

Intermediate-level Science Test



Spring 2025

RELEASED QUESTIONS

INTERMEDIATE-LEVEL SCIENCE TEST

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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 ruler and a calculator that you can use on the test if they help you answer the question.

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

Maple Syrup Production

New York State is one of the leading producers of maple syrup. This process begins with inserting a spout into a maple tree. Sap (sugar water) flows into buckets for collection. The sap is then transferred into pans and heated to reduce the water content in sap to make the more concentrated maple syrup.

The photographs below show sap being collected in buckets and the sap being heated in three pans over a wood fire.

Collection of Sap





Place the correct lettered particle diagram and particle motion description in the boxes below to indicate the arrangement of the particles and their motion as a result of adding thermal energy. [1]



The sap must be heated for a long period of time to become syrup. The graph below shows the relationship between temperature and time for sap being heated over a wood fire. Points X and Y represent temperatures of the sap at different times.



The Effect of Heating Time on the Temperature of the Sap

2 Which statement describes the temperature and the kinetic energy of the particles in sap as the sap is heated from point X to point Y?

- A The temperature and the kinetic energy remain the same.
- **B** The temperature remains the same and the kinetic energy increases.
- **C** The temperature increases and the kinetic energy remains the same.
- **D** The temperature and the kinetic energy increase.

The graph below shows the change in density of collected liquid as maple sap is heated over time to produce maple syrup. It takes 40 gallons of sap to make 1 gallon of syrup.



The Effect of Heating Time on Density

- **3** A student is given two unlabeled 5-milliliter samples, one of which is maple sap and the other is maple syrup. Based on the information in the graph, which piece of evidence would best distinguish maple sap from maple syrup?
 - A The sample with the greater mass is maple sap.
 - **B** The sample with the lower mass is maple sap.
 - **C** The sample with the greater volume is maple sap.
 - **D** The sample with the greater density is maple sap.

Maple syrup produced from maple trees is often called natural maple syrup. In addition to natural maple syrup, artificial maple syrup is produced to be used in cooking and as a topping. Artificial maple syrup is processed to mimic the taste and texture of natural maple syrup. The photos below show food labels from containers of both kinds of syrup.



- **4** Which statement explains why Syrup 2 is the artificial maple syrup and represents a synthetic material?
 - A The serving size of Syrup 2 contains more nutrients and has more calories than the serving size of Syrup 1.
 - **B** The Syrup 2 container has more servings than the Syrup 1 container.
 - **C** Syrup 2 does not require refrigeration.
 - **D** The ingredients in Syrup 2 include natural resources that have been chemically combined to make the syrup.

Maple syrup, both natural and artificial, is used as a topping on pancakes. Pancakes can be made by combining ingredients. The table below lists some information about making pancakes.

Step	Ingredients Added	Observations
 Combine dry ingredients in a bowl. 	Flour Salt Sugar Baking Powder	White substances are in bowl.
2. Add liquid ingredients to the bowl and mix to make batter.	Egg Vanilla concentrate Vegetable oil Milk	The white substance be- comes a liquid, and small bubbles form in the batter.
3. Place pancake batter on a hot pan and heat for two minutes.	None	Top of pancake remains white, and more bubbles appear.
4. Use a spatula to flip pancake over and heat for two minutes.	None	Top of flipped-over pancake is brown.
5. Remove pancake from heat.	None	Both top and bottom of pancake are brown and the middle is white and solid.

Procedure for Making Pancakes

5 The boxes below are summarized descriptions for some of the steps in making pancakes. Place a lettered summarized step during which a chemical reaction occurred into the space below.

Summarized Steps



Explain how the observations in the procedure can be used as evidence to determine that a chemical reaction occurred during your chosen step. [1]

Base your answers to questions 6 through 9 on the information below and on your knowledge of science.

Mount Lyell and the Lyell Glacier

The photographs below show the Lyell Glacier in 1901 and in 2011. The Lyell Glacier is located in the Sierra Nevada mountains of California within Yosemite National Park. Glaciers are sensitive indicators of climatic changes.

Mount Lyell and the Lyell Glacier, August 1901

Same View, September 2011



- 6 Which process in the cycling of water is responsible for the change in size of the Lyell Glacier?
 - A condensation of water vapor from the atmosphere
 - **B** melting of ice from the surface of the glacier
 - C precipitation of snow on the top of the glacier
 - **D** transpiration from the nearby forests
- 7 A student makes a claim that the Lyell Glacier changed in size between 1901 and 2011 because there was a rise in global temperatures. Which question, when investigated, includes a factor that caused the initial rise in global temperatures?
 - A How did planting more trees impact global temperatures?
 - **B** What effect did changes in glacial ice have on global temperatures?
 - C Which season most affected global temperatures?
 - D How did the burning of fossil fuels affect global temperatures?
- 8 The heating of glacial ice is unequal to the heating of exposed land surfaces. Explain how this contributes to the continued change in the size of the Lyell Glacier *and* will most likely cause there to be a warmer local climate. [1]

The graphs below show some information about the Lyell Glacier and about changing global sea level from 1900 to 2020.



Graph 1: Percent of Glacial Surface Area, Since 1903





- 9 Use evidence from the graphs and your knowledge of science to select **one** statement in *each* table to indicate:
 - how changes in glacial surface area affect global sea level
 - one action that would best mitigate this effect if the patterns in Graphs 1 and 2 continue [1]

Effect of Glacial Surface Area on Global Sea Level	
Glacial surface area increased while global sea level decreased	
Glacial surface area increased while global sea level increased	
Glacial surface area decreased while global sea level increased	
Glacial surface area decreased while global sea level decreased	

Mitigation Action	
Plant trees around all glaciers to provide shade from the Sun.	
Increase the temperatures of the oceans to increase evaporation of the ocean surface.	
Cover all glaciers with dark material to stop changes to glacial surface area.	
Build seawalls along coastal areas to prevent flooding.	

Base your answers to questions 10 through 13 on the information below and on your knowledge of science.

