Name: _____

New York State Testing Program

Intermediate-level Science Test

Grade 8

Spring 2024

RELEASED QUESTIONS

INTERMEDIATE-LEVEL SCIENCE TEST

Printed under contract with the New York State Education Department by NWEA.

Intermediate-level Science Test

TIPS FOR TAKING THE TEST

Here are some ideas to help you do your best:

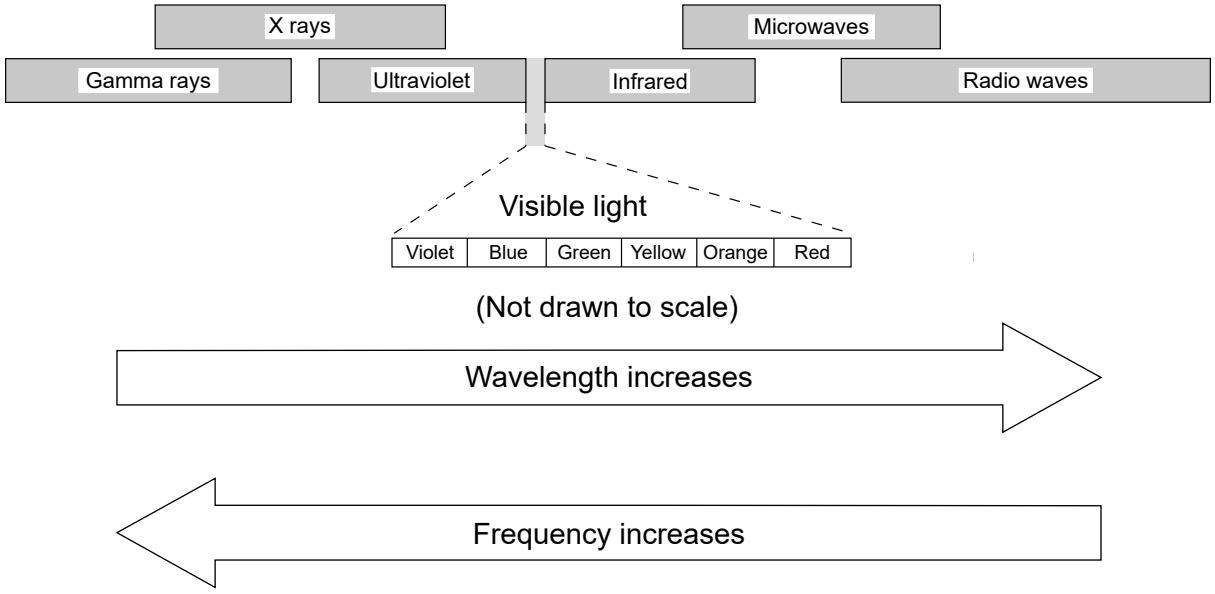
- Be sure to read all the directions carefully.
- Read each question carefully.
- Think about the answer before making your choice or writing your answer.
- Make sure you read all the information given for each question.
- You have a calculator that you can use on the test if it helps answer the question.

Base your answers to questions 1 through 5 on the information below and on your knowledge of science.

Energy Transfer by Waves

The electromagnetic spectrum comprises all frequencies of electromagnetic radiation that transmit energy and travel in the form of waves. This spectrum has different portions with different characteristics. The portion of the spectrum that humans can see is called visible light. People use the electromagnetic spectrum every day. Car radios, cell phones, and microwave ovens are just a few examples of devices that use the electromagnetic spectrum.

Electromagnetic Spectrum



1 Which claim best describes the relationship between the frequency and wavelength of waves in the electromagnetic spectrum?

A Waves with a higher frequency have a shorter wavelength.

B Waves with a higher frequency have a longer wavelength.

C Waves with a lower frequency have a shorter wavelength.

D There is no relationship between frequency and wavelength of waves.

GO ON

2 A student wants to develop a model that demonstrates the transmission of waves. Which concept should the student include in the model to show how the transmission of visible light is different from the transmission of sound waves?

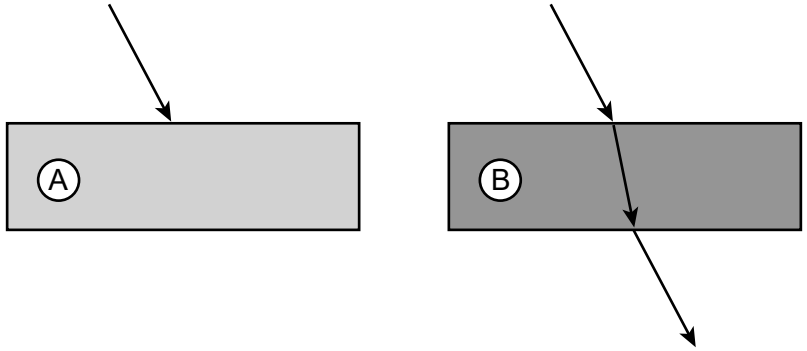
A Light and sound waves can be transmitted through space.

B Light can be transmitted through space and matter, but sound waves can only be transmitted through matter.

C Light can be transmitted through different forms of matter, but sound waves can only be transmitted through space.

D Light can be transmitted only through space, and sound waves can be transmitted through space and matter.

The models below represent the paths of visible light rays as the visible light rays interact with blocks made of different materials, labeled *A* and *B*.



3 Based on the behavior of these visible light rays, which claim can be made about materials *A* or *B*?

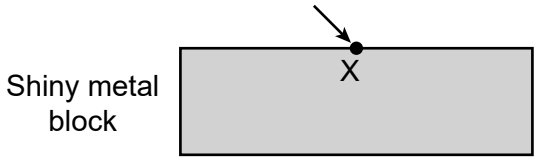
A Material *A* is transparent because the light ray is transmitted.

B Material *A* is transparent because the light ray is absorbed.

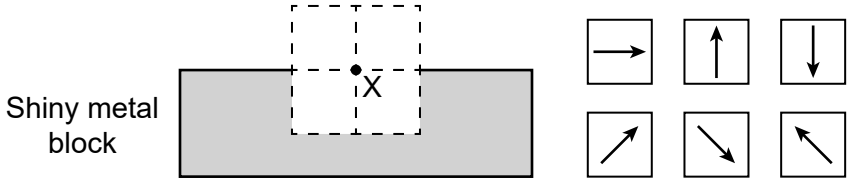
C Material *B* is transparent because the light ray is transmitted.

D Material *B* is transparent because the light ray is absorbed.

The model below represents a visible light ray striking the surface of a block of shiny metal at point *X*.



4 Place **one** arrow in a box to show the path of the light ray if the ray was reflected from the shiny metal surface at point *X*. [1]



The model below shows sound waves being emitted from a cell phone.

(Not drawn to scale)

5 Explain what happens to the sound if the amplitude of the waves increases. [1]

_____

_____

GO ON

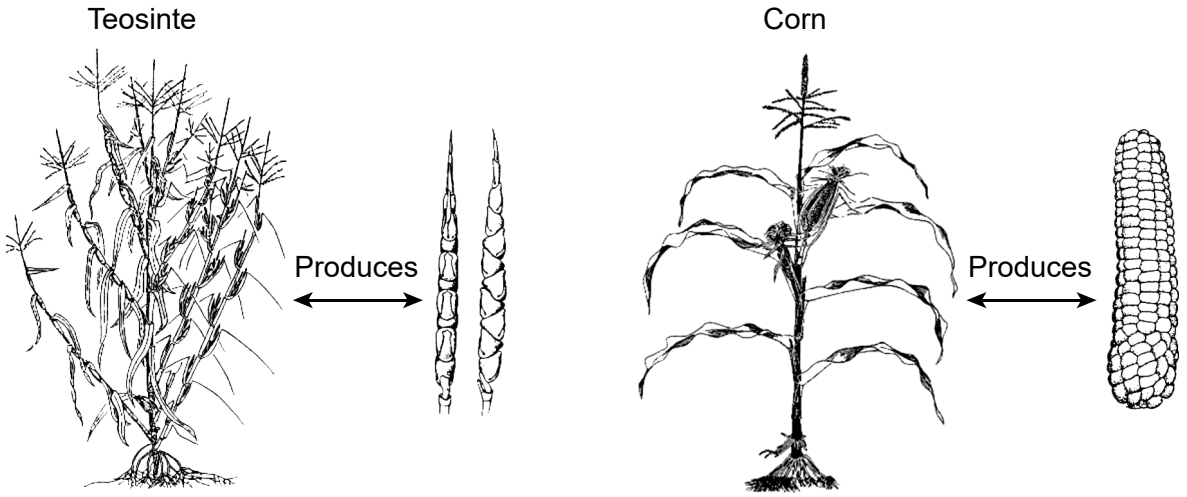
Base your answers to questions 6 through 11 on the information below and on your knowledge of science.

Variation and Corn

Through a variety of different processes, humans have used technology to alter the genetic make-up of wild plants and animals. Some of these altered organisms are used to produce more food.

Early farmers observed that some plants had more favorable characteristics than others, such as being better-tasting, having more seeds, or being easier to grow. Early farmers collected the seeds from the best plants and used them in an attempt to improve their plants. Slowly, the plants were changed over generations to have more favorable traits.

One example of a food crop that was altered around 9,000 years ago is corn. Teosinte is the early ancestor of corn. Teosinte is a large plant that has multiple branches with flowers that produce many structures that are not edible. Corn plants have only one main branch that produces flowers, which can develop into one or two large ears of corn that are edible.



6 How were two traits altered that resulted in modern day corn plants?

A The number of branches and the number of flowers increased.

B The number of branches and the amount of edible food decreased.

C The number of branches decreased, but the amount of edible food increased.

D The number of flowers decreased, but the number of branches increased.

GO ON

7 Identify the type of technique (*selective breeding or genetic engineering*) used to produce corn from teosinte and cite the evidence in the information to support your choice. [1]

Technique: _____

Evidence: _____

_____

8 Explain, in terms of offspring traits, why sexual reproduction and ***not*** asexual reproduction was used to produce corn plants from teosinte plants. [1]

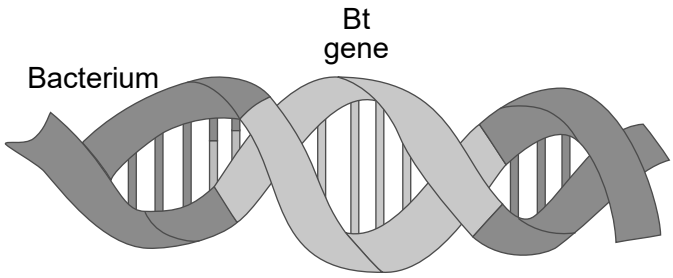
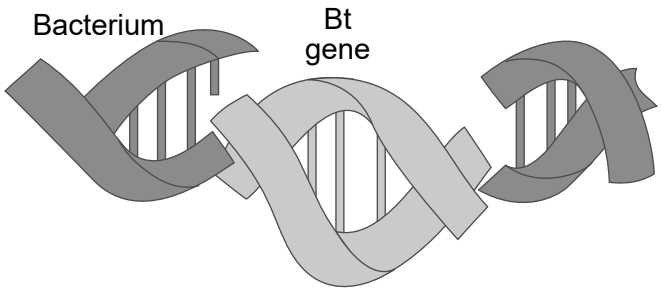
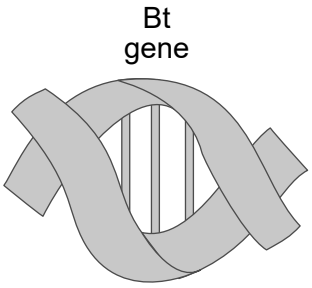
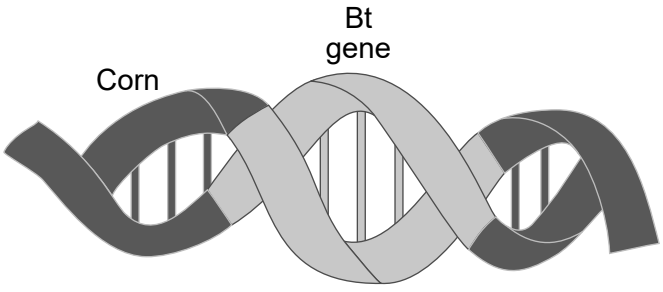
_____

_____

_____

GO ON

Insect pests damage a large amount of corn every year. One way scientists have successfully solved this problem is by growing a variety of corn that has an insect-resistant gene, the Bt gene, spliced into its genetic material. The Bt gene is cut from specific bacteria and inserted into the genetic material of corn. Insects feeding on this "Bt corn" get sick and die soon after. The chart below illustrates and describes a part of the process.

Genetic Material	Description
	Bt gene from bacterium will help corn resist harmful insects
	Bt gene being removed from bacterium genetic material
	Bt gene isolated from bacterium
	Bt gene inserted into corn genetic material

GO ON

9 Adding the genetic material from the bacterium to the genetic material of the corn is an example of

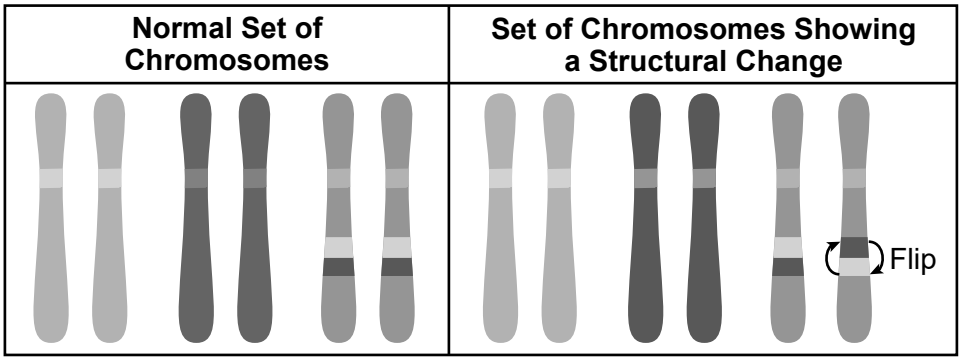
A natural selection

B biodiversity

C gene therapy

D genetic modification

Sometimes traits that are not expected show up in organisms such as corn. Some of these traits are desirable, while others are harmful. The model below shows a structural change occurring in a chromosome.



10 Which change would ***not*** result in a new trait being seen in future generations of corn?

A a mutation in the genetic material of a leaf

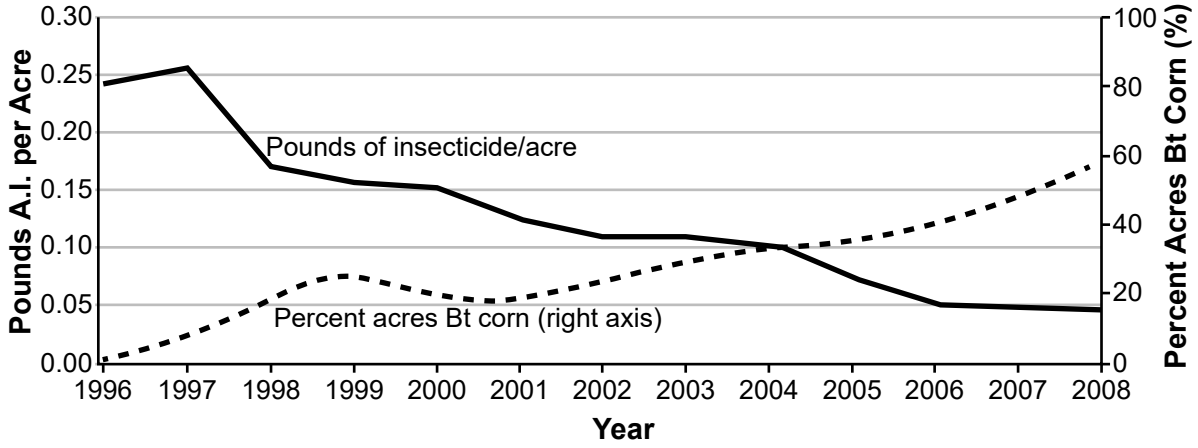
B an alteration in the genes of a sex cell

C a change in chromosomes during the production of seeds

D a modification of the genetic material in pollen

The graph below shows how the changes in acres of Bt corn grown from 1996 to 2008 have influenced the amount of insecticide used per acre over that same period of time.

