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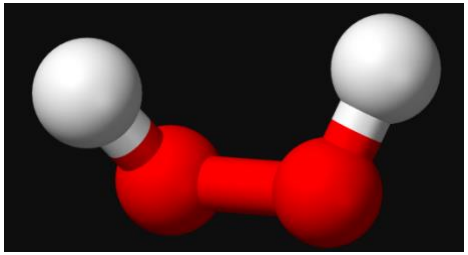
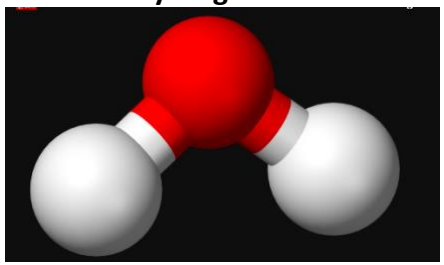
Question 1: Models

Water and hydrogen peroxide are both liquids and both contain hydrogen and oxygen molecules; however, their properties and uses are very different because of their molecular structure. Water is stable, while hydrogen peroxide is reactive. Models of the two molecules are pictured below. In the models, the white spheres represent hydrogen atoms and the red spheres represent oxygen atoms.

Water



Hydrogen Peroxide



Based on the models, what structural differences between the two molecules might account for their differing properties? Select **two** correct answers.

A. Water has two oxygen atoms while hydrogen peroxide has only one.
B. There are two hydrogen atoms bonded together in hydrogen peroxide while water only has one.
C. Water and hydrogen peroxide both contain two molecules of oxygen.
D. Water has half as many total atoms as hydrogen peroxide.
E. The hydrogen peroxide atom has a different shape because it has an extra atom in its molecule.

PE: 6-MS-PS1-1; DCI: MS.PS.1A.a; SEP: Developing and using models; CCC: Scale, proportion & quantity

Question 2: Satellite

According to "Space Debris and Human Spacecraft" on NASA's website, "More than 500,000 pieces of debris, or 'space junk', are tracked as they orbit the Earth. They all travel at speeds up to 17,500 mph, fast enough for a relatively small piece of orbital debris to damage a satellite or a spacecraft… On Feb. 10, 2009, a defunct Russian satellite collided with and destroyed a functioning U.S. Iridium commercial satellite." *Garcia, M. (2015, April 14). Space Debris and Human Spacecraft. Retrieved from www.nasa.gov*

If the space debris hit the satellite at the top speed mentioned in the article, the force exerted by the debris on the satellite when they collided is illustrated by the diagram below:

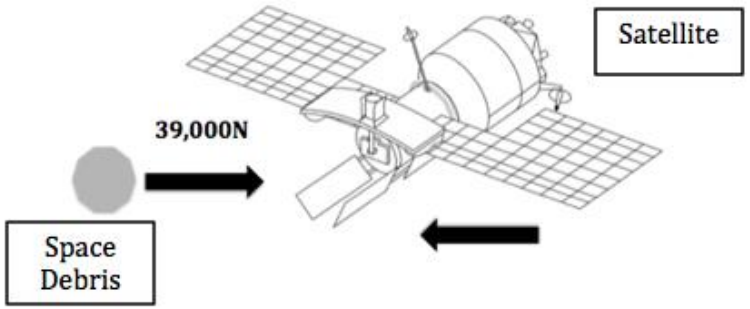


Image adapted from NASA at Wikimedia Commons with permission under JPL Image Use Policy

Based on the situation described in the situation to the left, what magnitude of force would the satellite exert on the space debris when it was hit if neither the debris nor the satellite changed direction after the collision?

A. It did not exert any force on the debris, the force would only go in one direction.
B. It exerted half the amount of force, around 19,500N.
C. It exerted the same amount of force, around 39,000N.
D. It exerted twice the amount of force, around 78,000N.

PE: 6-MS-PS2-1; DCI: MS.PS2A.a; CCC: Systems and system models

Question 3: 1004649

Juan’s dog Rolo likes to pull him on his skateboard in the neighborhood after school. Juan would like to design an investigation to calculate the difference in the amount of force needed for the dog to pull him on the skateboard.

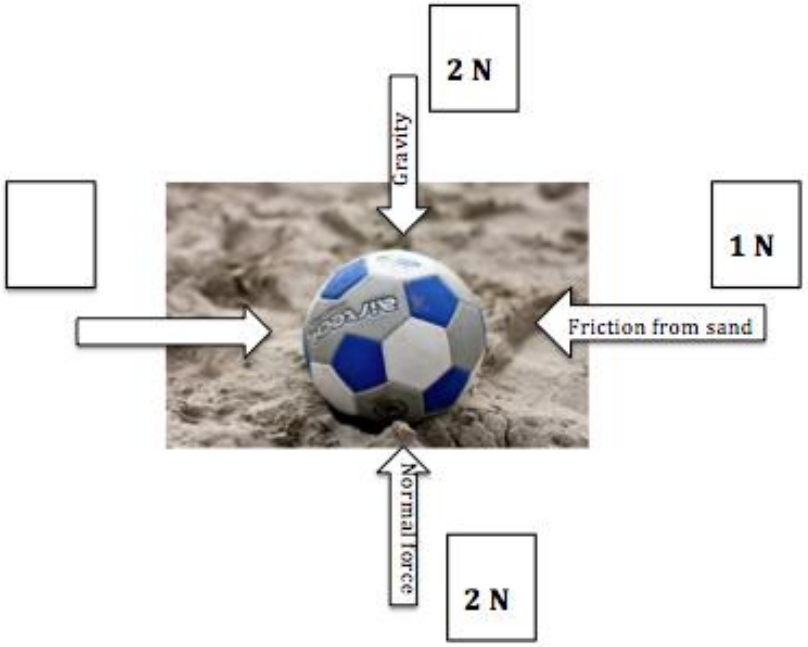
What factors must Juan consider in his plan to ensure he can accurately demonstrate the relationship between force and mass? Select **three** correct answers.

A. Juan must consider how he will measure force exerted by he and his brother on the skateboard.
B. Juan must consider how he will control his and his brother's masses to ensure they are equal.
C. Juan must be able to calculate the force the dog must exert to overcome the mass of Juan and the skateboard.
D. Juan must consider the surface that the skateboard rolls over to control friction for each trial.
E. Juan must consider how he will ensure constant speed of the skateboard for each trial.

PE: 6-MS-PS2-2; DCI: MS.PS2A.b; SEP: Planning and carrying out investigations

Question 4: Soccer Ball

Anitra notices that, even when it is fairly windy, her soccer ball never moves from the spot she left it in and wonders how much force is needed to move the ball. The forces acting on a soccer ball are illustrated in the diagram below.



Select the amount of force the wind must apply to the ball that would cause it to move.

A. 1.5 N
B. 0.75 N
C. 1 N
D. 0.5 N

PE: 6-MS-PS2-2; DCI: MS.PS2A.b; SEP: Developing and using models; CCC: Stability and Change

Question 5: Electric Motor

You and your friends want to have a contest designing your own electric toy cars. You will use the same basic idea in your design as the homemade electric motor below that includes a magnet, a metal screw, a battery, and an insulated wire:

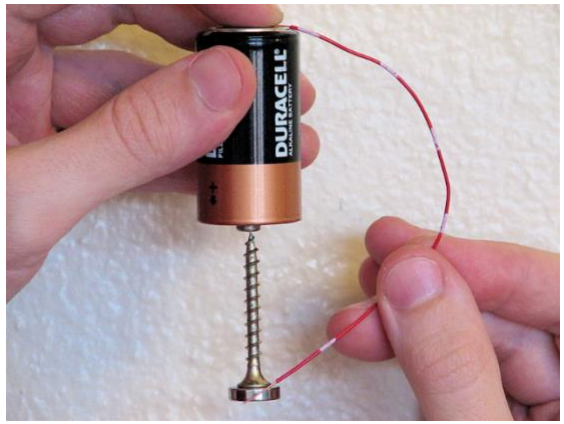


Image used from Windell H. Oskay at Wikimedia Commons with permission under Creative Commons 3.0.