The Lake Erie Ecosystem

New York State borders Lake Ontario and Lake Erie. Lake Erie is the shallowest and warmest of the Great Lakes. Due to its habitat diversity, Lake Erie supports more fish species than any other Great Lake. Both native and invasive fish species are found here. Some native fish species have been severely impacted due to pollution, habitat degradation, invasive species, and overfishing.

The model below represents a food web.



(Not drawn to scale)

- 10 Which pair of organisms in Lake Erie display a competitive relationship?
 - A smallmouth bass and zooplankton
 - B white perch and emerald shiner
 - **C** round goby and mussels
 - D phytoplankton and zooplankton

Lake Erie has been negatively affected by algal blooms during periods of warmer weather. These blooms consist of excessive growth of cyanobacteria (blue-green algae phytoplankton), which are capable of producing toxins that pose a risk to human and animal health. The overgrowth of this algae creates thick mats on the lake's surface (algal bloom) that block sunlight from reaching underwater plants. The photo below shows an algal bloom occurring.



Blue-green algae mat <

- 11 Which argument correctly describes how an algal bloom could affect populations of organisms in Lake Erie?
 - A Some photosynthetic organisms would not receive enough energy in order to make food.
 - **B** The population of mussels would be unaffected because they would feed on zooplankton instead of algae.
 - **C** Toxins would cause the population of smallmouth bass to increase because the population of emerald shiner would increase.
 - **D** Bottom feeders, like the round goby, would live closer to the surface of the lake in order to feed on phytoplankton.

Harmful algal blooms are caused by increases of phosphorus levels in the lake. Heavy spring rains lead to greater runoff of phosphorus from farm fields. About 85% of the phosphorous comes from agriculture. Other contributing sources of phosphorous runoff include septic tanks, lawns, golf courses, and wastewater treatment plants.

Graph 1 below shows some information about phosphorus in Lake Erie.



- 12 Which statement describes the predictability of phosphorous levels in Lake Erie, based on the information in *Graph 1*?
 - A The phosphorus levels in Lake Erie will increase from 0 to 100 every April and May.
 - **B** The greatest levels of phosphorus in Lake Erie will occur in August.
 - **C** There will be a constant rate of change in the amount of phosphorus entering Lake Erie during the summer months each year.
 - **D** Phosphorus levels will continue to increase to over 450 metric tons in the next three years.

The Lake Erie Watershed is the most human-populated watershed in the Great Lakes region. The water from the watershed is widely used for agriculture and industry. Resources from this area meet the agricultural needs of large regions for Ohio, Pennsylvania, and New York.

The table below compares the amount of water withdrawn from surface or groundwater for different uses from the Lake Erie Watershed, in millions of gallons per day (Mgal/day).

Sector	Amount Withdrawn in 2012 (Mgal/day)	Amount Withdrawn in 2015 (Mgal/day)
Public Water Supply	206.03	220.20
Industrial	189.17	198.26
Irrigation	6.84	3.19
Commercial and Institutional	3.23	3.49

Water Used from Lake Erie Watershed by Different Sectors – 2012 and 2015

- 13 Which argument best describes a possible relationship between water consumption and its impact on a Lake Erie ecosystem between 2012 and 2015?
 - A The decrease in water used for irrigation could have caused the lake level to rise, flooding shoreline ecosystems.
 - **B** The decrease in total water usage could have increased the stability of fish habitats.
 - **C** The increase in water used for industry could have decreased the amount of pollutants released into the watershed.
 - **D** The increase in total water usage could have caused the lake level to drop, negatively affecting shoreline organisms.

Base your answers to questions 14 through 18 on the information below and on your knowledge of science.

Observing Jupiter

Although Galileo Galilei did not invent the telescope, he made significant advancements and refinements to the telescope in 1609. This refined telescope allowed Galileo to make observations of Earth's Moon and the four largest moons that orbit Jupiter. Presently, spacecraft and space telescopes are used to make more detailed observations of our solar system.

Some data about Jupiter's four largest moons are shown below in Data Table 1.

Name of Moon	Mass (kg)	Equatorial Diameter (km)	Mean Distance from Jupiter (km)
Io	8.93 × 10 ²²	3.63 × 10 ³	4.22 × 10⁵
Europa	4.80 × 10 ²²	3.14 × 10 ³	6.71 × 10⁵
Ganymede	1.48 × 10 ²³	5.26 × 10 ³	1.07 × 10 ⁶
Callisto	1.08 × 10 ²³	4.82 × 10 ³	1.88 × 10 ⁶

Data	Table	1
ναια	Iable	

Some data about Earth's Moon are shown below in Data Table 2.

Data Table 2

Mass (kg)	Equatorial Diameter (km)	Mean Distance from Earth (km)
7.35 × 10 ²²	3.48 × 10 ³	3.83 × 10⁵

14 The scale model below represents the mean distance between Earth and Earth's Moon. The dots in the model represent the positions of celestial objects.



Which model best represents the mean distance between Jupiter and Europa, if drawn at the same scale as the Earth-Moon model?



15 The names of moons from *Data Table 1* and *Data Table 2* are listed below. Place their names in order from the largest mass to the smallest mass.



Compare the moons' equatorial diameters to the order of their masses. [1]

Many planets in our solar system have moons. The gravitational interaction between a planet and its moon keeps the moon in a relatively constant orbit around the planet.

Data Table 3 below shows some information about Jupiter and Saturn.

Planet	Moon	Mean Orbiting Distance of Moon from Planet (km)	Gravitational Force Exerted on Moon (N)
Jupiter	Io	4.22 × 10⁵	6.3 × 10 ²²
Saturn	Enceladus	2.40 × 10 ⁵	7.3 × 10 ¹⁹

- **16** Which argument explains why Enceladus experiences a weaker gravitational force than Io from the planet it orbits, even though Enceladus is closer to its planet?
 - A The gravitational force exerted on a planet's moon is affected by the planet's magnetic field.
 - **B** The strength of the gravitational force exerted by a planet on its moon is the same as the strength of the gravitational force exerted by the moon on a planet.
 - **C** The speed of Enceladus results in a kinetic energy that decreases the strength of the gravitational force exerted by Saturn.
 - **D** The masses of the planet and its moon affect the strength of the gravitational force exerted on the moon by the planet.

