

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

LIVING ENVIRONMENT

Thursday, August 18, 2016 — 12:30 to 3:30 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 made available for you to use while taking this examination.

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

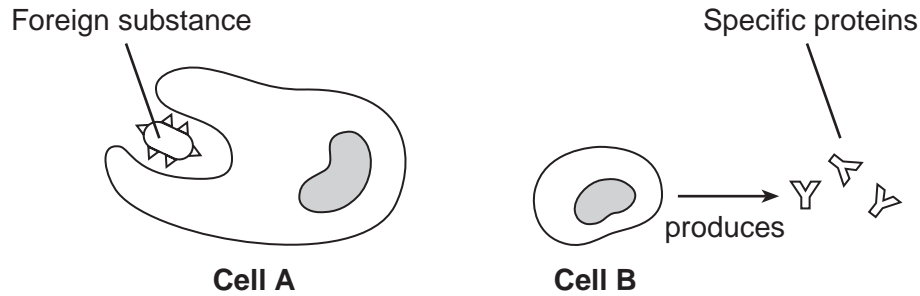
Part A

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 Which sequence represents structures organized from most complex to least complex?
 - (1) chloroplast → guard cell → leaf → oak tree
 - (2) guard cell → chloroplast → leaf → oak tree
 - (3) oak tree → guard cell → leaf → chloroplast
 - (4) oak tree → leaf → guard cell → chloroplast
- 2 Autotrophs differ from heterotrophs in that only autotrophs
 - (1) require carbon dioxide for cellular respiration
 - (2) release oxygen as a product of cellular respiration
 - (3) synthesize nutrients using carbon dioxide and water
 - (4) break down sugars to assemble other molecules
- 3 Burmese pythons are large snakes that have been introduced into the Florida Everglades ecosystem. Burmese pythons and alligators hunt the same prey. One likely effect of the introduction of the pythons is that
 - (1) alligators will have more prey available
 - (2) pythons will become native to the Everglades
 - (3) alligator populations will decline
 - (4) pythons will become an endangered species
- 4 Which activity enables humans to produce new genetic combinations in other organisms?
 - (1) selecting and breeding the organisms for specific traits
 - (2) increasing the number of enzymes available to the organisms
 - (3) growing organisms that reproduce asexually
 - (4) decreasing the amount of DNA in the diet of the organisms
- 5 Before a cell divides, an exact copy of each chromosome is made by the process of
 - (1) genetic engineering
 - (2) replication
 - (3) mutation
 - (4) recombination
- 6 Some time ago, there were thousands of California condors in North America. Large numbers were poisoned from lead in bullets that were used to kill the animals the condors fed on. An effort was made to help save this large scavenger. There are now more than 350 California condors in North America. The condors most likely increased in number because humans decided to
 - (1) produce lead-resistant condors through asexual reproduction
 - (2) pass laws against using lead bullets to kill animals used by condors for food
 - (3) introduce plants that didn't absorb the lead from discharged bullets
 - (4) produce lead-resistant prey for the condors through genetic engineering
- 7 In humans, the maintenance of a stable internal temperature is a direct result of
 - (1) detection of and reaction to stimuli in the environment
 - (2) digestion of starches and absorption of protein from the internal environment
 - (3) diffusion of water and excretion of glucose to the external environment
 - (4) transport of ATP and locomotion through the environment
- 8 Which molecules are needed to cut and copy segments of DNA?
 - (1) reproductive hormones
 - (2) carbohydrates
 - (3) antibodies
 - (4) biological catalysts
- 9 Evolution can occur at different rates; however, for evolution to occur, there must be
 - (1) variations within a species
 - (2) extinction of the species
 - (3) asexual reproduction
 - (4) no change in the genes of an organism

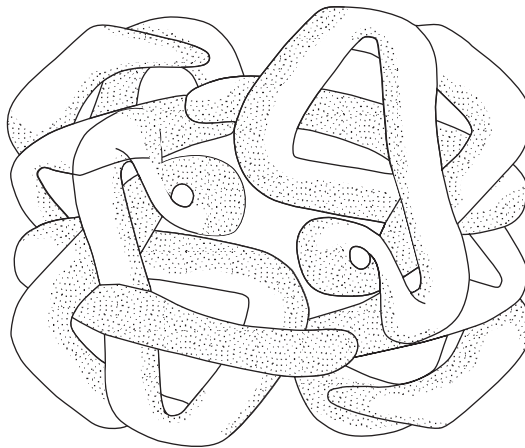
10 The two reactions illustrated in the diagrams below often occur when a foreign substance enters the body.



The cells labeled *A* and *B* are examples of cells known as

- (1) guard cells
- (2) reproductive cells
- (3) white blood cells
- (4) specialized skin cells

11 The diagram below represents a protein molecule present in some living things.



This type of molecule is composed of a sequence of

- (1) amino acids arranged in a specific order
- (2) simple sugars alternating with starches arranged in a folded pattern
- (3) large inorganic subunits that form chains that interlock with each other
- (4) four bases that make up the folded structure

12 Three human actions that have been made possible in recent times are:

- Doctors are able to diagnose and treat some fetal problems prior to the birth of a child.
- Cloning can produce large numbers of plants that are resistant to drought.
- Male insects can be sterilized with radiation to prevent them from mating successfully.

Which statement summarizes these three actions?

- (1) Reproductive technology has medical, agricultural, and ecological applications.
- (2) Development is a highly regulated process involving mitosis and differentiation.
- (3) Reproduction and development are subject to environmental effects.
- (4) Human development, birth, and aging should be viewed as a predictable pattern of events.

