The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, June 14, 2024 — 1:15 to 4:15 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for multiple-choice questions in Parts A, B–1, B–2, and D has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

You are to answer all questions in all parts of this examination. Record your answers for all multiple-choice questions, including those in Parts B–2 and D, on the separate answer sheet. Record your answers for all open-ended questions directly in this examination booklet. All answers in this examination booklet should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on the answer sheet or in this examination booklet as directed.

When you have completed the examination, you must sign the declaration printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice …

A four-function or scientific calculator must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part. [30]

Directions (1–30): For *each* statement or question, record on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

1 In an animal cell, all of the organelles work together to carry out

(1) photosynthesis
(2) diffusion
(3) metabolic processes
(4) information storage

2 A colony of 47,000 quaking aspen trees, all connected by one root system, is considered to be Earth's most massive organism. When the trees are stressed, shoots are sent out from the roots and develop into new trees. Every new tree in this colony would contain

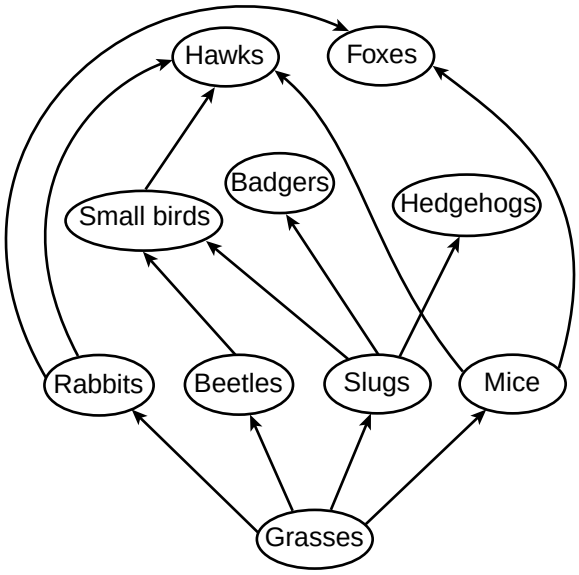
(1) the same genetic information, because it is produced asexually
(2) the same genetic information, because it is produced sexually
(3) less genetic material, since it is produced from root cells
(4) a different combination of genes, since it is produced from various roots

3 Scientists have found that different tissues in the prostate gland, a male reproductive organ, respond to different hormones. The tissues in the center area of the gland respond to testosterone and the tissues in the outer area of the gland respond to estrogen.

The cells that make up these two regions of the prostate are different in that

(1) cells in the center area produce more estrogen than cells in the outer area
(2) cells in the outer area have many testosterone receptors
(3) they contain different receptors on their cell membranes
(4) they contain different DNA sequences for the production of hormones

4 Energy transfers in a natural ecosystem are represented in the diagram below.



Which statement about this ecosystem is correct?

(1) A reduction in the number of species present would most likely upset the stability of this ecosystem.
(2) This ecosystem would not be affected if decomposers did not perform their function.
(3) This ecosystem lacks producer organisms.
(4) There are most likely more foxes than rabbits in this ecosystem.

5 The process of differentiation occurs when

(1) two different cells, a sperm cell and an egg cell, combine to produce a zygote
(2) different zygotes are formed each time that an egg and sperm unite
(3) different kinds of cells and tissues form during embryonic development
(4) two different sexes are present among the offspring, after sexual reproduction

6 Which two human systems work together to provide glucose for the cells of the body?

(1) nervous and reproductive systems
(2) nervous and respiratory systems
(3) circulatory and digestive systems
(4) circulatory and respiratory systems

7 The chart below includes structures found in a multicellular organism. Which row contains the structures that would be most numerous?

Row	Structures
(1)	organs
(2)	tissues
(3)	organelles
(4)	cells

8 Dioxin, a toxin associated with waste incineration and some plastics, has been found to directly disrupt normal gamete production in human females. Dioxin most likely affects the

(1) testes and progesterone production
(2) ovaries and estrogen production
(3) DNA in the nuclei of sperm cells
(4) pancreas and insulin production

9 A gene present only in a single plant species was found to regulate protein content. This gene could increase the protein content of other food crops in the developing world. The most likely method that scientists would use to incorporate this gene into a variety of food crops is

(1) genetic engineering
(2) selective breeding
(3) sexual reproduction between the plants with this gene and those without it
(4) deletion of the genes that limit protein production from each individual food crop plant

10 A decrease in predators within an ecosystem would lead to an increase in herbivores. The increase in herbivores would cause a *decrease* in

(1) decomposers
(2) prey
(3) consumers
(4) producers

11 The lioness (female lion) and cub shown below have similar characteristics.

Source: Kids Discover

In order for some of the genetic information in the lioness to be present in the cub, the genetic information from the mother must have been

(1) copied and present in the egg cell of the lioness
(2) combined with genetic information from another lioness
(3) contained in half of the DNA found in the sperm cells of the father
(4) able to make enzymes to produce all of the carbohydrates found in the mother

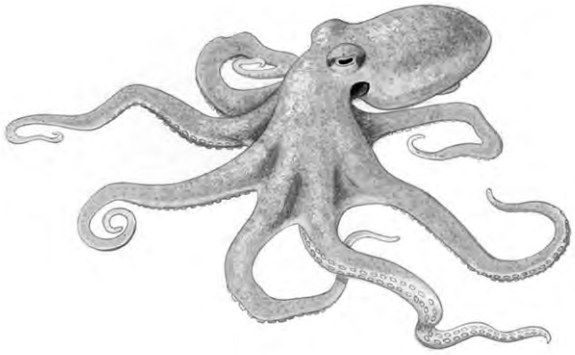
12 Which statement best describes a critical function of the placenta?

(1) Meiosis occurs in the placenta, allowing for the development and release of eggs.
(2) Blood from the mother and fetus mixes at the placenta, providing nutrients and oxygen.
(3) The placenta filters out all harmful toxins and chemicals from the mother's blood, so that they cannot reach the fetus.
(4) The exchange of oxygen and carbon dioxide occurs between the mother and developing fetus across the placenta.

13 Organisms maintain internal stability in a changing environment. To do this, they make a series of adjustments. The process of making these continual adjustments is referred to as

(1) cellular respiration
(2) active transport
(3) natural selection
(4) dynamic equilibrium

14 A species of octopus lives in the depths of the ocean where oxygen levels are low. These octopuses have specific proteins in their blood that allow for more efficient oxygen transport than in those that live in surface waters.



Source: http://www.fisheat.it/octopus-octopus-vulgaris/

Which statement best explains the presence of these proteins in the octopuses living deep in the ocean?

(1) Migration to warmer and shallower ocean water favored the formation of the specific proteins.
(2) Octopuses that had the specific proteins were able to survive and reproduce in the deep water environment and passed the trait on to future generations.
(3) When some octopuses migrated to a deeper environment, they needed to produce new proteins so that their blood could carry more oxygen.
(4) Mutations occurred in the body cells of the octopuses, which resulted in the specific proteins being produced and passed on to their offspring.

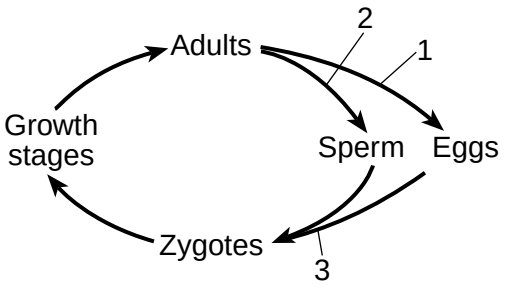
15 Tissue engineering is being developed as a technology that would use laboratory-grown tissues to replace diseased or damaged human body parts, such as hearts and kidneys. In order to build these new body parts, scientists would start by

(1) assembling molecules directly into tissues that can make body systems
(2) making organelles and using the organelles to develop organs
(3) engineering body systems in order to develop organelles for transplant
(4) growing cells to develop tissues and then growing these tissues to form an organ

16 People with cystic fibrosis have decreased levels of some digestive enzymes in their small intestines. It is essential that they take enzyme supplements in order to prevent malnutrition. These enzymes are an important part of the digestive process because they

(1) break down foods so that nutrients can be absorbed and used
(2) contain vitamins and other nutrients necessary for a healthy diet
(3) allow the person to synthesize large, inorganic nutrient molecules
(4) are the building blocks of carbohydrates and other nutrient molecules

17 A reproductive cycle is illustrated below.



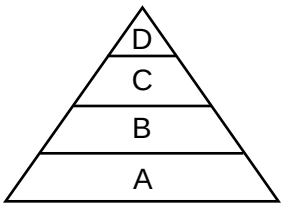
Which statement about this reproductive cycle is correct?

(1) Mutations that occur during processes 1 and 2 will not be passed on to offspring.
(2) Exact copies of the parents are produced, which leads to a stable population.
(3) Sorting and recombining of genes occurs, which leads to new genetic combinations.
(4) The three processes result in offspring with half as much genetic information as the adults.

18 Kidney-transplant surgery places a healthy kidney from one person into the body of another. The body will often produce substances that work against this transplanted organ. The system most directly involved in attacking the transplanted kidney is the

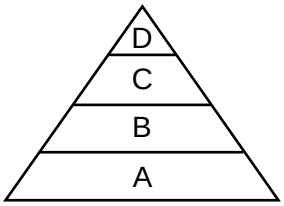
(1) excretory system
(2) nervous system
(3) circulatory system
(4) immune system

19 An energy pyramid for a forest ecosystem is represented below. The four levels (*A*-*D*) represent different types of organisms in the ecosystem.



Which numbered column in the chart below contains four terms that correctly identify the most likely types of organisms that could be found at each of the four levels in the pyramid?