The model below represents some information about Io and Jupiter.



Orbits of Io and Jupiter

(Not drawn to scale)

17 A student claims that the Sun exerts a gravitational force on Jupiter, but not on Io. Indicate if you support or refute this claim. Justify your choice using evidence from the Orbits of Io and Jupiter model and your scientific knowledge. [1]



Justification: _

In 2023, the Jupiter Icy Moons Explorer (JUICE) spacecraft was launched to investigate Jupiter and three of its moons. This mission will begin collecting data in 2031 and is expected to last eight years. It will focus on learning more about each moon's environment, as well as their potential for supporting life, as it passes by them.

When planning and building JUICE, scientists needed to meet the mission's objectives and consider both criteria and constraints. The objectives for the mission are listed below.

- Collect data on the ocean-bearing icy moons of Callisto, Europa, and Ganymede.
- Determine if there is water beneath the surface of the moons.
- Study the magnetic fields of Ganymede and Callisto.
- Map the topographic surface of Jupiter's moons.
- Investigate the upper layers of Ganymede's and Callisto's atmospheres.
- Search for evidence of potentially habitable environments on Jupiter.
- 18 In order to successfully meet their objectives, scientists planning and building the JUICE spacecraft mission had to address the
 - A criterion that the spacecraft collect water from beneath the surface of the moons
 - **B** criterion that the spacecraft can perform multiple tasks
 - C constraint of collecting all necessary data by 2031
 - D constraint of the effect of the tilt of Jupiter's axis of rotation on data collection

Base your answers to questions 19 through 23 on the information below and on your knowledge of science.

Organ Systems and Responses

On the field, a soccer player responds to stimuli in various ways. Coordinated responses are a result of the player's body systems working together. These responses are intended to help the body maintain homeostasis or are learned behaviors performed by the player.



(Not drawn to scale)

- **19** The player's coach always encourages all participants to work together as a team. The player claims that the human body works similarly because the body consists of interacting systems. Which piece of evidence supports this claim?
 - A Cells in the human body contain a nuclei, cell membrane, and vacuoles.
 - **B** Organs in the human body are composed of different types of tissue.
 - **C** The mouth, stomach, and intestines are organs of the human digestive system.
 - **D** The tissues of the muscular system move the human skeletal system.



In soccer, when a shot is taken, the goalie from the opposing team tries to catch or block the shot in order to prevent the other team from scoring. This action involves a series of coordinated responses in the goalie's body.



Reaction to Incoming Ball

Place the lettered items below in the correct sequence to model how this 20 information is processed by the goalie. [1]



The model below represents the transport of gases within a muscle cell in a soccer player's body. Structures labeled X are organelles within the muscle cell.





(Not drawn to scale)

21 From the table below, which row correctly matches the name and function of the organelles labeled *X*?

Row	Organelles	Function
Α	mitochondria	Release energy stored in chemical bonds
В	mitochondria	Use energy to produce more complex molecules
С	chloroplasts	Convert light energy into chemical bond energy
D	chloroplasts	Produce energy from a carbon-based gas

- A Row A
- **B** Row B
- C Row C
- **D** Row D

The model below identifies the chemical formulas of some molecules in the cells of a soccer player. One molecule is missing.

Production of Energy Model

 $\begin{array}{c} \hline \\ H_2 \longrightarrow CO_2 + H_2O + Energy \\ \hline \\ Missing \\ reactant \end{array}$

22 Identify the unidentified reactant in this model *and* a body system that supplies this reactant. [1]

Missing Reactant: _____

Body System: ______ system

While playing soccer, athletes often experience changes in body temperature. The model below represents the different ways the human body responds to changes in body temperature to maintain homeostasis.



Body Response Model

23 Which row correctly pairs a sensory organ and the body's response to increased activity while playing soccer?

Row	Sensory Organ	Body Response
Α	eyes	blood vessels constrict
В	ears	shivering releases heat
С	skin	sweat glands secrete fluid
D	tongue	heat is generated

- A Row A
- **B** Row B
- C Row C
- D Row D

Base your answers to questions 24 through 27 on the information below and on your knowledge of science.

Rust

A student in New York State left their bicycle outside all winter in the rain and the snow. When they went to ride it on a spring day, they noticed the bike chain was rusted. It took some time to remove the rust.



Bike Chain with Rust After One Winter

Bike Chain Cleaned and Rust Removed



The student decided to conduct research to find out how the rust formed and what they could do to prevent their bike chain from getting rusty again next winter. Through research, the student found out that bike chains are made of steel, which is made of 99% iron. Therefore, they decided to use steel nails to test for causes of and solutions to the rusting problem. Rust is produced when iron reacts with oxygen and water. The chemical formula for the reaction is shown below.

Reaction of Iron, Water, and Oxygen to Produce Rust



Chemical Formula for Rust Reaction



- **24** Given this reaction, which statement correctly identifies the properties of the substances that are *different* before and after this reaction has taken place?
 - A Before the reaction oxygen is a gas, while after the reaction oxygen is part of solid rust.
 - **B** Before the reaction iron is a solid, while after the reaction rust is a solid.
 - C Before the reaction water is a vapor, while after the reaction water is a liquid.
 - **D** Before the reaction the substances are a solid, a liquid, and a gas, while after the reaction the substances are a solid and a gas.
- 25 Which table shows the **total** number of atoms in the reactants and the **total** number of atoms in the products for the chemical reaction?