Select **two** of the following questions that you could investigate to ensure the most powerful motor for your toy car.

A. How does the size of the battery affect the strength of the motor?
B. How do the materials that the car is made from affect the speed of the car?
C. How does the strength of the magnet affect the speed of the car?
D. How does air resistance affect the strength of the motor?
E. How does the size of the magnet affect the strength of the motor?

PE: 6-MS-PS2-3; DCI: MS.PS2B.a; SEP: Generating questions and defining problems; CCC: Cause and effect

Question 6: Gr6 Moons

According to solarsystem.nasa.gov, "Saturn's largest moon Titan is an extraordinary and exceptional world. Among our solar system's more than 150 known moons, Titan is the only one with a substantial atmosphere. And of all the places in the solar system, Titan is the only place besides Earth known to have liquids in the form of rivers, lakes and seas on its surface… Titan is larger than the planet Mercury and is the second-largest moon in our solar system." *Titan - Overview. (2018, May 03). Retrieved from solarsystem.nasa.gov*

The table below compares the mass and gravitational pull for Saturn and Titan to Earth and our Moon:

Object	Saturn & Titan	Earth & Our Moon
Combined Mass	**95.02**	**1.012**
Force of Gravity between the planet and its moon	**3,400,000,000,000,000,000,000,000 N (3.4 x 10^24 N)**	**190,000,000,000,000,000,000 N (1.9 x10^20 N)**
Orbital Period	**16 Days**	**29 Days**

Chart created with data from Solar System Exploration: NASA with permission under NASA Media Usage Guidelines

Based on the information to the left, what argument is **best** supported by the evidence presented?

A. As the orbital period gets longer, the gravitational pull gets stronger.
B. As the mass of the objects decrease, the gravitational pull gets stronger.
C. As the mass of the objects increase, the gravitational pull gets stronger.
D. As the distance between the objects increases, the gravitational pull gets stronger.

PE: 6-MS-PS2-4; DCI: MS.PS2B.b; SEP: Engaging in argument from evidence

Question 7: Popcorn

Jori was making microwave popcorn and watching it pop. Her grandmother told her not to stand in front of the microwave because it was dangerous. Since Jori had been studying electromagnetic fields in science, she was interested to find out if microwaves really are dangerous. The World Health Organization article, "Electromagnetic fields and public health" states that microwaves cannot emit more than 50 watts of energy per square meter at a distance of 5 cm from the outside of the microwave oven. *Electromagnetic fields & public health: Microwave ovens. (2016, August 04). Retrieved from www.who.int*

How can Jori investigate the relationship between the distance from the microwave and the strength of the electromagnetic field (EMF) when she makes popcorn?

A. Jori can put an EMF meter inside the microwave after she pops the popcorn to take measurements.
B. Jori can use an EMF meter at 5 cm away from different microwaves while they are being used.
C. Jori can hold an EMF meter only at the distance she usually stands from the microwave and takes measurements while making popcorn.
D. Jori can hold an EMF meter at different distances from the microwave while she is making popcorn and take measurements.

PE: 6-MS-PS2-5; DCI: MS.PS2B.c; SEP: Planning and carrying out investigations; CCC: Cause and effect

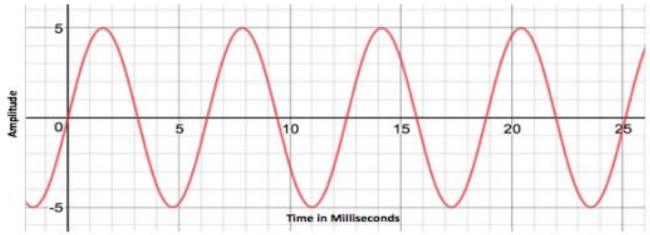
Question 8: Trials

Eliseo loves to play his flute and was interested in observing the effect of the sound waves his instrument makes. He covered a plastic cup with a balloon and sprinkled salt on top. He then played different notes on his flute at different levels of loudness near the cup and observed what happened to the salt. While playing, he used an oscilloscope to graph the sound waves and calculated the energy produced based on the amplitude of the waves.

The graphs and data for each trial are shown below.

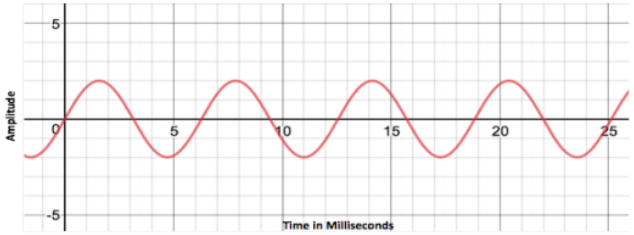
Trial 1: 50 units of energy

Graph 1



Trial 2: 8 units of energy

Graph 2

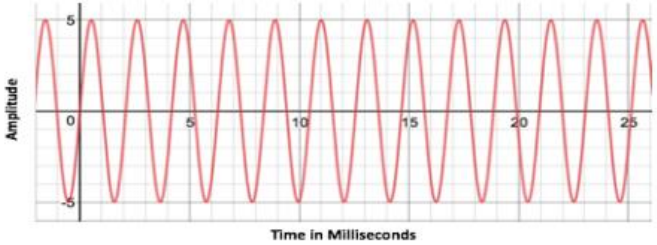


Trial 3: 50 units of energy

Graph B

Trial 4: 50 units of energy

Graph C



Based on the data, what conclusion can be drawn about wave characteristics and energy for Eliseo's trumpet?

A. The energy increases by a large amount when the amplitude increases.
B. The energy increases by a small amount when the frequency increases.
C. The energy decreases by a small amount when the amplitude increases.
D. The energy increases by a large amount when the frequency increases.

PE: 6-MS-PS4-1; DCI: MS.PS4A.a; CCC: Patterns

Question 9: Sports Balls

Three best friends each play different sports and were curious about the relationship of mass to the kinetic energy of each of the balls they use to play. They calculated the kinetic energy of each ball using the approximate mass and a common velocity of 10m/s to compare them. The table below contains their data.

Ball Type	**Tennis Ball**	**Baseball**	**Soccer Ball**
Approximate Mass	60 g	150 g	400 g
Kinetic Energy	3 J	7.5 J	20 J

Based on the data in the table, what can be concluded about the relationship between mass and kinetic energy?

A. The relationship between mass and kinetic energy is not proportional since the mass increases by different amounts for each object.
B. The relationship between mass and kinetic energy is positive and proportional since the mass is 20 times the kinetic energy for each object.
C. The relationship between mass and kinetic is negative and proportional since the kinetic energy is 1/20 of the mass for each object.
D. There is no relationship between mass and kinetic energy because the mass and kinetic energy change by different amounts for each object.

PE: 6-MS-PS3-1; DCI: MS.PS3A.a; SEP: Analyzing and interpreting data; CCC: Scale, proportion, and quantity

Earth and Space Science Discrete Items Overview

Performance expectation	Question	Three-dimensional alignment	Descriptor	Answer key
6-MS-ESS1-1	1	SEP: Developing and using models DCI: MS.ESS1A.a CCC: Patterns	Moons	Part A: C Part B: C
	2	SEP: Developing and using models DCI: MS.ESS1B.b	Midnight Sun	A
6-MS-ESS1-2	3	SEP: Developing and using models DCI: MS.ESS1B.a CCC: System and system models	Spitzer	B, C
6-MS-ESS1-3	4	SEP: Analyzing and interpreting data DCI: MS.ESS1B.a CCC: Scale, proportion, and quantity	Dwarf Planet	D
6-MS-ESS3-4	5	SEP: Engaging in argument from evidence DCI: MS.EVS1B.a CCC: Cause and effect	Gr6 Red Snapper	B

Question 1: Moons

Jasmine's family wants to go on an overnight canoe trip on the Ouiska Chitto River as soon as possible. Her dad says that it is best to go when there is a full moon since there is more visibility at night. Jasmine has observed the moon for three nights in a row (Tuesday, Wednesday, Thursday). Her observations of the moon are shown below:

Image Adapted from Moon Phase Calendar May-June 2005 by Torumen at Wikimedia Commons with permission under Creative Commons Licensing

Part A: Based on the pattern in Jasmine's observations, when would be the best time for Jasmine's family to take their canoe trip?