- 13 Natural selection is best described as
- (1) a change in an organism in response to a need of that organism
 - (2) a process of nearly constant improvement that leads to an organism that is nearly perfect
 - (3) differences in survival rates as a result of different inherited characteristics
 - (4) inheritance of characteristics acquired during the life of an organism

- 14 Which statement best describes a situation where competition occurs in an ecosystem?
- (1) A deer outruns an attacking wolf.
 - (2) A deer, during the winter, consumes tree bark.
 - (3) A deer and a rabbit consume grass in a field.
 - (4) A deer and a rabbit are both startled by a hawk flying overhead.

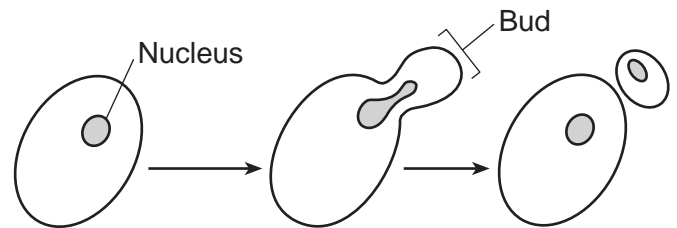
- 15 A woman changes her hair color to red; however, her children will not inherit this red hair color because the woman does not have
- (1) genes for red hair in her skin
 - (2) genes for red hair in her sex cells
 - (3) proteins for red hair in the placenta
 - (4) proteins for red hair in her egg cells

- 16 Fossils provide evidence that
- (1) life on Earth millions of years ago was more complex than life is today
 - (2) the changes that will occur in species in the future are easy to predict
 - (3) many species of organisms that lived long ago are now extinct
 - (4) most species of organisms that lived long ago are exactly the same today

- 17 A male frigatebird displays to the female by inflating its large red throat sac, throwing its head back, vibrating its wings, and producing a “drumming” sound with its throat sac. For the frigatebird, this behavior has most likely resulted in
- (1) hiding from predators
 - (2) greater reproductive success
 - (3) locating new sources of food
 - (4) reduced population growth

- 18 Plant species X lives in a hot, dry environment. Slowly, over hundreds of years, the climate becomes wetter. Fungi attack species X and cause the population of species X to decrease. However, plant species X could survive if the plants
- (1) try to mutate quickly and synthesize new proteins
 - (2) are watered often and fertilized with extra nutrients
 - (3) can adapt to the new conditions by mating with the fungus
 - (4) have a few members of the population that are fungus-resistant

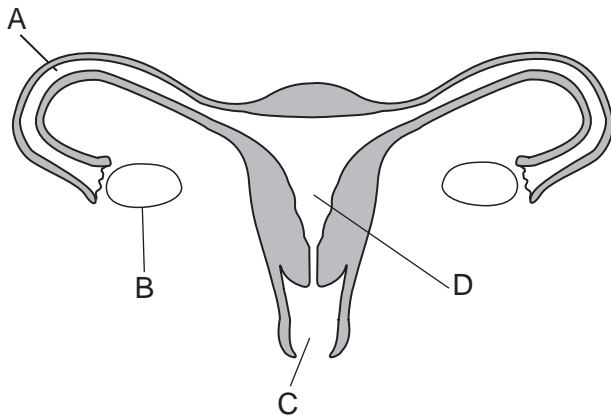
- 19 The diagram below represents reproduction in a yeast cell. The genes in the bud are identical to the genes in the parent.



- This type of production of offspring is a form of
- (1) sexual reproduction
 - (2) asexual reproduction
 - (3) gene manipulation
 - (4) genetic engineering

- 20 A human cell that contains all of the information necessary for the growth and development of a complete organism is
- | | |
|------------------|-----------------|
| (1) a sperm cell | (3) a zygote |
| (2) a gamete | (4) an egg cell |
- 21 When would exposure to a potentially harmful substance be most likely to damage many organs in a developing embryo?
- (1) during the last three months of pregnancy
 - (2) during the early stages of pregnancy
 - (3) during the formation of the zygote
 - (4) during meiosis in both males and females

22 The human female reproductive system is represented below.



Within which structure does the placenta normally develop?

- (1) A
- (2) B
- (3) C
- (4) D

23 An energy-rich organic compound needed by organisms is

- (1) water
- (2) salt
- (3) oxygen
- (4) glucose

24 SCIDS (Severe Combined Immunodeficiency Syndrome) is a disorder where a genetic mutation inhibits the production and functioning of T-cells. T-cells are special types of white blood cells that play a role in the body's immune response. A possible symptom of SCIDS would be an increase in the

- (1) number of antigens produced
- (2) red blood cell count
- (3) number of infections by pathogens
- (4) ability to maintain homeostasis

25 An organ, such as a kidney, used for transplant needs to be tested for compatibility with the person who is to receive the organ. If this is not done, the

- (1) donated organ might attack the body
- (2) donated organ might attack the immune system
- (3) immune system might attack its own body cells
- (4) immune system might attack the donated organ

26 A researcher concludes from a 10-year study that the biodiversity of an ecosystem had increased. Which set of observations represents evidence for this claim?

- (1) There were more niches and greater stability in the ecosystem.
- (2) There were more niches and less energy lost as heat in the ecosystem.
- (3) There were fewer niches for decomposers and less stability.
- (4) There were fewer niches for consumers and greater cycling of materials.