Element	Reactants	Products	
Iron	5	12	
Hydrogen	8	7	
Oxygen	6	6	
Α			

Element	Reactants	Products
Iron	4	4
Hydrogen	12	12
Oxygen	12	12
	ſ	

Element	Reactants	Products
Iron	4	4
Hydrogen	6	6
Oxygen	12	12

Element	Reactants	Products		
Iron	1	4		
Hydrogen	8	7		
Oxygen	18	7		
D				

The student conducted three experiments in order to test if water and oxygen in the environment rust steel nails. They used appropriate safety equipment and followed all safety procedures. Three separate steel nails were placed in separate test tubes, each containing different substances. All three test tubes were sealed with stoppers.

- In test tube 1, the nail was partially placed in water.
- In test tube 2, the nail was submerged in water that was boiled to remove oxygen and a layer of oil was added to prevent oxygen from re-entering the water.
- In test tube 3, the nail was enclosed in air and a chemical (anhydrous calcium chloride) that removes water vapor from the air was added.

The nails were left in the test tubes for approximately three weeks. A model representation of the experiment is shown below.



26 The results of the three experiments are shown in the table below.

Test Tube Number	Rust Formed	Rust Did Not Form
1	\checkmark	
2		\checkmark
3		\checkmark

Use information from the chemical reaction to construct an explanation for the reason rust did *or* did not form in **one** of the test tubes. [1]

Test tube number: _____

Explanation:

The student, located in New York State, wants to have a shed built on the back of their house to protect the bicycle from future weather conditions. The criteria for the shed materials are:

- pressure-treated lumber
- not affected by cold, snowy winters
- reasonably priced
- quality materials that do not rust

The builder, whose priority is to build a safe, durable shed that will last, must decide what materials and nails to use in the construction of the shed.

Design	Steel Nail Type	Nail Characteristics	Shed Material	Shed Characteristics	Constraints and Uses
1	hot- dipped in zinc	 expensive can be used with any decking coating doesn't chip off does not rust 	pressure- treated wood	— moderately expensive — requires maintenance	 not for coastal environments nails can be used where corrosion is a concern
2	hot- galvanized with iron zinc alloy	 moderately expensive can be used with any decking coating thick- ness can vary affecting rust resistance 	pressure- treated wood	— moderately expensive — requires maintenance	 nails cannot be used in water or underground can be exposed to weather
3	electro- galvanized in zinc powder	 least expensive cannot be used with pressure treated wood will rust if exposed to air 	untreated wood	— least expensive — rots quickly	 nails cannot be used in water or underground wood does not last long outdoors
4	stainless steel	— most expensive — long lasting — does not rust	plastic composite boards	 most expensive long lasting little maintenance 	— can be used in coastal environments

Materials Used in Four Shed Designs

27 Which statement best explains why one of the designs meets *all* of the criteria and is the best choice for the shed materials?

- A Design 1 is the best because the nails won't rust and it uses pressure-treated lumber.
- **B** Design 2 is the best because the nails are not expensive and it uses pressure-treated lumber.
- **C** Design 3 is the best because the nails and the untreated wood for the shed are the least expensive.
- **D** Design 4 is the best because the nails and shed materials will not rust and are long lasting.



Base your answers to questions 28 through 31 on the information below and on your knowledge of science.

Earth's Tectonic Plates

Geoscience processes have changed features on Earth's surface throughout Earth's history. Mt. Everest is one surface feature that directly formed when the Indian subcontinent collided with the Eurasian Plate. *Diagram 1* models the inferred rate of movement of the Indian subcontinent over the last 71 million years. *Diagram 2* shows the current location of the Himalayan mountains and Mt. Everest relative to the Indian subcontinent and the Eurasian Plate.



Diagram 1

Diagram 2



Select the two statements that support the claim: 28

The Indian subcontinent collided with the Eurasian Plate. [1]

		_	

The age of the rocks in the Eurasian Plate is different than the age of the rocks in the Indian subcontinent.



Each year, the Indian subcontinent moved 5-15 centimeters south.

The Indian subcontinent rotated counterclockwise as it traveled north.



The Himalayan mountain range was formed due to movement of tectonic plates.



The Eurasian Plate is 71 million years old.

The map below shows information about some tectonic plates and their interactions. A seamount is a structure that forms under the ocean. The lines on the map represent plate boundaries.



Locations of Four Geologic Structures

- 29 Based on evidence from the map, it can be inferred that
 - A mountains and trenches form at plate boundaries
 - B mountains and seamounts only form in the middle of the oceans
 - C new ocean floor is created at trenches
 - D all geologic structures are formed under the ocean

The map below shows some information about the bedrock below the Atlantic Ocean. The dark line that runs down the center of the ocean floor bedrock is a boundary between two tectonic plates.



Ages of Atlantic Ocean Floor Surface

- **30** The evidence in the map that supports the idea that Earth's plates are spreading apart at the boundary is that the age of the ocean floor bedrock
 - A decreases steadily from North America to Europe
 - **B** increases steadily from North America to Europe
 - C decreases as distance from the boundary increases
 - **D** increases as distance from the boundary increases
- **31** Explain how the shapes of the continents shown in the Ages of Atlantic Ocean Floor Surface map are evidence for past plate motion. [1]

Base your answers to questions 37 through 41 on the information below and on your knowledge of science.

Sickle Cell Anemia

Sickle cell anemia is a genetic disease that causes severe symptoms in humans. People with sickle cell anemia do not have enough normal red blood cells to carry oxygen to body cells. The disease is caused by a mutation of a gene that makes hemoglobin. Hemoglobin is the protein that carries oxygen in red blood cells. Normal hemoglobin and hemoglobin in sickled red blood cells look different. The mutation in the gene slightly changes the shape of the hemoglobin molecule which also changes the shape of the red blood cell.

Model 1 represents a change in the genetic material caused by a mutation in the gene that makes hemoglobin.



Model 1

37 Identify the position within the gene in *Model 1* (labeled 1, 2, and 3) where the mutation occurs and describe how a person with sickle cell anemia experiences either harmful, beneficial, or neutral effects. [1]

Position number:
Description:

38 Describe how this mutation changes the structure of the hemoglobin molecule and how it then changes the shape of the red blood cell. Include both the molecule *and* the cell in your answer. [1]

The model below represents the potential genetic outcomes for offspring of two parents. Each parent carries one allele for normal red blood cell production (H) and one allele for sickle-shaped red blood cell production (h). A carrier is an individual who has only one allele associated with a disease and who does not usually show symptoms of this disease.



