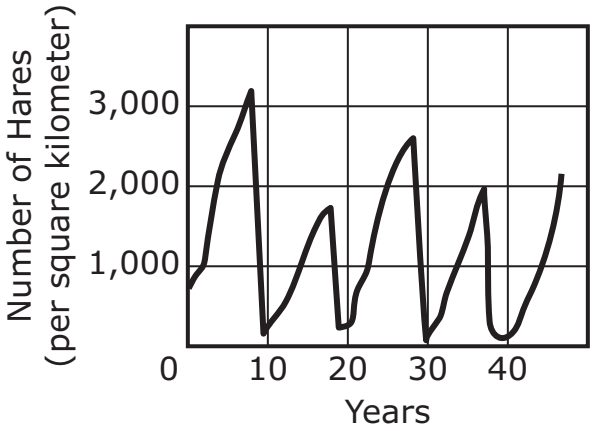
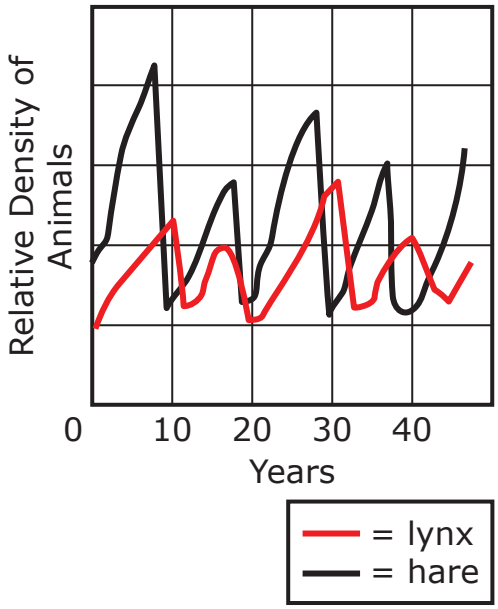


Figure 3: Lynx and Hare Populations over Time

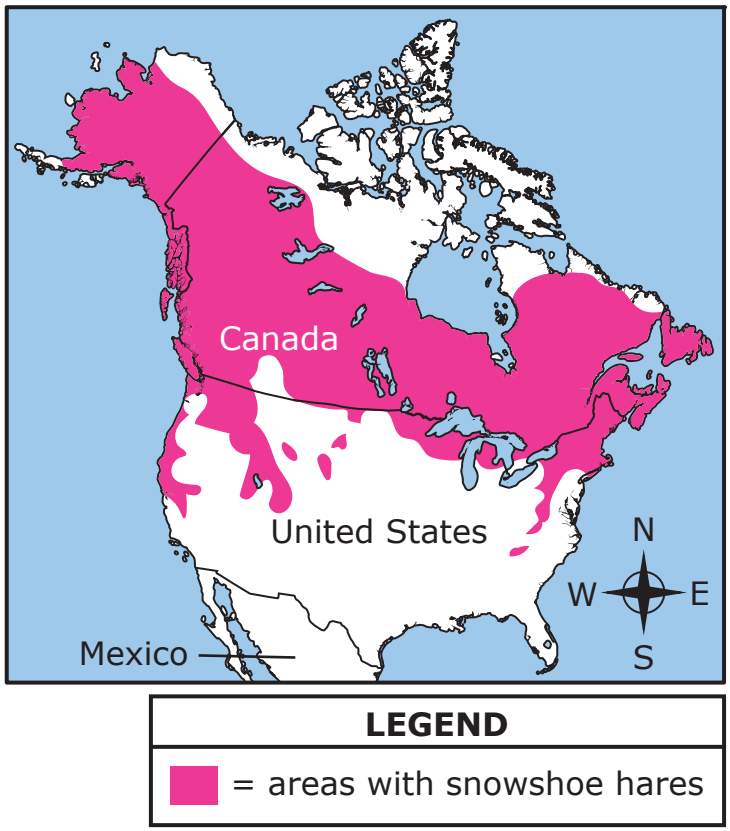


Part 3

These maps show the ranges of Canada lynx and snowshoe hares.

Figure 4: Range of Canada Lynx

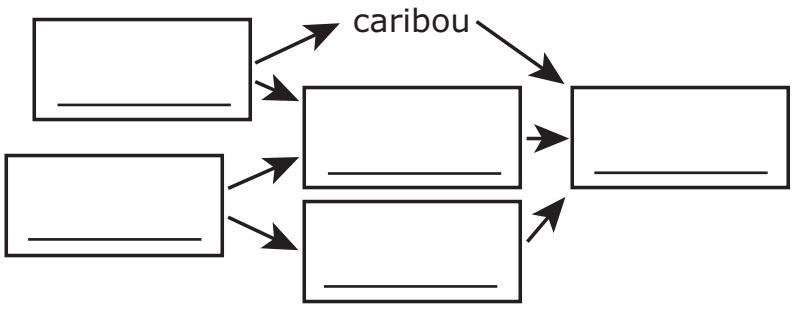
Figure 5: Range of Snowshoe Hares



11. A student creates a food web for the organisms listed in the table from Part 1. The student learns that caribou eat shrubs, and birds eat grass seeds.