27 The final consumers in many food webs are

- (1) autotrophs
- (2) hosts
- (3) herbivores
- (4) carnivores

28 Abandoned farmland that once grew corn is now covered with bushes and small trees. These observed changes resulted directly from

- (1) evolutionary change
- (2) ecological succession
- (3) loss of biodiversity
- (4) selective breeding

29 The overuse of chemical fertilizers has resulted in the growth of some lawns in which decomposers cannot live. This would interfere most directly with the ability of the lawn ecosystem to

- (1) recycle energy
- (2) recycle nutrients
- (3) maintain atmospheric pH
- (4) reduce biodiversity

30 On Long Island, several businesses use geothermal technology. This involves taking heat from within Earth and using it to heat buildings. One benefit of this technology is that it

- (1) contributes to global warming
- (2) reduces the ozone shield
- (3) reduces dependence on fossil fuels
- (4) decreases resources for many species

Part B-1

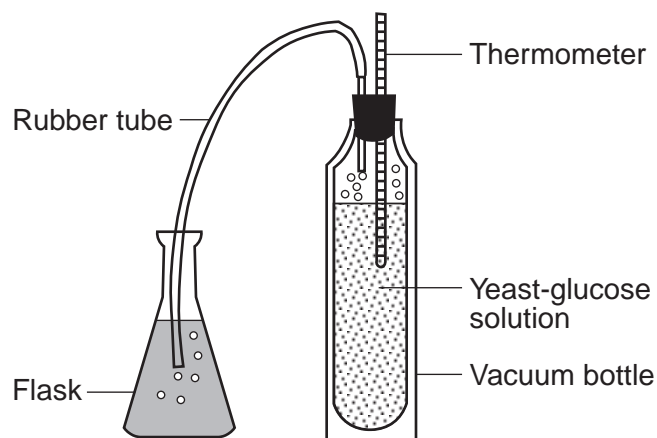
Answer all questions in this part. [13]

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.

31 Recently, researchers from Stanford University have changed mouse skin cells into mouse nerve cells. This was accomplished by inserting genes that control the synthesis of certain proteins into the skin cells. This type of research is often successful in advancing knowledge regarding the functioning of human cells because

- (1) cells present in humans often function in similar ways to cells present in other organisms
- (2) cells from different types of organisms function differently when transplanted into humans
- (3) the cells in all complex organisms contain the same genes and function in similar ways
- (4) cellular research using mice can always be applied to human cells since all complex organisms produce the same proteins

32 In the experimental setup below, which substance would be used to prove that the gas produced by the yeast in the vacuum bottle could change the pH of the liquid in the flask?

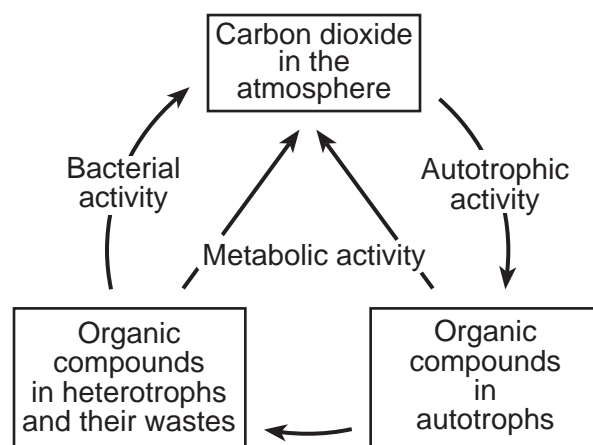


- (1) an indicator
- (2) a chemical messenger
- (3) an enzyme
- (4) a salt solution

33 Which statement best expresses a basic scientific assumption?

- (1) Interpretation of experimental results has provided explanations for all natural phenomena.
- (2) If a conclusion is valid, similar investigations by other scientists should result in the same conclusion.
- (3) For any conclusion to be valid, the design of the experiment requires that only two groups be compared.
- (4) After a scientist formulates a conclusion based on an experiment, no further investigation is necessary.

34 The diagram below represents a cycle that occurs in nature.

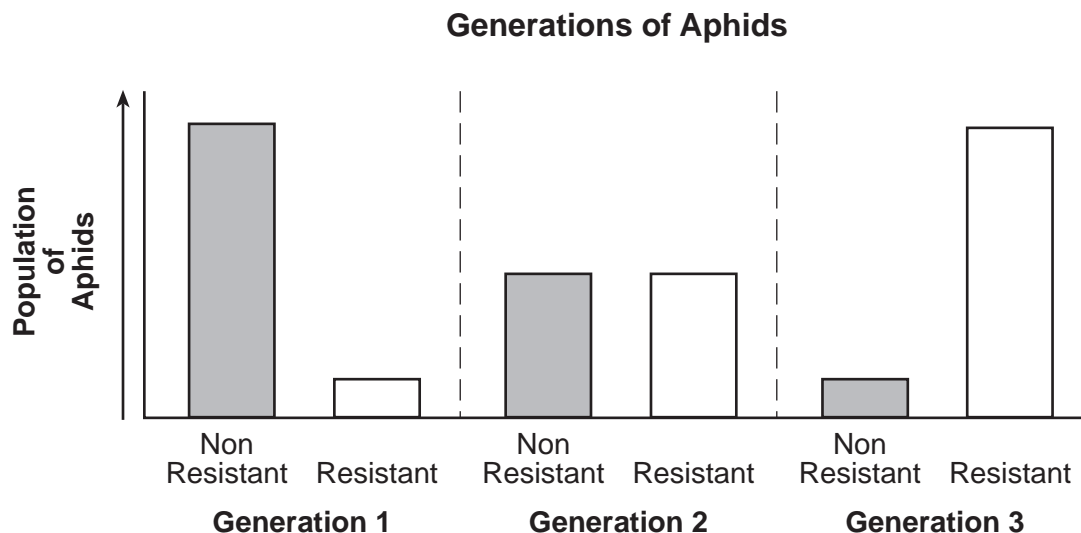


Which phrase describes a human activity that could have a *negative* effect on this cycle?