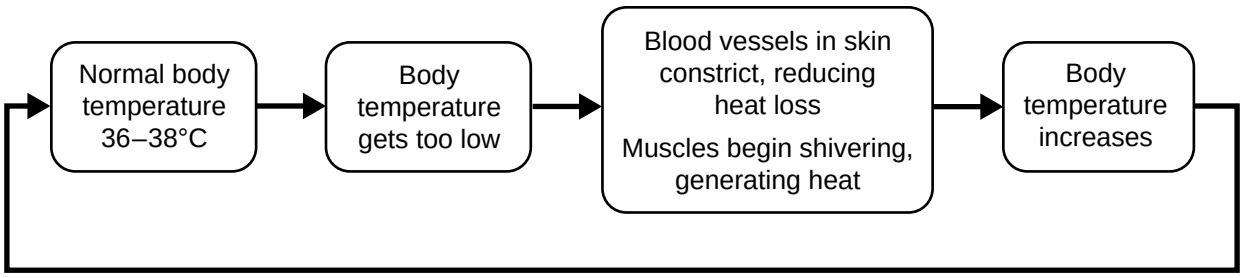
Pyramid Levels



Types of Organisms

(1)	(2)	(3)	(4)
carnivores	carnivores	heterotrophs	producers
heterotrophs	carnivores	autotrophs	carnivores
producers	herbivores	herbivores	herbivores
herbivores	producers	producers	heterotrophs

20 The diagram below shows information about human body temperature regulation.



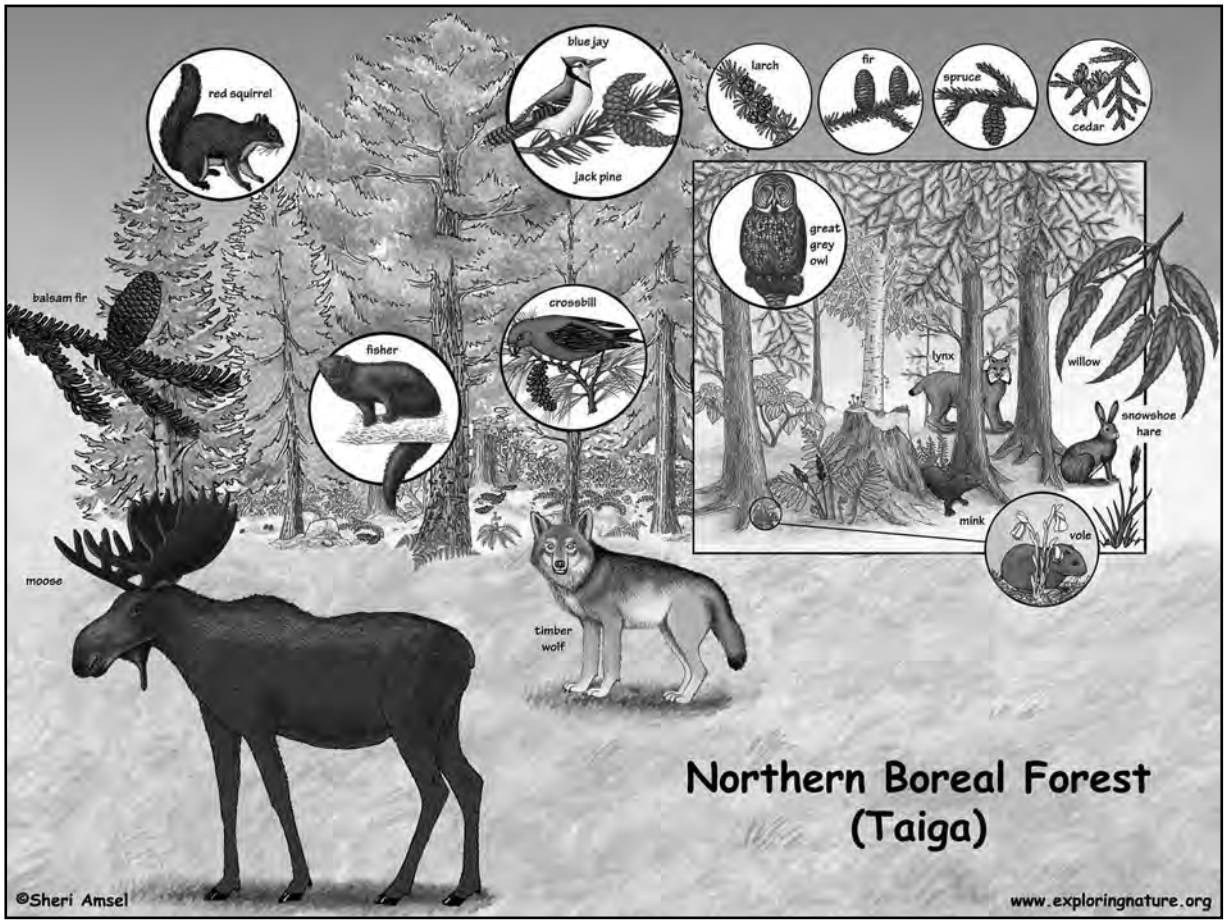
These events can be best described as an example of

(1) a feedback mechanism that maintains homeostasis
(2) a cycle that regulates cellular communication
(3) an immune system response to increasing heart rate
(4) a body system regulating hormone production

21 The World Wildlife Federation's recent report indicated that there has been a 60% decline in the size of monitored wildlife populations in just over 40 years. The most likely factor contributing to this decline was

(1) animals reproducing successfully
(2) the destruction of many natural habitats
(3) passing environmental protection laws
(4) the introduction of native species into habitats

22 An Adirondack Mountain ecosystem is represented below.

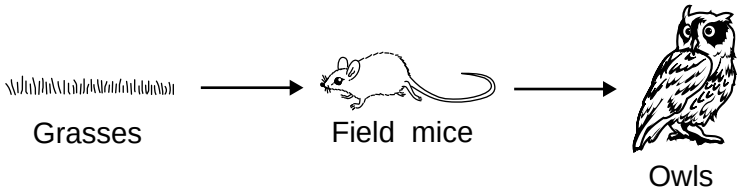


Source: https://www.exploringnature.org/db/view/1709

An abiotic factor in this ecosystem is the

(1) pH of the soil where the trees grow
(2) number of deer of reproductive age
(3) different species of grass present
(4) balance between predators and prey

23 A partial food chain is represented below.



A student observed owls hunting mice in a field. Some chemicals from the waste products of the owls were made available to be absorbed by the roots of the grasses due to the action of

(1) autotrophs
(2) carnivores
(3) herbivores
(4) decomposers

24 Which two terms are opposite processes?

(1) autotrophic nutrition and photosynthesis
(2) asexual reproduction and cloning
(3) digestion and synthesis
(4) natural selection and evolution

25 Which human activity would most likely deplete finite resources?

(1) recycling of aluminum and paper
(2) protection of wildlife habitats
(3) uncontrolled population growth
(4) regulations that reduce industrial pollution

26 Macaques are a species of monkey. They normally reproduce sexually, but, in January 2018, scientists cloned two baby macaques from a single body cell.

Source: https://www.sciencenews.org/article/baby-macaques-primates-clones-dolly-sheep

These monkeys are genetically

(1) identical to each other, but different from the donor of the body cell
(2) different from each other, but identical to the donor of the body cell
(3) identical to each other and to the donor of the body cell
(4) different from each other and from the donor of the body cell

27 Which event would most likely be the immediate result of significantly lowering the oxygen concentration in a freshwater lake?

(1) a decrease in the number of fish
(2) an increase in the number of plants
(3) an increase in biodiversity
(4) a decrease in water temperature

28 Scientists have modified papayas to be resistant to the papaya ringspot virus and to decrease the time that it takes for them to ripen. These modifications

(1) may cause papayas to ripen too slowly, causing loss of revenue
(2) are passed to any organism that eats them, making the organism resistant to the virus
(3) are an example of using agricultural technologies to increase farm yields
(4) could spread ringspot virus throughout the entire ecosystem

29 Vaccinated individuals are protected from disease because their bodies have been stimulated to

(1) produce antibodies against specific pathogens
(2) synthesize antigens against harmful microbes
(3) make fewer white blood cells during infection
(4) manufacture more enzymes to react to microbes

30 A species of predatory wasp is introduced to control an insect pest. A possible *negative* consequence of this action is that the new predatory wasp may

(1) limit the population of the insect pest
(2) prey on beneficial insects
(3) disrupt mineral availability in the ecosystem
(4) cause an increase in pesticide-resistant plants

Part B–1

Answer all questions in this part. [13]

Directions (31–43): For *each* statement or question, record on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

Base your answers to questions 31 and 32 on the information below and on your knowledge of biology.

Mercury Levels in Various Fish or Seafood Types

Industrialization has contributed to unsafe levels of mercury compounds building up in aquatic ecosystems, including in the tissues of many predatory fish species. As a result, many people have concerns about eating any seafood. The mercury, at relatively high levels, can be especially harmful during development of a fetus and of young children. It can also affect adult health in various ways.

However, seafood is also an important part of a healthy diet. The omega-3 fats in seafood are essential to the proper functioning of the circulatory system. They are also important for optimal development of a baby's brain and nervous system.

The table below contains data about mercury levels in several kinds of seafood.

Fish or Seafood Type	**Mercury Content** (ppm/oz.)
Swordfish	0.995
King mackerel	0.73
Cod	0.11
Trout	0.07
Halibut	0.024
Tilapia	0.013
Shrimp	0.009

Source: Adapted from www.zmescience.com

31 Based on the information given, which statement concerning the eating of fish and seafood is most accurate?

(1) People should avoid eating seafood because the negative effects of the mercury in seafood are far worse than any benefits that eating seafood may provide. Even shrimp and tilapia contain high levels of mercury.

(2) The normal development of a baby's nervous system requires that the mother be more concerned with eating enough seafood and less concerned with the side effects of higher levels of mercury on the child.

(3) Eating certain selected species of seafood can provide health benefits without the negative effects of high mercury intake.

(4) It is important that pregnant women eat a regular diet of seafood, including swordfish, halibut, and cod.

32 Which statement is best supported by the information provided about the levels of mercury present in seafood?

(1) Human activities do not affect mercury levels in fish species.

(2) Future generations can be affected by choices made by past and present generations.

(3) Fish that consume plants have the highest levels of mercury compounds.

(4) If people stop eating fish, then the mercury levels in fish will decrease.

33 Grasshopper mice feed on bark scorpions, but, unlike other mice, grasshopper mice are unaffected by the painful venom of the scorpion. Scientists have determined that these mice have one amino acid difference in their pain receptors, which causes the receptor to function differently and prevents feeling the pain associated with the scorpion venom. This change in protein function was originally caused by a change in

(1) molecular bases located in the nucleus
(2) fat molecules in the cell membrane
(3) the amino acids in the DNA
(4) the genes located in the protein

34 Certain organisms living deep in the ocean can obtain energy from inorganic compounds that flow out of volcanic vents. They can use this energy to synthesize energy-rich organic compounds.