- 39 Which statement is generally true for an individual who inherits the mutated sickle cell anemia gene from only one parent?
 - A The person will not be able to carry enough oxygen to body cells.
 - **B** The person would be unaffected and able to produce enough healthy red blood cells to transport oxygen.
 - **C** The person will produce clumped hemoglobin if the sickle cell gene was inherited only from the mother.
 - **D** The person will be able to transport more oxygen than someone who does not inherit this gene from either parent.

40 Complete the Punnett square model to determine the genetic probabilities of the offspring of a mother who is a carrier of the sickle cell gene and a father who is not a carrier, but has normal hemoglobin. Select the correct genetic outcomes from the choices given and place them in the boxes to complete the model. Some choices may be used more than once or not at all.



Choices for Genetic Outcomes

Using your completed Punnett square model as evidence, explain how the presence of sickle cell anemia in the offspring compares to the presence of sickle cell anemia in the parents. [1]

Explanation:

Sickle cell anemia can be treated using a process called CRISPRmediated gene therapy. This technology involves removing specific cells from a patient. The mutated genes in these cells are corrected and the newly edited cells are placed back into the patient's body to start making new normal blood cells.



- 41 Which statement about the function of cell parts accurately describes how CRISPR technology influences the traits of humans who have sickle cell anemia?
 - A The mutated gene is edited out of the patient's genetic material using the CRISPR technology and is replaced with a gene that produces normal hemoglobin.
 - **B** The CRISPR technology corrects the mutated gene so that each cell can grow into a human with normal hemoglobin.
 - **C** The mutated genes are removed from the patient's genetic material using CRISPR technology and the patient's red blood cells no longer produce any hemoglobin.
 - **D** The CRISPR technology removes the genetic material from all of the patient's body cells and replaces them with corrected genetic material that can be passed on to offspring.

Base your answers to questions 42 through 46 on the information below and on your knowledge of science.

Practical Applications of Magnetism

A team of students investigated factors that affect the strength of magnets and electromagnets. In addition, this team studied how magnetic forces can be used in practical applications. The team used appropriate safety equipment and followed all safety procedures as they worked.

The team determined the number of steel washers that a neodymium magnet could pick up when the magnet was kept at five different temperatures.



Relationship Between Temperature and Number of Washers Picked Up

42 Write a question that this team could ask to determine if a variable represented in the graph affects the strength of this magnetic force. [1]

Question: _____

The team then investigated factors that affected the strength of the magnetic force exerted by an electromagnet. The model of the experimental setup and data taken are shown below. The current through the electromagnet was measured in amperes (A). The electromagnet was used to lift iron filings from a pile on a table. The mass of the iron filings lifted was measured in grams.



Data	Tahlo	1
Data	laple	

Current Through Electromagnet (A)	Number of Turns of Coiled Wire	Type of Metal Bar	Mass of Iron Filings Lifted (g)
2	50	Iron	10.5
3	50	Iron	15.0
4	50	Iron	21.5
5	10	Iron	5.0
5	20	Iron	10.5
5	30	Iron	15.5
5	50	Iron	26.5
5	50	Nickel	25.0
5	50	Copper	24.5

43 The list below contains variables that can be manipulated in this investigation. Select the **three** variables that the team investigated in order for them to determine each variable's effect on the strength of the magnetic force exerted by the electromagnet. [1]

the number of turns of wire around the metal bar



the type of metal filings



the mass of metal filings lifted

the amount of current through the wire



Engineers design recycling plants that use magnetic forces to sort metals like steel and iron from plastics, paper, and glass. The team of students investigated the recycling process that the engineers designed and developed.

Their model below represents a built-in magnet separator used in recycling. The separator is composed of two conveyor belt mechanisms. Ferrous metal (containing iron), glass, plastics, and paper travel on a lower conveyor belt in the direction shown. Ferrous metal is attracted to a magnet located inside the upper conveyor belt mechanism and travels in the direction shown. The various objects eventually fall into separate containers below.



Recycling Separator with Built-In Magnet

- **44** Which statement provides evidence that the objects that need to be sorted are in a magnetic field created by the magnet located inside the upper conveyor belt mechanism?
 - A Ferrous metals are pulled upward from the lower conveyor belt by a magnetic force exerted by the magnet that is not in contact with these metals.
 - **B** Plastics and paper remain on the lower conveyor belt because they are not in the magnetic field produced by the magnet.
 - **C** All the objects eventually fall off the conveyor belts due to a force exerted by the magnet.
 - **D** The magnetic force creates friction that holds the objects in place as the objects move along both conveyor belts.

Electromagnets are used to lift and move magnetic metals in recycling facilities. These metals may be sharp and very heavy, but with the use of an electromagnetic crane, the metal can be moved safely and easily. The team of students investigated the types of objects that were able to be lifted by the electromagnetic crane.



- **45** The team of students observed that the crane was able to lift the car. When the electromagnet was placed on the more massive bus, the crane was *not* able to lift it. Which argument is supported by this evidence?
 - A The gravitational force on the bus is greater than the gravitational force on the car but less than the magnetic force exerted by the crane.
 - **B** The gravitational force on the bus is greater than the gravitational force on the car and greater than the magnetic force exerted by the crane.
 - **C** The gravitational force on the bus is less than the gravitational force on the car but greater than the magnetic force exerted by the crane.
 - **D** The gravitational force on the bus is less than the gravitational force on the car and less than the magnetic force exerted by the crane.
- **46** The team of students claimed that the electromagnetic crane has done work on the car because they observed that the car was lifted from Earth's surface to the position shown in the model. Which argument about the energy of the Earth-car system best supports this claim?
 - A The work done by the crane decreased the amount of energy of the Earth-car system.
 - **B** The work done by the crane did not transfer energy to the Earth-car system.
 - **C** The work done by the crane increased the potential energy of the Earth-car system.
 - **D** The work done by the crane changed the thermal energy of the Earth-car system.