A. They should go on the upcoming weekend.
B. They should go in about one week.
C. They should go in about two and a half weeks.
D. They should go in about four weeks.

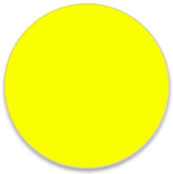
PE: 6-MS-ESS1-1; DCI: MS.ESS1A.a; SEP: Developing and using models; CCC: Patterns

Part B: Select the model using the symbols below that best illustrates the relative positions of the Earth, Moon, and Sun that will result in a full moon and the best visibility for the camping trip.

Sun	
Earth	
Moon	

A.

B.



C.

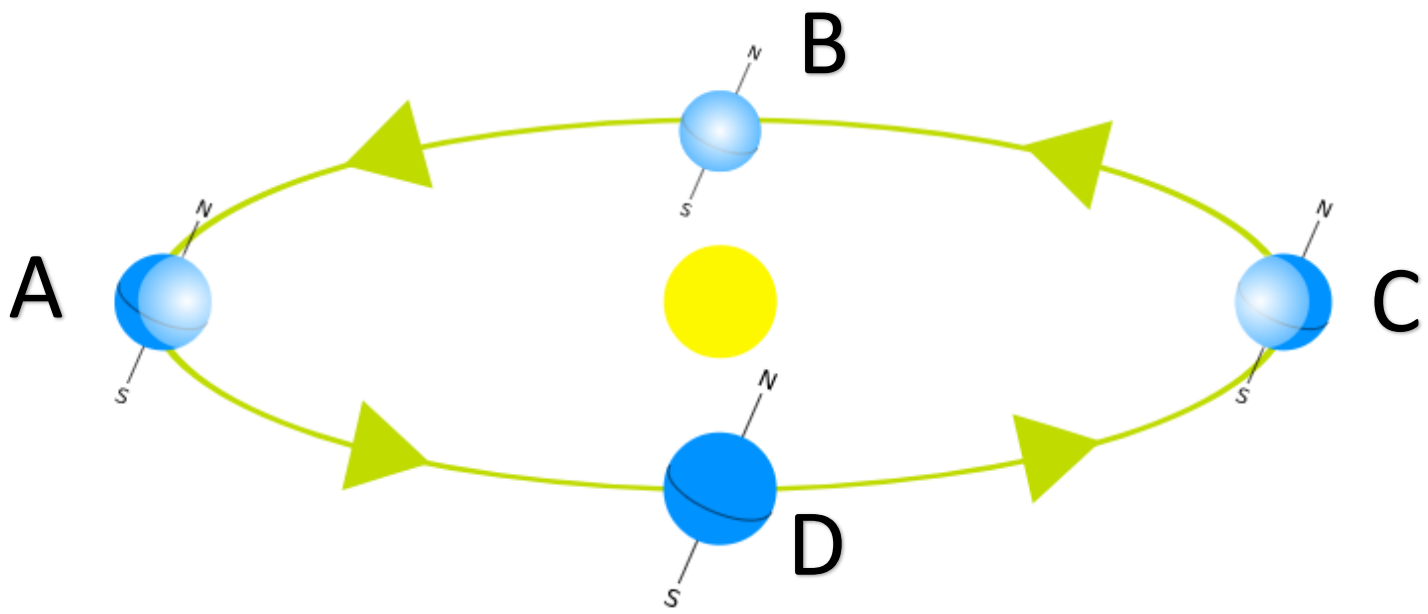
D.

PE: 6-MS-ESS1-1; DCI: MS.ESS1A.a; SEP: Developing and using models; CCC: Patterns

Question 2: Midnight Sun

In the town of Longyearbyen, Norway, the sun does not set for four consecutive months. Longyearbyen is located in the Arctic Circle in the Northern hemisphere. From Mid-April until Mid-August, this town experiences what is termed “Midnight Sun”, pictured below, meaning the sun can be seen at midnight.

Select the position of the Earth in the diagram below that illustrates its location in relation to the Sun during the “Midnight Sun” in Longyearbyen.



PE: 6-MS-ESS1-1; DCI: MS.ESS1B.b; SEP: Developing and using models

Question 3: Spitzer

NASA's Spitzer Space Telescope has discovered a system of planets in the Aquarius constellation. This exoplanet system is called TRAPPIST-1. The illustration below shows the TRAPPIST-1 System compared to our inner Solar System with the “habitable zone” of each in green.

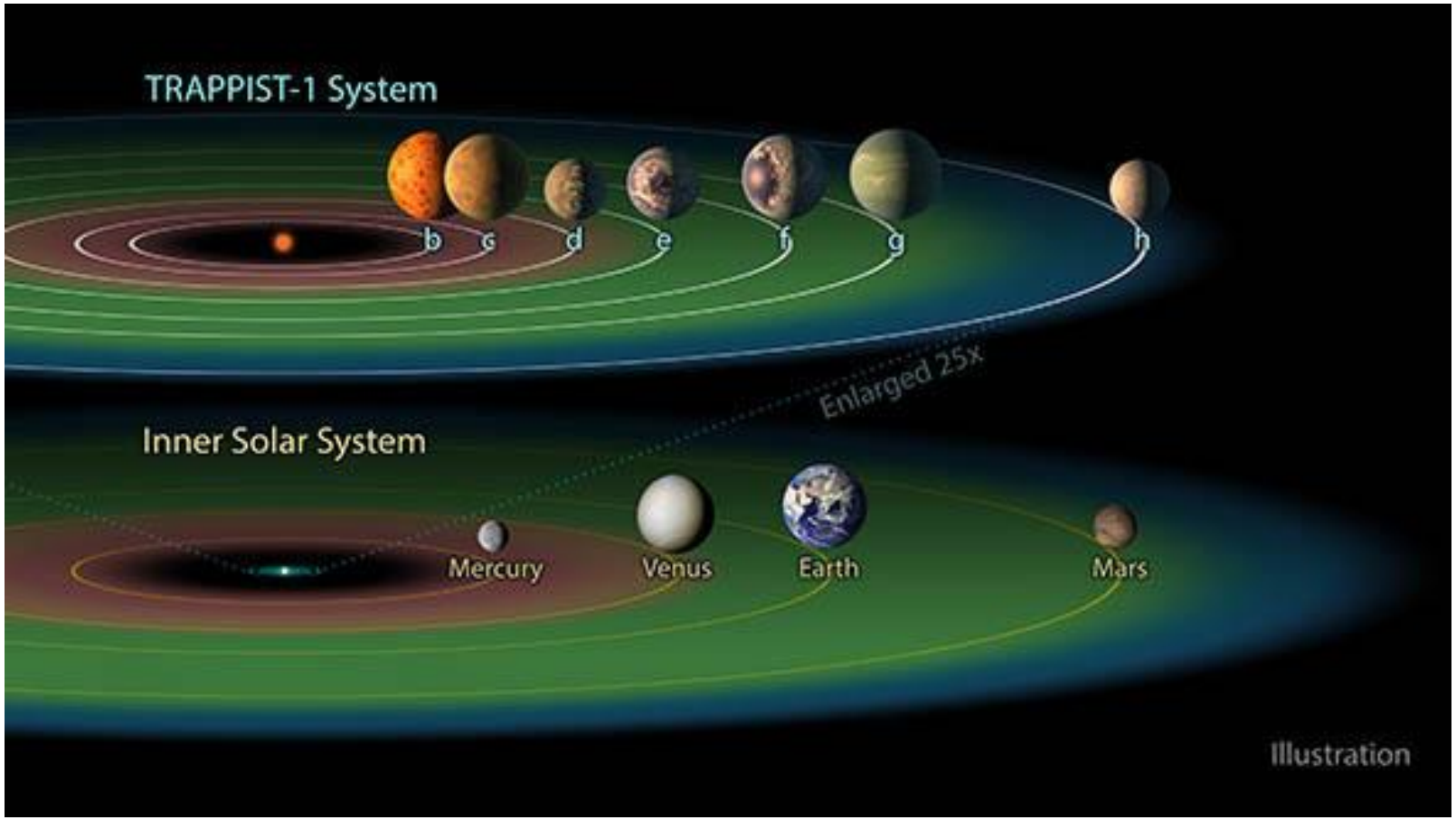


Image used from Photo Journal Courtesy NASA/JPL-Caltech with permission under JPL Image Policy

Based on the illustration and description, what conclusion can be drawn about the TRAPPIST-1 system? Select the **two** correct answers from the choices below.