Which row in the chart below correctly pairs an organism that performs a similar function in land environments with the process involved?

Row	Organism	Process
(1)	small mammal	respiration
(2)	grasses	photosynthesis
(3)	small mammal	photosynthesis
(4)	grasses	respiration

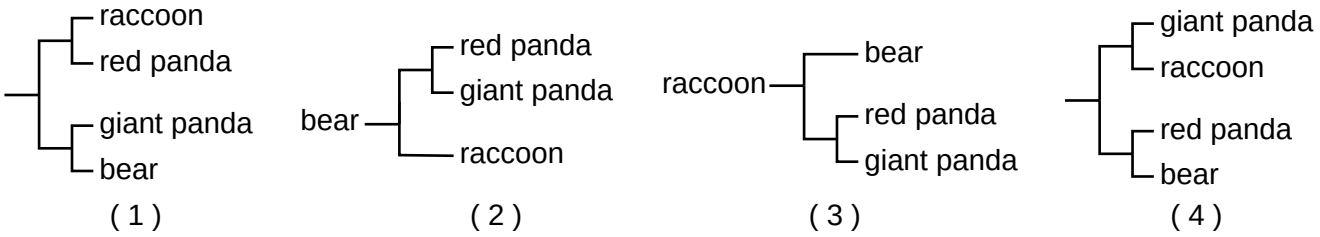
35 Scientists are concerned about the decreasing numbers in the populations of Atlantic salmon along the east coast of North America due to overfishing and changes in their breeding environments. Some businesses have developed farm-raised populations of certain varieties of salmon. Large, farm-raised populations have a limited genetic diversity as compared to wild-caught salmon.

Which row in the chart below correctly pairs possible effects of fish farming?

Row	Negative Effect of Fish Farming	Positive Effect of Fish Farming
(1)	Loss of biodiversity among farmed fish	Increased sales of fish, a food source
(2)	Increased sales of fish, a food source	Limited genetic diversity in salmon population
(3)	Loss of biodiversity in wild fish	Decreased population size
(4)	Increased biodiversity	Increased population size

36 DNA studies have shown that bears and raccoons evolved from a common ancestor about 50 million years ago. Giant pandas evolved from a more recent ancestor that was related to bears. The red panda evolved from a more recent ancestor that was related to raccoons.

Which evolutionary tree best represents these sequences of events?



37 Researchers studying water fleas (tiny organisms that live in fresh water) have noticed that the appearance of the water flea follows a pattern, as seen in the table below.

The Effect of Predator Type on Water Flea Appearance

Type of predator found in water flea environment	No predator	Stickleback fish	Backswimmer bug
Water flea appearance (Not drawn to scale)			

Source: https://www.livescience.com/55297-how-water-fleas-grow-body-armor.html

If all three water fleas are genetically identical, which statement best explains why the three water fleas have different appearances?

(1) Random alterations of genes occur in water fleas when they eat different foods.
(2) Predators in the water flea's environment cause mutations in the water flea.
(3) Genes are not involved in the appearance of these water fleas.
(4) Water flea gene expression can be influenced by the type of predator present in their environment.

Base your answers to questions 38 and 39 on the information below and on your knowledge of biology.

Mitochondria Inherited from Father

It was widely accepted that humans inherit their mitochondria only from their mothers. In 2002, an individual suffering from fatigue and muscle pain was found to have a mutation in his mitochondrial DNA. DNA sequencing of family members revealed that he had inherited the mutated mitochondria from his father. Since 2002, evidence of additional cases of children inheriting mitochondrial mutations from their fathers has been found.

38 The discovery that humans can inherit mitochondria from their fathers illustrates the concept that

(1) inquiry does not judge the reliability of sources
(2) experiments without controls are not valid
(3) scientific explanations are tentative and subject to change
(4) advancements in technology usually make scientific theories invalid

39 The most likely explanation for why children who inherited mutated mitochondria suffer fatigue and muscle pain is that their mitochondria fail to

(1) provide the antigens needed to fight the mutated DNA
(2) regulate the transport of nutrients to the muscle cells
(3) synthesize the starch needed by the muscles
(4) release enough energy for cells to function properly

Base your answers to questions 40 and 41 on the information and photo below and on your knowledge of biology.

Burmese pythons are an invasive species in the Everglades National Park. In 2010, there was a rare "hard freeze," which residents hoped would eliminate these pests that were originally from very warm areas in Asia. Roughly 40% to 90% of the pythons were killed by the freeze event. Since not all of the pythons were killed during the freeze event, the members of the current large python population in the Everglades might differ from the members of the python population from before 2010.

Source: Associated Press, August 18, 2017

40 Which statement best describes a likely cause for the changes that might exist in the present python population?

(1) The python species needed cold-tolerant genes, and they appeared in 2010 by rapid mutation.
(2) The freeze event served as a selecting agent, and a higher percentage of the pythons existing today are cold-tolerant.
(3) Many individual pythons were unable to reproduce during the freeze event and did not pass on their cold-tolerant genes.
(4) There was no actual change in the population, and if a similar freeze event occurred again, 40-90% of the snakes would die.

41 Pythons in their native habitat often eat a large animal and then do not feed again for weeks. In the Florida Everglades, food sources are often small mammals and birds. The current large python population in Florida can be described as a species that

(1) will quickly die out because there are no appropriate food sources in their environment
(2) will develop new digestive organs as needed to succeed in the Florida Everglades
(3) has expanded only because small animals reproduce so quickly that they provide an unlimited food source
(4) has already successfully adapted to an unfamiliar environment through natural selection

Base your answers to questions 42 and 43 on the information and photo below and on your knowledge of biology.

Fishers

Fishers are mammals that prefer to live in forested areas. The fisher feeds on acorns, berries, and apples, as well as on smaller mammals and birds. They are one of the few organisms that are successful in killing and eating porcupines. Porcupines are large rodents that have sharp spines, or quills, that cover most of their body. The fisher has no natural enemies. Most fisher deaths are due to automobiles and trapping. The population has also been negatively affected by logging and road-building.

Source: www.massaudubon.org

42 Recently, new regulations have been adopted that affect the trapping of fishers. Which action would probably result in an increase in the fisher population?

(1) removing all regulations regarding fisher trapping
(2) increasing the area where fisher trapping is allowed
(3) changing the fisher trapping season from 46 to 30 days
(4) decreasing the cost of the permit needed for fisher trapping

43 Humans have negatively affected the ecosystem that fishers occupy. An altered or changed ecosystem can

(1) never recover or become stable again
(2) usually recover gradually to a point of long-term stability
(3) never recover unless there is a decrease in biodiversity
(4) usually recover quickly into the same ecosystem as it was previously

Part B–2

Answer all questions in this part. [12]

Directions (44–55): For those questions that are multiple choice, record on the separate answer sheet the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided in this examination booklet.

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

Monarch Butterfly Parasites

Monarch butterflies are in trouble! Their populations have been declining quickly in recent years due to several factors, including habitat loss, climate change, and infection by parasites.

To investigate ways to reduce this decline, some scientists studied a parasite that often infects and weakens monarch larvae (caterpillars). The larvae ingest parasite spores as they feed on milkweed plants. Once in the intestinal tract of the caterpillar, some of the spores can infect the cells of the intestine and reproduce.

The scientists collected samples of the parasite from four areas of North America where monarchs live. They found four different variations in the parasites. Scientists cloned each of the four variations of parasites in order to have enough to test with the monarch larvae.

Monarch larvae feed exclusively on milkweed plants. Two types of milkweed monarchs feed on are swamp milkweed (SM) and tropical milkweed (TM). Both kinds of plants contain chemicals known as cardenolides, but tropical milkweed has higher levels of these chemicals. These chemicals are absorbed into the tissues of the larvae as they feed on milkweed. The cardenolides give the larvae some resistance to infection by the parasites.

The scientists conducted experiments to determine how the harm caused by these parasites may be affected by the amounts of cardenolides in the two kinds of milkweed.

The monarch larvae were divided into groups. Each of the groups was fed one of the two types of milkweed and then exposed to one of the four parasite clones: E-1, E-11, F-3, or F-13.

The overall purpose of the testing was to determine whether it was the type of parasite clone or the type of plant that the larvae were fed that would have the greatest effect on the percent of caterpillars that became infected.

The data table below shows the results obtained by the scientists.

Infections Based on Type of Food Plant and Parasite Clone

Parasite Clone to Which Larvae were Exposed	Percent of Larvae Feeding on Tropical Milkweed (TM) that Became Infected	Percent of Larvae Feeding on Swamp Milkweed (SM) that Became Infected
E-1	83	100
E-11	88	92
F-3	75	100
F-13	86	100

Directions (44–45): Using the information in the data table, construct a bar graph on the grid provided, following the directions below.