Pounds of Insecticide Active Ingredient (A.I.) per Planted Acre And Percent Acres of Bt Corn (%) from 1996 to 2008



11 The graph indicates that the design solution of adding the Bt gene into corn plants helps protect the stability of an ecosystem by

A keeping the amount of insecticide used constant

B keeping the amount of corn grown constant

C decreasing the amount of insecticide used

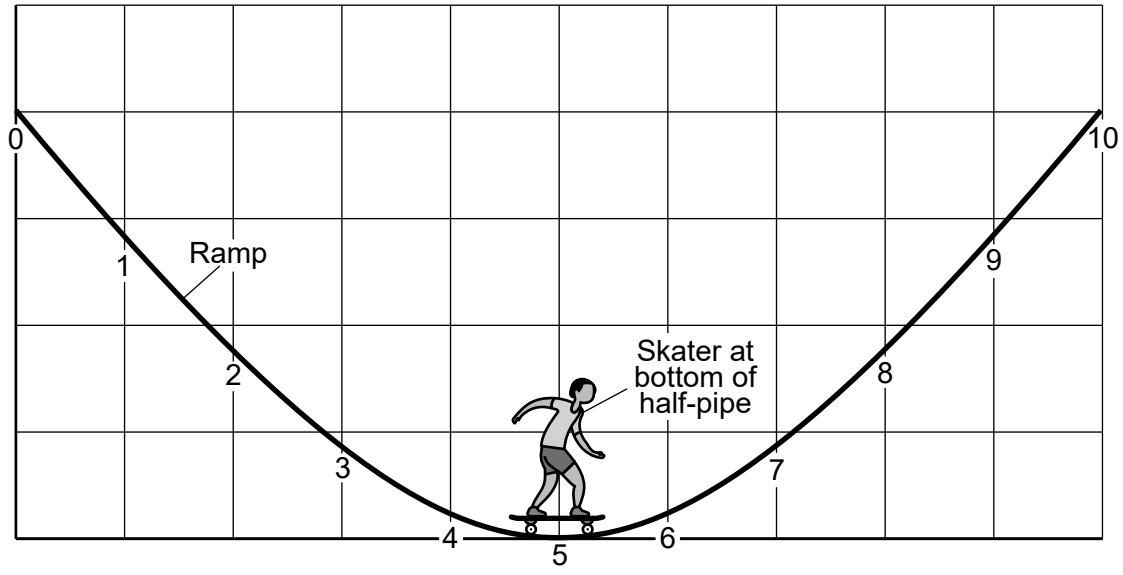
D decreasing the amount of Bt corn grown

Base your answers to questions 12 through 16 on the information below and on your knowledge of science.

Energy of Skateboarders

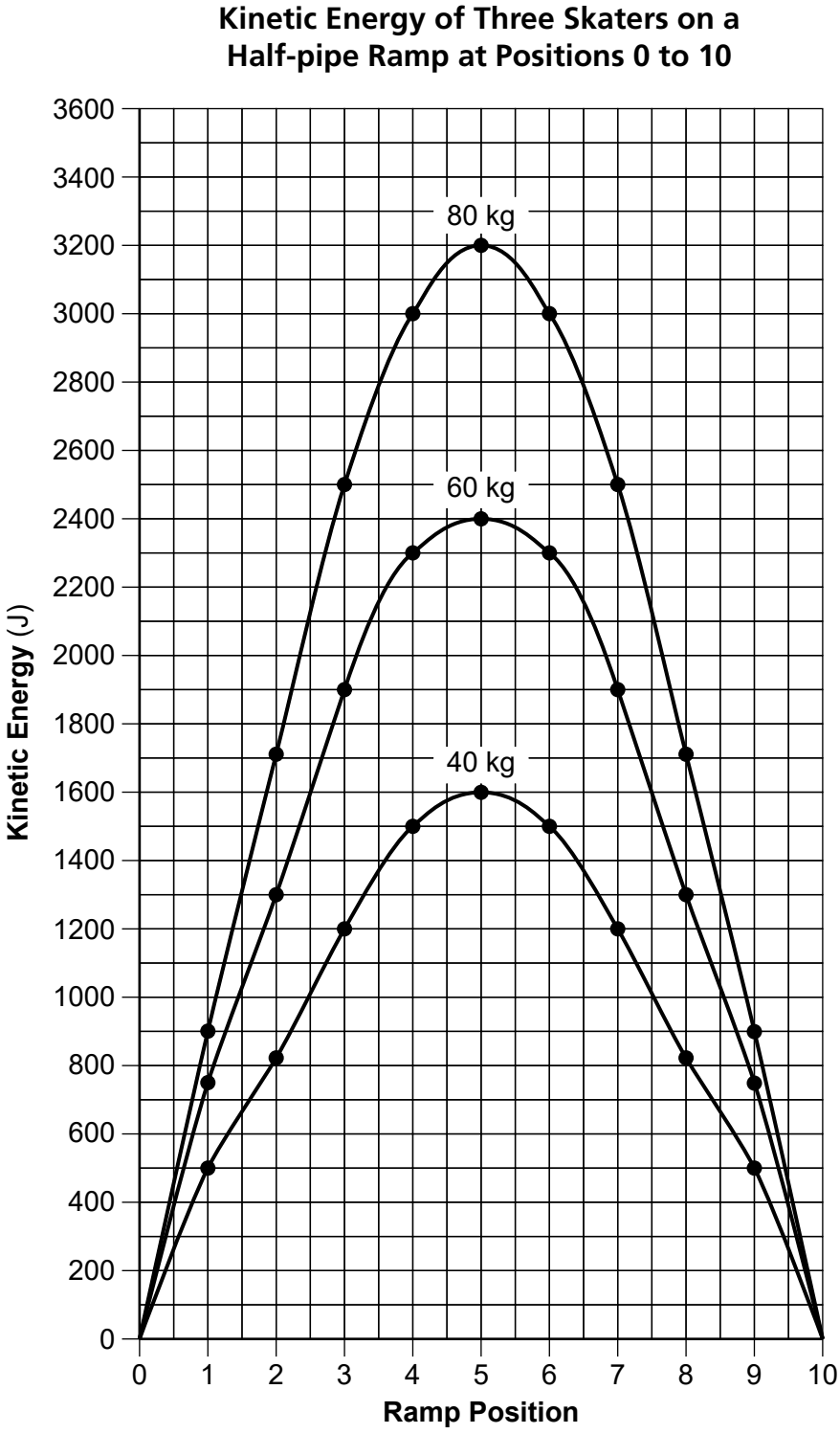
Three skaters, who weighed between 88 pounds (40 kg) and 177 pounds (80 kg), went to a local skate park and each tried the half-pipe. A half-pipe is a U-shaped ramp, as shown below.

Positions on Half-pipe Ramp



GO ON

Data on the kinetic energy of the three skaters (40 kg, 60 kg, and 80 kg) at ten different positions of the half-pipe ramp were collected and graphed. The locations of the positions on the ramp are shown below.



GO ON

12 Describe how the kinetic energy of the **three** skaters was affected as a result of the mass of each skater. Use quantitative information from any **one** ramp position on the graph to support your answer. [1]

The data table below shows the speed (m/s) and kinetic energy (J) of the 80-kg skater from position 0 to position 5.

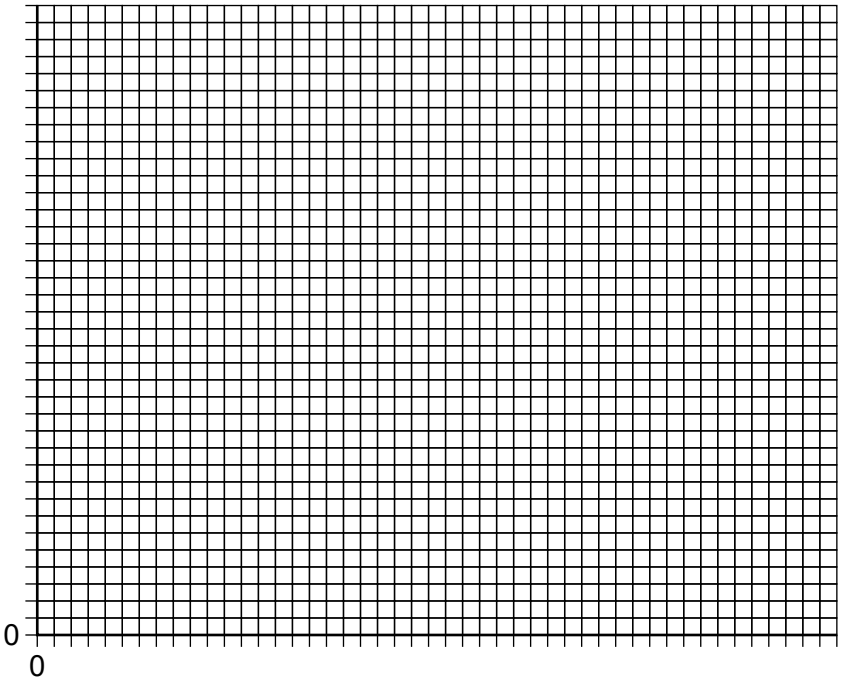
Speed and Kinetic Energy of 80-kg Skater

Position	**Speed** (m/s)	**Kinetic Energy** (J)
0	0	0
1	4.8	900
2	6.6	1700
3	7.8	2500
4	8.6	3000
5	8.8	3200

13 The student wants to show the data for the speed (m/s) and kinetic energy (J) of the 80-kilogram skater from position 0 to position 5. From the choices provided, fill in the boxes next to the grid to identify:

- the names of the correct independent and dependent variable
- the appropriate range and interval (per grid space) for the data [1]

Kinetic Energy (J)	Position Number	Speed (m/s)
0-5, with an interval of 1	0-9, with an interval of 0.2	0-3400, with an interval of 100
0-4000, with an interval of 50		



Variable

_____

Range & Interval

_____

_____

Variable

_____

Range & Interval

_____

_____

GO ON

14 Which table summarizes the relationship between the speed of a skater and the skater's kinetic energy?

Speed	Kinetic Energy
Increases	Increases

A

Speed	Kinetic Energy
Increases	Decreases

C

Speed	Kinetic Energy
Increases	Stays the Same

B

Speed	Kinetic Energy
Decreases	Stays the Same

D

15 If friction is ***not*** present, the mass of the skateboarder does ***not*** affect their speed at positions on the half-pipe.

The formula for Kinetic Energy is:

$KE = \frac{1}{2}mv^2$ KE = Kinetic energy (J)
m = mass (kg)
v = speed (m/s)

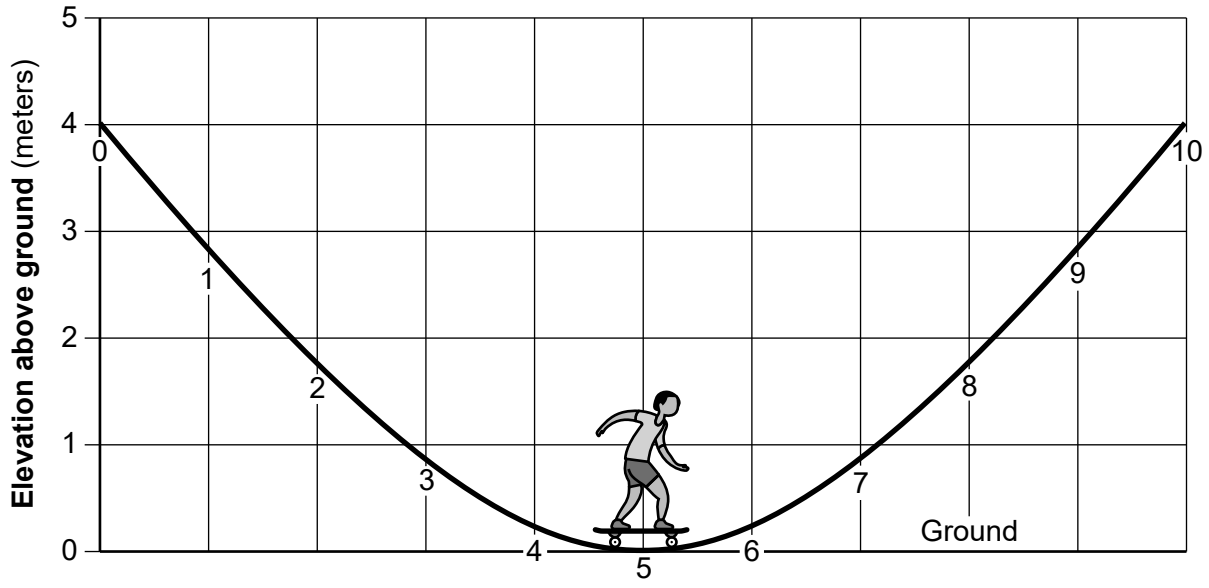
Use the data from the *Speed and Kinetic Energy of 80-kg Skater* table to complete the formula and calculate the kinetic energy of a 50-kg skateboarder at the position at the bottom of the ramp (position 5). [1]

$KE = \frac{1}{2}\left(\square\ \text{kg}\right)\left(\square\ \text{m/s}\right)^2$

$KE = \square\ \text{J}$

GO ON

Positions on Half-pipe Ramp with Elevation



16 Which statement explains how the model of the ramp shown would need to be modified in order to *increase* the potential energy of the skater at position 10?

A The elevation of the ramp above ground would have to decrease to 2 meters.

B The elevation of the ramp above ground would have to increase to greater than 4 meters.

C The length of the ramp would have to double and remain at the same elevation.

D The length of the ramp would be reduced by half and remain at the same elevation.

GO ON

Base your answers to questions 17 through 22 on the information provided and on your knowledge of science.

Reservoirs and Town Water Districts

A town water district provides its residents with drinking water that is safe, plentiful, and able to meet all state and federal health standards. Town water districts obtain water from reservoirs (large bodies of water, such as lakes or ponds), town wells (where groundwater is pumped to the surface), and neighboring towns or cities. The town water district then processes the water received from multiple sources in a treatment plant to ensure it is safe to use. The water is then transported through pipes to homes and businesses.

In order to maintain an adequate water supply for businesses, household use, and fire protection, a town water district may restrict water usage to ensure that sufficient water is available for residents and emergency services. In any system, some water is lost. Lost water leaves the system due to leaks, water main breaks, the flushing of hydrants, firefighting, theft, and water meter inaccuracy. A water meter measures the amount of water used in a building.

One town water district located near Albany, New York, reported that approximately 100% of the buildings in this town have water meters. The average percentage of water lost in the United States is 16%. The town has been monitoring this lost water in their district. The data table below shows information about this town's water usage over a period of five years.

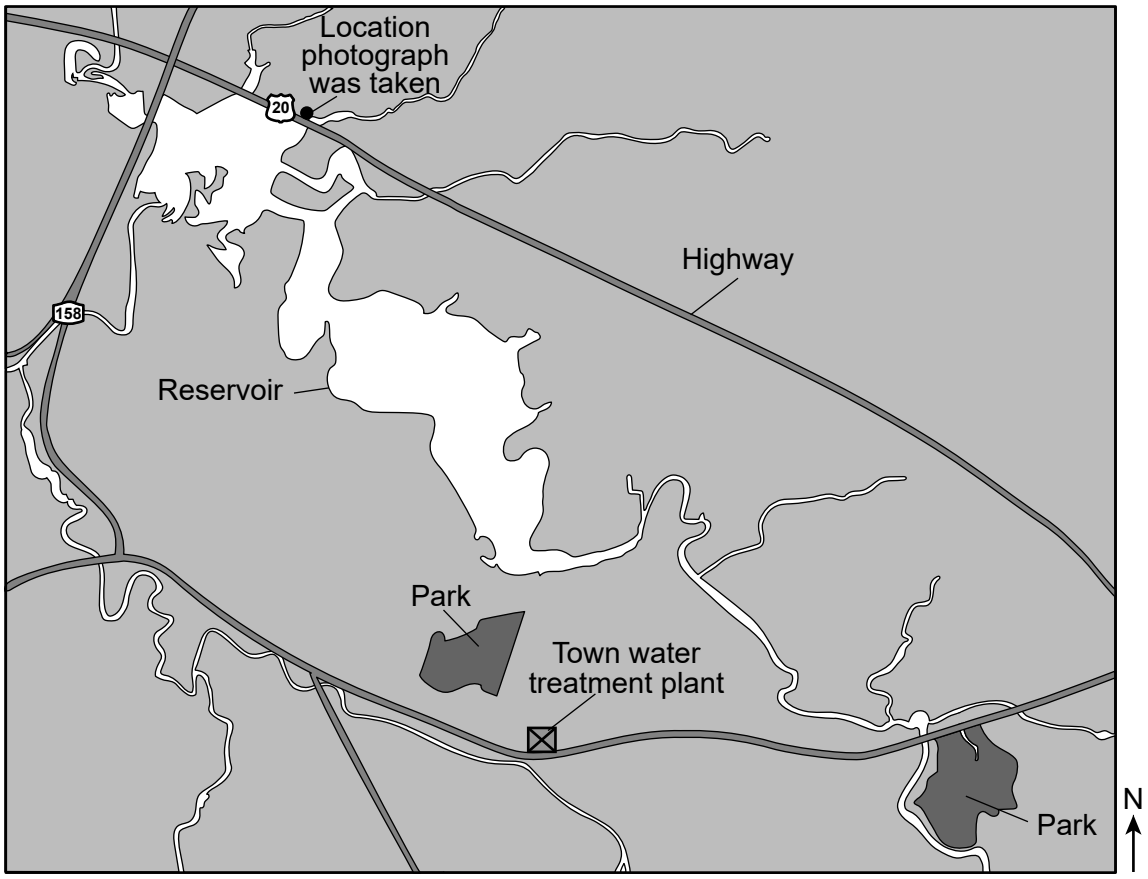
Town Water District Data for Five Years

Year	Population	Total Water Used (gallons)	Water Accounted For By Meters (gallons)	Percentage of Water Lost (%)
2018	27,314	1,088,830,000	991,272,374	9
2017	27,104	1,027,626,000	960,892,349	6
2016	27,023	1,137,802,000	1,042,067,658	8
2015	26,636	1,116,688,000	1,048,566,701	6
2014	26,315	1,087,960,000	962,008,167	12

17 Explain how these monitoring methods have made a positive impact on the total water used by comparing the data of 2014 to the data of 2018. [1]

GO ON

The map below shows the location of the town water district's reservoir. The photograph below shows a portion of the reservoir as seen from a location on the highway heading east.