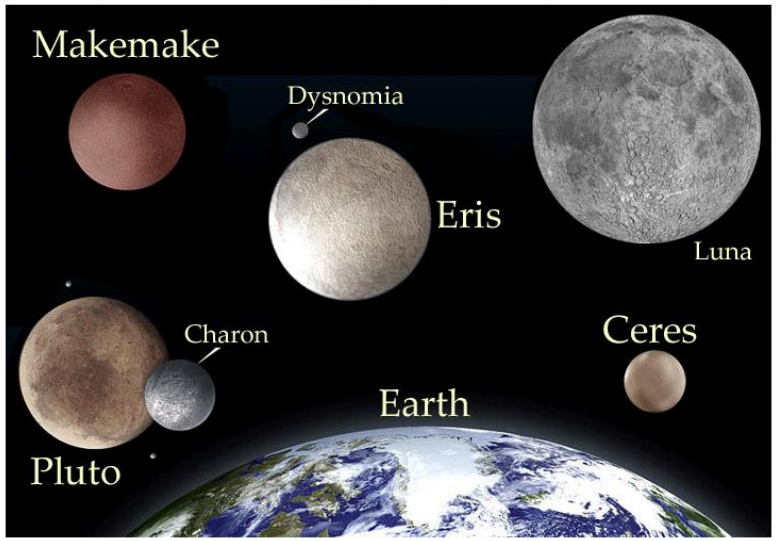
A. TRAPPIST-1 has more mass than the Sun.
B. TRAPPIST-1 planets have a shorter orbital period than the planets in our Solar System.
C. TRAPPIST-1 has planets held in orbit by gravity.
D. TRAPPIST-1's planets contain life.
E. TRAPPIST-1's planets are held in orbit at a greater distance than our Sun's planets.

PE: 6-MS-ESS1-2 DCI: MS.ESS1B.a; SEP: Developing and using models; CCC: System and system models

Question 4: Dwarf Planets

To date, there are 5 known dwarf planets in our Solar System. Two of the five, "Pluto and Ceres were once considered planets until new discoveries triggered scientific debate about how to best describe them—a vigorous debate that continues to this day." *Planets. (2018, February 06). Retrieved from solarsystem.nasa.gov*

The image below shows the sizes of dwarf planets, the Earth and the Earth's moon (Luna). Sizes are to scale but distances are not.



The table below compares characteristics of Pluto, Earth, and Luna (Earth's moon):

	Pluto	Earth	Luna (our moon)
Circumference at Equator	7,231.9km	40,030.2km	10,917.0km
Mass compared to Earth	0.002	1	0.012
Density	2.050g/cm^3	5.513g/cm^3	3.344g/cm^3
Surface gravity	0.66m/s^2	9.80665m/s^2	1.624m/s^2

Chart created with data from Solar System Exploration: NASA with permission under NASA Media Usage Guidelines

What conclusion could be drawn about the differences between dwarf planets based on the data?

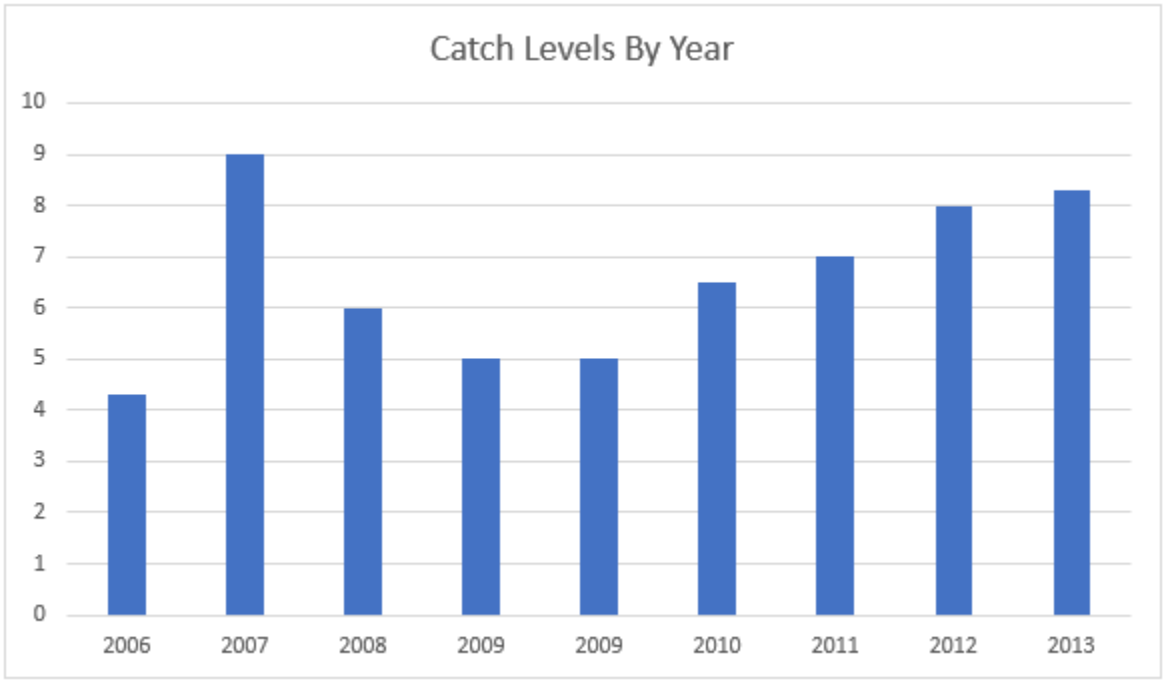
A. Dwarf planets have a larger density than moons.
B. Dwarf planets are similar in size to planets.
C. Dwarf planets always have moons.
D. Dwarf planets are much smaller than planets.

PE: 6-MS-ESS1-3; DCI: MS.ESS1B.a; SEP: Analyzing and interpreting data; CCC: Scale, proportion, and quantity

Question 5: Gr6 Red Snapper

The federal government has imposed regulations on red snapper fishing due to a sharp decrease in the red snapper population beginning in the 1950s because of increased commercial fishing and technology. (Red Snapper Overview, NOAA) *Red Snapper Overview: Southeast Regional Office. Retrieved from sero.nmfs.noaa.gov*

The table below shows projections from NOAA about the impact of their revised plan for rebuilding the red snapper population on fishing:



Graph created with data from NOAA Fisheries with permission under NOAA copyright policy

The Louisiana Wildlife and Fisheries Commission obtained permission from the federal government to manage private recreational fishing of red snapper in both state and federal waters for 2018-19. Based on data from the percent of fish allowed by the federal government already caught in August of 2018, the commission imposed a weekend-only season until the limit is reached.
Louisiana Red Snapper Landings Estimates through July 22. (n.d.). Retrieved from www.wlf.louisiana.gov

Based on the data projections, how were the regulations set forth by the federal government predicted to impact fishing from an economic standpoint?

A. Imposing regulations will continue to reduce the amount of fish caught and have a negative impact on the fishing industry.
B. Imposing regulations will eventually increase the amount of fish caught and have a positive impact on the fishing industry.
C. Imposing regulations will immediately increase the amount of fish caught and have a positive impact on the fishing industry.
D. Imposing regulations will not change the amount of fish caught and have no positive impact on the fishing industry.