- (1) a decrease in the amount of sulfates given off by motor vehicles
- (2) an increase in recycling programs for plastics and metals
- (3) the continued deforestation and removal of forest resources
- (4) development of programs to conserve wildlife

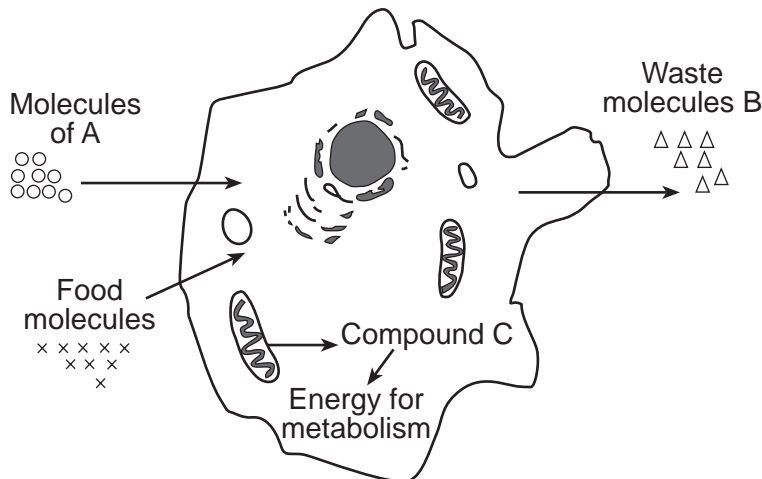
Base your answers to questions 35 through 37 on the information and graph below and on your knowledge of biology.

A farmer growing potatoes notices aphids, a type of insect, feeding on the plants. An insecticide was sprayed on the plants several times over a two-year period. The graph represents samples of three different generations of insecticide-resistant and nonresistant aphids over this time period.



- 35 The resistance gene was present in the aphid population as a result of
- (1) the need of the potatoes to become resistant to the insecticide
 - (2) changes in the aphids' local habitat by the insecticide
 - (3) a recombination of the proteins in the potato cells
 - (4) a random change in the aphids' DNA sequence
- 36 In year three, the farmer discontinued the use of the insecticide. Which statement would best predict the population in generation 4?
- (1) The nonresistant aphid would become extinct.
 - (2) The nonresistant aphid population would likely increase.
 - (3) The resistant aphid would mutate to a nonresistant aphid.
 - (4) The plants would be free of insect populations.
- 37 One *negative* consequence of using an insecticide is that it
- (1) selects for insecticide-resistant organisms
 - (2) keeps a balance of organic compounds
 - (3) encourages biodiversity in plants
 - (4) gives the nonresistant aphids a survival advantage
-

38 The activity of a single-celled organism is represented in the diagram below.



Which concept is best illustrated by this diagram?

- (1) The life functions performed by single-celled organisms are different from the life functions performed by complex organisms.
- (2) Single-celled organisms carry out life functions that are essential for survival.
- (3) Since single-celled organisms lack organs, they can survive only in moist environments.
- (4) Single-celled organisms contain one organelle that performs all the life functions.

39 The chart below provides information about two scientific discoveries in the field of biology.

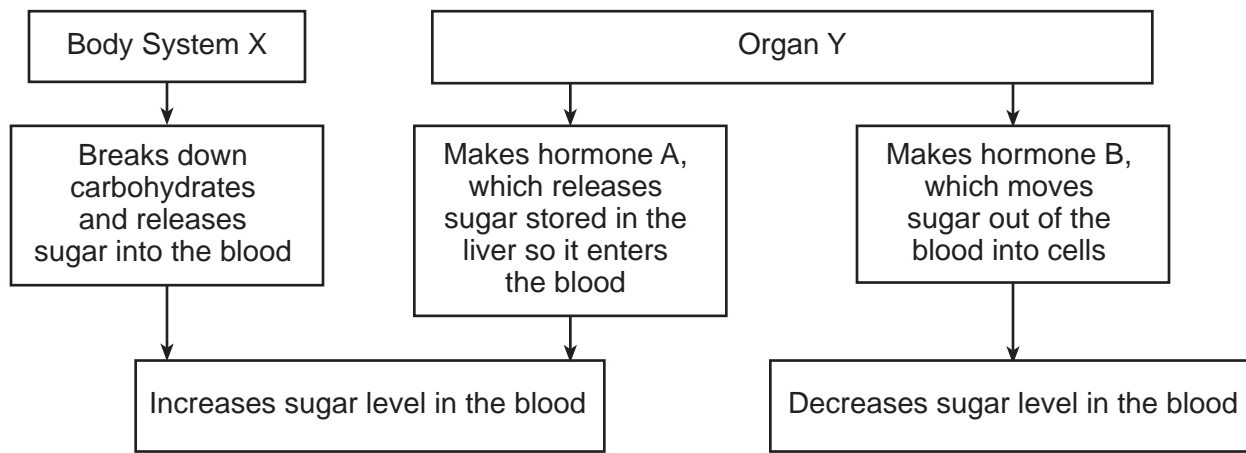
Early Discovery	Later Discovery
People living near swamps are more likely to get malaria than people who do not live near swamps. Burning swamps early in the summer reduces the amount of malaria.	Mosquitoes breed and lay their eggs in swamps and other pools of still water. Mosquitoes are the carriers of the organisms that cause malaria.
Dark-staining bodies called chromosomes can be seen only in dividing cells. The number of chromosomes doubles during cell division.	Chromosomes contain DNA, which is able to copy itself. DNA carries the genetic code, which is passed from a parent cell to two or more daughter cells.