GO ON

18 Which explanation identifies how past geologic processes are responsible for the distribution of water located in this town?

A The large amount of water found in the reservoir is a result of land uplift and heavy precipitation over the last 1000 years.

B Rivers that feed into the reservoir were formed by past erosion of land surfaces and are the main source of water for the reservoir.

C Rivers and reservoirs form every year as a result of water coming from melting ice and snow in the springtime.

D Water is distributed equally throughout Albany County because of past mountain building processes caused by tectonic plate motion.

19 The location of a road next to the reservoir can pose problems for maintaining water quality and usage. Which argument describes a correct relationship between the need to put salt on roads to keep roads safe in winter and its impact on water quality of the nearby reservoir?

A Salt from roads can travel to the reservoir and contaminate the water and nearby wells.

B A certain amount of salt is needed by organisms, so putting salt on roads has little effect on water quality, usage, and nearby ecosystems.

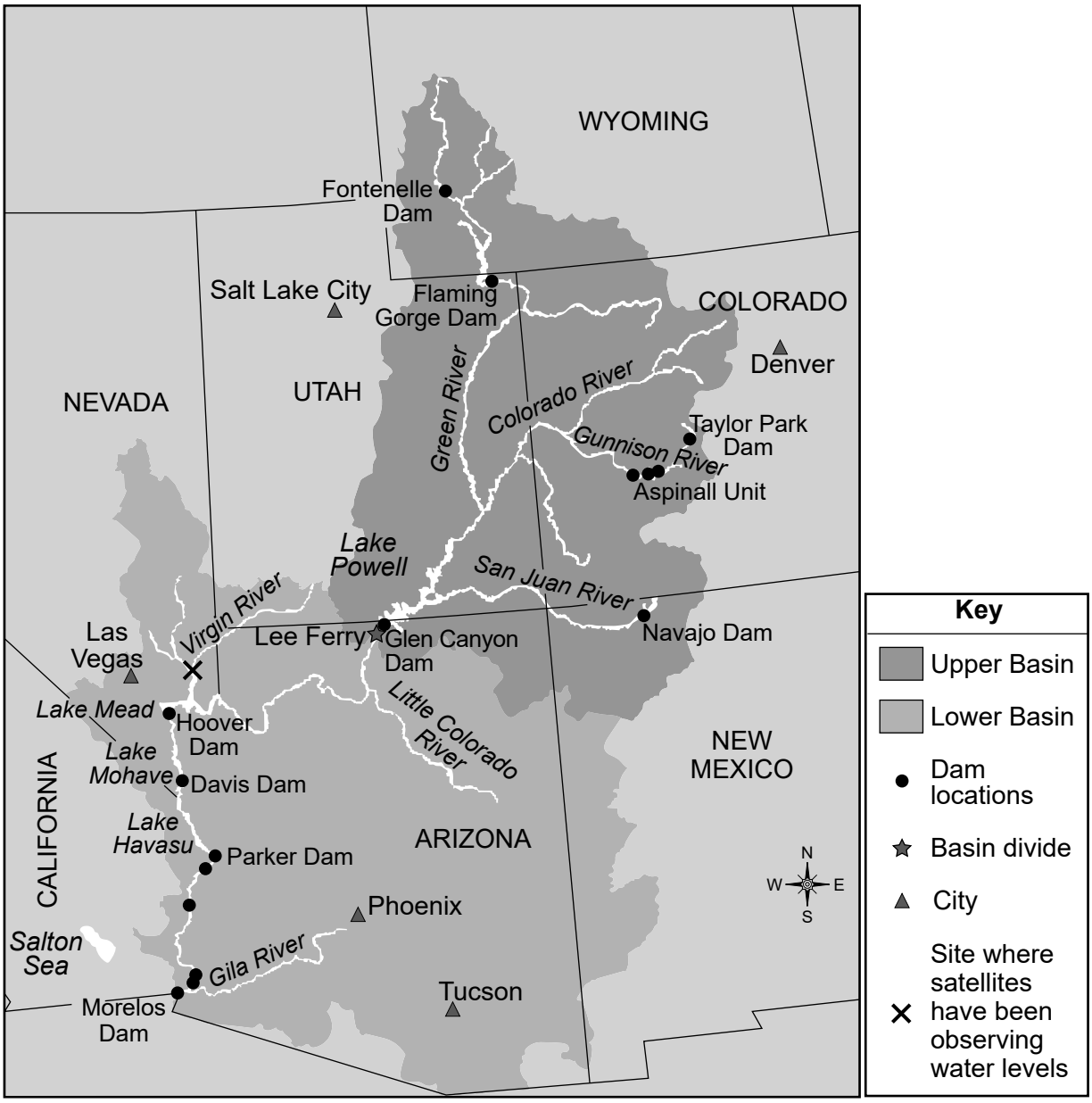
C Putting salt on roads for safety reasons also kills plants near the reservoirs, which increases the amount of water in the reservoir that can be used by humans.

D Putting salt on roads in winter will have no effect on water quality and usage because salt and water do not react.

A reservoir is an important design method for providing a large continuous source of water. It can also be used to produce electricity. Many areas of the United States have man-made reservoirs. The Colorado River Basin is a significant water source for several states. Dams and reservoirs have been built to provide greater access to this water.

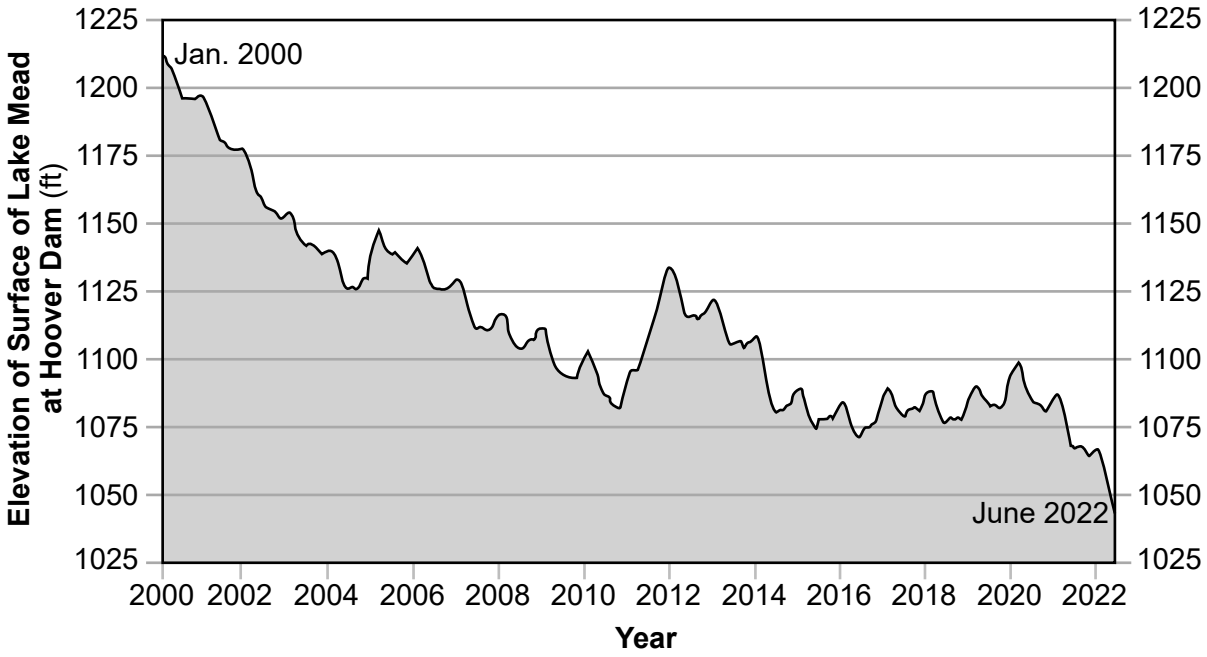
Lake Mead, in both Arizona and Nevada is the largest reservoir in the United States. It supplies water to millions of people in seven states. Water levels have been trending downward for the last 22 years. One reason for the decline is the worst drought in 100 years.

Colorado River Basin



GO ON

Elevation of Surface of Lake Mead from 2000-2022



20 Determine the approximate amount of water, in feet, that has been lost from Lake Mead between January 2000 and June 2022, and based on the trend, describe **one** action that residents in the seven states could take to limit the negative effects of this change in water level. [1]

Water lost: _____ ft

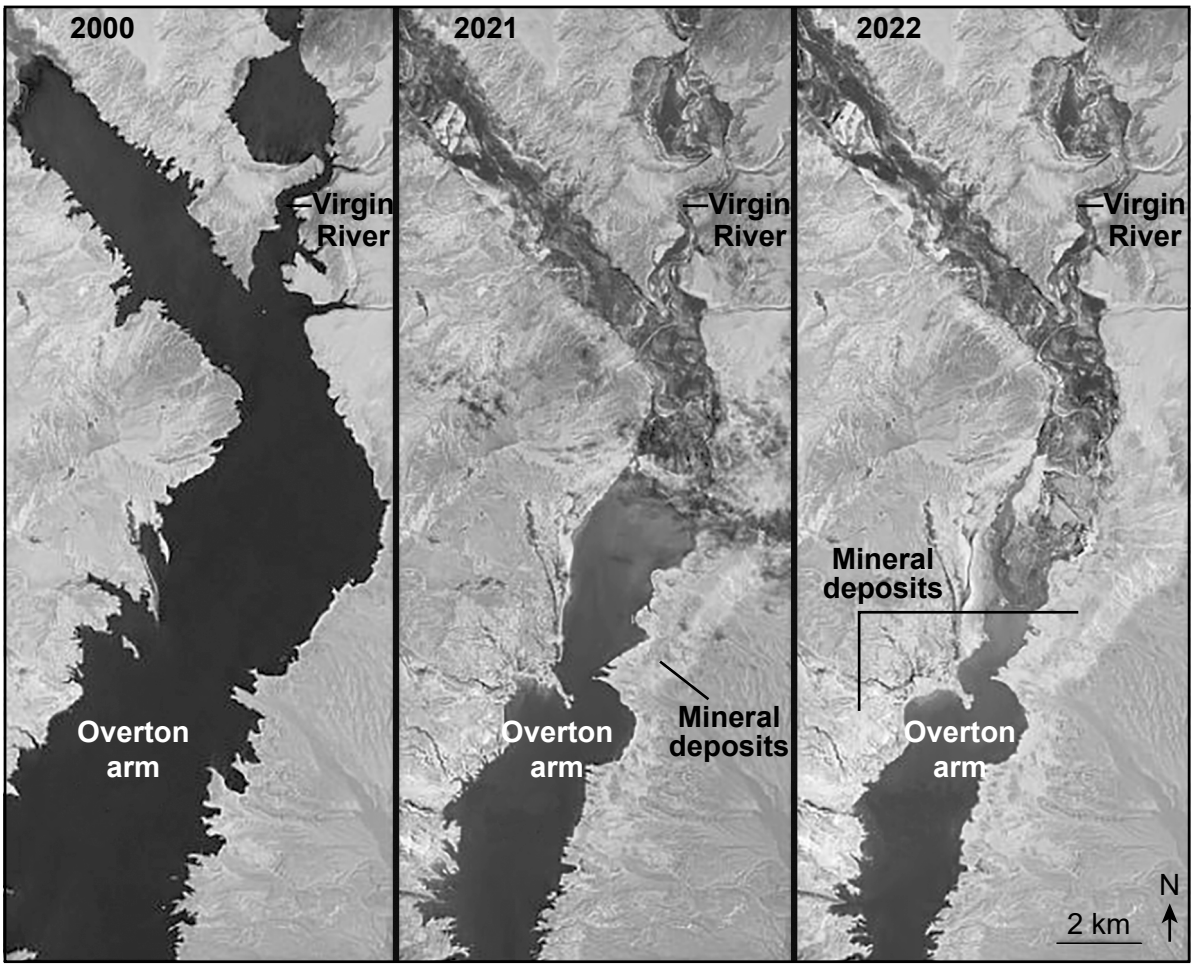
Action: _____

_____

_____

GO ON

The three satellite images below were taken of the area around location *X* on the *Colorado River Basin* map. The lighter areas on the outside of the river are mineral deposits of the lakeshore that were once underwater or dissolved in the water.



21 Scientists have been using both global and local technologies to monitor the amount of water in the Colorado River Basin. The technologies have helped government agencies to conclude that

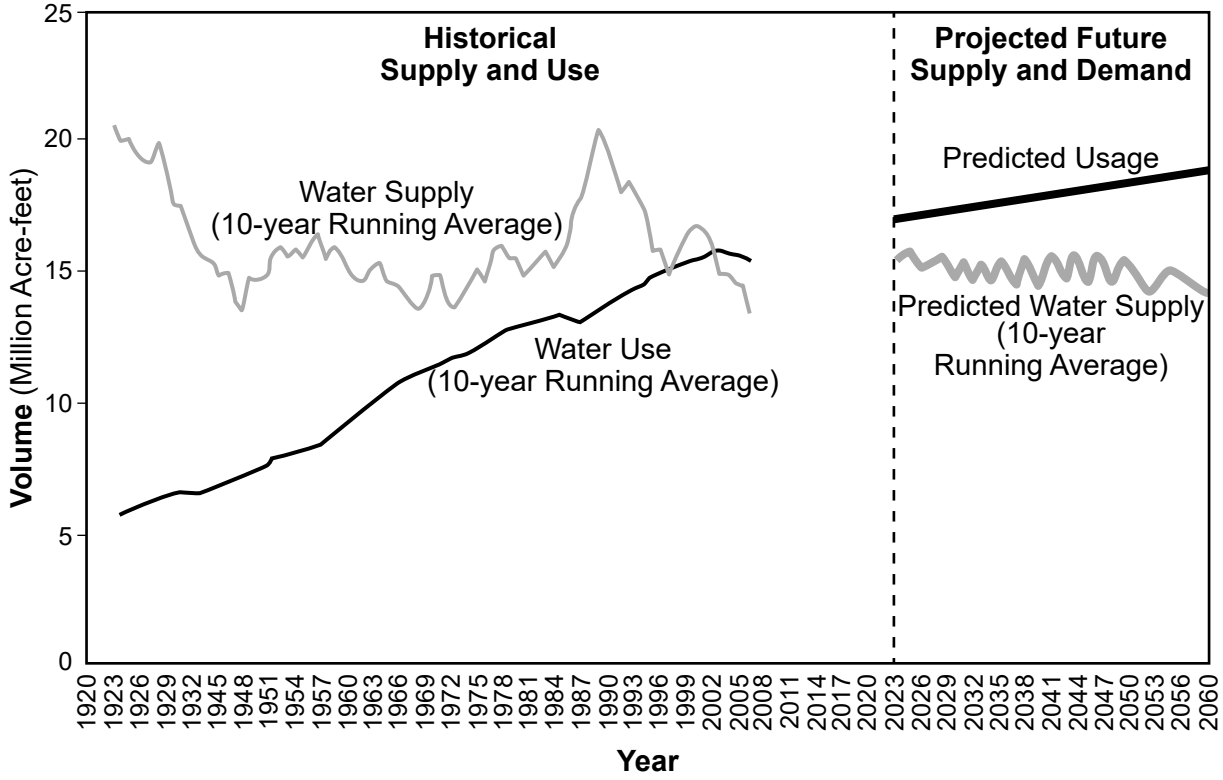
A the amount of water in waterways is influenced by the presence of minerals dissolved in the water requiring more water purification plants

B flood mitigation plans are needed because the amount of water in the Colorado River Basin is increasing at a slow rate

C there was a cyclic trend to the amount of water in the Colorado River Basin between 2000 and 2022 therefore no new mitigation plans are needed

D water conservation plans are needed because water levels in the rivers leading into Lake Mead are a major cause for the downward trend in lake surface elevation

The graph below compares the historical water supply and usage to the predicted future water supply and usage for the Colorado River Basin. Volume of water is in million acre-feet. One acre foot is approximately the amount of water needed to cover a football field (about an acre) with one foot of water. Data on historical supply and use was not collected from 1933 to 1944.