Base your answers to questions 47 through 51 on the information below and on your knowledge of science.

Behavior and Evolution of Guppies

Guppies, *Poecilia reticulata*, are a common aquarium fish with variations in color and scale patterns. Common aquarium guppies are descendants of wild ancestors. These ancestors lived in mountain streams in the tropical forests of northeast South America and some Caribbean Islands. Modern-day guppies are still found in these areas.

Guppies in the wild can migrate over waterfalls and rapids to places where most predators can't follow them. Once guppies arrive in a safer environment, they evolve rapidly, becoming genetically distinct from their ancestors while still being considered the same species. The body cells of all guppies have 23 pairs of chromosomes.

The body color of a female guppy is gray, while the body color of a male guppy can be a wide variety of colors and may have spots or stripes. These markings are not evident in young guppies, but appear as male guppies mature. Studies have consistently demonstrated that females prefer to mate with males with larger and more colorful spots. Male guppies are able to reproduce at seven weeks, and female guppies are able to reproduce at 10 to 20 weeks.



47 Identify the type of reproduction exhibited by guppies.

Type of Reproduction	
Sexual	
Asexual	

Complete the model by placing the number of chromosomes within each of the three cells. Choices may be used more than once. [1]



- **48** Which statement implies an evolutionary relationship by providing evidence of anatomical similarities and differences between aquarium guppies and guppies in their natural habitat?
 - A Aquarium guppies have similar body structures when compared with guppies in their natural habitat, but each has variations in their appearance that help them survive.
 - **B** Fossil evidence shows variation between aquarium guppies and guppies in their natural habitat.
 - **C** Guppies in their natural habitat are threatened with extinction and are being caught and raised in aquariums to protect the species.
 - **D** The pattern of embryological development for aquarium guppies is not closely related to that of guppies in their natural habitat.

A population of guppies was transferred from their natural environment into a large aquarium. The graph below shows the relationship between the percent of male guppies in this population with a specific variation of a trait over time. On the graph below, identify the variation of the specific trait of male guppies that increased over time *and* the variation that decreased over time by selecting the appropriate label for each line on the graph and placing this label in the appropriate box.



Explain how natural selection caused the occurrence of **both** variations of the trait to increase or decrease over time. [1]

Variation Choices

Two predators of guppies are cichlids and rivulus. Cichlids feed on adult guppies. Rivulus eat only young guppies before the guppies develop spots.



In another investigation, ponds under three different sets of conditions were used to raise guppies. In the first pond, guppies existed without any predators. After six months, one-third of the guppies were transferred to a pond with cichlids and one-third were transferred to a pond with rivulus. The remaining guppies were left in the first pond.

Graph 1 below represents the average number of spots on male guppies at 0, 6, 10, and 20 months of this investigation.



50 Predict the appearance of the guppy populations in the cichlid pond at month 25. Use numerical evidence from *Graph 1* to support your prediction. [1]

Guppies are known to be very tolerant of and adaptable to new environments, and able to consume multiple food sources, including mosquito larvae. As a result, guppies have been frequently introduced into established ecosystems to control mosquito populations. Guppies are now found worldwide. Due to the increasing need for mosquito-borne disease control, guppy relocation will likely continue.

Mosquito control is an issue in Malaysia. Population control methods for mosquitos include:

- cleaning up mosquito breeding areas by draining standing water
- using guppy fishes to eat mosquito larvae
- using ABATL (mosquito larvae insecticide) which is deadly to mosquito larvae
- fogging which uses an airborne insecticide to kill adult mosquitos
- 51 Given these solutions for controlling mosquito populations in Malaysia, which statement describes the *best* solution that maintains biodiversity in the ecosystem?
 - A Fogging neighborhoods with chemicals provides rapid and widespread reduction of the mosquito population.
 - **B** Using insecticides will kill mosquito larvae, and other organisms can eat these larvae with chemicals in them.
 - **C** Introducing guppy fishes to eat mosquitoes and other native species does not involve the use of chemicals.
 - **D** Cleaning up breeding areas will naturally reduce mosquito populations without significantly harming other species in an ecosystem.

Base your answers to questions 52 through 56 on the information below and on your knowledge of science.

Energies of Dropped Marbles

Students investigated the relationship between speed and kinetic energy by dropping a glass marble (mass = 18.5 g) into a cup of flour. The depth of the marble in the flour is a measure of the kinetic energy of the marble upon impact. Four different drop heights (12.5 cm, 25 cm, 50 cm, and 100 cm) were investigated. The speed of the marble at impact was calculated for each of these heights. The data table below shows some data collected during this experiment.

Height of Drop (cm)	Speed (m/s)	Depth of Marble in Flour (cm)	Kinetic Energy (g•m²/s²)
12.5	1.6	0.6	23.7
25	2.2	1.3	44.8
50	3.1	2.4	88.9
100	4.4	4.1	

Data on a Dropped Marble

- 52 What was the dependent variable in this investigation?
 - A material of marble
 - B mass of marble
 - C depth of marble in flour
 - D height of drop

The formula for determining kinetic energy (KE) is:

 $KE = 0.5 \times (mass of marble) \times (speed on impact)^2$

53 Which graph correctly shows the speed (m/s) and the resulting kinetic energy $(g \cdot m^2/s^2)$ for each of the four different drop heights?