Which statement is the best interpretation of the material presented in the chart?

- (1) Scientific explanations are built by combining evidence that can be observed with what people already know.
- (2) Inquiry involves making judgments about the reliability of the source and relevance of the information.
- (3) Science provides information, but values are also essential to making ethical decisions.
- (4) Hypotheses are valuable even if they turn out not to be true, because they may lead to further investigation.

Base your answers to questions 40 through 43 on the diagram below and on your knowledge of biology. This diagram represents the roles of different parts of the human body in keeping blood sugar at a balanced, normal level over time.

Homeostasis of Blood Sugar Level



40 The diagram shows human body structures that are coordinated to maintain homeostasis. Which row correctly identifies the functions of these structures?

Row	Body System X	Organ Y
(1)	Digestion	Regulation
(2)	Circulation	Synthesis
(3)	Excretion	Transport
(4)	Locomotion	Nutrition

41 When body system X releases too much sugar into the blood, the body can maintain homeostasis by making

- (1) more hormone A, only
- (2) more hormone B, only
- (3) more hormone A and more hormone B
- (4) no hormone A and no hormone B

42 If organ Y becomes unable to produce enough hormone B, then homeostasis would be disrupted. To restore homeostasis and compensate for the lack of hormone B, one useful action would be to

- (1) increase the production of hormone A
- (2) remove organ Y from the body surgically
- (3) reduce the carbohydrates in body system X
- (4) reduce the synthesis of enzymes in organ Y

43 If body system X temporarily stops releasing sugar into the blood, a likely response of the body would be to

- (1) stop using enzymes in body system X
- (2) stop organ Y from producing hormone A
- (3) start to increase synthesis of hormone B
- (4) start to increase synthesis of hormone A

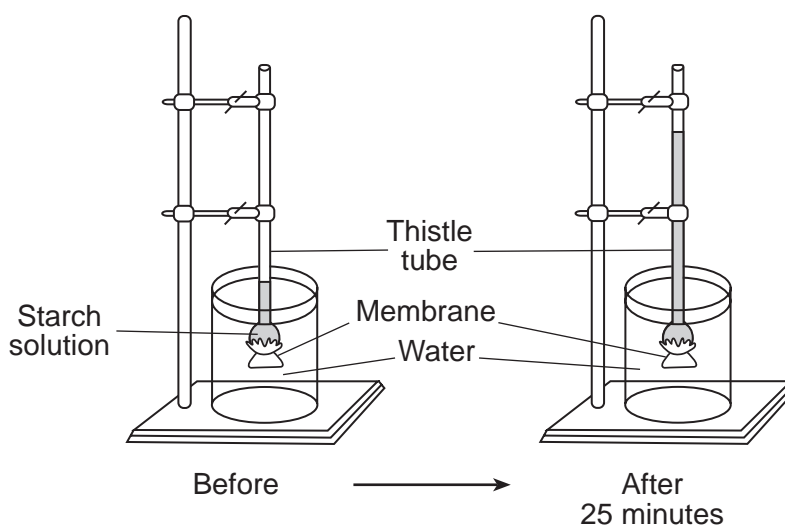
Part B-2

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 47 on the information, diagram, and table below and on your knowledge of biology.

A concentrated starch solution was placed in a thistle tube with a semi-permeable membrane covering the wide opening. It was then placed in a beaker of water. The height of the solution in the tube was measured every 5 minutes for 25 minutes. The setup and the data collected are shown below.



Height of Liquid in Thistle Tube

Time (min)	Height (cm)
0	2
5	3
10	6
15	8
20	10
25	11

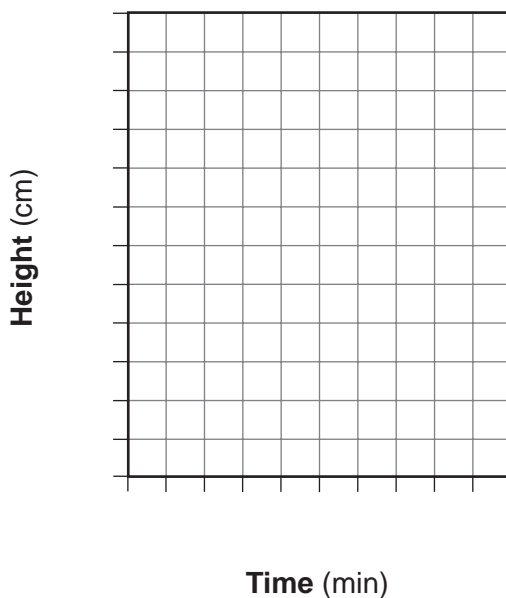
Directions (44–45): Using the information in the data table, construct a line graph on the grid below, following the directions below.