PE: 6-MS-ESS3-4; DCI: MS.EVS1B.a; SEP: Engaging in argument from evidence; CCC: Cause and effect

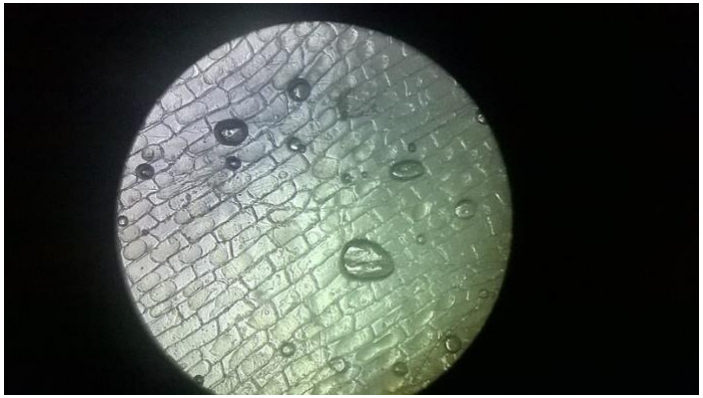
Life Science Discrete Items

Performance expectation	Question	Three-dimensional alignment	Descriptor	Answer key
6-MS-LS1-1	1	DCI: MS.LS1A.a CCC: Scale, proportion, and quantity	Gr6 Minerals	A

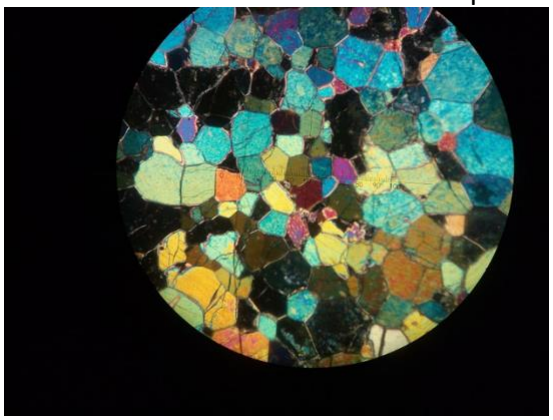
Question 1: Gr6 Minerals

Minerals are solid natural substances that have a specific chemical makeup; however, a chemical is not alive and does not come from living things. Bentley wanted to observe how the structure of a living thing differed from a nonliving natural substance; so, she examined an onion peel and the mineral olivine under a microscope. The images are shown below:

Onion peel under a microscope:



Mineral olivine under a microscope:



Based on the evidence of the microscopic images, how does the structure of the onion compare from the mineral olivine?

A. The onion and the mineral are both made up of smaller components, but the onion has many similar, regularly shaped cells.
B. The onion and the mineral are both made up of smaller components and they both have many similar, identically shaped cells
C. The onion is made up of smaller components, but the mineral is not.
D. The onion and the mineral are both made up of smaller components, but the onion has many different colored, irregularly shaped parts.

PE: 6-MS-LS1-1; DCI: MS.LS1A.a; CCC: Scale, proportion, and quantity

Item Sets

Item set	Phenomenon	Performance expectation(s)
1	Deer	6-MS-LS2-1
2	Bowling	6-MS-PS3-1 and 6-MS-PS2-2
3	Ocean Waves	6-MS-PS4-1

Item set 1: Deer
Item set 1 performance expectation(s): 6-MS-LS2-1

Performance expectation	Question	Question types	Three-dimensional alignment	Answer key
6-MS-LS2-1	1	MC	DCI: MS.LS2A.a SEP: Analyzing and interpreting data	C
6-MS-LS2-1	2	HT	DCI: MS.LS2A.a SEP: Analyzing and interpreting data CCC: Cause and effect	negative, decrease
6-MS-LS2-1	3	MC	DCI: MS.LS2A.b CCC: Cause and effect	B
6-MS-LS2-1	4	MC	DCI: MS.LS2A.c SEP: Analyzing and interpreting data CCC: Cause and effect	B
6-MS-LS2-1	5	CR	DCI: MS.LS2A.c SEP: Analyzing and interpreting data CCC: Cause and effect	CR scoring guide

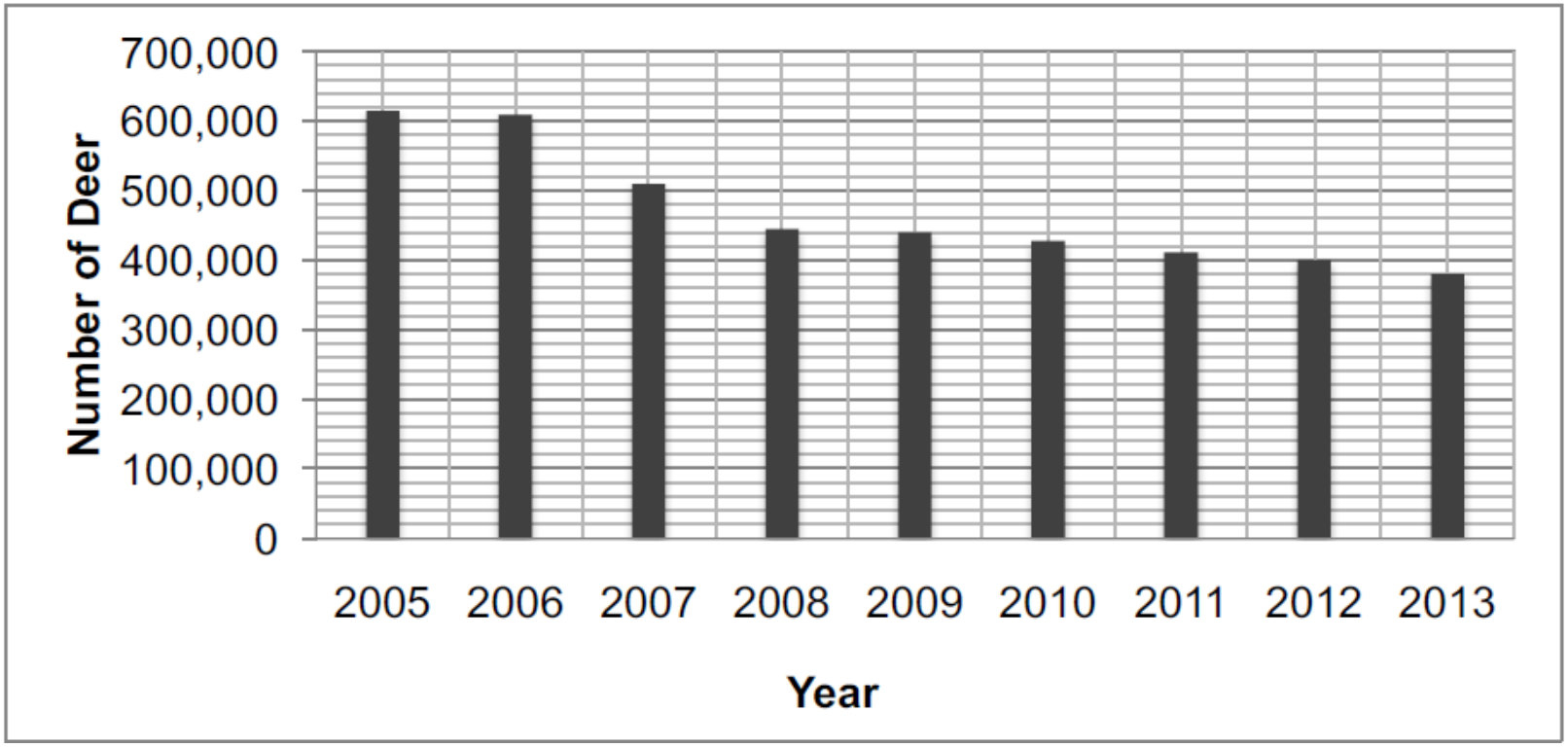
Question Types: MC = Multiple Choice, HT = Hot Text, CR = Constructed Response