Based on this information, write the letters for the organisms in the boxes to create a model that shows how matter and energy move through this forest ecosystem. Each letter may be used once.

A.	birds	D.	shrubs
B.	Canada lynx	E.	snowshoe hare
C.	grasses		



12. Based on the information in Part 2, which year in the study was **most likely** associated with a decrease in available energy from plants?

Ⓐ Year 9

Ⓑ Year 15

Ⓒ Year 27

Ⓓ Year 45

13. Based on the information in Part 1 and Part 2, which statement **most likely** explains the conditions between Year 15 and Year 20?

Ⓐ A decrease in caribou population in Year 17 led to a decrease in the Canada lynx population and an increase in the snowshoe hare population in Year 20.

Ⓑ A disease slowed the population growth of Canada lynx in Year 17, but the disease did not affect the snowshoe hare population in that same year.

Ⓒ A new predator of snowshoe hares migrated to the area in Year 17, which led to an increase in the Canada lynx population in Year 20.

Ⓓ A severe drought in Year 17 caused a sharp reduction in both the Canada lynx population and the snowshoe hare population.

14. The maps in Part 3 show the ranges for the Canada lynx and the snowshoe hare. The scientists collected data on sightings of these animals during the study. They observed that the Canada lynx traveled outside their normal range at certain times.

Circle one correct response in each box to complete the sentence.

Based on the information in Part 1 and Part 2, the **most likely** year during the study when Canada lynx were observed outside their range is _____

Year 5
Year 15
Year 30
Year 35

because the main food source for the Canada lynx was _____ during this year.

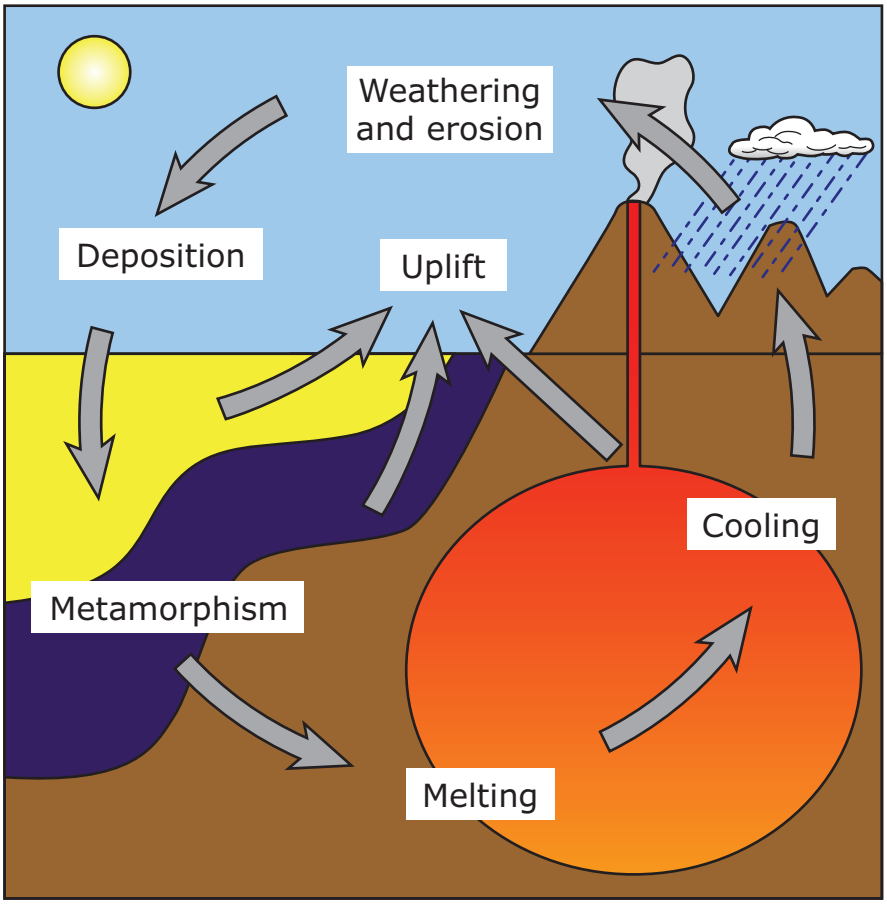
more abundant
less abundant
stable

15. A disease that affects snowshoe hares may also have an effect on the ecosystem. Based on the information in Part 1, explain how a disease affecting the snowshoe hare population would affect the overall ecosystem. Your response should include:

- how the disease would cause a decrease in population of some organisms in the ecosystem
- how the disease would cause an increase in population of other organisms in the ecosystem

16. This model shows interactions in one of Earth's systems.

The Rock Cycle



KEY
= sedimentary rock
= metamorphic rock
= igneous rock

How does energy from the Sun affect this cycle?

Ⓐ It causes heating of water that results in weathering and erosion.

Ⓑ It causes heating of rocks that results in metamorphism.

Ⓒ It causes heating of Earth that results in melting.

Ⓓ It causes heating of the air that results in uplift.

This is the end of Item Set 3.

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