22 Scientists have inferred that the increase in human population is responsible for the pattern of water usage. Construct an argument, supported by evidence, for how this increasing human population will impact the future usage of water in the Colorado River Basin and how this usage will impact the Colorado River Basin. [1]

Water usage: _____

_____

Impact to Colorado River Basin: _____

_____

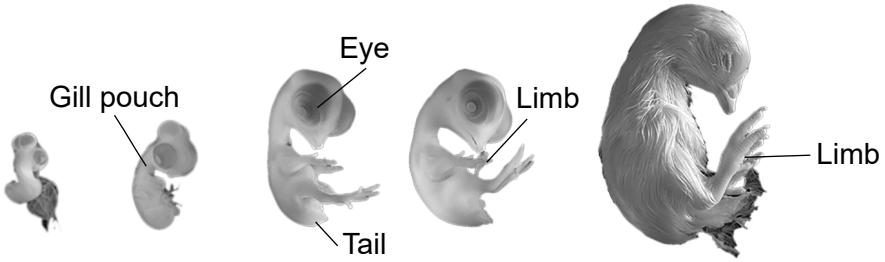
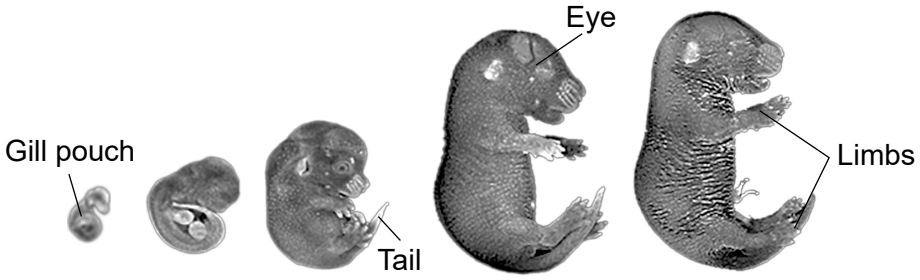
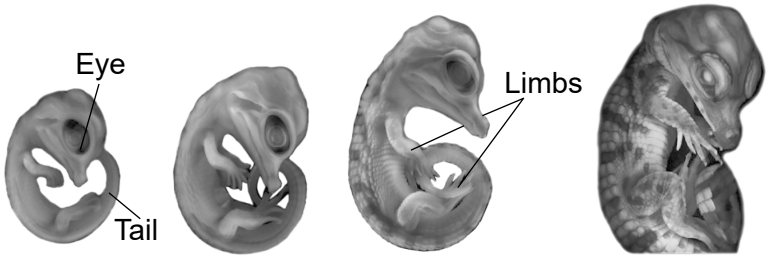
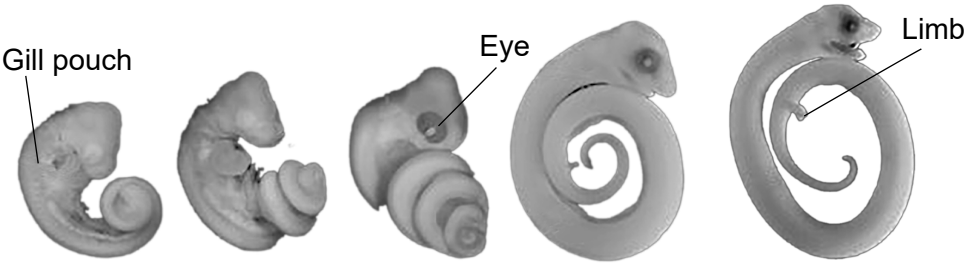
GO ON

Base your answers to questions 23 through 27 on the information below and on your knowledge of science.

Evolutionary Relationships

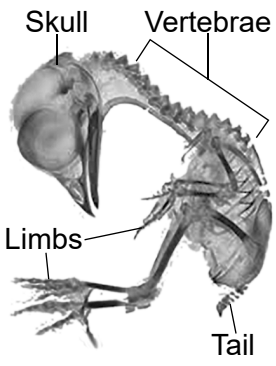
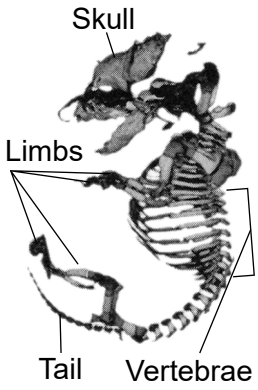
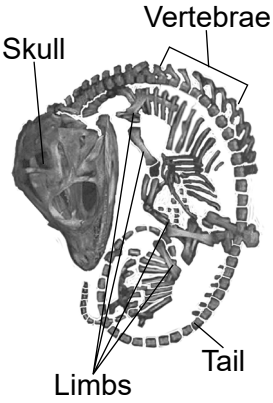
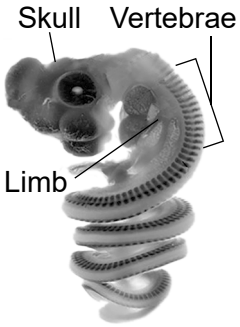
The chart below shows the embryonic development of four organisms.

Stages of Embryonic Development

Chicken Embryos	
Mouse Embryos	
Crocodile Embryos	
Snake Embryos	

(Not drawn to scale)

The chart below shows embryonic images of four organisms.

Chicken Embryo	Mouse Embryo	Crocodile Embryo	Snake Embryo
			

(Not drawn to scale)

23 Which statement can be supported using evidence from the photographs in the *Stages of Embryonic Development* chart and the embryonic images?

A Only the crocodile and snake embryos have tails.

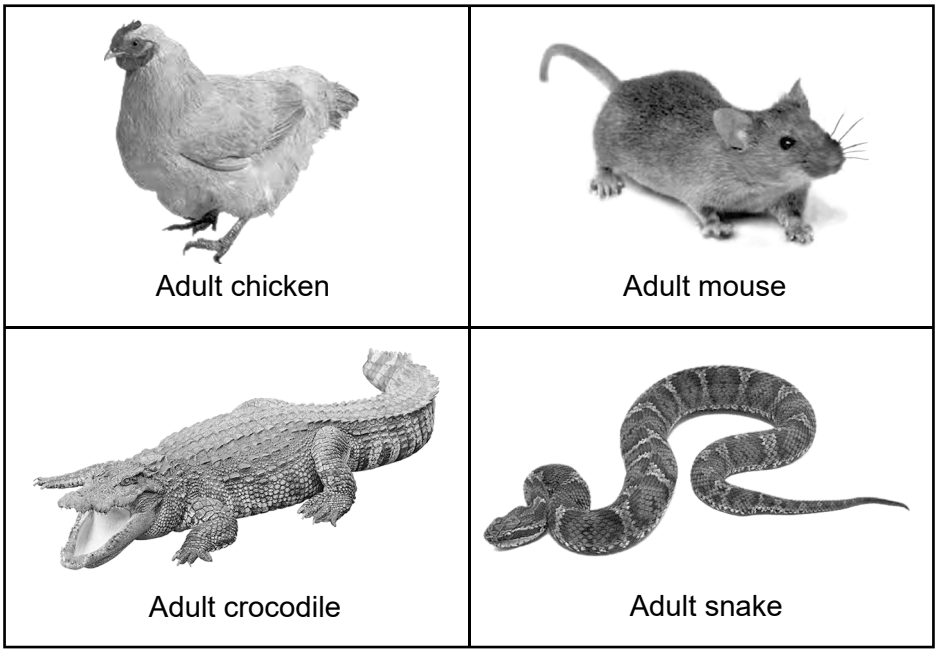
B The mouse, chicken, and crocodile embryos develop similar outer coverings.

C Eyes are present during all stages of embryonic development for all four organisms.

D All four organisms have limbs at some point during their embryonic development.

The photographs below show the adult form of the four organisms from the *Stages of Embryonic Development* chart.

Images of Adult Organisms



(Not drawn to scale)

24 The table below lists the four organisms and structures associated with these organisms. Place checkmarks (✓) in the appropriate boxes to indicate if the structures are found in the Embryo Stage only, the Adult Stage only, or in both the Embryo and Adult stages. [1]

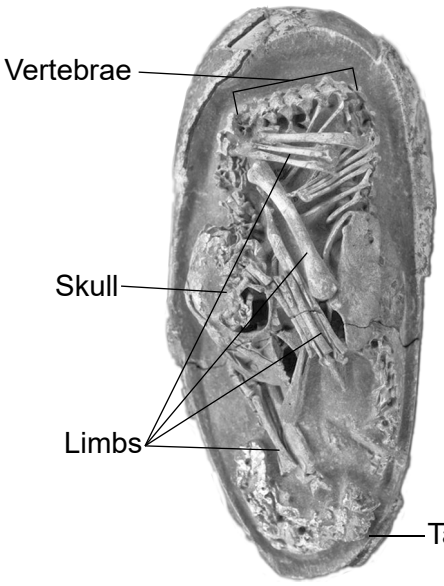
Organism	Structure	Found in Embryo Stage Only	Found in Adult Stage Only	Found in Both Embryo and Adult Stages
Chicken	Gill Pouches			
Mouse	Four Limbs			
Crocodile	Eyes			
Snake	Colored Scales in a Pattern			

GO ON

Baby Yingliang

In 2000, a dinosaur embryo fossil was discovered in east China and is now housed in the Yingliang Stone Natural History Museum where it was dubbed "Baby Yingliang." Estimated to be 27 centimeters long from head to tail, the creature lies inside a 17-cm-long egg. Paleontologists believe it belongs to a toothless theropod dinosaur, or oviraptorosaur, dating back 72 to 66 million years, within the Cretaceous Period.

Embryonic Skeleton of Baby Yingliang



Scientific Illustration of Baby Yingliang

(Not drawn to scale)

25 Scientists have inferred that Baby Yingliang has a strong evolutionary relationship with the chicken. Identify **two** pieces of evidence that supports this inference. [1]

Evidence 1: _____

_____

Evidence 2: _____

_____

GO ON

Scientists who study dinosaurs compare not only their embryological development, but also their behavior in how they protect their eggs in which the embryos are found.

For millions of years, parents across the animal kingdom have cared for their eggs and young, providing both time and resources. Nest building is a common behavior in many organisms, such as modern day birds and crocodiles. Some of these animals cover their nests entirely and leave them. Others leave their nests open and incubate the eggs by brooding, or sitting on the nest, to keep the eggs warm and protected.

The table below lists four dinosaur types and the nesting behaviors thought to be associated with each type.

Nesting Behaviors of Various Dinosaur Types

Dinosaur Types	Nesting Behavior
Maiasaura	— nested in large colonies, laying on eggs — parents may have extensively provided food and protection for their hatchlings
Oviraptor	— curled up laying on its nest — protective of eggs
Allosaurus	— laid between 10 and 20 eggs
Gigantoraptor	— laid their eggs in a ring around their bodies to incubate eggs without sitting directly on them

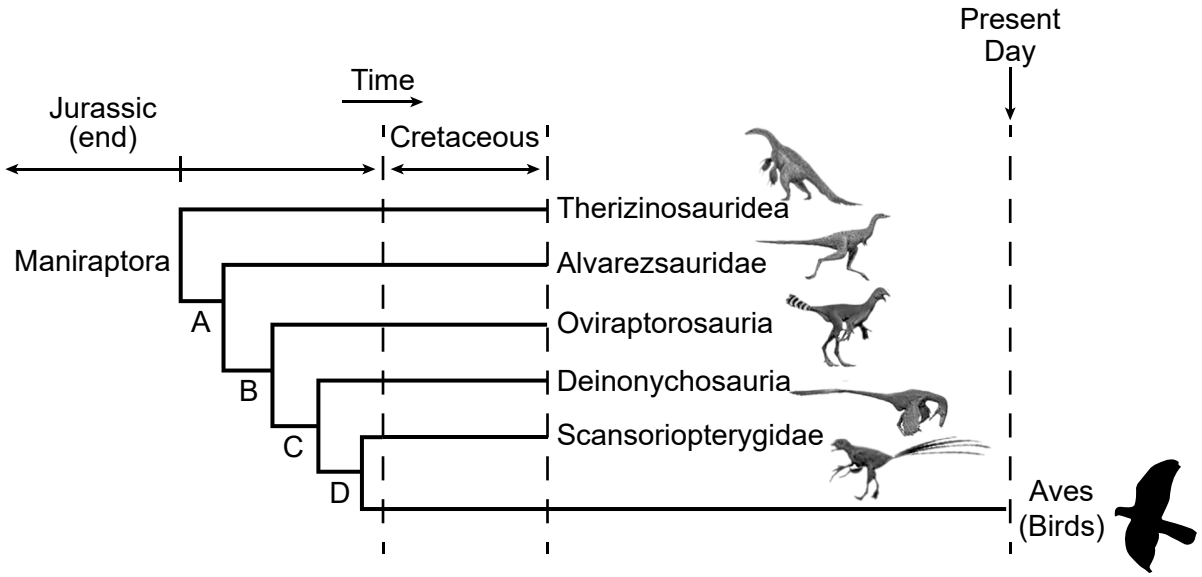
26 Identify and explain how **one** specific behavior is thought to have helped dinosaurs increase the probability of successful reproduction. [1]

Behavior: _____

Explanation: _____

_____

The Oviraptorosaurus is a descendant of a group of dinosaurs called Maniraptora. The model below represents the evolutionary relationships amongst different groups of organisms. The bars indicate the time on Earth when these groups of organisms lived. The letters *A*, *B*, *C*, and *D* are descendants of the Maniraptora. Jurassic and Cretaceous refer to time periods in Earth's geologic history when dinosaurs existed.



27 Which statement about the pattern observed in the model is most accurate?

A There has been no change in life forms throughout much of geologic history.

B There has been little diversity in life forms after the Maniraptora group.

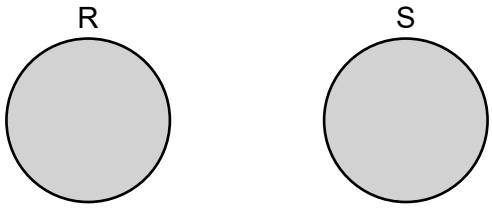
C Members of Oviraptorosauria are all extinct while members of Aves are still in existence.

D All the descendants of Maniraptora have survived to the present day.

Base your answers to questions 28 through 32 on the information below and on your knowledge of science.

Gravitational Forces

Students are investigating the factors that affect the strength of the gravitational force that one object exerts on another object. Students collected data using a computer simulation in order to find the strength of the gravitational force that object *R* exerted on object *S*. The masses of *R* and *S*, as well as the distance between the centers of *R* and *S*, were changed in order to find the effect of these changes on the strength of the gravitational force.



Simulation	**Object R** (kg)	**Object S** (kg)	**Distance** (m)	**Gravitational Force** (N)
1	10	10	3	7.43×10^{-10}
2	10	20	3	14.8×10^{-10}
3	10	10	6	1.85×10^{-10}
4	10	20	6	3.71×10^{-10}

28 Which pair of simulations can be used as evidence to support the claim that changing the masses of *R* and *S*, as well as changing the distance between the masses, affect the strength of the gravitational force that *R* exerts on *S*?