Item Set 1

Deer

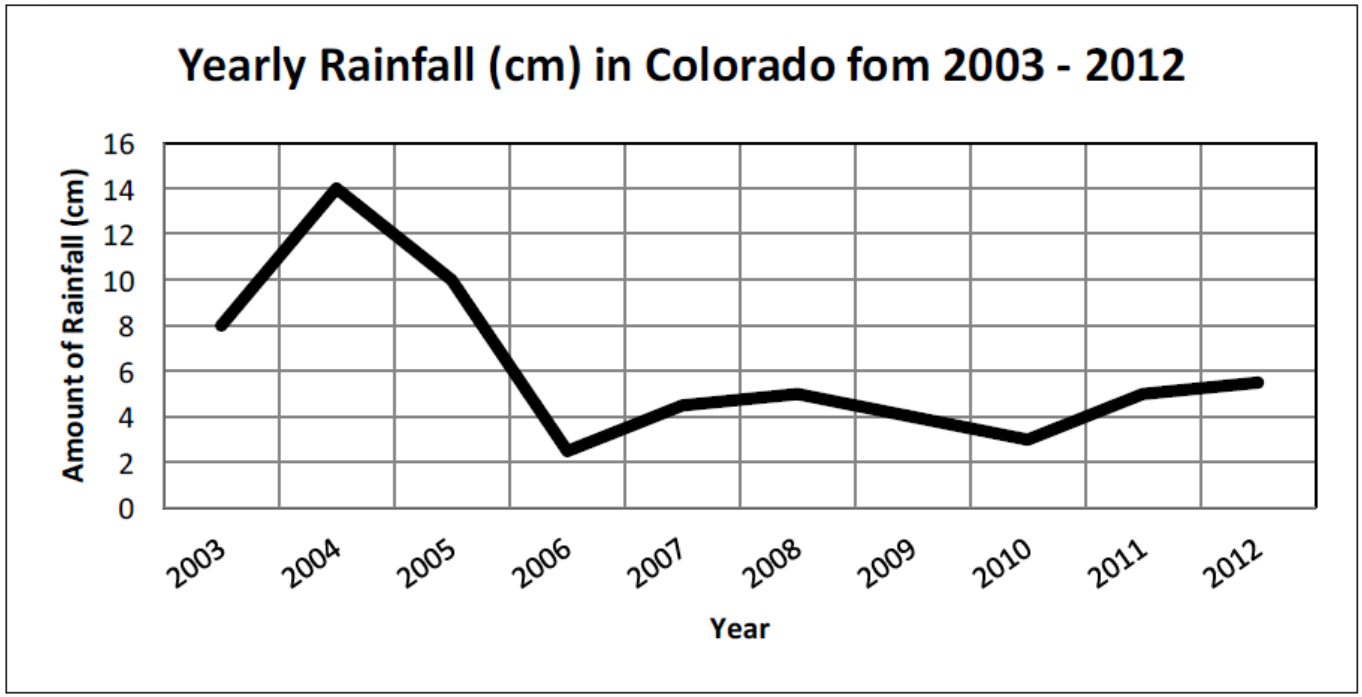
The Colorado Parks and Wildlife Commission monitors deer populations because the state sells hunting licenses. The graph below shows a change in the number of deer in Colorado from 2005-2013.

Graph 1: Change in Number of Deer in Colorado from 2005-2013



The graph below shows the annual rainfall in Colorado from 2003-2012.

Graph 2: Yearly Rainfall in Colorado from 2003-2012



Scientists have evidence that:

- Deer can only eat a native grass called Sagebrush.
- Sagebrush has always grown in Colorado.
- Elk can eat Sagebrush and Cheatgrass.
- Cheatgrass is not native to Colorado, but was introduced from Europe.

Sagebrush

Cheatgrass

Images

Table 1: Amounts of Two Types of Grasses in Colorado

Type of Grasses	Year 2005 (square miles)	Year 2008 (square miles)	Year 2010 (square miles)	Year 2013 (square miles)
Cheatgrass	41,000	52,000	61,000	66,000
Sagebrush	185,000	140,000	110,000	100,000

Question 1:

Which of the following explanations **best** supports the claim: “Populations are dependent on non-living factors in an ecosystem.”?

A. As the amount of sagebrush decreased, the deer population decreased.
B. As the amount of rainfall increased, the deer population decreased.
C. As the amount of rainfall decreased, the deer population decreased.
D. As the amount of cheatgrass increased, the deer population decreased.

PE: 6-MS-LS2-1; DCI: MS.LS2A.a; SEP: Analyzing and interpreting data

Question 2:

How has the introduction of Cheatgrass impacted the deer population in Colorado over time?

Cheatgrass has had [a positive, a negative, no] impact on the deer population, causing the deer population to [increase, decrease, stay the same] over time.

PE: 6-MS-LS2-1; DCI: MS.LS2A.a; SEP: Analyzing and interpreting data; CCC: Cause and

Question 3:

What is the **best** explanation for the impact of Cheatgrass on the deer population?

A. Cheatgrass competes with the deer for available resources such as food and water.
B. Cheatgrass caused a decrease in Sagebrush, making less food available for the deer.
C. Cheatgrass has increased resources for the deer by adding an additional food source.
D. Cheatgrass has decreased the amount of water in the area, limiting the deer population's access to water.

PE: 6-MS-LS2-1; DCI: MS.LS2A.b; CCC: Cause and Effect

Question 4:

Which explanation for the change in the deer population (illustrated by Graph 1) is **best** supported by the data?

A. The deer population increased due to a decrease in hunting.
B. The deer population decreased due to a decrease in available resources.
C. The deer population decreased due to a decrease in habitat from human development.
D. The deer population increased due to a decrease in the predator population in the area.

PE: 6-MS-LS2-1; DCI: MS.LS2A.c; SEP: Analyzing and interpreting data; CCC: Cause and Effect

Question 5:

Provide an example of additional information about physical or biological factors in the ecosystem that might help you to better understand the change in the number of deer. Explain how this new information would provide evidence for the cause of the change.

PE: 6-MS-LS2-1; DCI: MS.LS2A.c; SEP: Analyzing and interpreting data; CCC: Cause and Effect

Constructed Response Scoring Guide

Scoring Information, Q5, Grade 6, Deer Item Set	
Score	**Description**
2	The student provides a reasonable example of data about physical or biological factors that would help to understand the decline in the deer population and accurately explains how that information would provide evidence for the cause of the change. **Sample Student Response** Additional information about the number of elk in the area would help me to better understand the decrease in the deer population. Since the deer compete with elk for a food resource, changes in the elk population can affect the amount of food available for the deer. If the elk population had increased dramatically, it could be causing the deer population to decline.
1	The student provides a reasonable example of data about physical or biological factors that would help to understand the decline in the deer population but does not accurately explain how that information would provide evidence for the cause of the change.
0	The student **does not** provide a reasonable example of data about physical or biological factors that would help to understand the decline in the deer population **or does not** accurately explain how that information would provide evidence for the cause of the change.

Item set 2: Bowling
Item set 2 performance expectation(s): 6-MS-PS3-1 and 6-MS-PS2-2

Performance expectation	Question	Question types	Three-dimensional alignment	Answer key
6-MS-PS3-1	1	EBSR	SEP: Analyzing and interpreting data DCI: MS.PS3A.a CCC: Scale, proportion, quantity	C, A
6-MS-PS2-2	2	MC	DCI: MS.PS2A.b CCC: Stability and change	C
6-MS-PS2-2	3	MC	SEP: Investigations DCI: MS.PS2A.b CCC: Stability and change	D
6-MS-PS2-2	4	CR	DCI: MS.PS2A.b CCC: Stability and change	CR Scoring Guide

Question Types: MC = Multiple Choice, EBSR = Evidence-Based Selected Response, CR = Constructed Response

Item Set 2

Bowling

Sara conducted an experiment on kinetic energy by rolling two different bowling balls. She tested a blue and yellow bowling ball with different masses in kilograms. She released each ball at three different velocities in meters per second.