44 Mark an appropriate scale on the axis labeled "Percent of Monarch Larvae Infected." [1]

45 Construct a bar graph following the directions below. [1]

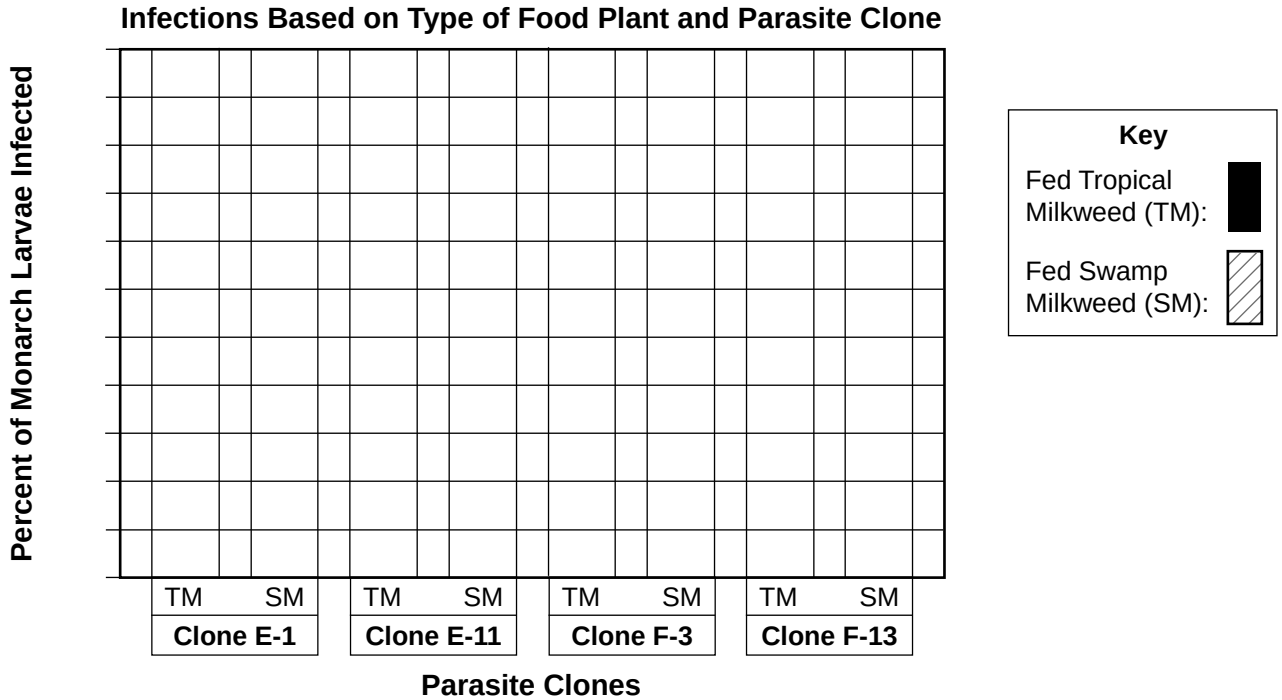
- Construct vertical bars in the area provided on the grid to represent the results for each parasite clone for the larvae that were fed tropical milkweed (TM) in the areas marked TM.

Shade the TM bars in black, as shown: 

- Construct vertical bars in the area provided on the grid to represent the results for each parasite clone for the larvae that were fed swamp milkweed (SM) in the areas marked SM.

Shade the SM bars with diagonal lines, as shown: 

44–45



46 State whether the types of milkweed that the larvae were fed made a difference in whether or not the larvae became infected. Support your answer. [1]

Note: The answer to question 47 should be recorded on your separate answer sheet.

47 Which row in the chart below correctly identifies the average percent of infection of the larvae that ate tropical milkweed and the average percent of infection of the larvae that ate swamp milkweed?

Row	Average Percent Infected that Ate Tropical Milkweed (TM)	Average Percent Infected that Ate Swamp Milkweed (SM)
(1)	75	92
(2)	88	100
(3)	83	98
(4)	98	83

48 Describe how the results of the experiment might have been different if very few spores of parasite clone F-13 were placed on the milkweed leaves, compared with the number of spores placed on leaves for the other three clones. [1]

Base your answers to questions 49 through 51 on the information below and on your knowledge of biology.

Frogsicles: Frozen but Still Alive

The wood frog has the amazing ability to survive winter in a frozen state. Ice crystals touching the frog can trigger the freezing of its body fluids. Most of the water moves out of their cells and into body cavities, where it turns into solid ice. Their cells are protected from dehydration and frostbite by the antifreezing effect of their cells absorbing extremely high concentrations of sugar. When these frogs freeze, they stop breathing, their heart stops beating, and they enter a state of dormancy that can last several months. In spring, the frogs thaw, and the excess sugar moves out of their cells. The frogs resume normal activities in less than 24 hours.

Source: https://www.anchoragepress.com/

Note: The answer to question 49 should be recorded on your separate answer sheet.

49 A wood frog's body systems' responses to ice crystals touching it in winter and to the conditions in the spring can best be explained by

(1) the differentiation of mature body cells during development
(2) a response of their cells to changing environmental conditions
(3) the enzymatic breakdown of water as the frog freezes
(4) a response of the immune system to excess sugar levels

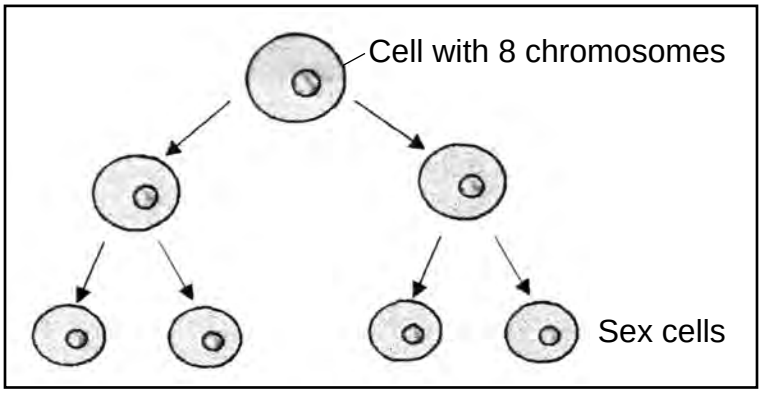
Note: The answer to question 50 should be recorded on your separate answer sheet.

50 Which scientific question could lead to an investigation to help determine the stimulus that causes wood frogs to thaw in the spring?

(1) Do the frogs thaw if the air temperature remains below freezing all winter?
(2) Does the changing length of daylight or warming cause the frogs to thaw?
(3) Do the frogs get hungry when they are frozen?
(4) Does the weight of the frog change after they freeze?

51 Identify *one* structure present in the cells of these frogs that plays a role in the rapid removal of water and the absorption of high concentrations of sugar. Justify your answer. [1]

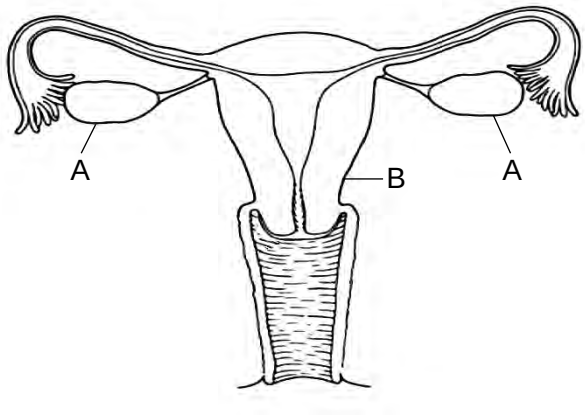
52 A cellular process that produces sex cells in fruit flies is represented in the diagram below.



Based on the information in the diagram, how many chromosomes will be present in each of the sex cells of the fruit fly? [1]

_____ **chromosomes**

53 The model below represents the reproductive system of human females.



Describe the roles of structures *A* and *B* in the production of offspring. [1]

A: _____

B: _____

Base your answers to questions 54 and 55 on the information below and on your knowledge of biology.

A student placed four different test tubes in a water bath at 37°C, human body temperature. The contents of the test tubes are listed below. Two of them contain a human enzyme.

Test Tube	Contents
1	ground meat, water, protein-digesting enzyme
2	bread, water, starch-digesting enzyme
3	ground meat, water
4	bread, water

After 15 minutes, the student tested the contents of each tube for the presence of both amino acids and glucose. He obtained the results shown in the table below.

Test Tube Number	Indicator for Amino Acids	Indicator for Glucose
1	positive	negative
2	negative	positive
3	negative	negative
4	negative	negative

54 Describe the results that the student would most likely obtain if he ran the same experiment again but placed the test tubes in a hot water bath at 65°C for 15 minutes. Justify your answer. [1]

55 Identify the purpose of Test Tubes 3 and 4 in this experiment. Justify your answer. [1]

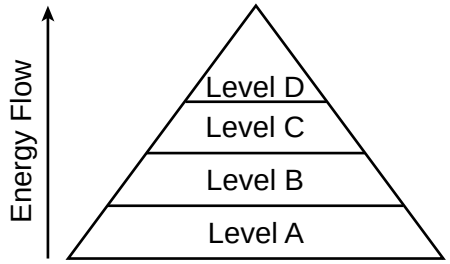
Part C

Answer all questions in this part. [17]

Directions (56–72): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 56 and 57 on the information below and on your knowledge of biology.

The process of photosynthesis is responsible for providing the energy necessary to sustain most ecosystems on Earth. The flow of energy in an ecosystem is represented in the diagram below.



56 Identify the source of energy for an ecosystem and describe how it is transferred from one level in the system to the next. [1]

The chart below is a summary of the net number of atoms in the molecules used and produced during the process of photosynthesis.

Type of Atom	Number of Atoms in the Molecules Used for Photosynthesis	Number of Atoms in the Molecules Produced by Photosynthesis
Carbon (C)	6	6
Hydrogen (H)	12	12
Oxygen (O)	18	18

57 A student claimed that there is no gain or loss of matter during photosynthesis. Provide evidence from the data to support this claim. [1]

Base your answers to questions 58 through 61 on the information and charts below and on your knowledge of biology.

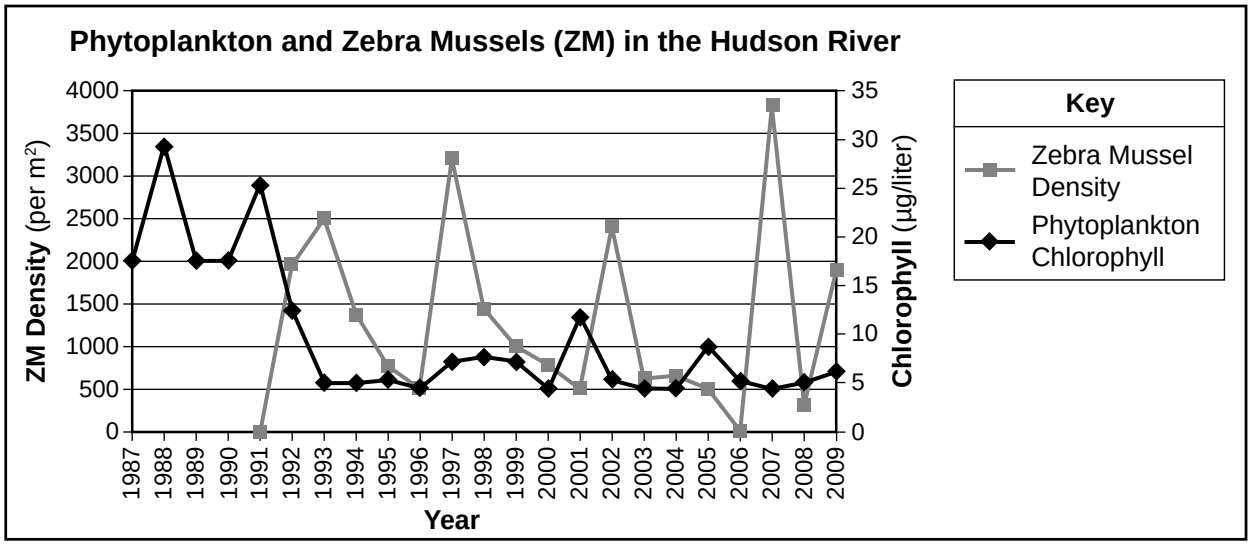
Hudson River Zebra Mussels

Researchers have been monitoring the effects of zebra mussels in the Hudson River. Zebra mussels are small, aquatic, clam-like animals that arrived in the United States in cargo ships traveling from Europe to the Great Lakes in the 1980s. Since waterways connect the Hudson River to the Great Lakes, zebra mussels had spread to the Hudson River by 1991. Zebra mussels can produce a million eggs per year, and the larvae drift before attaching to hard surfaces.