44 Mark an appropriate scale, without any breaks in the data, on each labeled axis. [1]

45 Plot the data for height on the grid. Connect the points and surround each point with a small circle. [1]



Height of Liquid in Thistle Tube



46 Explain why the height of the solution in the thistle tube increased during the 25-minute period. [1]

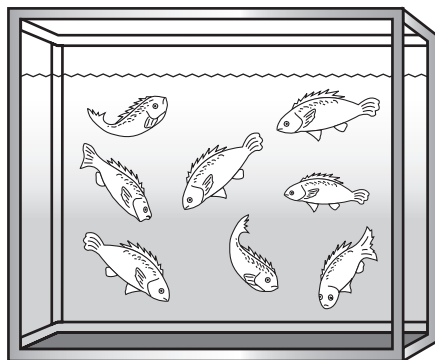
Note: The answer to question 47 should be recorded on your separate answer sheet.

47 The experiment was repeated, and an amber-colored solution was added to the water in the beaker. After 10 minutes, the water in the beaker remained amber-colored and the starch solution had turned blue-black. The most likely reason for this observation is that

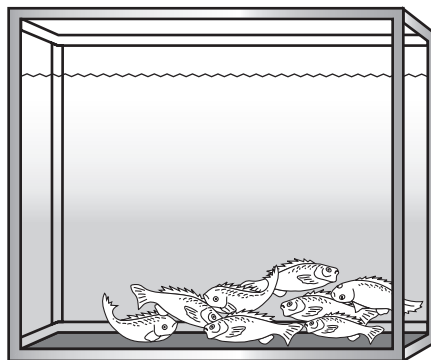
- (1) starch molecules moved out of the thistle tube
- (2) water molecules moved into the thistle tube
- (3) amber-colored solution moved into the thistle tube
- (4) water molecules moved out of the thistle tube

Base your answer to question 48 on the information and diagrams below and on your knowledge of biology.

When fish of certain species are injured, a chemical substance stored in skin cells of the fish is released into the water. This chemical causes an alarm response among other fish of the same species in the area. Nearby fish of this species become more alert and group together near the bottom.



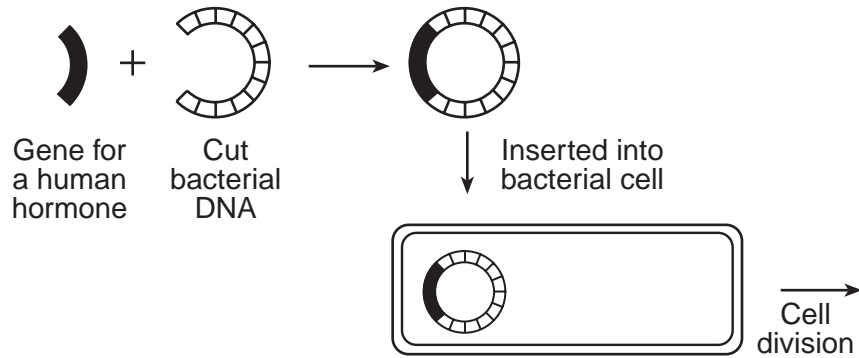
No Alarm Response



Alarm Response

48 Explain why the chemical released from the injured fish may *not* cause an alarm response in other fish species. [1]

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



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

49 The process represented in the diagram is

- (1) DNA replication
- (2) natural selection
- (3) gel electrophoresis
- (4) genetic engineering

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

50 The original gene for the production of a human hormone was most likely removed from a

- (1) chromosome
- (2) ribosome
- (3) mitochondrion
- (4) cell membrane

51 State *one* possible reason why a gene for the production of a human hormone would be placed in bacterial DNA. [1]

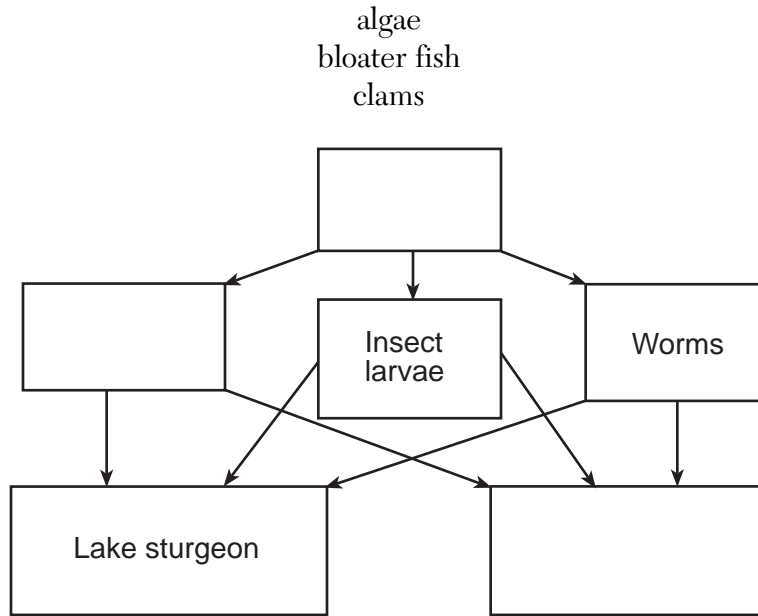
Base your answers to questions 52 through 55 on the passage below and on your knowledge of biology.

The lake sturgeon is a fish that often grows over six feet long and can weigh close to two hundred pounds. It is currently an endangered species in the Great Lakes area, although the species has lived in those lakes and rivers for millions of years. Now, there is a program to increase the sturgeon population by reintroducing lake sturgeon to areas where they have disappeared.

Like the lake sturgeon, bloater fish are also found in the Great Lakes. Both find their food on or near the bottoms of lakes. They eat a variety of small organisms, including insect larvae, worms, and clams. These small organisms feed on algae.