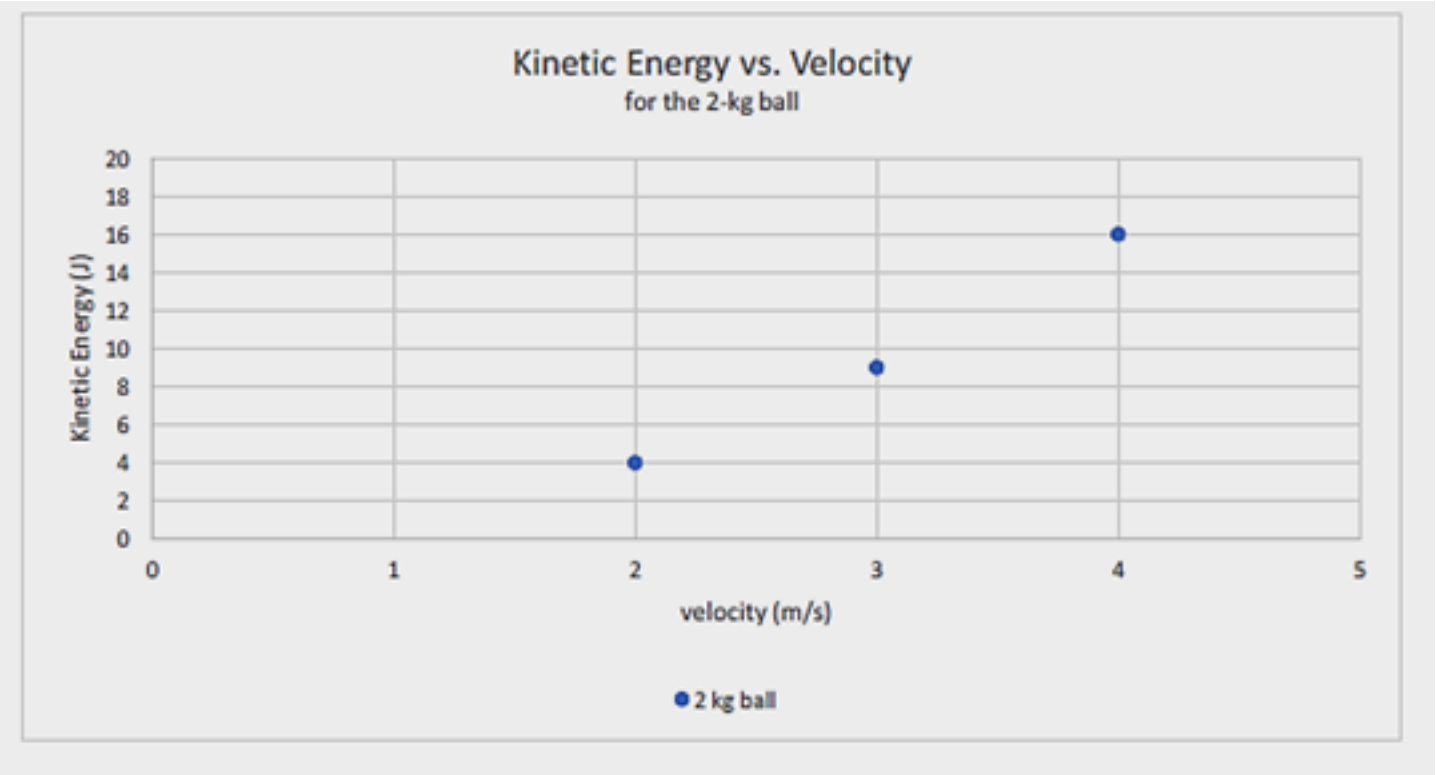
Sara then determined the kinetic energy in Joules for each throw and recorded her results in the shaded rows below. However, she accidentally spilled some water on the lab book and cannot see the last number.

Table 1: Sara's Data Table

		Velocity		
		2 m/s	3 m/s	4 m/s
Mass	2 kg	4 J	9 J	16 J
	4 kg	8 J	18 J	?

Table used from Stanford NGSS Assessment Project with permission under Creative Commons Attribution 4.0 licensing

Graph 1: Sarah's Data from the 2-kg Blue Ball



Graph used from [Stanford NGSS Assessment Project] with permission under [Creative Commons Attribution 4.0] licensing

Question 1

Part A: Based on the pattern between mass and kinetic energy illustrated in Table 1, what is the missing data for the kinetic energy of a 4 kg ball at 4 m/s?

A. 16 J
B. 28 J
C. 32 J
D. 36 J

Part B: Based on this data, how would you describe the relationship between the mass and kinetic energy of an object?

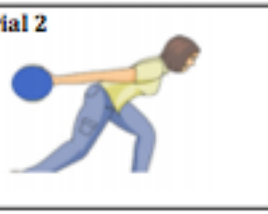
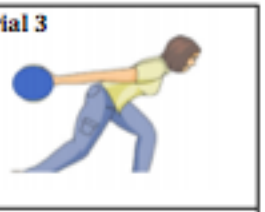
A. The kinetic energy is proportional to its mass.
B. The kinetic energy doubles and mass stays the same.
C. The kinetic energy increases at a faster rate than the mass.
D. The kinetic energy increases by the same amount as the mass.

PE: 6-MS-PS3-1; DCI: MS.PS3A.a; SEP: Analyzing and interpreting data; CCC: Scale, proportion, and quantity

Question 2

The table below shows Sara's trials with the blue ball.

Table 2: Sara's Trials with the Blue Ball

	Trial 1	Trial 2	Trial 3
			
Mass (kg)	2	2	2
Velocity (m/s)	2	3	4

In which trial diagram is Sara exerting the most force on the bowling ball in order to achieve the increased speed?

A. Sarah exerts the most force in Trial 1.
B. Sarah exerts the most force in Trial 2.
C. Sarah exerts the most force in Trial 3.
D. Sarah exerts the same amount of force in all three trials.

PE: 6-MS-PS2-2; DCI: MS.PS2A.b; CCC: Stability and change

Question 3:

Sara wants to perform another experiment to demonstrate how mass affects acceleration when the ball travels down the lane. Sara will use the same two balls as in her previous experiment.

Which of the following scenarios would **best** demonstrate this concept?

A. Sara applies different amounts of force to each ball and measures how far they move before stopping.
B. Sara applies the same amount of force to each ball and records the force with which the balls hit a bowling pin.
C. Sara applies different amounts of force to only the blue ball and measures the distance the ball travels.
D. Sara applies the same amount of force to each ball and calculates the change in velocity from the starting point to a designated distance.

PE: 6-MS-PS2-2; DCI: MS.PS2A.b; CCC: Stability and change

Question 4:

Sara asserts that the forces acting on each bowling ball are balanced as it moves down the lane. Why is she incorrect?

PE: 6-MS-PS2-2; DCI: MS.PS2A.b; CCC: Stability and change

Constructed Response Scoring Guide

Scoring Information, Q4, Grade 6, Bowling Item Set	
Score	**Description**
2	The student explains that the overall forces on the object can only be balanced if the motion of the object does not change and that the ball will slow down as it continues down the lane due to friction making forces unbalanced **Sample Response:** Sara is incorrect because, in order for the forces to be balanced, the ball's motion would have to be constant. Since the velocity of the ball will decrease due to friction between the ball and the lane, the forces on the ball will be unbalanced.
1	The student explains that the overall forces on the object can only be balanced if the motion of the object does not change OR that the ball will slow down as it continues down the lane due to friction making forces unbalanced
0	The student **neither** explains that the overall forces on the object can only be balanced if the motion of the object does not change **nor** that the ball will slow down as it continues down the lane due to friction making forces unbalanced

Item set 3: Ocean Waves
Item set 3 performance expectation: 6-MS-PS4-1

Performance expectation	Question	Question types	Three-dimensional alignment	Answer key
6-MS-PS4-1	1	MC	SEP: Mathematical thinking DCI: MS.PS4A.a CCC: Patterns	D
6-MS-PS4-1	2	MC	SEP: Mathematical thinking DCI: MS.PS4A.a CCC: Patterns	D
6-MS-PS4-1	3	MC	SEP: Mathematical thinking DCI: MS.PS4A.a CCC: Patterns	D
6-MS-PS4-1	4	CR	SEP: Mathematical thinking DCI: MS.PS4A.a CCC: Patterns	CR Scoring Guide