A 1 and 2

B 2 and 3

C 3 and 4

D 1 and 3

29 Which argument about mass, distance, and gravitational force can be made using evidence from the table?

A An increase in only the distance between the objects does not affect the strength of the gravitational force.

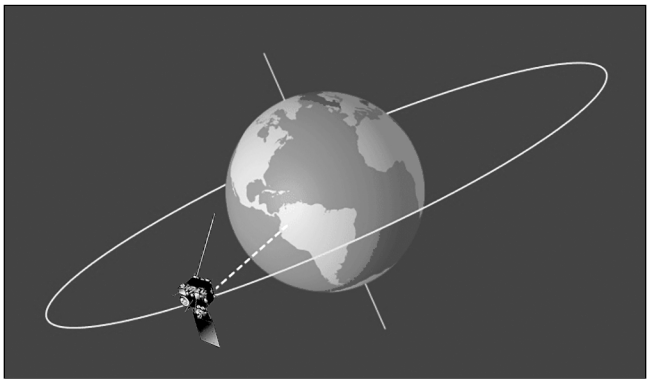
B An increase in only the mass of one object does not affect the strength of the gravitational force.

C An increase in only the distance between the objects decreases the strength of the gravitational force.

D An increase in only the mass of one object decreases the strength of the gravitational force.

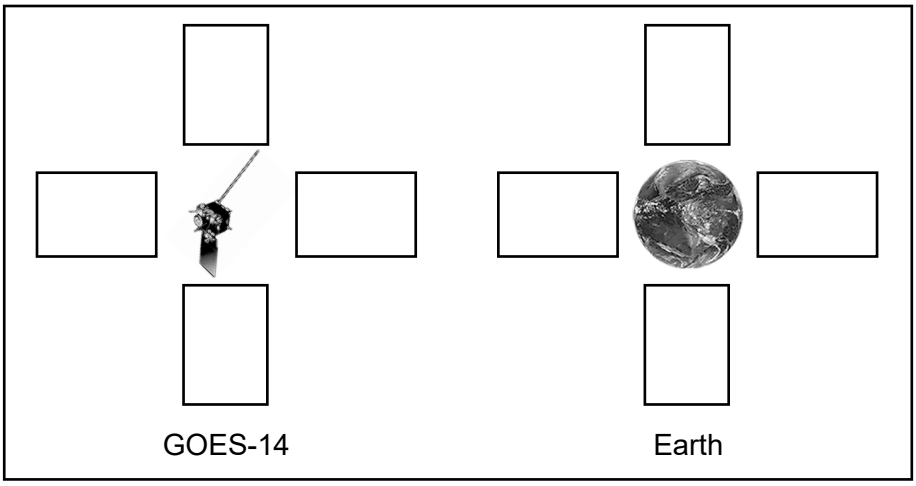
Some satellites that orbit Earth, like the GOES-14 satellite, are geostationary. This geostationary satellite travels over the equator. It moves in the same direction and at the same rate Earth is spinning. From Earth, a geostationary satellite looks like it is standing still since it is always above the same location. In 2022, there were 402 geostationary satellites in orbit around Earth.

Geostationary Satellite Orbit Around Earth

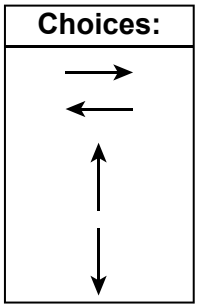


30 Complete the model below by placing **one** arrow, from the four choices given, in a box around each object to indicate the direction of the gravitational force that Earth exerts on GOES-14 *and* the direction of the gravitational force that GOES-14 exerts on Earth. [1]

Model of Direction of Gravitational Force—GOES-14 and Earth



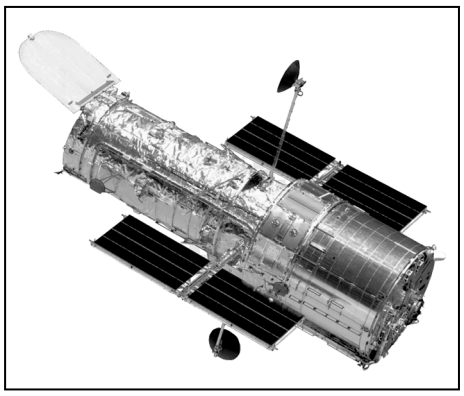
(Not drawn to scale)



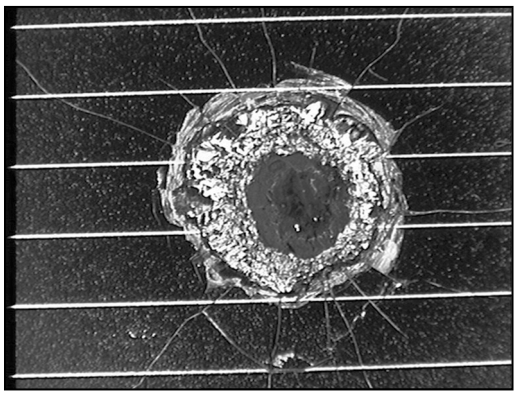
The Hubble is a space telescope located in an orbit around Earth. It is powered by solar panels and it is approximately the same size and mass of a large school bus.

Fragments from non-functional satellites or even paint flecks from the International Space Station are found in space and called orbital debris. Hubble has evidence of impacts from this debris in the form of tiny impact craters across its solar panels. These tiny particles have struck Hubble at very fast speeds of up to 10 kilometers per second.

Hubble Space Telescope



2.5-mm Hole in Hubble's Solar Panel



31 The force exerted on Hubble during a collision with space debris does ***not*** significantly affect the motion and location of this telescope. Which statement best explains this phenomenon?

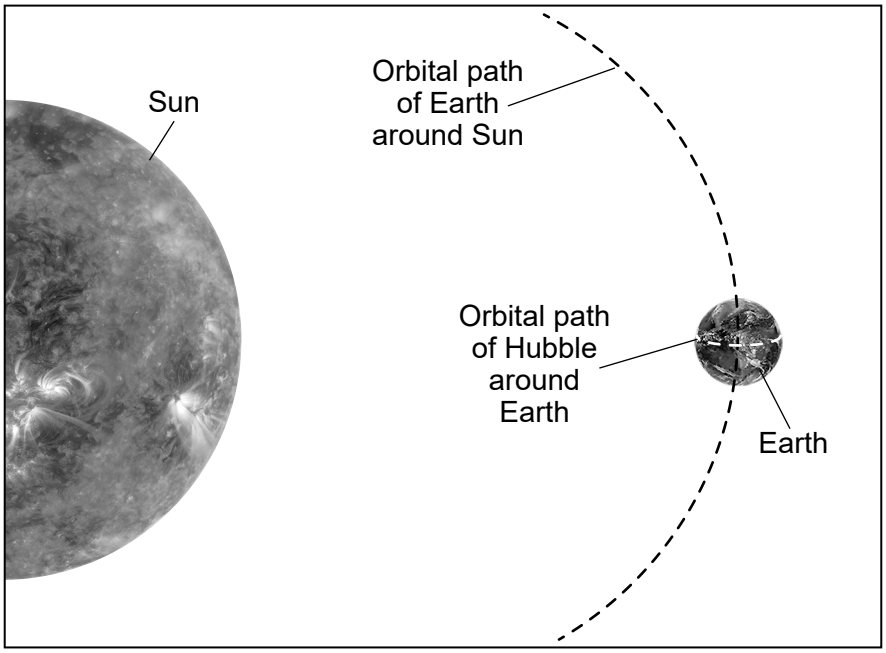
A The sum of the forces acting on Hubble is zero.

B The mass of Hubble is less than the mass of the space debris.

C Hubble exerts a stronger force on the space debris than the force exerted by the space debris on Hubble.

D The mass of Hubble is very large and the strength of the force of impact is relatively small.

The model below represents the locations of the Sun, Earth, and the Hubble telescope in our solar system. Earth and Hubble complete a trip around the Sun in a year, while Hubble completes a trip around Earth in approximately 95 minutes.



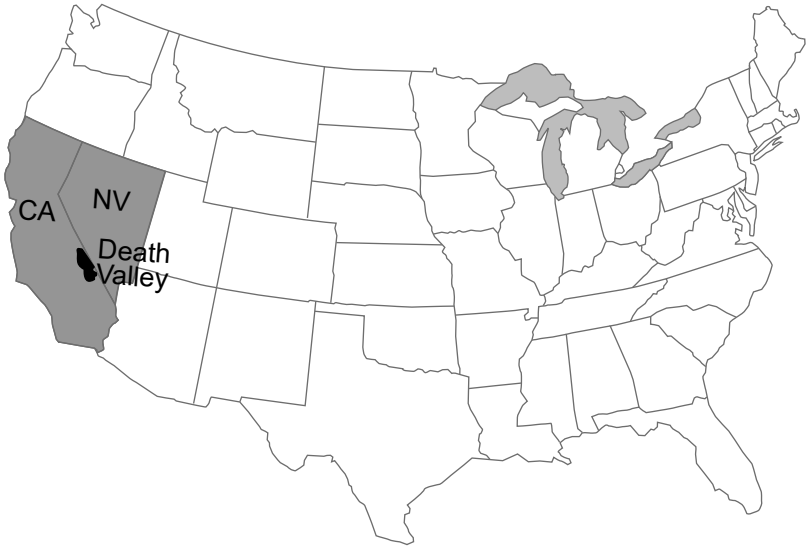
(Not drawn to scale)

32 Explain, in terms of forces, why Hubble stays in its orbit around Earth, *and* why Earth stays in its orbit around the Sun. Include **both** Hubble-Earth and Sun-Earth interactions in your answer. [1]

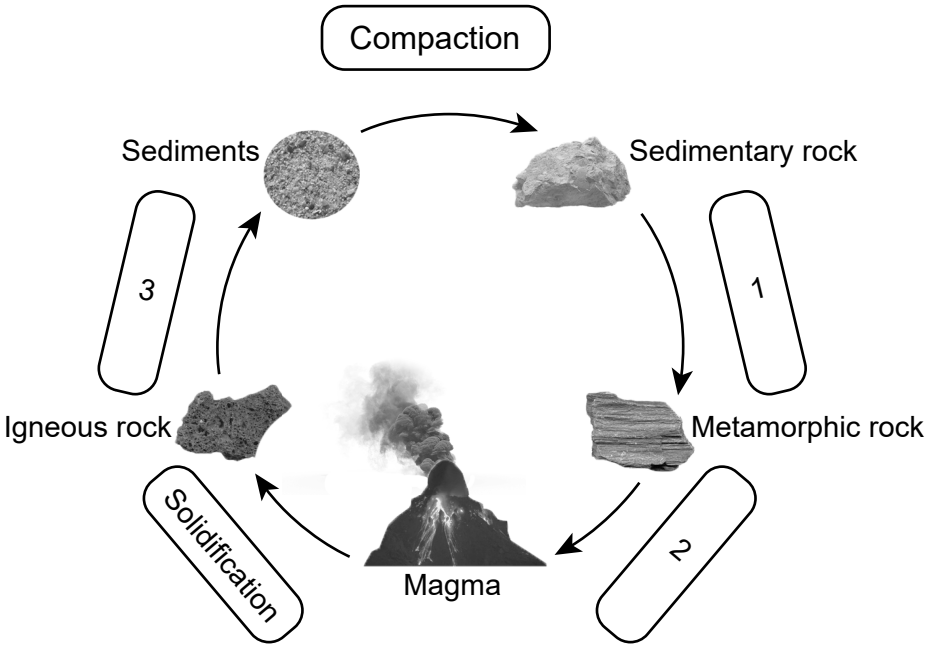
Base your answers to questions 33 through 38 on the information below and on your knowledge of science.

Death Valley

Death Valley National Park, located on the border of California (CA) and Nevada (NV), is the largest national park in the continental U.S. It has the lowest elevation in North America at 282 feet below sea level and contains the driest desert in North America. Rock strata in the Death Valley region can provide evidence for the geologic history of the area. The oldest rocks are metamorphic and are approximately 1.7 billion years old. Sedimentary rocks in the valley region are about 500 million years old and are evidence that the area was the site of a warm shallow sea. Igneous rock layers are believed to range from 65.5 to about 2 million years old when volcanic ash and cinder from nearby volcanoes covered the region.



The rock cycle model below shows the formation of rocks as a result of sedimentary, igneous, and metamorphic processes.



33 Which list identifies the names of the missing processes, numbered 1 through 3, of the rock cycle?

A 1 = erosion; 2 = deformation; 3 = melting

B 1 = deformation; 2 = melting; 3 = erosion

C 1 = melting; 2 = deformation; 3 = erosion

D 1 = deformation; 2 = erosion; 3 = melting

34 Which two sources of energy are responsible for the cycling of Earth materials and the flow of energy, as shown in the rock cycle model?

A the Sun and Earth's hot interior

B Earth's hot interior and the Moon's hot interior

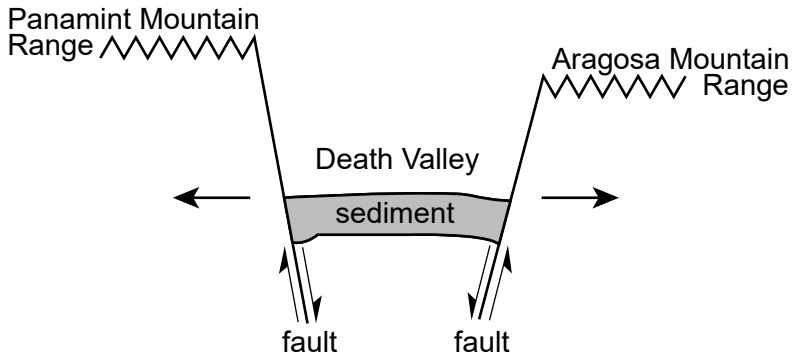
C evaporation and condensation of water on Earth's surface

D the Sun's energy and Earth's magnetic fields

The map below shows Death Valley. The arrows on the model below indicate the direction of land movement that produced the valley.

Map of Death Valley Region

Model of Death Valley Topography



Death Valley Faults

(Not drawn to scale)

35 Which piece of evidence would support the claim that Death Valley National Park is the result of past tectonic plate motions?

A Death Valley is the lowest elevation in North America.

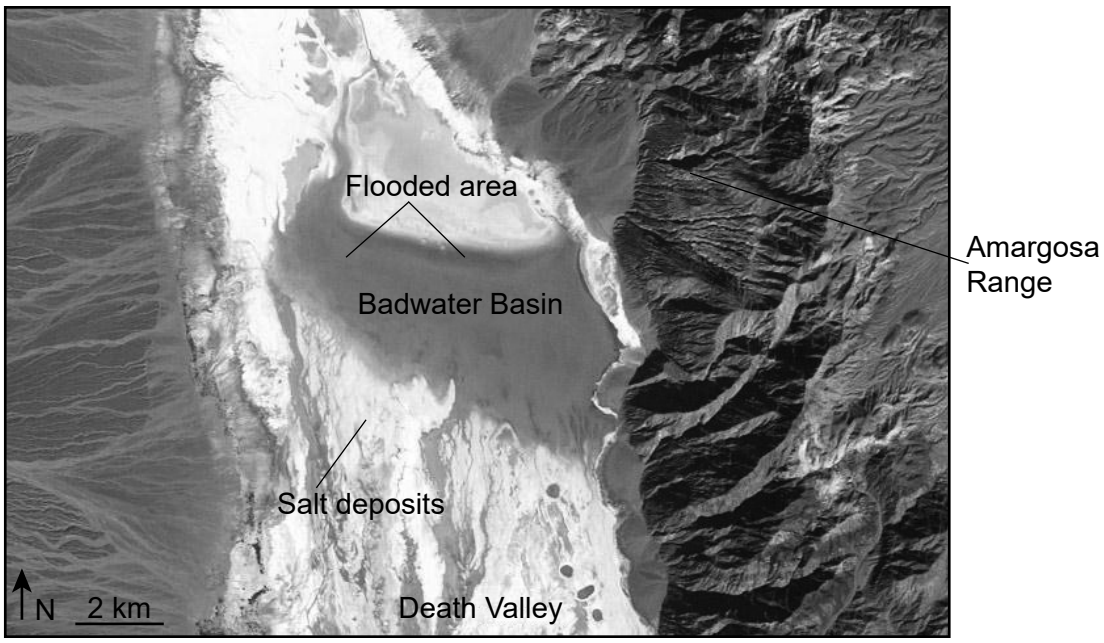
B The locations of the mountain ranges on either side of Death Valley are almost parallel to each other.