52 Identify *one* population that will *decrease* in size after the lake sturgeon are added to the new ecosystems. Support your answer. [1]

53 Part of the food web of a lake ecosystem is represented in the diagram below. Indicate the position in the food web where each organism listed below would be placed, by writing the name of each in the appropriate box. [1]



54 Identify which population, other than lake sturgeon, will increase in size after the lake sturgeon are added to the new ecosystems. Support your answer. [1]

55 State what the arrows in the food web represent. [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 and drawing below and on your knowledge of biology. The drawing represents a salamander. Salamanders are small amphibians that live in a variety of environments.

Two species of salamander inhabit an island. The habitat on each side of the island is different. One side tends to be wet; the other side tends to be dry. Researchers want to know if the salamanders will survive equally well on either side of the island. Species *A* lives on the wet side of the island, while Species *B* lives on the dry side of the island. Researchers develop two artificial habitats, one that simulates conditions on the wet side and one that simulates conditions on the dry side.



- 56 Explain why researchers would put the salamanders in an artificial environment, as opposed to conducting the experiment in their natural habitat. [1]

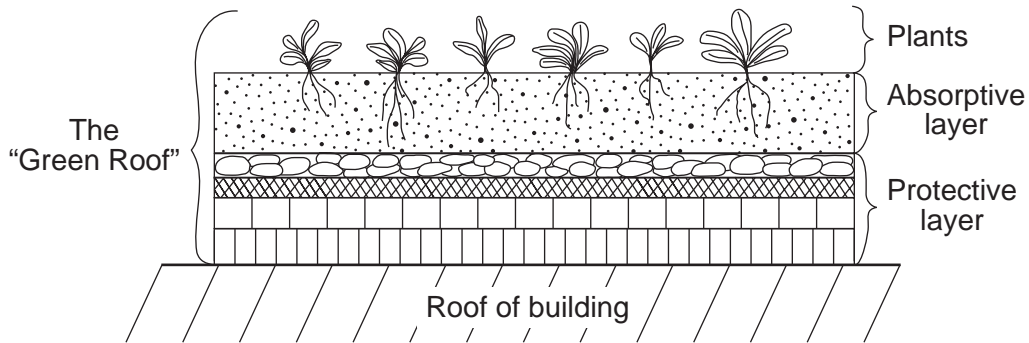
- 57 Researchers put three salamanders of each species in each of the two different artificial environments. Why would other scientists question the validity of the conclusions based on this setup? [1]

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

Green Roofs

People in Albany and New York City are using “green roofs” to improve the environment. A green roof can be added to many buildings that have large, flat roofs. Green roofs have three parts: a protective layer to separate plant roots from the roof of the building, an absorptive layer to catch and hold rainwater, and a layer of plants. Often, green roofs use *Sedum*, a short, desert plant, because it is efficient at storing water in its leaves and can withstand the colder climate.

A green roof saves energy, reduces carbon dioxide in the atmosphere, and prevents rainwater and melting snow from overloading sewer systems. It can also protect the roof of a building from damage. However, green roofs can be expensive to install, and require care and maintenance.



58 Most varieties of *Sedum* are not native plants in Albany or New York City. State *one* reason why it may be dangerous to introduce a new species to an established ecosystem. [1]

59 State *one* reason why a green roof reduces the amount of carbon dioxide in the atmosphere. [1]

60 State *one* reason why it is important to reduce the amount of carbon dioxide in the atmosphere. [1]

61 State *one disadvantage* of a green roof. [1]

62 A scientist took samples from a culture of *E. coli* bacteria and placed them in each of 100 petri dishes. Once the bacteria began to grow in the dishes, she exposed 50 of the dishes to x-ray radiation and 50 to natural light. After five days, she examined samples of DNA from the bacteria and recorded any differences she found between the DNA of the two groups. State *one* hypothesis the experiment would test. [1]

Base your answers to questions 63 and 64 on the passage below and on your knowledge of biology.

Super Vaccine Could Eliminate Flu

Every flu season, vaccine makers must bet on which strain of influenza A will pose the greatest threat to the public, and millions of Americans must decide whether to get a shot. In August, virologist Gary Nabel at the National Institutes of Health (NIH) announced progress toward a universal flu vaccine: two shots of it could provide years of protection from every known influenza A virus.

“We use a prime-boost strategy, meaning that we immunize with two vehicles that deliver the vaccine in different ways,” Nabel says. In their experimental treatment, he and his colleagues injected mice, ferrets, and monkeys with viral DNA, causing their muscle cells to produce hemagglutinin, a protein found on the surface of all flu viruses. The animals’ immune systems then began making antibodies that latch onto the protein and disable the virus. The researchers followed the DNA injection with a traditional seasonal flu shot, which contains dead viruses. This one-two punch protected the test subjects against influenza A viruses that had emerged in 1934 and 2007, and other experiments showed that the antibodies it generated successfully neutralized a wide variety of flu strains. Nabel’s colleagues at the NIH are already testing similar approaches in humans.

Source: Rowe, A. “Super Vaccine Could Eliminate Flu.”
Discover, Jan./Feb. 2011, p. 37.

63 Identify *one* specific difference, other than it is a two-step vaccination, between Nabel’s vaccination and a traditional flu vaccine. [1]

64 Explain how injecting dead or weakened viruses into a person can help to fight against future infections from that virus. [1]

Base your answers to questions 65 through 68 on the information below and on your knowledge of biology.