GO ON

54	Identify the evidence from the data table that supports the claim that when work is done on or by the marble, the energy of the marble changes as energy is transferred to or from the marble. [1]							
55	Stu a <u>c</u> rei im	udents repeated the same investigation using a drop height of 50 cm, but used glass marble that had a mass of 37.0 g instead of 18.5 g. The speed on impact mained 3.1 meters/second. Compare the kinetic energies of the two marbles upon pact with the flour. [1]						
56	Be wa A	fore each marble was dropped, the amount of potential energy the marble had as the greatest at 12.5 cm because the amount of potential energy increases as the drop height						
	В	Increases 12.5 cm because the amount of potential energy increases as the drop height decreases						
	C	100 cm because the amount of potential energy increases as the drop height increases						
	D	100 cm because the amount of potential energy increases as the drop height decreases						

Grade 8 Intermediate-level Science Test

Spring 2025

1 [1] Allow 1 credit for all *four* correctly labeled boxes in the correct locations, as shown below:



- 2 [1] Allow 1 credit for A.
- 3 [1] Allow 1 credit for *B*.
- 4 [1] Allow 1 credit for D.

5 [1] Allow 1 credit for a correctly selected step with an explanation that contains appropriate supporting evidence from the procedure. Acceptable responses include, but are not limited to:

Summarized Step Having	В
a Chemical Reaction:	Add Li

B Add Liquid Ingredients to Bowl and Mix

—Bubbles formed in the batter, which is evidence of a new substance.

—Bubbles formed because a gas was produced.

Summarized Step Having	С		
a Chemical Reaction:	Heat Batter in Hot Pan		

-Bubbles formed in heated batter, which is evidence of a new substance.

—Bubbles formed because a gas was produced.

- —The top of the pancake was brown after the pancake was flipped, indicating a new substance.
- —Both the top and bottom of the pancake were brown and the middle was white. This color change is evidence for a new substance.
- 6 [1] Allow 1 credit for *B*.
- 7 [1] Allow 1 credit for D.
- 8 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - The decrease in the size of the glacier decreases the amount of light reflected by the white glacial surface, causing more of it to be converted into heat, which will eventually warm the climate.
 - As more of the glacier melts, more of the dark surface will be exposed, increasing the amount of energy that will be absorbed, warming the climate of the area.

9 [1] Allow 1 credit for *one* correctly selected statement in each table, as shown below:

Effect of Glacial Surface Area on Global Sea Level					
Glacial surface area increased while global sea level decreased					
Glacial surface area increased while global sea level increased					
Glacial surface area decreased while global sea level increased	\checkmark				
Glacial surface area decreased while global sea level decreased					

Mitigation Action					
Plant trees around all glaciers to provide shade from the Sun.					
Increase the temperatures of the oceans to increase evaporation of the ocean surface.					
Cover all glaciers with dark material to stop changes to glacial surface area.					
Build seawalls along coastal areas to prevent flooding.	\checkmark				

- 10 [1] Allow 1 credit for B.
- 11 [1] Allow 1 credit for A.
- 12 [1] Allow 1 credit for B.
- 13 [1] Allow 1 credit for D.
- 14 [1] Allow 1 credit for C.
- 15 [1] Allow 1 credit for the correct order, as shown below, *and* a correct comparison.



Mass

Acceptable responses include, but are not limited to:

- The order of the equatorial diameters is the same as the order of the masses.
- The moons' equatorial diameters and masses would be the same from largest to smallest.
- As diameter increased, the mass increased.

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

- 17 [1] Allow 1 credit for Refute *and* a correct justification. Acceptable responses include, but are not limited to:
 - Io travels around the Sun as well as Jupiter, proving that the Sun exerts a gravitational force on Io.
 - The Sun and Io both have mass and interact at a distance, indicating a gravitational force between them.
 - Io is part of the solar system and everything in the solar system revolves around the Sun because of the gravitational force between the Sun and all solar system objects.
- 18 [1] Allow 1 credit for B.
- 19 [1] Allow 1 credit for D.
- 20 [1] Allow 1 credit for a correct model, as shown below:



- 21 [1] Allow 1 credit for A.
- 22 [1] Allow 1 credit for a correctly identified reactant *and* body system. Acceptable responses include, but are not limited to:

Missing Reactant:

- Sugar
- glucose/C₆H₁₂O₆

Body System:

- digestive
- circulatory
- 23 [1] Allow 1 credit for C.
- 24 [1] Allow 1 credit for A.
- 25 [1] Allow 1 credit for C.

26 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Test Tube 1:

- Rust formed because the nail was exposed to both oxygen and water in the test tube.
- Rust occurred because the nail was exposed to oxygen in the air and water.

Test Tube 2:

- Rust did not form because there was no oxygen in the test tube or the water.
- Rust needs oxygen to form, and there was no oxygen.

Test Tube 3:

- Rust only forms when H_2O and oxygen are present, and there was no H_2O vapor in the test tube.
- Rust did not form because there was no water vapor in the test tube, and rust needs H_2O to form.

Note: If test tube 1 or 2 is selected, the student must state oxygen, not air.

- 27 [1] Allow 1 credit for A.
- 28 [1] Allow 1 credit for *two* correctly selected statements, as shown below:



The age of the rocks in the Eurasian Plate is different than the age of the rocks in the Indian subcontinent.



Each year, the Indian subcontinent moved 5-15 centimeters south.



The Indian subcontinent rotated counterclockwise as it traveled north.



The Himalayan mountain range was formed due to movement of tectonic plates.



The Eurasian Plate is 71 million years old.

- 29 [1] Allow 1 credit for A.
- 30 [1] Allow 1 credit for *D*.

- 31 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - The coastlines of South America and Africa fit together like puzzle pieces.
 - The shapes of the continents appear to fit together like pieces of a puzzle.
 - South America and Africa look like they could fit together with no space between them.
- 37 [1] Allow 1 credit for position 2 *and* a correct harmful description. Acceptable responses include, but are not limited to:
 - It is harmful because a person would not have enough normal red blood cells to carry oxygen throughout their body.
 - It is harmful because the person would not get enough oxygen to their body cells.
- 38 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - The mutation causes the hemoglobin molecule to become chained together instead of separated molecules. This causes the shape of the red blood cells to become sickle shaped.
 - The molecules are connected from one to the other in the abnormal hemoglobin molecule bending the red blood cells.
- 39 [1] Allow 1 credit for *B*.

40 [1] Allow 1 credit for a correct Punnett square, as shown below, *and* a correct explanation.