Mussels feed by filtering water through their gills and straining out algae, called phytoplankton, and microscopic animals. By the end of 1992, without a predator, the zebra mussels outweighed all other consumers in the river. They filtered a volume of water equal to all of the water in the river every one to four days during the summer, removing food and dissolved oxygen. Zebra mussels caused problems by clogging water pipes and damaging boats, docks, buoys, and other structures.

Graph 1 below represents data collected by the researchers. The phytoplankton levels were based on the data regarding the chlorophyll that they contained.

Graph 1



Source: Adapted from www.caryinstitute.org

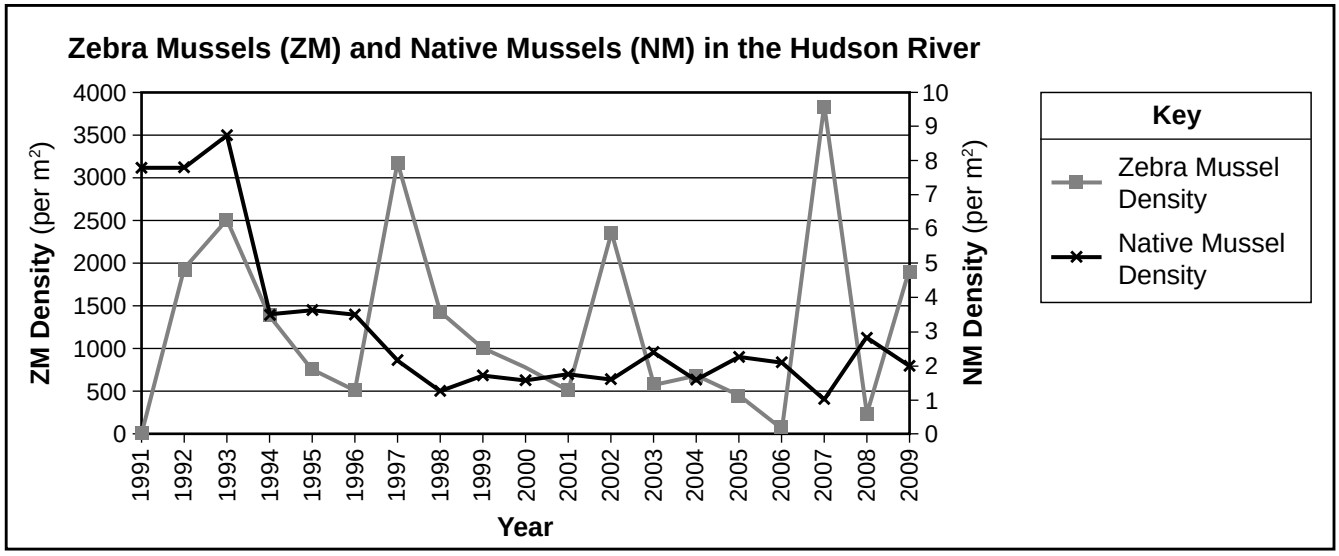
58 State *one* reason that the zebra mussels could successfully spread throughout the rivers and lakes in the U.S. [1]

59 A student made a claim that once zebra mussels were established in the Hudson River, the zebra mussel population would affect the food webs by reducing the food available for native consumer populations. Explain how the data in graph 1 could be used to support the student's claim. [1]

60 Other than reducing the food available for native populations, state *one negative* consequence of failing to keep zebra mussels out of the Great Lakes. [1]

The graph below shows changes in two mussel populations in the Hudson River.

Graph 2



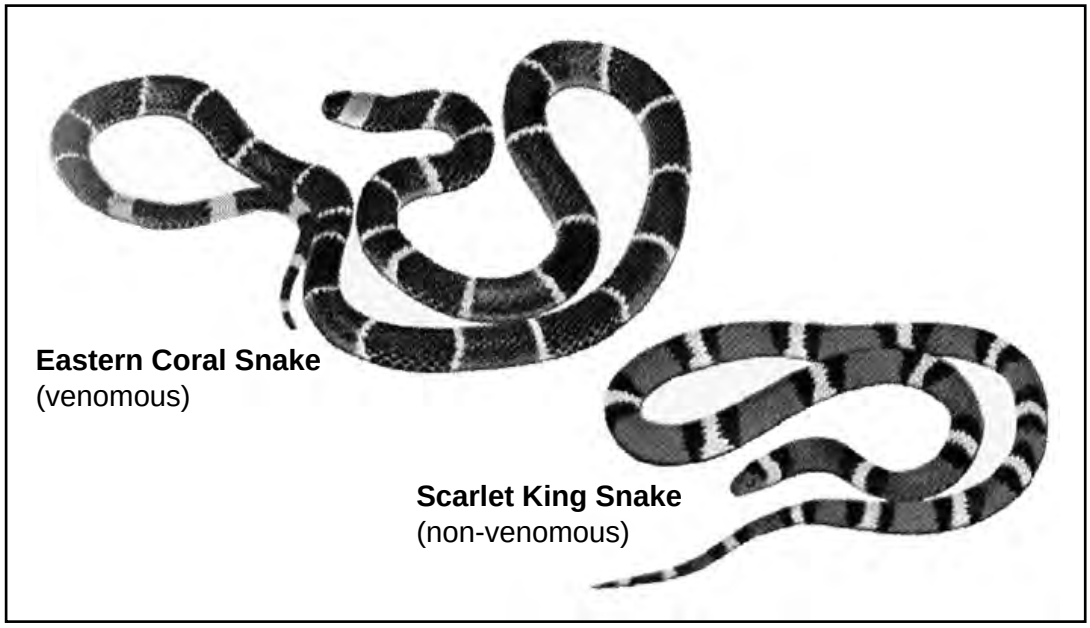
Source: Adapted from www.caryinstitute.org

61 The native mussels and zebra mussels have similar ecological roles. State *one* reason for the pattern represented by the data in Graph 2. [1]

Base your answers to questions 62 and 63 on the information and illustration below and on your knowledge of biology.

Mimicry in Snakes

Mimicry is an evolved resemblance between two species. The harmless scarlet king snake mimics the Eastern coral snake. The king snake has evolved red, yellow, and black bands that make it look very similar to the venomous coral snake. In some areas, both snakes are found together and consume some of the same organisms for food.



Source: https://www.petmd.com/sites/default/files/coral_snake.gif

62 Explain how mimicry is a benefit to the king snake species. [1]

63 Predict how the population size of king snakes might change over time *without* coral snakes in the area where they live. Justify your answer. [1]

Base your answers to questions 64 and 65 on the passage below and on your knowledge of biology.

Predators in the Adirondacks

To help keep the number of deer in check, an environmental group proposes the reintroduction of large predators, such as mountain lions, into the Adirondacks. Coyotes are a main predator of deer, especially the sick and young ones. Opponents of the proposal believe that the Adirondack deer population has been regulated by coyotes, hunting, bad winters, and land development projects. They also question the ability of the mountain lions to survive in the current Adirondack environment.

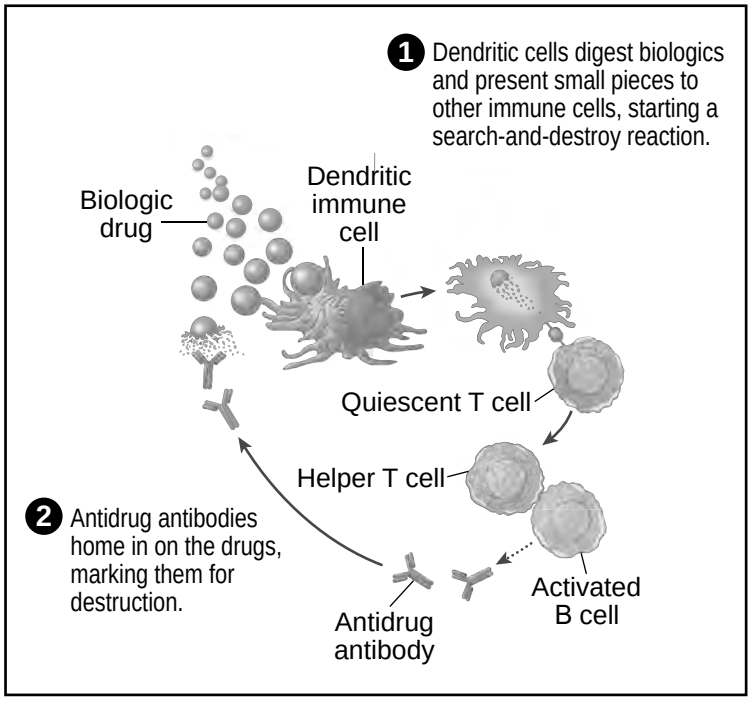
64 Describe *one* possible result of reintroducing mountain lions into the Adirondacks. [1]

65 Explain how land development projects could reduce the deer population in the Adirondacks. [1]

Base your answers to questions 66 through 68 on the information below and on your knowledge of biology.

Biologics

The newest drugs to treat deadly illnesses like cancer, autoimmune diseases, and heart disease are called biologics. Biologics are drugs that mimic naturally occurring proteins. These biologics are injected into patients. Doctors recently noticed that these drugs do not work for some patients. They developed the model below to explain why the drugs are ineffective in as many as 50% of patients.