C There is thick sediment on the bottom of Death Valley.

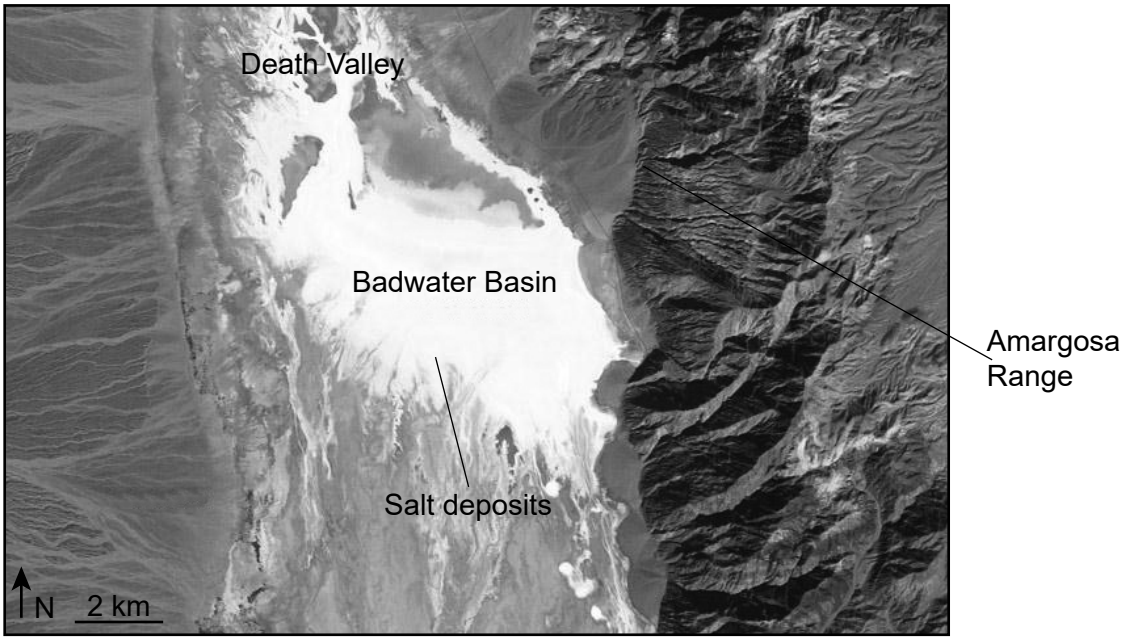
D There are uplifted mountain ranges on either side of Death Valley.

GO ON

In February 2005, Badwater Basin in Death Valley received about six inches of rain from streams flowing into the enclosed basin that flooded the area. The photographs below show this region shortly after the flood in February 2005 and again in February 2007, in which mineral salt deposits are clearly visible.



February 2005



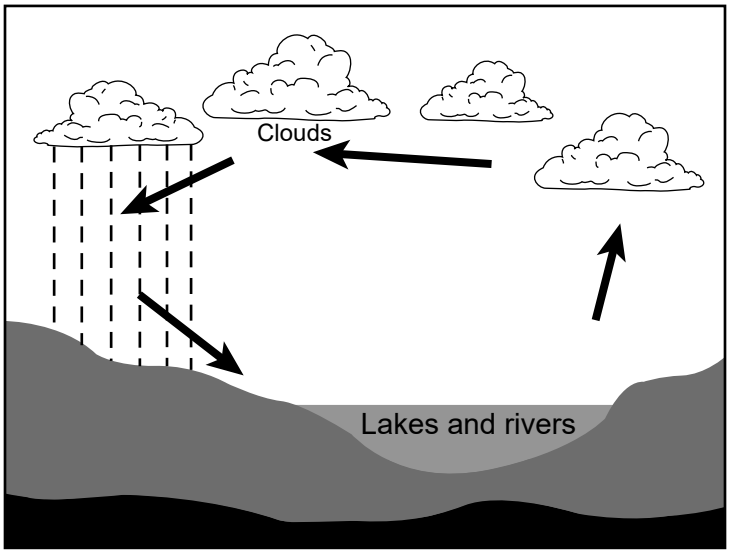
February 2007

GO ON

The salt flats region in Death Valley covers over 200 square miles. Salt flat formation requires:

- a large basin where streams carry salts down to the basin
- an enclosed basin, like Death Valley, where the salts dissolved in stream water can be trapped and not wash away
- an arid climate with high temperatures to drive water cycle processes

The arrows on the water cycle model below represent the ways water changes its state as it moves through multiple pathways.



36 Identify **one** water cycle process that is directly responsible for the formation of the large mineral salt flats in Death Valley and explain how this process is driven by energy from the Sun. [1]

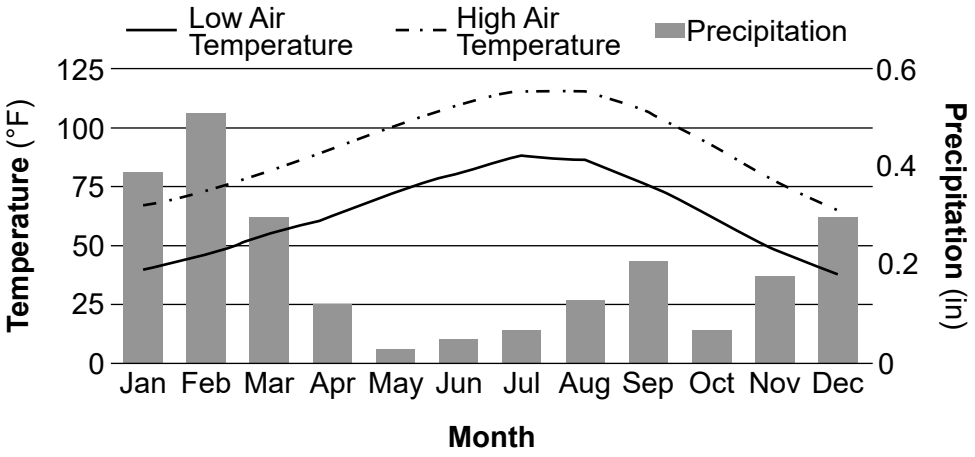
Process: _____

Explanation: _____

_____

GO ON

The climate graph below shows the average high and low air temperatures and the average monthly precipitation from 1981 through 2010 for Death Valley, California.



37 Using the data as evidence, predict the season (*spring*, *summer*, *fall*, or *winter*) during which a flood is most likely to occur in Death Valley, California. Also, explain how the data provides evidence for your prediction. [1]

Season: _____

Explanation: _____

_____

38 Which statement is a reasonable action that could be taken by Death Valley Park officials to mitigate the effects of flash floods or flooding events for park visitors?

A Based on seasonal rainfall data, place barrels throughout the park to catch some of the extra rainfall.

B Use precipitation data to decide when to post road closures and detours in areas that typically flood.

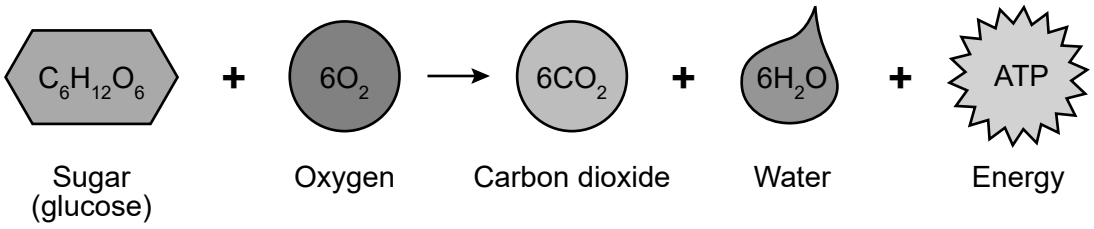
C When any rainfall occurs, close the entire national park to prevent loss of property and life.

D Build barriers along the sides of all roads in the national park to keep flood waters off the road at times of high precipitation events.

Base your answers to questions 39 through 43 on the information below and on your knowledge of science.

Respiration

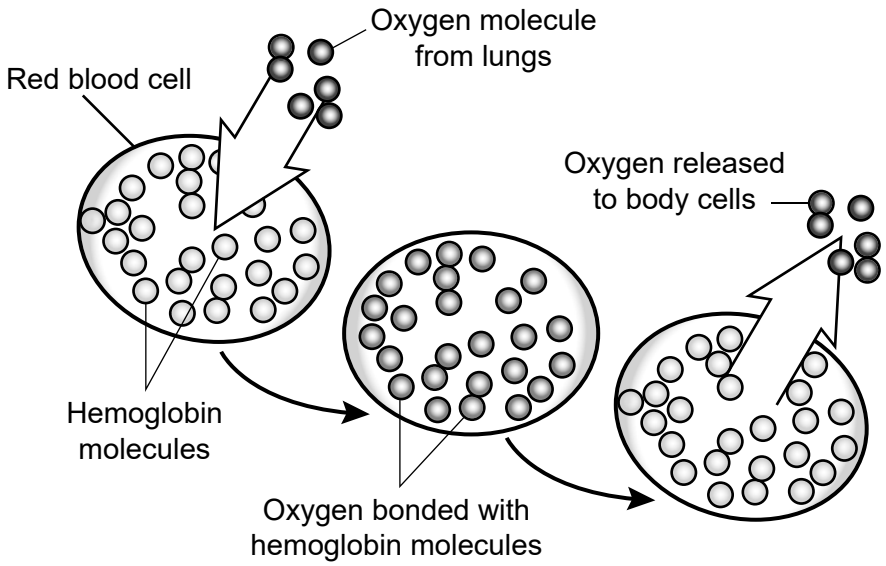
In order for athletes to run, bike, or hike long distances, more oxygen needs to be delivered to their cells. Athletes also need energy from food. Foods high in carbohydrates, such as sugar, provide this energy when the sugar and oxygen react to produce carbon dioxide, water, and energy during cellular respiration. The chemical reaction for this process is modeled below.



39 Identify the carbon-based molecule that is formed when a sugar molecule is rearranged during cellular respiration. [1]

_____

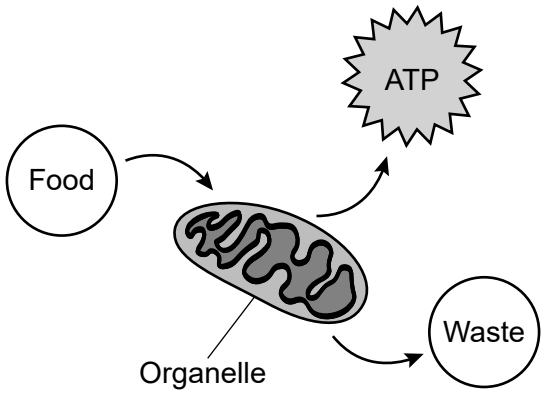
The transfer of oxygen within the human body is partially shown in the model below. Hemoglobin is the protein that red blood cells use to transport oxygen.



40 Use evidence from the model to explain how **two** organ systems work together to deliver oxygen to body cells for cellular respiration. Include **both** organ systems in your explanation. [1]

GO ON

The model below represents cellular respiration taking place in an organelle within a body cell.



41 Which organelle is represented in the model and is correctly paired with its function for the cell as a whole?

A nucleus; control center of the cell

B chloroplast; captures energy to make food

C mitochondrion; releases energy from food

D cell membrane; allows food to enter and wastes to leave the cell

Sherpas are an ethnic group that live on the high southern slopes of the Himalaya Mountains in eastern Nepal. They are famous for their hiking skills and for guiding experienced hikers to the summit (top) of Mount Everest at 8848 meters (29,032 feet), carrying heavy loads.

Sherpas have lived on the high plateau of the Himalayas at an average altitude of more than 4480 meters (14,700 feet) going back at least 6,000 years when the earliest settlement appeared. This is a period of time sufficient to drive the natural selection of genetic variants favoring survival and performance in the low oxygen environment of mountain locations.

A Sherpa Carrying 15 Ladders for Hikers Trying to Summit Mount Everest

42 Which argument describes how the high altitude environment of the Himalayan region has affected the Sherpa population?

A Sherpas make glucose more efficiently than populations living at lower altitudes.

B Sherpas produce less carbon dioxide during cellular respiration than populations living at lower altitudes.

C Sherpas release more oxygen during cellular respiration than populations living at lower altitudes.

D Sherpas perform cellular respiration more efficiently with less oxygen than populations living at lower altitudes.

43 Natural selection has caused a genetic trait of Sherpas to change over a long period of time by

A decreasing the frequency of a favorable trait through asexual reproduction

B decreasing the frequency of a favorable trait through sexual reproduction

C increasing the frequency of a favorable trait through asexual reproduction

D increasing the frequency of a favorable trait through sexual reproduction

Base your answers to questions 44 through 48 on the information below and on your knowledge of science.

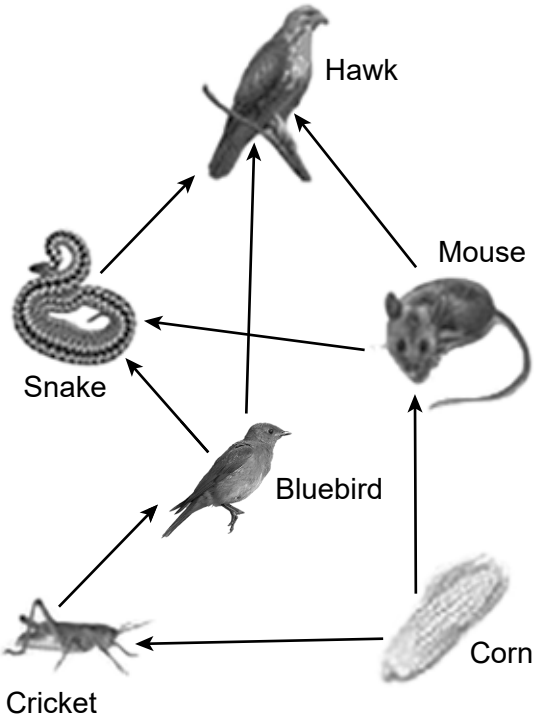
Ecosystem of the Eastern Bluebird

New York chose the Eastern Bluebird as the state bird in 1970. Bluebirds eat mostly insects and berries. They fly down to the ground or hover in mid-air to catch insects. In winter months when insects are less available, berries are an important food source.

It is a migratory bird that is found in open woodlands, farmlands, and fruit orchards. In recent decades, the bluebird population has increased due to the conservation efforts of providing more birdhouses for nesting sites. These houses have been intentionally placed along "bluebird trails" that follow their migration. They typically fly to the southeast United States or Mexico in winter.

Eastern Bluebird

The model below represents a food web within an ecosystem which includes the bluebird.



44 Which table shows a correct interaction that the bluebird has with another organism in this food web?

Predator	Prey
cricket	bluebird

A

Predator	Prey
bluebird	hawk

C

Predator	Prey
snake	bluebird

B

Predator	Prey
bluebird	mouse

D

45 A student writes an explanation about the relationship between the bluebird and the corn using information from the food web model. They stated that "the corn is a direct food source for the bluebird."

Revise the explanation to indicate the correct relationship between the bluebird and an organism that is a food source for the bluebird. Use evidence from the food web model to support the revised explanation. [1]

Revised explanation: _____

Evidence from model: _____

GO ON

The house sparrow is another bird commonly found in New York State. These birds frequently take over the nests and destroy the eggs of other birds. Once a male house sparrow establishes a territory, he remains there year-round and defends that territory, preventing other bird species from building nests in the area. House sparrows eat mostly grains and seeds, but, in summer, will eat insects and feed them to their young.