Mother

		Н	h
Father	Н	НН	Hh
	Н	НН	Hh

Acceptable responses include, but are not limited to:

- There is no change in the presence of sickle cell anemia from the parents to the offspring, since no individual is hh.
- It is the same because both parents and all offspring have at least one H so no one has sickle cell anemia.
- 41 [1] Allow 1 credit for A.
- 42 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - How does the temperature of the magnet affect the strength of the magnetic force exerted by the magnet?
 - What is the effect of the magnet temperature on the strength of the magnetic force?
 - When the temperature of a magnet changes, how does the number of washers it can pick up change?

Note: Questions must include a questioning word or a question mark.

43 [1] Allow 1 credit for *three* correctly selected variables, as shown below:



- 44 [1] Allow 1 credit for A.
- 45 [1] Allow 1 credit for B.
- 46 [1] Allow 1 credit for C.
- 47 [1] Allow 1 credit for indicating sexual *and* a correctly completed model, as shown below:



48 [1] Allow 1 credit for A.

49 [1] Allow 1 credit for identifying *both* lines correctly, as shown below, *and* an appropriate explanation.



Appearance of Male Guppy Traits as a Function of Time

Acceptable responses include, but are not limited to:

- The percent of males with large, colorful spots increased over time because females prefer mating with males with these traits, resulting in more male offspring exhibiting these traits and fewer males with small, non-colorful spots.
- Males with colorful spots are preferred by females for mating, so that trait increases over time in offspring, causing a decrease in the percent of guppies with small, noncolorful spots.
- 50 [1] Allow 1 credit for a prediction of less spots *and* acceptable evidence. Acceptable responses include, but are not limited to:
 - The guppy populations will have less spots at month 25 than at month 20 because the graph shows a continuing decrease in number of spots.
 - By month 25 there should be less than nine spots per fish because the number of spots begins decreasing at 6 months.
- 51 [1] Allow 1 credit for *D*.

- 52 [1] Allow 1 credit for C.
- 53 [1] Allow 1 credit for *B*.
- 54 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - As the height of the dropped marble increases, the depth of the marble in the flour increases.
 - As drop height increases, the speed of the marble increases.
 - The higher the drop height, the higher the energy of the marble.
- 55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 - If the mass of the marble is double, the kinetic energy is double.
 - If the mass increases, the kinetic energy on impact increases.
 - The kinetic energy would increase for the marble with a greater mass.
- 56 [1] Allow 1 credit for C.

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

2025 Intermediate-level Science Test Map to the Standards

Question	Туре	Кеу	Points	Performance Expectation	Subscore	Percentage of Students Who Answered Correctly (P-Value)
1	Constructed Response		1	MS-PS1-4	PS	
2	Multiple Choice	А	1	MS-PS1-4	PS	
3	Multiple Choice	В	1	MS-PS1-7	PS	
4	Multiple Choice	D	1	MS-PS1-3	PS	
5	Constructed Response		1	MS-PS1-2	PS	
6	Multiple Choice	В	1	MS-ESS2-4	ESS	
7	Multiple Choice	D	1	MS-ESS3-5	ESS	
8	Constructed Response		1	MS-ESS2-6	ESS	
9	Constructed Response		1	MS-ESS3-2	ESS	
10	Multiple Choice	В	1	MS-LS2-2	LS	
11	Multiple Choice	А	1	MS-LS2-4	LS	
12	Multiple Choice	В	1	MS-ESS3-2	ESS	
13	Multiple Choice	D	1	MS-ESS3-4	ESS	
14	Multiple Choice	С	1	MS-ESS1-3	ESS	
15	Constructed Response		1	MS-ESS1-3	ESS	
16	Multiple Choice	D	1	MS-PS2-4	PS	
17	Constructed Response		1	MS-ESS1-2	ESS	
18	Multiple Choice	В	1	MS-ETS1-1		
19	Multiple Choice	D	1	MS-LS1-3	LS	
20	Constructed Response		1	MS-LS1-8	LS	
21	Multiple Choice	А	1	MS-LS1-2	LS	
22	Constructed Response		1	MS-LS1-7	LS	
23	Multiple Choice	С	1	MS-LS1-8	LS	
24	Multiple Choice	А	1	MS-PS1-2	PS	
25	Multiple Choice	С	1	MS-PS1-5	PS	
26	Constructed Response		1	MS-PS1-2	PS	
27	Multiple Choice	А	1	MS-ETS1-2		
28	Constructed Response		1	MS-ESS2-3	ESS	
29	Multiple Choice	А	1	MS-ESS2-3	ESS	
30	Multiple Choice	D	1	MS-ESS1-4	ESS	
31	Constructed Response		1	MS-ESS2-3	ESS	
37	Constructed Response		1	MS-LS3-1	LS	
38	Constructed Response		1	MS-LS3-1	LS	
39	Multiple Choice	В	1	MS-LS3-1	LS	
40	Constructed Response		1	MS-LS3-2	LS	
41	Multiple Choice	А	1	MS-LS4-5	LS	
42	Constructed Response		1	MS-PS2-3	PS	
43	Constructed Response		1	MS-PS2-3	PS	
44	Multiple Choice	А	1	MS-PS2-5	PS	
45	Multiple Choice	В	1	MS-PS2-2	PS	
46	Multiple Choice	С	1	MS-PS3-5	PS	
47	Constructed Response		1	MS-LS3-2	LS	
48	Multiple Choice	А	1	MS-LS4-2	LS	
49	Constructed Response		1	MS-LS4-6	LS	
50	Constructed Response		1	MS-LS2-4	LS	
51	Multiple Choice	D	1	MS-LS2-5	LS	
52	Multiple Choice	C	1	MS-PS3-1	PS	
53	Multiple Choice	В	1	MS-PS3-1	PS	
54	Constructed Response		1	MS-PS3-5	PS	

55	Constructed Response		1	MS-PS3-1	PS	
56	Multiple Choice	С	1	MS-PS3-2	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/standards-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).