Source: Adapted from *Scientific American*, January 2018

66 Based on the information in the model, explain why the biologic drugs are ineffective for some people. [1]

67 Explain why biologic drugs may be more effective in patients diagnosed with AIDS. [1]

68 In order to make the biologic drugs more effective, doctors experimented with coating the biologic drugs with a synthetic vaccine particle (SVP). This SVP changes the way that the immune system responds to the drug particle by blocking the production of antidrug antibodies.

Explain why a person would still have immunity to other pathogens after being exposed to these SVPs. [1]

Base your answers to questions 69 through 71 on the information below and on your knowledge of biology.

Plants Rebound in the Chesapeake Bay

Chesapeake Bay vegetation, including sea grass and freshwater plants, is an important part of the area's coastal ecosystem. These areas act as nurseries that shelter young fish and invertebrates, clean the water, and stabilize shorelines by preventing erosion.

In the 1950s, the human population greatly increased in the Bay area. As the growth continued, cities and farms were releasing large amounts of nitrogen compounds and other nutrients into the water. These nutrients had a very positive effect on the growth of small microscopic organisms, such as algae and plankton, in the Bay. As the algae continued to grow near the surface, the growth of more complex plants living deeper in the Bay decreased.

In the 1980s, state and federal regulations were passed that limited the amount of nutrients that could be present in the runoff from farms and wastewater treatment plants. As a result, underwater plants are now growing again in the Bay, and there has been a large decrease in the amount of nitrogen compounds present in the water.

69 State *one* possible reason why the rapid growth of algae in the Bay resulted in a decline in the number of complex underwater plants. [1]

70 Explain *one* specific way in which the change from more complex plants to more algae could disrupt food webs in the Bay region. [1]

71 In order to determine which nutrient had the greatest effect on the overgrowth of the algae, several types of data were collected. Identify *one* type of evidence that researchers would look for to support the conclusion that nitrogen compounds were responsible for the algae growth. [1]

Mosquitoes are insects whose bite can cause discomfort and disease in humans. In an attempt to control mosquito populations, scientists have used radiation to prevent the males from producing functional sperm.

Source: https://www.orkin.com/other/mosquitoes

72 Explain how the mosquito population can be controlled as a result of this procedure. [1]

Part D

Answer all questions in this part. [13]

Directions (73–85): For those questions that are multiple choice, record on the separate answer sheet the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided in this examination booklet.

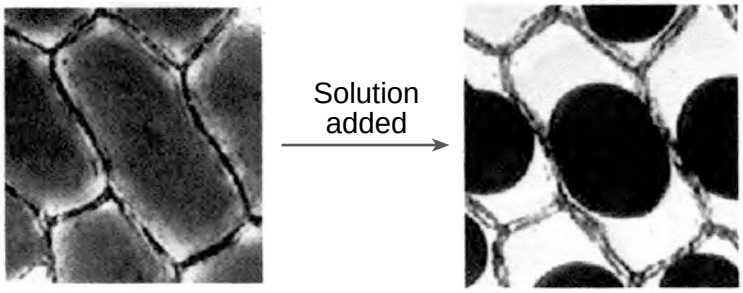
Note: The answer to question 73 should be recorded on your separate answer sheet.

73 After exercising outside on a cold day, a student noticed that his fingers were not as cold as when he started. One possible explanation for this phenomenon would be that exercising

(1) causes more sweat to be produced, which cools the body
(2) increases the blood circulation, causing body parts to feel warmer
(3) increases the breathing rate to remove waste products
(4) decreases the amount of energy needed, so the fingers feel warmer

Note: The answer to question 74 should be recorded on your separate answer sheet.

74 The diagram below represents changes in some red onion cells being observed with a compound microscope after a particular solution was added.



Which statement best explains the changes observed?

(1) Distilled water was added to the slide and diffusion caused water to move out of the onion cells.
(2) Salt solution was added to the slide and active transport caused water to move out of the onion cells.
(3) Distilled water was added to the slide and active transport caused water to move out of the onion cells.
(4) Salt solution was added to the slide and diffusion caused water to move out of the onion cells.

Note: The answer to question 75 should be recorded on your separate answer sheet.

Base your answer to question 75 on the information below and on your knowledge of biology.

A homeowner observed different types of birds feeding at bird feeders filled with an assortment of food.

75 Competition arises most often when two birds have similar

(1) enzymes
(2) niches
(3) habitats
(4) ecosystems

Base your answers to questions 76 and 77 on the information below and on your knowledge of biology.

To demonstrate some of the steps involved in the analysis of DNA, a student was given two paper strips with single-stranded DNA sequences recorded on them. The two strips are illustrated below.

Strip 1: TTACCGGATTACCCGATTACCGGATAATCTCCGGATATCCGTT

Strip 2: TTAGGCTTAAGCTAATGGCCTAATAGTTAATACGGTAATACAT

The student cut between the C and G in each of the shaded CCGG sequences in strip 1 and between the As in the shaded TAAT sequences in strip 2. Both sets of DNA fragments were arranged on a paper model of a gel.

Note: The answer to question 76 should be recorded on your separate answer sheet.

76 The results of this type of DNA analysis are often used to help determine

(1) if two organisms contain the same carbohydrate molecule
(2) the number of DNA molecules in an organism
(3) if the DNA codes for the synthesis of fat molecules in all cells of an organism
(4) the evolutionary relationship between two organisms from different species

77 Identify the specific type of molecules performing the action of cutting the DNA samples. [1]

78 In the *Making Connections* lab, for trial 1, students squeezed a clothespin as many times as they could in a minute. State *one* specific biological reason why their muscle cells "got tired" during the second trial. [1]

Base your answers to questions 79 and 80 on the information below and on your knowledge of biology.

An experiment was conducted to measure the effect of exercise on pulse rate for a group of high school students. The table below shows the results.

Student Tested	Pulse Rate at Rest	Pulse Rate After Exercising
1	70	92
2	52	87
3	80	118
4	72	104
5	60	96
6	66	124

79 Explain why the resting pulse rates for these students were *not* all the same. [1]

80 Explain how the increased pulse rate as a result of exercising helps the body maintain homeostasis. [1]

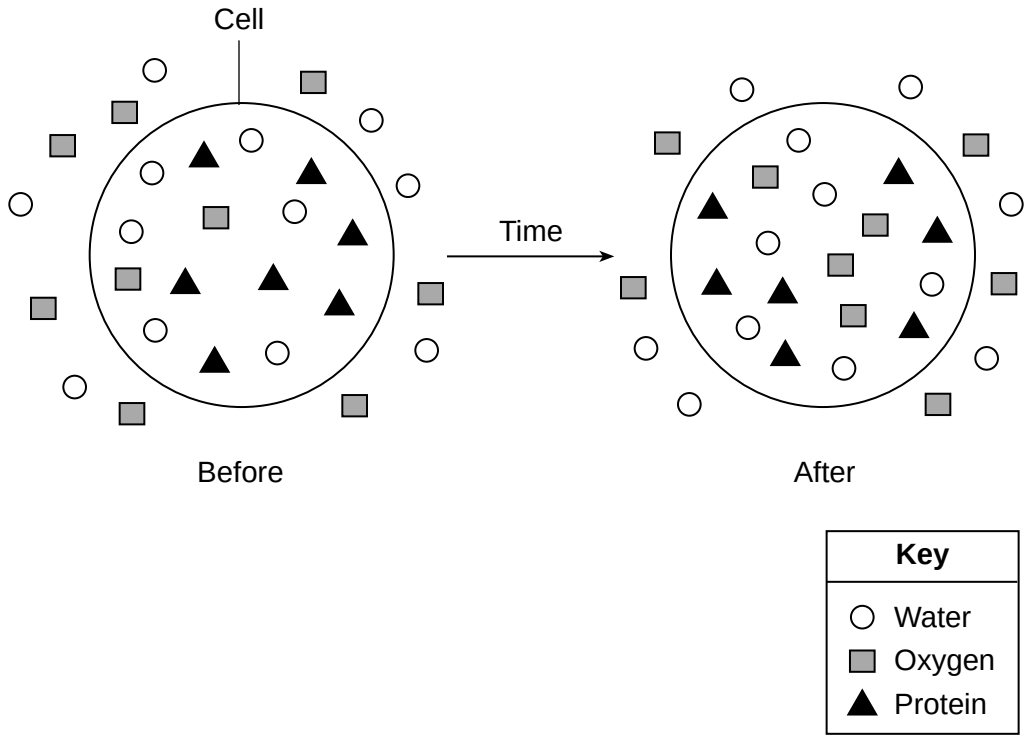
Note: The answer to question 81 should be recorded on your separate answer sheet.

Shown below are two tools that students used as models of finch beaks during the *Beaks of Finches* lab investigation.

81 Which important concept of natural selection do these model beaks represent?

(1) dynamic equilibrium
(2) limiting factor
(3) environment
(4) variation

Base your answers to questions 82 and 83 on the diagram below and on your knowledge of biology. The diagram shows the changes in distribution of certain molecules inside and outside of an artificial cell over a period of time.



Note: The answer to question 82 should be recorded on your separate answer sheet.

82 The change in the distribution of oxygen molecules was most likely due to

(1) membrane receptors
(2) active transport
(3) synthesis
(4) diffusion

83 State *one* possible reason why the proteins did *not* move out of the cell. [1]

84 Other than beak adaptations, identify *one* characteristic that would help finches on an island compete successfully, and explain specifically why that characteristic would make them successful. [1]

85 During a hurricane, a large raft made up of tree trunks, branches, and other vegetation was washed off the coast of an island. A few days later, this raft washed up on the shore of a new island a few miles away. Along with the vegetation present in the raft, there were about a dozen lizards that were native to the original island, but their species was not living on the new island. A similar species of lizard did live there and had for many years.

Once the lizards arrived at the new island, they found food and other resources that they needed to survive.