House Sparrow

46 From the list of interactions below, identify the pattern of interaction that a house sparrow would have with a bluebird in a particular ecosystem. Describe **two** environmental factors that create this pattern of interaction. [1]

Interactions

competition
mutualism
parasitism

Pattern of Interaction: _____

Factor 1: _____

_____

Factor 2: _____

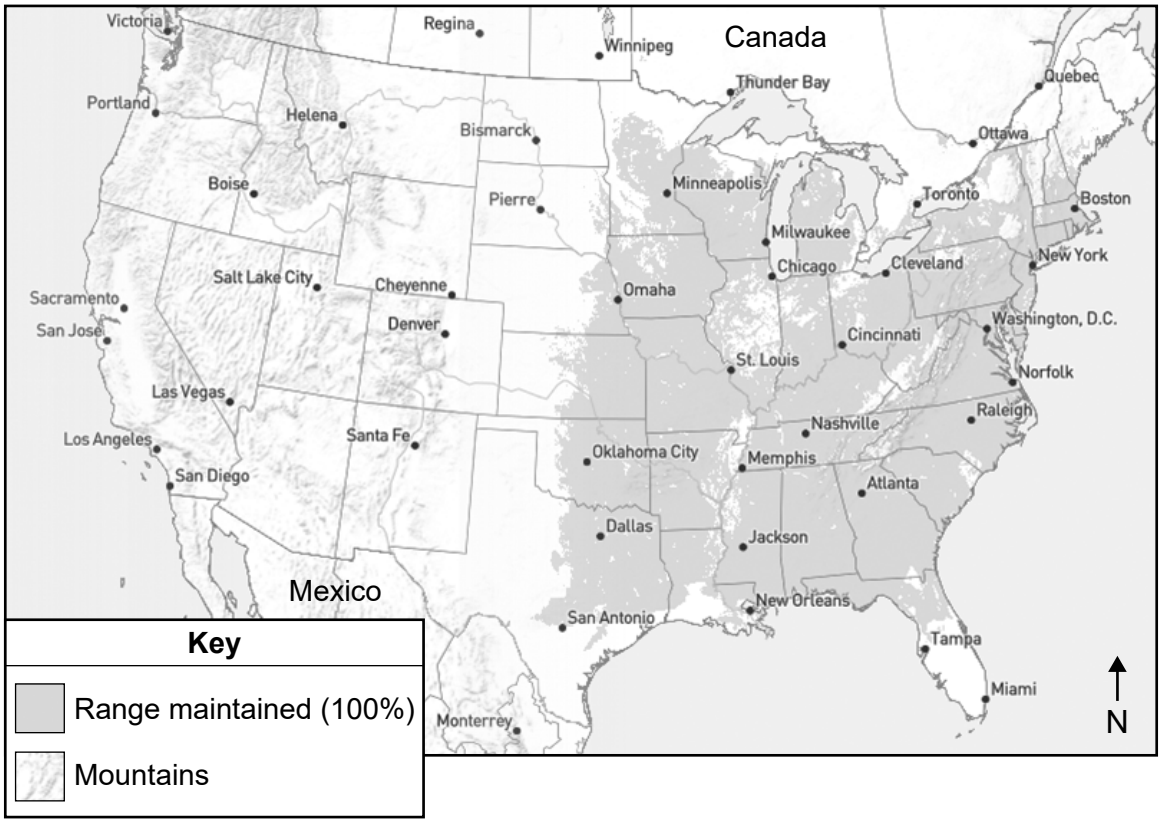
_____

GO ON

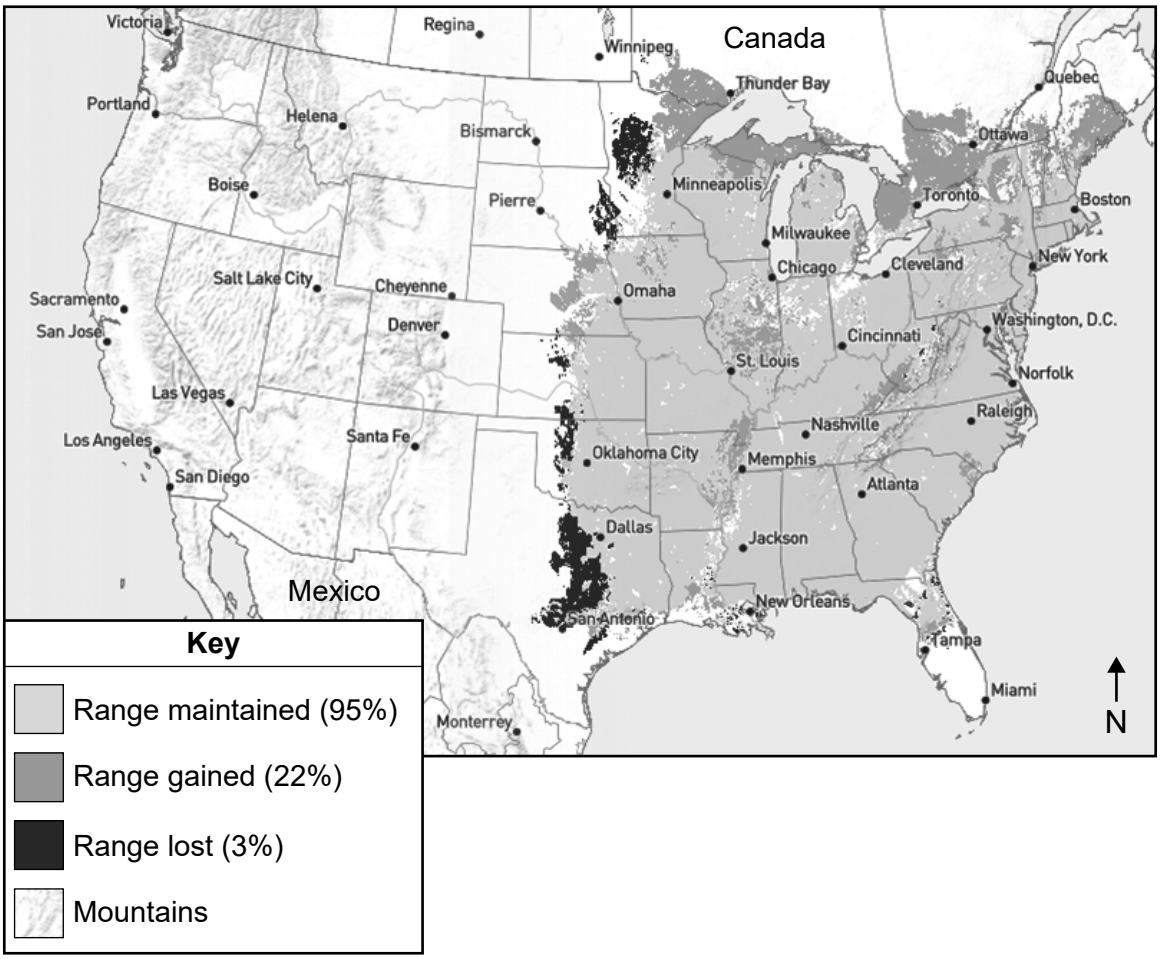
The maps below compare the range of the Eastern bluebird for our current worldwide average temperature and the predicted ranges for a worldwide average temperature 2°C greater than at present. A species range is the geographic area where a particular species can be found during its lifetime.

Scientists infer a 2°C increase in global temperatures could happen as early as 2050 without mitigation efforts. Rising global temperatures have the potential to alter ecosystems that affect the ranges of many species.

Eastern Bluebird Range for Present Day Global Temperature



Eastern Bluebird Range with 2°C Global Temperature Increase



47 Which evidence found on the maps supports the argument that changes to worldwide average temperatures affect the range of the Eastern bluebird?

A The increase in average temperatures will cause the Eastern bluebird range to increase only into the San Antonio region.

B The increase in average temperatures will cause the Eastern bluebird range to decrease only in the Minneapolis-Bismarck region.

C As the climate warms, Eastern bluebird ranges will decrease west of Oklahoma City and shift farther north into the Toronto region.

D As the climate warms, the range of the Eastern bluebird will shift south to Miami and west toward Cheyenne.

The use of synthetic pesticides in the United States began in the 1930s. These pesticides killed insects that ate food crops. This use continued in the 1950s in order to increase the amount of food produced on farms. Some pesticides were found to have considerable health risks, including causing forms of cancer, and the use of some pesticides has been banned in the United States.

Farmers Applying Pesticides

Farmers today have tried to use methods to control insects that are not harmful to the environment. One method is to place bluebird boxes around their crops to encourage bluebirds to live there.

Bluebird Box and Bluebird on Farm

48 How does the use of bluebird boxes on farms minimize the impact of pesticides on the environment?

A Bluebirds living in bluebird boxes decrease the number of insects on farms with minimal health risks to humans.

B Bluebirds living in bluebird boxes pollinate the plants that would otherwise be pollinated with pesticides.

C Bluebird boxes are more expensive to buy and maintain than buying and using pesticides.

D Bluebird boxes attract other types of birds to the area which discourage insects from eating crops.

Base your answers to questions 49 through 53 on the information below and on your knowledge of science.

The Chemistry of Propane

Propane (C_3H_8) is a flammable gas at standard temperature and pressure. It can be compressed (put under pressure) and stored in steel containers as a liquid. Propane tanks are often used as the fuel source for barbecue grills, as well as residential (home) heating. A valve on the steel container releases the liquid propane, which vaporizes (turns into gas) when it is returned to standard temperature and pressure.

Propane Tank

Barbecue with Propane Tank

Larger Propane Tank Outside Home

Reaction for Propane Combustion (Burning):

$$\underset{\text{propane (gas)}}{C_3H_8} + \underset{\text{oxygen (gas)}}{5\,O_2} \rightarrow \underset{\text{water (liquid)}}{4\,H_2O} + \underset{\text{carbon dioxide (gas)}}{3\,CO_2} + \underset{\text{heat/light}}{\text{Energy}}$$

Reactants | **Products**

Key

Symbol	Element name
C	Carbon
H	Hydrogen
O	Oxygen

49 How many different types of atoms make up **one** molecule of propane?

A 8

B 2

C 3

D 11

50 Provide evidence to support the claim that a chemical reaction has occurred during the combustion of propane. [1]

51 The reaction for the burning of propane shows a conservation of matter because

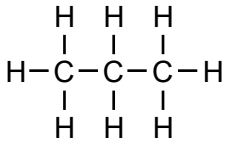
A water is produced during the reaction

B energy is produced during the reaction

C the mass of the water and carbon dioxide equals the mass of the propane and oxygen

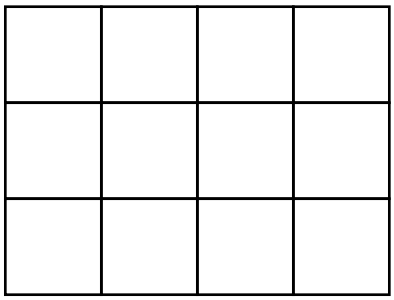
D the volume of the water and carbon dioxide equals the volume of the propane and oxygen

The model below represents one molecule of propane.

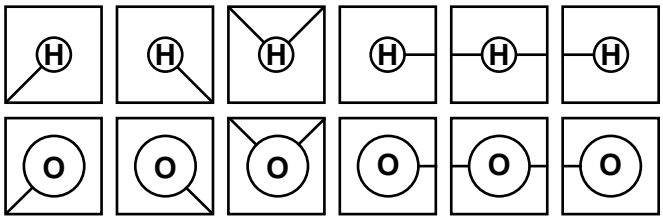


52 Develop a ball and stick model of **one** water molecule showing the correct orientation and arrangement of the individual atoms by arranging the symbols in the grid below. Symbols may be used more than once. [1]

Water Molecule Grid

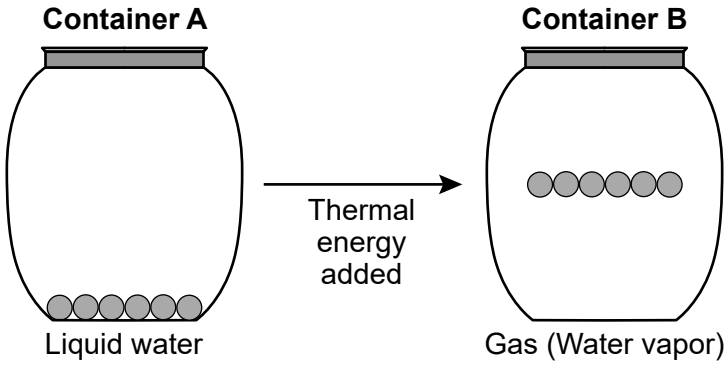


Symbol Choices



GO ON

Two containers, *A* and *B*, are shown below. *Container A* represents a model of the arrangement of six particles of liquid water. In *Container B*, a student made a model of these same six particles after thermal energy was added and the water became water vapor. The student's particle diagram was incorrectly drawn.



53 Explain how the particles should be drawn to correctly represent the particle arrangement of water vapor. [1]

Grade 8
Intermediate-level
Science Test

Spring 2024

INTERMEDIATE-LEVEL SCIENCE TEST

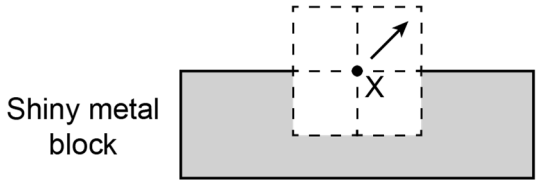
Intermediate-level Science Test – Rating Guide
Spring 2024

1 [1] Allow 1 credit for *A*.

2 [1] Allow 1 credit for *B*.

3 [1] Allow 1 credit for *C*.

4 [1] Allow 1 credit for drawing an arrow that has an angle of reflection approximately the same as the angle of incidence, as shown below:



Note: The student drawn ray must have an arrow on the end.
If the original/given arrow is also drawn, it must be correct.

5 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The sound becomes louder.

— The energy of the sound will increase.

6 [1] Allow 1 credit for *C*.

7 [1] Allow 1 credit for selective breeding and correct evidence. Acceptable responses include, but are not limited to:

— Over the years, people chose teosinte plants with desirable characteristics to breed and produce seeds with these desirable traits.

— Selective breeding involves choosing parents with particular characteristics to breed together and produce offspring with more desirable characteristics. This eventually resulted in modern corn.

8 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- — Sexual reproduction allows for variation in offspring traits so the best traits can be obtained, while asexual reproduction leads to the same traits in parents and offspring.
- — Sexual reproduction leads to more variety in traits so better traits can be obtained.

9 [1] Allow 1 credit for *D*.

10 [1] Allow 1 credit for *A*.

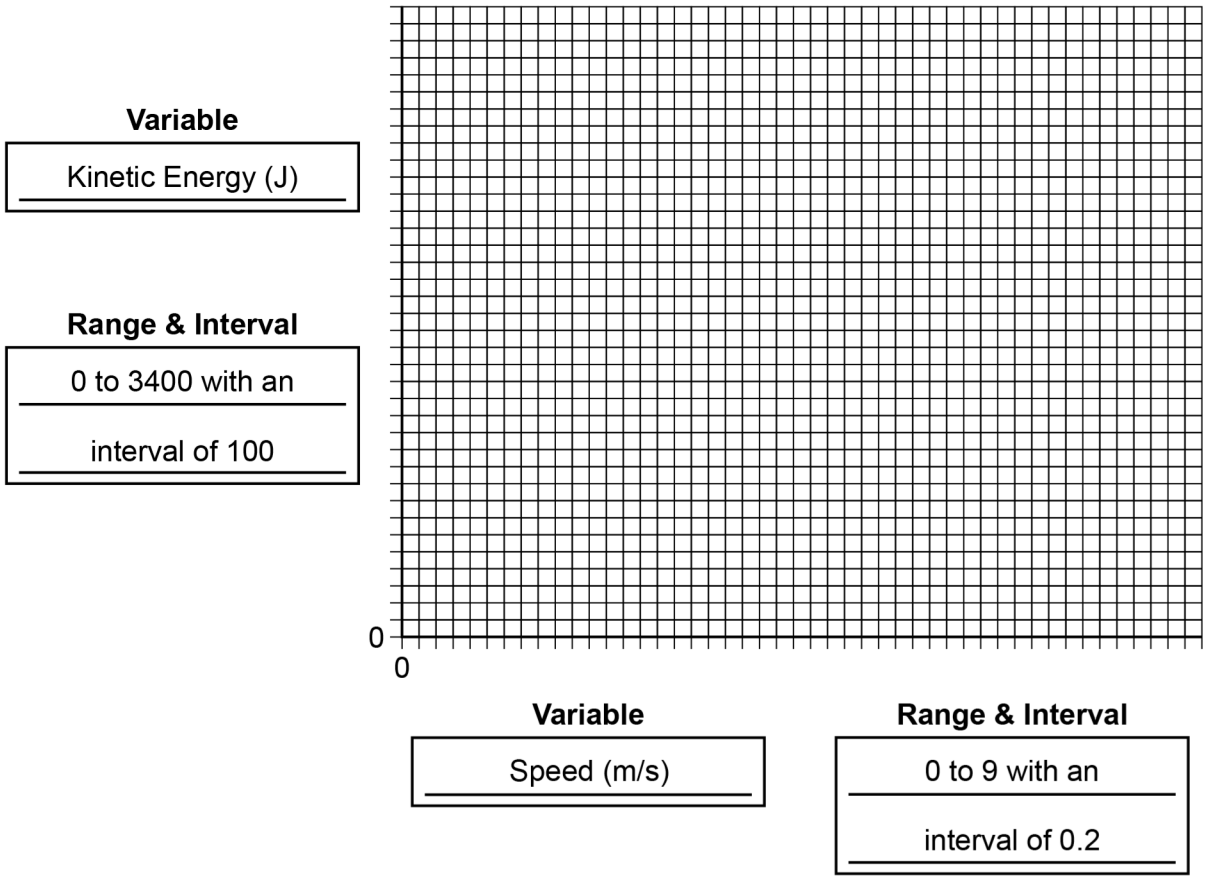
11 [1] Allow 1 credit for *C*.