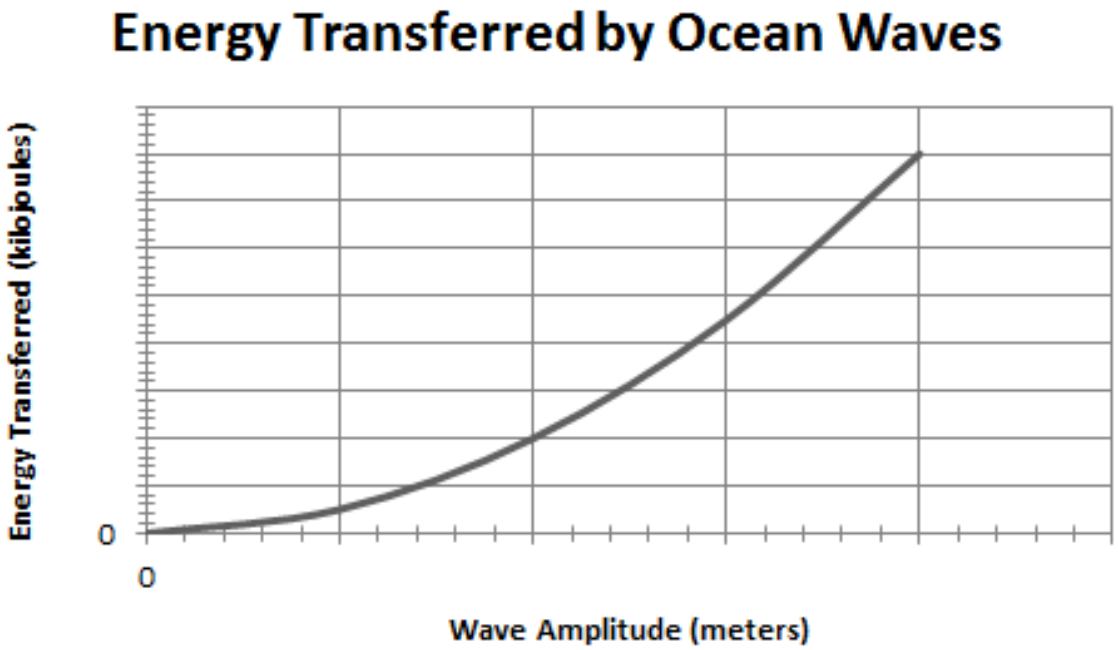
Question Types: MC = Multiple Choice, CR = Constructed Response

Item Set 3

Energy

Ocean wave power is a technology that harvests electric power from the motion of waves. Oceanic wave power captures the kinetic energy of the movement of the waves and converts it into electrical power.

The graph below shows the relationship between the amount of energy transferred by ocean waves and their average amplitude.



A company is deciding where to build a plant to generate electricity from ocean wave energy. Individual waves at any location vary in size, so the company measured waves at two different locations, calculated the average wave amplitude, and measured how much energy was generated. The results are shown in the table below.

Location	Average Wave Amplitude (meters)	Energy Generated (kilojoules)
A	2	400
B	4	1600

Question 1:

Use the graph and the table to estimate the amount of energy that would be transferred at a location where the amplitude is 8 m.

A. 800 kilojoules
B. 1600 kilojoules
C. 3200 kilojoules
D. 6400 kilojoules

PE 6-MS-PS4-1; DCI: MS.PS4A.a; SEP: Using mathematics and computational thinking; CCC: Patterns

Question 2:

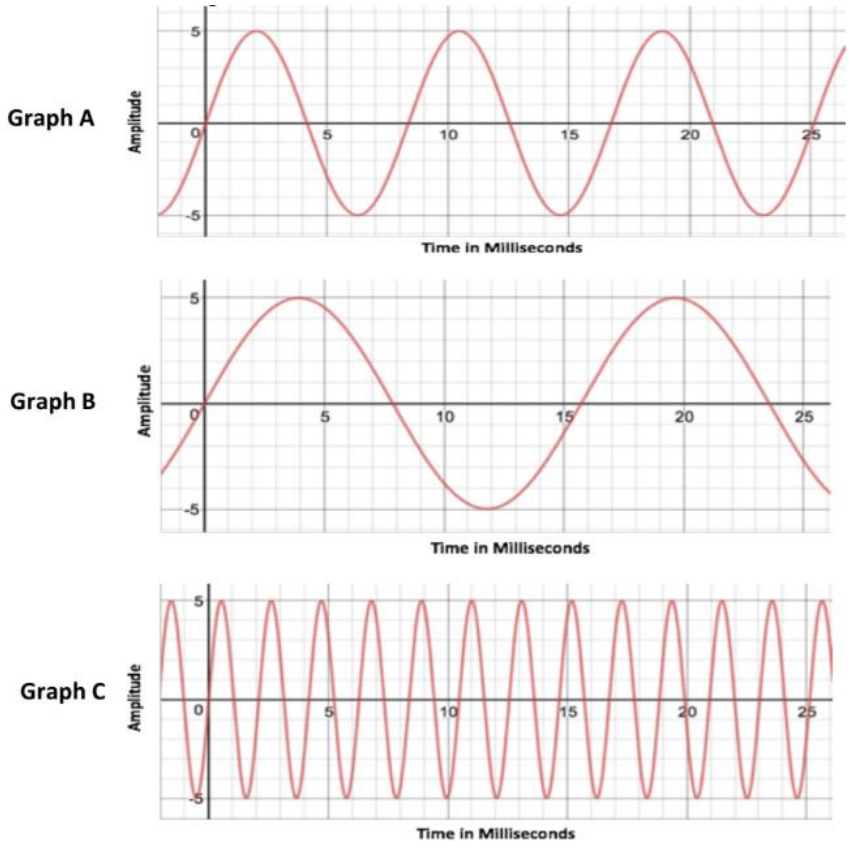
How does the energy transferred by a wave change when the amplitude triples?

A. it does not change
B. it increases by one-third
C. it triples
D. it increases six times

PE 6-MS-PS4-1; DCI: MS.PS4A.a; SEP: Using mathematical and computational thinking; CCC: Patterns

Question 3:

The graphs below represent waves taken at the same location during different times of the day. Graph A was at 8:00 am, Graph B was at 12:00 pm, and Graph C was at 4:00 pm.



Based on the data in the graphs, at what time of day will the waves generate the most energy?

A. 8:00 am
B. 12:00 pm
C. 4:00 pm
D. The time of day does not matter.

PE 6-MS-PS4-1; DCI: MS.PS4A.a; SEP: Using mathematical and computational thinking; CCC: Patterns

Question 4:

Which location should the company select to build the plant to generate electricity from ocean waves? Support your claim with evidence from the stimulus.

PE 6-MS-PS4-1; DCI: MS.PS4A.a; SEP: Using mathematical and computational thinking; CCC: Patterns

Constructed Response Scoring Guide

Scoring Information, Q4, Grade 6, Ocean Waves Item Set	
Score	**Description**
2	The student chooses Location B and includes greater amplitude means more energy in waves that can be converted. **Sample Student Response:** Location B because the waves have a greater amplitude which means they would have more energy that could be converted to electricity.
1	The student chooses Location B without reason.
0	The student chooses Location A or does not respond.

LEAP 2025 Practice Test Guidance

The LEAP 2025 Practice Test Guidance provides information on how to access the LEAP 2025 Practice Tests and how to use the practice tests instructionally. The LEAP 2025 practice test is intended to be used as an instructional tool and **not** to predict performance on the summative test. That is because the items on the practice test have not gone through the same review process as the LEAP 2025 operational test items, such as field-testing and data review. The LEAP 2025 practice tests are instructional tools designed to provide students and teachers a look at the different item types on the summative assessment and are not inclusive of all content covered by the Louisiana Student Standards for Science.