Describe *one* specific way that the newly arriving lizards might affect the population of lizards already present on the new island. [1]

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LIVING ENVIRONMENT

The State Education Department / The University of the State of New York

Regents Examination in Living Environment – June 2024

Scoring Key: Parts A, B-1, B-2 and D (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Living Environment	June '24	**1**	**3**	MC	1	1
Living Environment	June '24	**2**	**1**	MC	1	1
Living Environment	June '24	**3**	**3**	MC	1	1
Living Environment	June '24	**4**	**1**	MC	1	1
Living Environment	June '24	**5**	**3**	MC	1	1
Living Environment	June '24	**6**	**3**	MC	1	1
Living Environment	June '24	**7**	**3**	MC	1	1
Living Environment	June '24	**8**	**2**	MC	1	1
Living Environment	June '24	**9**	**1**	MC	1	1
Living Environment	June '24	**10**	**4**	MC	1	1
Living Environment	June '24	**11**	**1**	MC	1	1
Living Environment	June '24	**12**	**4**	MC	1	1
Living Environment	June '24	**13**	**4**	MC	1	1
Living Environment	June '24	**14**	**2**	MC	1	1
Living Environment	June '24	**15**	**4**	MC	1	1
Living Environment	June '24	**16**	**1**	MC	1	1
Living Environment	June '24	**17**	**3**	MC	1	1
Living Environment	June '24	**18**	**4**	MC	1	1
Living Environment	June '24	**19**	**2**	MC	1	1
Living Environment	June '24	**20**	**1**	MC	1	1
Living Environment	June '24	**21**	**2**	MC	1	1
Living Environment	June '24	**22**	**1**	MC	1	1
Living Environment	June '24	**23**	**4**	MC	1	1
Living Environment	June '24	**24**	**3**	MC	1	1
Living Environment	June '24	**25**	**3**	MC	1	1
Living Environment	June '24	**26**	**3**	MC	1	1
Living Environment	June '24	**27**	**1**	MC	1	1
Living Environment	June '24	**28**	**3**	MC	1	1
Living Environment	June '24	**29**	**1**	MC	1	1
Living Environment	June '24	**30**	**2**	MC	1	1
Living Environment	June '24	**31**	**3**	MC	1	1
Living Environment	June '24	**32**	**2**	MC	1	1
Living Environment	June '24	**33**	**1**	MC	1	1
Living Environment	June '24	**34**	**2**	MC	1	1
Living Environment	June '24	**35**	**1**	MC	1	1
Living Environment	June '24	**36**	**1**	MC	1	1
Living Environment	June '24	**37**	**4**	MC	1	1
Living Environment	June '24	**38**	**3**	MC	1	1
Living Environment	June '24	**39**	**4**	MC	1	1
Living Environment	June '24	**40**	**2**	MC	1	1
Living Environment	June '24	**41**	**4**	MC	1	1
Living Environment	June '24	**42**	**3**	MC	1	1
Living Environment	June '24	**43**	**2**	MC	1	1
Living Environment	June '24	**47**	**3**	MC	1	1
Living Environment	June '24	**49**	**2**	MC	1	1
Living Environment	June '24	**50**	**2**	MC	1	1
Living Environment	June '24	**73**	**2**	MC	1	1
Living Environment	June '24	**74**	**4**	MC	1	1
Living Environment	June '24	**75**	**2**	MC	1	1
Living Environment	June '24	**76**	**4**	MC	1	1
Living Environment	June '24	**81**	**4**	MC	1	1
Living Environment	June '24	**82**	**4**	MC	1	1

Regents Examination in Living Environment – June 2024

Scoring Key: Parts B-2, C, and D (Constructed Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Living Environment	June '24	**44**	–	CR	1	1
Living Environment	June '24	**45**	–	CR	1	1
Living Environment	June '24	**46**	–	CR	1	1
Living Environment	June '24	**48**	–	CR	1	1
Living Environment	June '24	**51**	–	CR	1	1
Living Environment	June '24	**52**	–	CR	1	1
Living Environment	June '24	**53**	–	CR	1	1
Living Environment	June '24	**54**	–	CR	1	1
Living Environment	June '24	**55**	–	CR	1	1
Living Environment	June '24	**56**	–	CR	1	1
Living Environment	June '24	**57**	–	CR	1	1
Living Environment	June '24	**58**	–	CR	1	1
Living Environment	June '24	**59**	–	CR	1	1
Living Environment	June '24	**60**	–	CR	1	1
Living Environment	June '24	**61**	–	CR	1	1
Living Environment	June '24	**62**	–	CR	1	1
Living Environment	June '24	**63**	–	CR	1	1
Living Environment	June '24	**64**	–	CR	1	1
Living Environment	June '24	**65**	–	CR	1	1
Living Environment	June '24	**66**	–	CR	1	1
Living Environment	June '24	**67**	–	CR	1	1
Living Environment	June '24	**68**	–	CR	1	1
Living Environment	June '24	**69**	–	CR	1	1
Living Environment	June '24	**70**	–	CR	1	1
Living Environment	June '24	**71**	–	CR	1	1
Living Environment	June '24	**72**	–	CR	1	1
Living Environment	June '24	**77**	–	CR	1	1
Living Environment	June '24	**78**	–	CR	1	1
Living Environment	June '24	**79**	–	CR	1	1
Living Environment	June '24	**80**	–	CR	1	1
Living Environment	June '24	**83**	–	CR	1	1
Living Environment	June '24	**84**	–	CR	1	1
Living Environment	June '24	**85**	–	CR	1	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2024 Regents Examination in Living Environment** will be posted on the Department's web site at https://www.nysedregents.org/LivingEnvironment/ on the day of the examination. Conversion charts provided for the previous administrations of the Living Environment examination must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, June 14, 2024 — 1:15 to 4:15 p.m., only

RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Regents Examination in Living Environment. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

Allow 1 credit for a correct response to each item.

At least two science teachers must participate in the scoring of the Part B–2, Part C, and Part D open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

Students' responses must be scored strictly according to the Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. Do not attempt to correct the student's work by making insertions or changes of any kind. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Friday, June 14, 2024. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

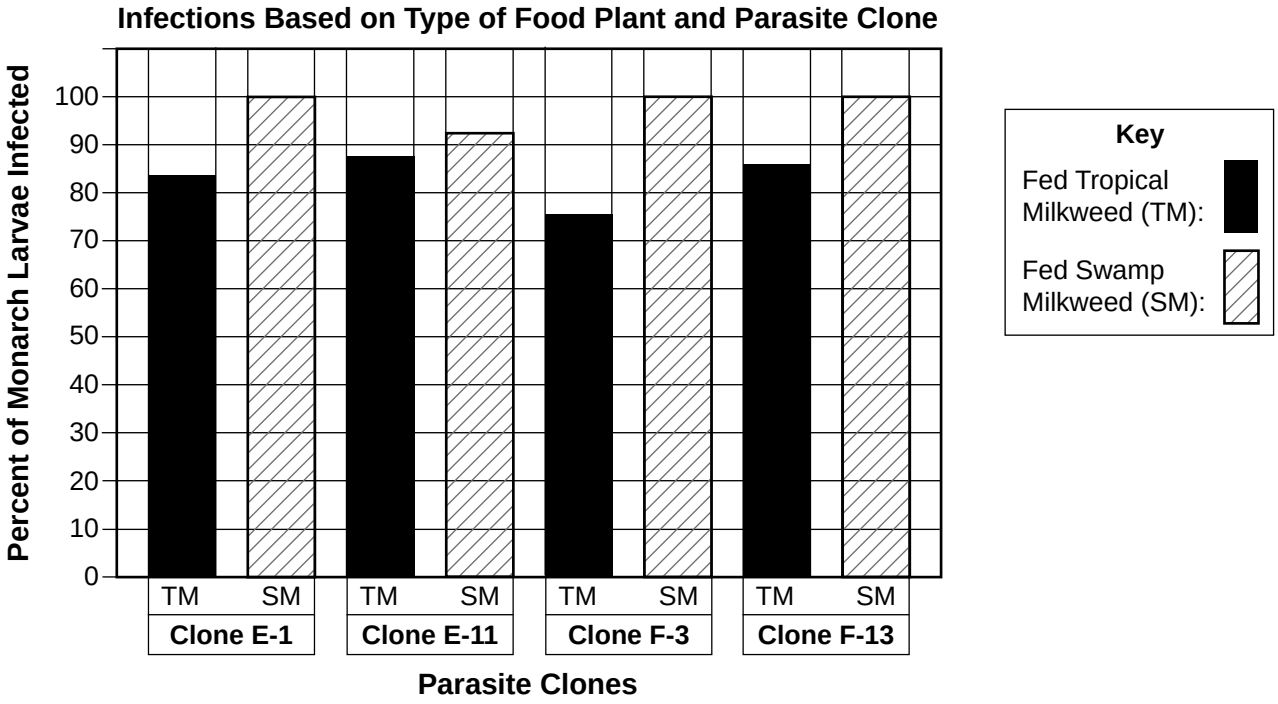
Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Part B–2

44 [1] Allow 1 credit for marking an appropriate scale on the axis labeled "Percent of Monarchs Infected."

45 [1] Allow 1 credit for constructing vertical bars to represent the results for each parasite clone for the larvae grown on the two types of milkweed plants.

Example of a 2-credit graph for questions 44-45:



Note: Allow credit if the correct data are clearly represented, even if the bars are *not* shaded in. An appropriate scale only needs to include the data range in the data table.

46 [1] Allow 1 credit for stating whether the types of milkweed that the larvae were fed made a difference in whether or not the larvae became infected and supporting the answer. Acceptable responses include, but are not limited to:

— The larvae that ate swamp milkweed (SM) almost all became infected while those that ate the tropical milkweed (TM) had lower infection rates overall.

— Nearly all of the larvae that fed on swamp milkweed became infected, only 75% to 88% of those that ate the tropical milkweed were infected.

— The different types of milkweed did not make a large difference because the range was not significant/large.

47 3

48 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Fewer larvae in that group would have been infected, since they may not have ingested any spores.

— It would look like the F-13 clones were less able to infect the larvae because some larvae may not have eaten the spores.

— There would be fewer larvae infected by the F-13 clones than by the other three clones, since there was less chance that they would eat any of the spores as they fed on the milkweed leaves.

— The larvae may not have eaten enough of the spores of clone F-13 to get infected.

— If only a few spores are needed for infection, there may be no change.

49 2

50 2

51 [1] Allow 1 credit for identifying *one* structure in the cells of these frogs that plays a role in the rapid removal of water and absorption of high concentrations of sugar and justifying the answer. Acceptable responses include, but are not limited to:

— cell membrane, because it is responsible for the transport of substances into and out of the cell

— cell membrane, because diffusion and active transport take place there

— cell membrane, because it controls which molecules enter and leave the cell

— mitochondria, because they provide the ATP/energy for active transport

52 [1] Allow 1 credit for 4.