12 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- — As the mass of the skaters increased, the kinetic energy increased. The 80-kg skater had a kinetic energy of 3200 J at position 5, while the other two skaters were only 2400 J and 1600 J for the same position.
- — Kinetic energy increased as the mass of the skaters increased. At positions 1 through 9 the kinetic energy of the 80-kg skater was always greater than the other two skaters. At position 1 it was 900 J compared to 740 J and 500 J.
- — Kinetic energy is proportional to the mass of the skater. At position 5, the kinetic energy of the 40-kg skater is 1600 J and the kinetic energy of the 80-kg skater is 3200 J.

Note: The quantitative information used at any point must be correct.

13 [1] Allow 1 credit for all *four* correctly labeled boxes, as shown below:



14 [1] Allow 1 credit for *A*.

15 [1] Allow 1 credit for correct numerical values in all three boxes, as shown below:

KE = ½ (50 kg) (8.8 m/s)^2

KE = 1936 J

16 [1] Allow 1 credit for *B*.

17 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- — A higher population should mean more water is being used, but the usage is almost the same because water lost was cut from 12% in 2014 to 9% in 2018.
- — A lower percentage of water was lost in 2018 than in 2014, even though a similar amount of water was used.
- — Even though population has increased from 2014 to 2018, the water usage has hardly increased at all because the water lost has decreased.

18 [1] Allow 1 credit for *B*.

19 [1] Allow 1 credit for *A*.

20 [1] Allow 1 credit for any value from 164 to 180 feet and a correct action. Acceptable responses include, but are not limited to:

- — Limit the amount of water used in the household, such as turning off water while brushing teeth, taking shorter showers, and only running the dishwasher infrequently.
- — Plant only native plants outside that require little water.
- — Don’t have a grass lawn that needs to be watered.
- — Use a rain barrel to trap and reuse precipitation.

21 [1] Allow 1 credit for *D*.

22 [1] Allow 1 credit for correct responses for water usage and impact to Colorado River Basin. Acceptable responses include, but are not limited to:

Water usage:

- — More water will be used.
- — There will be a greater usage of water.
- — It will increase.

Impact to Colorado River Basin:

- — Water levels will drop in the lakes and rivers found in the basin.
- — More mineral deposits will be found where rivers once flowed.
- — The shape of the river channel will change.
- — The composition of the land surface will change.
- — Less water is available to other organisms in the ecosystem.

23 [1] Allow 1 credit for *D*.

24 [1] Allow 1 credit for *four* checkmarks, as shown below:

Organism	Structure	Found in Embryo Stage Only	Found in Adult Stage Only	Found in Both Embryo and Adult Stages
Chicken	Gill Pouches	✓		
Mouse	Four Limbs			✓
Crocodile	Eyes			✓
Snake	Colored Scales in a Pattern		✓	

Note: Allow credit if a symbol other than a checkmark is used.

25 [1] Allow 1 credit for *two* correct pieces of evidence. Acceptable responses include, but are not limited to:

- The skulls of the chicken and Baby Yingliang are similar in shape.
- The limbs are similar in the two organisms.
- The shape of the eye sockets are similar in shape.
- Both the chicken and the Baby Yingliang have beaks.
- The chicken and Baby Yingliang both have a tail.

26 [1] Allow 1 credit for *both* an acceptable behavior and a supporting explanation. Acceptable responses include, but are not limited to:

Behavior	Explanation
— Nests in large colonies	— Eggs protected by many adults
— Laying on eggs	— Keeps eggs warm and protected
— Laying eggs in a ring	— Offers warmth and parental protection from predators
— Producing more eggs	— More young will reach adulthood for more successful reproduction

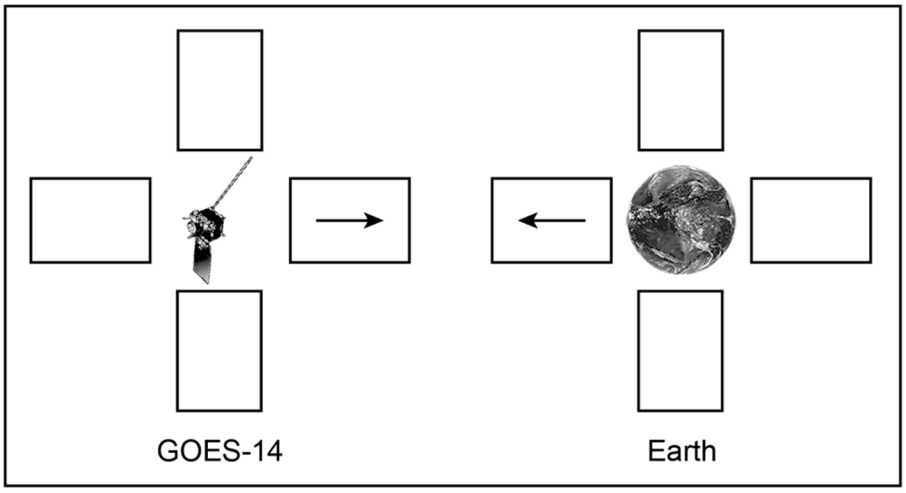
27 [1] Allow 1 credit for *C.*

28 [1] Allow 1 credit for *B.*

29 [1] Allow 1 credit for *C.*

30 [1] Allow 1 credit for *two* correctly drawn arrows, as shown below.

Example of a 1-credit response:



(Not drawn to scale)

Note: Credit should be allowed for arrows that show attraction of GOES-14 toward Earth and Earth toward GOES-14.

31 [1] Allow 1 credit for *D.*

Intermediate-level Science Test – Rating Guide
Spring 2024

32 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- The Sun exerts a gravitational force on Earth, keeping Earth in orbit around the Sun, while Earth exerts a gravitational force on Hubble keeping it in orbit around Earth.
- Earth is held in orbit around the Sun by a gravitational pull exerted by the Sun, and Hubble is held in orbit around Earth by a gravitational pull exerted by Earth.

33 [1] Allow 1 credit for *B.*

34 [1] Allow 1 credit for *A.*

35 [1] Allow 1 credit for *D.*

36 [1] Allow 1 credit for evaporation and an acceptable explanation. Acceptable responses include, but are not limited to:

- Water is heated by energy from the Sun, making water molecules on the surface of the water move faster and escape into the air as water vapor.
- Energy from the Sun warms the surface of the water, causing water molecules to move into the air as a gas, leaving salt behind.

37 [1] Allow 1 credit for winter and an acceptable explanation. Acceptable responses include, but are not limited to:

- The data shows the greatest precipitation occurring in December, January, February, and March, which are winter months.
- The winter months of December, January, February, and March, have the greatest amounts of precipitation.

38 [1] Allow 1 credit for *B.*

39 [1] Allow 1 credit for carbon dioxide *or* CO_2 *or* ATP.

Note: Allow credit for upper or lower case letters for carbon dioxide.

Intermediate-level Science Test – Rating Guide
Spring 2024

40 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- The respiratory system provides oxygen from the lungs to the red blood cells and the circulatory system transports the oxygen to the cells throughout the body.
- The respiratory system and circulatory system work together to transfer oxygen from the air to the lungs to the blood, and then to the body cells.

41 [1] Allow 1 credit for *C*.

42 [1] Allow 1 credit for *D*.

43 [1] Allow 1 credit for *D*.

44 [1] Allow 1 credit for *B*.

45 [1] Allow 1 credit for *both* a correct revised explanation and correct evidence. Acceptable responses include, but are not limited to:

Revision:

- Crickets are the direct source of food for the bluebird.
- Bluebirds eat insects, not corn.

Evidence:

- The arrow points from the cricket to the bluebird, which indicates that bluebirds eat insects for energy.
- The arrows in the model show flow of energy, so energy flows from crickets to bluebirds.
- The model shows an arrow between bluebirds and crickets, so bluebirds eat crickets for energy.

46 [1] Allow 1 credit for competition and *two* acceptable environmental factors. Acceptable responses include, but are not limited to:

- Both birds have a common need for living space and both use nests.
- House sparrows and bluebirds need food and both eat insects.

47 [1] Allow 1 credit for *C*.

48 [1] Allow 1 credit for *A*.

49 [1] Allow 1 credit for *B*.

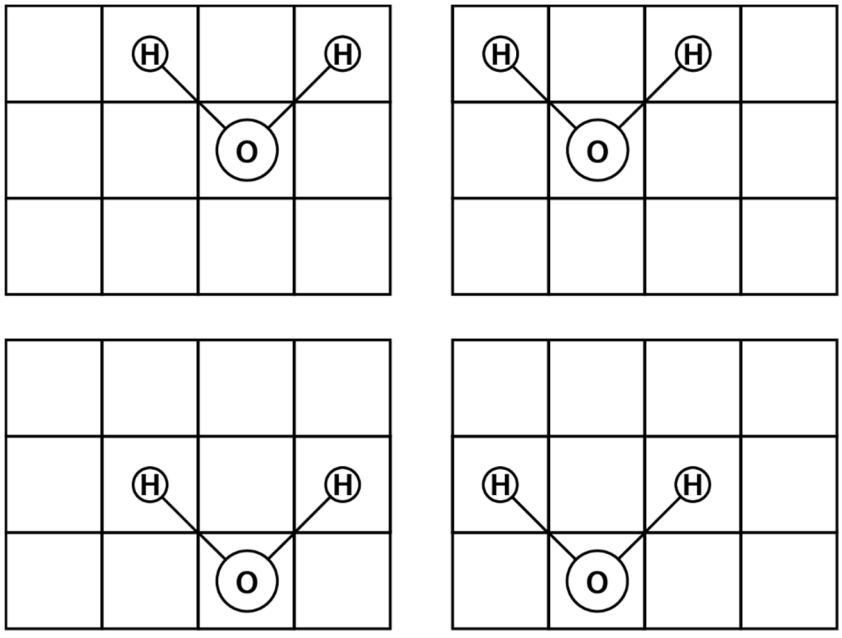
50 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— New substances were formed.
— The reactants are different than the products.
— A new gas is formed with different properties than the other substances.
— The atoms of the reactants were rearranged to form the new molecules/products.
— When new molecules were formed heat/light energy was released.

51 [1] Allow 1 credit for *C*.

52 [1] Allow 1 credit for a correct model of two hydrogen atom symbols bonded to a central oxygen atom symbol anywhere in the grid, as shown below.

Examples of a 1-credit response:



53 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- The particles should have been arranged randomly so that they are not touching each other.
- The particles should be drawn so that they are spaced throughout the container and not touching.

Performance Levels

For each subject area, students perform along a continuum of the knowledge and skills necessary to meet the demands of the New York State Learning Standards. New York State Elementary-level and Intermediate-level Science assessments are designed to classify student performance into one of four levels based on the knowledge and skills the student has demonstrated. Due to the need to identify student proficiency, the state tests must provide students at each performance level opportunities to demonstrate their knowledge and skills in the Learning Standards.

These performance levels are defined as:

NYS Level 4

Students performing at this level **excel** in standards for their grade. They demonstrate knowledge, skills, and practices embodied by the Learning Standards that are considered **more than sufficient** for the expectations at this grade.

NYS Level 3

Students performing at this level are **proficient** in standards for their grade. They demonstrate knowledge, skills, and practices embodied by the Learning Standards that are considered **sufficient** for the expectations at this grade.

NYS Level 2

Students performing at this level are **partially proficient** in standards for their grade. They demonstrate knowledge, skills, and practices embodied by the Learning Standards that are considered partial but insufficient for the expectations at this grade. Students performing at Level 2 are considered on track to meet current New York high school graduation requirements but are **not yet proficient** in Learning Standards at this grade.

NYS Level 1

Students performing at this level are **below proficient** in standards for their grade. They may demonstrate **limited** knowledge, skills, and practices embodied by the Learning Standards that are considered **insufficient** for the expectations at this grade.

THE STATE EDUCATION DEPARTMENT

THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

2024 Intermediate-level Science Test Map to the Standards

Grade 8 Released Questions

Question	Type	Key	Points	Performance Expectation	Subscore	Percentage of Students Who Answered Correctly (P-Value)
1	Multiple Choice	A	1	MS-PS4-1	PS	
2	Multiple Choice	B	1	MS-PS4-2	PS	
3	Multiple Choice	C	1	MS-PS4-2	PS	
4	Constructed Response		1	MS-PS4-2	PS	
5	Constructed Response		1	MS-PS4-1	PS	
6	Multiple Choice	C	1	MS-LS4-5	LS	
7	Constructed Response		1	MS-LS4-5	LS	
8	Constructed Response		1	MS-LS3-2	LS	
9	Multiple Choice	D	1	MS-LS4-5	LS	
10	Multiple Choice	A	1	MS-LS3-1	LS	
11	Multiple Choice	C	1	MS-ETS1-2		
12	Constructed Response		1	MS-PS3-1	PS	
13	Constructed Response		1	MS-PS3-1	PS	
14	Multiple Choice	A	1	MS-PS3-1	PS	
15	Constructed Response		1	MS-PS3-1	PS	
16	Multiple Choice	B	1	MS-PS3-2	PS	
17	Constructed Response		1	MS-ESS3-3	ESS	
18	Multiple Choice	B	1	MS-ESS3-1	ESS	
19	Multiple Choice	A	1	MS-ESS3-4	ESS	
20	Constructed Response		1	MS-ESS3-2	ESS	
21	Multiple Choice	D	1	MS-ESS3-2	ESS	
22	Constructed Response		1	MS-ESS3-4	ESS	
23	Multiple Choice	D	1	MS-LS4-3	LS	
24	Constructed Response		1	MS-LS4-3	LS	
25	Constructed Response		1	MS-LS4-2	LS	
26	Constructed Response		1	MS-LS1-4	LS	
27	Multiple Choice	C	1	MS-LS4-1	LS	
28	Multiple Choice	B	1	MS-PS2-4	PS	
29	Multiple Choice	C	1	MS-PS2-4	PS	
30	Constructed Response		1	MS-PS2-5	PS	
31	Multiple Choice	D	1	MS-PS2-2	PS	
32	Constructed Response		1	MS-ESS1-2	ESS	
33	Multiple Choice	B	1	MS-ESS2-1	ESS	
34	Multiple Choice	A	1	MS-ESS2-1	ESS	
35	Multiple Choice	D	1	MS-ESS2-3	ESS	
36	Constructed Response		1	MS-ESS2-4	ESS	
37	Constructed Response		1	MS-ESS3-2	ESS	
38	Multiple Choice	B	1	MS-ESS3-2	ESS	
39	Constructed Response		1	MS-LS1-7	LS	
40	Constructed Response		1	MS-LS1-3	LS	
41	Multiple Choice	C	1	MS-LS1-2	LS	
42	Multiple Choice	D	1	MS-LS2-4	LS	
43	Multiple Choice	D	1	MS-LS4-4	LS	
44	Multiple Choice	B	1	MS-LS2-2	LS	
45	Constructed Response		1	MS-LS2-2	LS	

46	Constructed Response		1	MS-LS2-2	LS	
47	Multiple Choice	C	1	MS-LS2-4	LS	
48	Multiple Choice	A	1	MS-ESS3-3	ESS	
49	Multiple Choice	B	1	MS-PS1-1	PS	
50	Constructed Response		1	MS-PS1-2	PS	
51	Multiple Choice	C	1	MS-PS1-5	PS	
52	Constructed Response		1	MS-PS1-1	PS	
53	Constructed Response		1	MS-PS1-4	PS	

* This item map identifies the Performance Expectation with which each test question is aligned. All NYSP-12SLS Performance Expectations are three-dimensional (https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf). The integration of these three dimensions provides students with a context for the content of science (DCI), the methods by which science knowledge is acquired and understood (SEP), and the ways in which the sciences are connected through concepts that have universal meaning across the disciplines (CCC).