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

— Structure *A* produces the egg/gamete and structure *B* provides a place for the embryo/fetus to develop.

— *A*: produce eggs *B*: where fetus develops

— *A*: produces hormones *B*: where the placenta forms

54 [1] Allow 1 credit for describing the results that the student would most likely obtain if he ran the same experiment again but placed the test tubes in a hot water bath kept at 65°C for 15 minutes and supporting the answer. Acceptable responses include, but are not limited to:

— All of the results would be negative. The increased temperature would most likely destroy/denature the enzymes.

— There would be no positive results. Since the enzymes worked at human body temperature, 65°C would most likely change the shape of the enzymes so that they would not break down the proteins in the meat or the starch in the bread.

55 [1] Allow 1 credit for control/comparison and supporting the answer. Acceptable responses include, but are not limited to:

— Test Tubes 3 and 4 are controls. There were no enzymes in these two test tubes.

— Test Tubes 3 and 4 were used as a comparison. They were used to prove that enzymes were needed to digest the food.

— Test Tubes 3 and 4 would show that enzymes were necessary to break down the proteins in the meat and the starch in the bread.

Part C

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The Sun provides energy for producers to carry out photosynthesis to make sugar. When organisms are eaten, some of the chemical energy in the sugar molecules is transferred to the next level.

— The Sun's energy is converted into chemical energy by photosynthesis. When consumers eat other organisms, the energy is transferred through the food web.

— The Sun provides the energy, and some of it is passed from organism to organism as they feed on each other.

57 [1] Allow 1 credit for claiming that there is no gain or loss of matter during photosynthesis and providing evidence from the data to support the claim. Acceptable responses include, but are not limited to:

— According to the chart, the number of atoms in the molecules used during photosynthesis is the same as the number of atoms in the molecules produced by the process.

— The amount of carbon, hydrogen, and oxygen is the same going into the reaction and coming out of the reaction.

58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— There were no predators to keep the zebra mussels in check.

— The mussels could outcompete the native mussels.

— They reproduce quickly and drift to other waterways.

— The Great Lakes connect to other waterways.

— They were well adapted to live in the waterways.

— Boats can easily carry and transport the eggs and larvae.

— The mussels produce a million eggs per year.

59 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— After 1992, the zebra mussels had consumed most of the phytoplankton, so there was little for the other consumers to eat.

— Between 1988 and 2009, the amount of phytoplankton chlorophyll decreased from about 30 µg/liter to 6 µg/liter.

60 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The zebra mussels spread and clogged water pipes and damaged boats, docks, buoys, and other structures.

— The damage that they caused costs money to repair.

— Zebra mussels reduced biodiversity.

— They reduce dissolved oxygen in the water.

61 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The zebra mussels outcompeted the native mussels, so there were more zebra mussels.

— Once the zebra mussels were established in the river, they outcompeted the native mussels, and then the native mussels didn't have enough food and declined.

— The native and zebra mussels competed for the same food, so when the zebra mussels increased, the native mussels decreased.

62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Mimicry is advantageous because the king snake looks like a venomous coral snake. Predators will see the king snake and avoid it.

— The mimicry reduces the chance that the king snake will be eaten, so it can live longer and reproduce.

63 [1] Allow 1 credit for predicting how the population size of king snakes might change over time *without* coral snakes in the area where they live and justifiying your answers. Acceptable responses include, but are not limited to:

— The population of king snakes would decrease. The mimicry would not be an advantage, and they might be attacked more by predators.

— The population of king snakes might increase, as they would not compete with the coral snakes for some food.

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The deer population could decline/be better controlled.

— They would compete with the coyotes, and the coyote population would decrease or leave the area.

— There might not be enough food to support two predators, and each population would decrease.

— The mountain lions might move into populated areas and pose a threat to people and pets.

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Building projects take up space and reduce the resources available to the deer, so the number of deer would go down.

— Since there will be less land for food, the deer population will decrease through competition.

— The development projects remove plants and trees, resulting in less food for the deer.

66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— If antibodies recognize the drug protein, the drug protein is marked for destruction.

— White blood cells/dendritic cells may engulf and destroy the drug particles.

— The immune system destroys the drug particles before they can work.

— Activated T cells produce antibodies that mark the drug for destruction.

67 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— AIDS patients have weakened immune systems; therefore, they would be less likely to attack the biologic drug particles, making the drugs more effective.

— AIDS patients have weaker immune systems and may not attack the drug particles.

68 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— People will still have immunity to other pathogens because antibodies are specific to the pathogen. The SVPs block only the antibodies to this drug.

— Antibodies are specific; the SVPs block the production only of antibodies that match the drug.

— Antibodies are specific.

69 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The algae growth blocked light, which the plants needed for photosynthesis.

— The plants did not get enough light to carry out photosynthesis.

— The plants died out because they didn't have light for the process of photosynthesis.

— Algae may have used nutrients also needed by the complex plants.

70 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The organisms that were eating the complex plants would either die out or move away from the region due to a lack of food.

— The food webs would become unstable, since the organisms supported by the complex plants would lose their source of energy.

— New food webs would develop in the area. These webs would depend on algae as their source of energy.

— Shelter for young fish will decline.

71 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— If the analysis of the data showed that algae growth increased more rapidly when more nitrogen compounds were in the Bay, this would support the conclusion.

— One piece of evidence would be if the data show that, as nitrogen compounds increased or decreased in the Bay, the growth rate of the algae did the same.

— If the research data show that, of all the nutrients, nitrogen had the greatest effect on algae growth, then nitrogen would be the main cause of the algae growth.

72 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Eggs need to be fertilized by functional sperm in order for offspring to be produced.

— If males cannot produce functional sperm, eggs will not be fertilized and there will be no offspring.

— If the mosquitoes can't produce sperm, they cannot reproduce/produce offspring.

Part D

73 2

74 4

75 2

76 4

77 [1] Allow 1 credit for enzyme, restriction enzyme, or biological catalyst.

78 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Their muscle cells got tired because waste products were building up in them from the activity.

— Muscle fatigue caused them to slow down/become weaker.

— They might not be getting enough oxygen/nutrients.

79 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Resting pulse rates for different people can differ depending on their size, weight, degree of physical fitness, or genetic makeup.

— They may have been doing different things before the resting pulse rate was taken.

— naturally occuring variation between individuals

80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The increased heart rate helps the cells get rid of the extra wastes produced from the activity.

— The pulse rate increase helps get oxygen to/take carbon dioxide away from the muscle cells that were involved in the exercise activity, causing the level of these gases to quickly return to normal.

81 4

82 4

83 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The proteins are too large to diffuse through the artificial cell membrane.

— The artificial cell membrane is not permeable to the proteins.

84 [1] Allow 1 credit for identifying *one* characteristic and explaining specifically why that characteristic would make them successful. Acceptable responses include, but are not limited to:

— Better eyesight would help them find smaller seeds more easily than other finches.

— Better eyesight/hearing would help them detect predators in their environment, giving them a better chance to get away from them.

— Being stronger or more aggressive could help them be more successful at obtaining food.

— Flying faster or being able to fly farther may help them escape predators or get to other food sources that other finches cannot.

85 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The new lizards might outcompete the lizards already there and drive them to extinction.

— They could eat some of the species of plants or animals that the original lizards eat, which would disrupt the food webs/diversity.

— They might fill an ecological niche on the new island that was not already filled and survive with no negative effects on the native species.

Regents Examination in Living Environment

June 2024

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2024 Regents Examination in Living Environment* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Friday, June 14, 2024. Conversion charts provided for previous administrations of the Regents Examination in Living Environment must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.

2. Select the test title.

3. Complete the required demographic fields.

4. Complete each evaluation question and provide comments in the space provided.

5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

June 2024 Living Environment

Standards	Question Numbers			
	Part A 1–30	**Part B–1 31–43**	**Part B–2 44–55**	**Part C 56–72**
Standard 1 — Analysis, Inquiry and Design				
Key Idea 1		31, 38	46, 47, 48, 50	
Key Idea 2				
Key Idea 3				59
Appendix A (Laboratory Checklist)			44, 45, 55	
Standard 4				
Key Idea 1	1, 4, 6, 7, 10, 15, 16, 23, 24	39, 42	51	
Key Idea 2	2, 9, 11, 28	33, 37	52	72
Key Idea 3	14, 17	36, 40, 41		62, 63
Key Idea 4	5, 8, 12, 26		53	
Key Idea 5	3, 13, 18, 20, 27, 29	34	49, 54	66, 67, 68
Key Idea 6	19, 22	43		56, 57, 58, 61, 70, 71
Key Idea 7	21, 25, 30	32, 35		60, 64, 65, 69

Part D 73–85	
Lab 1	76, 77
Lab 2	73, 78, 79, 80
Lab 3	75, 81, 84, 85
Lab 5	74, 82, 83

The State Education Department / The University of the State of New York

Regents Examination in Living Environment – June 2024

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

Raw Score	Scale Score
85	**100**
84	**98**
83	**97**
82	**97**
81	**96**
80	**95**
79	**94**
78	**93**
77	**93**
76	**92**
75	**91**
74	**90**
73	**90**
72	**89**
71	**88**
70	**88**
69	**87**
68	**86**
67	**86**
66	**85**
65	**84**
64	**83**
63	**83**
62	**82**
61	**81**
60	**80**
59	**80**
58	**79**
57	**78**

Raw Score	Scale Score
56	**78**
55	**77**
54	**76**
53	**75**
52	**75**
51	**74**
50	**73**
49	**72**
48	**72**
47	**71**
46	**70**
45	**69**
44	**68**
43	**67**
42	**66**
41	**65**
40	**64**
39	**63**
38	**62**
37	**61**
36	**60**
35	**59**
34	**58**
33	**56**
32	**55**
31	**54**
30	**53**
29	**51**
28	**50**

Raw Score	Scale Score
27	**49**
26	**47**
25	**46**
24	**45**
23	**43**
22	**42**
21	**40**
20	**39**
19	**37**
18	**35**
17	**34**
16	**32**
15	**30**
14	**29**
13	**27**
12	**25**
11	**23**
10	**21**
9	**19**
8	**17**
7	**15**
6	**13**
5	**11**
4	**9**
3	**7**
2	**5**
1	**2**
0	**0**

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Living Environment.