Bald Eagle Facts

- Bald eagles eat primarily fish, carrion (dead animals), smaller birds, and rodents. Their most important non-carrion food is fish, which they catch by swooping down and grabbing fish that are near the surface of the water.
- The number of nesting pairs in the lower 48 United States increased from fewer than 450 in the early 1960s to more than 4,500 adult bald eagle nesting pairs in the 1990s. Today, there are an estimated 9,789 nesting pairs of bald eagles.
- Bald eagles are found in large numbers in certain areas during the winter (known as roosts). These winter roosts are located in areas where prey are plentiful. Winter roosts are protected under federal law, and managed with a buffer zone to reduce human disturbance. As winter ends, the eagles return to their summer nesting/hunting areas.

Bald Eagle Research

In the winter of 2009, volunteers from an Audubon group conducted a survey of roosting bald eagles at four locations in an area in the lower Hudson River Valley. The data below show the average number of eagles sighted and the number of visits made by the volunteers each month. Among the other data collected were percent ice cover and percent cloud cover on the surface of the water. The eagles fly freely between these four sites, depending on a variety of conditions.

Some of the data are shown in the table below.

Bald Eagles Sighted at Four Hudson Valley Locations in 2009

Location	January		February		March	
	Average Number of Eagles	Number of Visits	Average Number of Eagles	Number of Visits	Average Number of Eagles	Number of Visits
Croton Reservoir	22.86	7	47.88	8	9.17	6
George's Island Park	27.00	7	18.38	8	5.00	4
George's Island North	12.29	7	4.43	7	2.20	5
Stony Point	3.57	7	3.63	8	0.00	5

65 State *one* reason why the percent ice cover is important to the ability of eagles to obtain food. [1]

66 What inference can be made about the percent ice cover at Croton Reservoir between January and February 2009? Support your answer. [1]

67 State *one* reason why the number of eagles sighted showed a change at all four sites between February and March. [1]

68 State *one* possible reason why a popular hiking trail in this area is closed during eagle roosting seasons. [1]

Base your answers to questions 69 through 72 on the information below and on your knowledge of biology.

Coral Reef Ecosystems

There are many ecological interactions that maintain the biodiversity present in coral reefs. In addition to coral, microscopic algae, seaweed, sea grasses, sponges and worms, and a variety of fish are among the organisms that live in reef ecosystems. Ocean currents often link different reef systems and move organisms from one reef area to another. This movement is a factor in repopulating a reef that has been damaged by environmental changes.

One environmental change involves an increased growth of seaweed. When the population of seaweed increases, the reef shifts from a coral-dominated ecosystem to a seaweed-dominated ecosystem. This change disrupts the relationships between the organisms that live there.

Studies have shown that, as the density of seaweed in a reef area increases, the number of fish that eat the seaweed in that area decreases. This may be due to the presence of more predators, or the taste of the more mature plants. The fish move to areas where there is less seaweed growth. As this trend continues, the reef areas are taken over by the seaweed. Once this happens, it is very hard to remove the seaweed and restore the reef to a healthy ecosystem.

In addition to this problem, temperature changes are threatening the ocean currents that connect the reef systems. A change in the currents would reduce the movement of fish larvae from one area to another. This contributes to the seaweed problem.

69 State the role of the sea grasses in the reef ecosystem. [1]

70 Identify *one* abiotic factor that is affecting the stability of the coral reef ecosystems and state how the factor identified is important to the coral reef ecosystems. [1]

Abiotic factor: _____

Effect: _____

71 State *one* reason why it is important to maintain the stability of the coral reefs. [1]

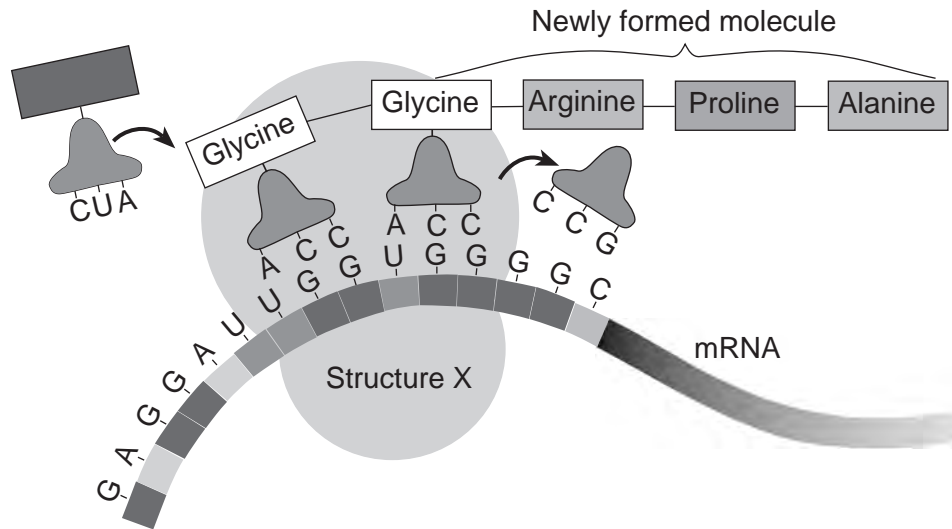
72 State *one* advantage of the fish larvae moving by ocean currents into a damaged reef ecosystem. [1]

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 the statement or answers the 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 73 and 74 on the diagram below, which represents a process that occurs in living cells, and on your knowledge of biology.



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

73 The process shown in the diagram is

- (1) cellular respiration
- (2) cellular reorganization
- (3) gene recombination
- (4) protein synthesis

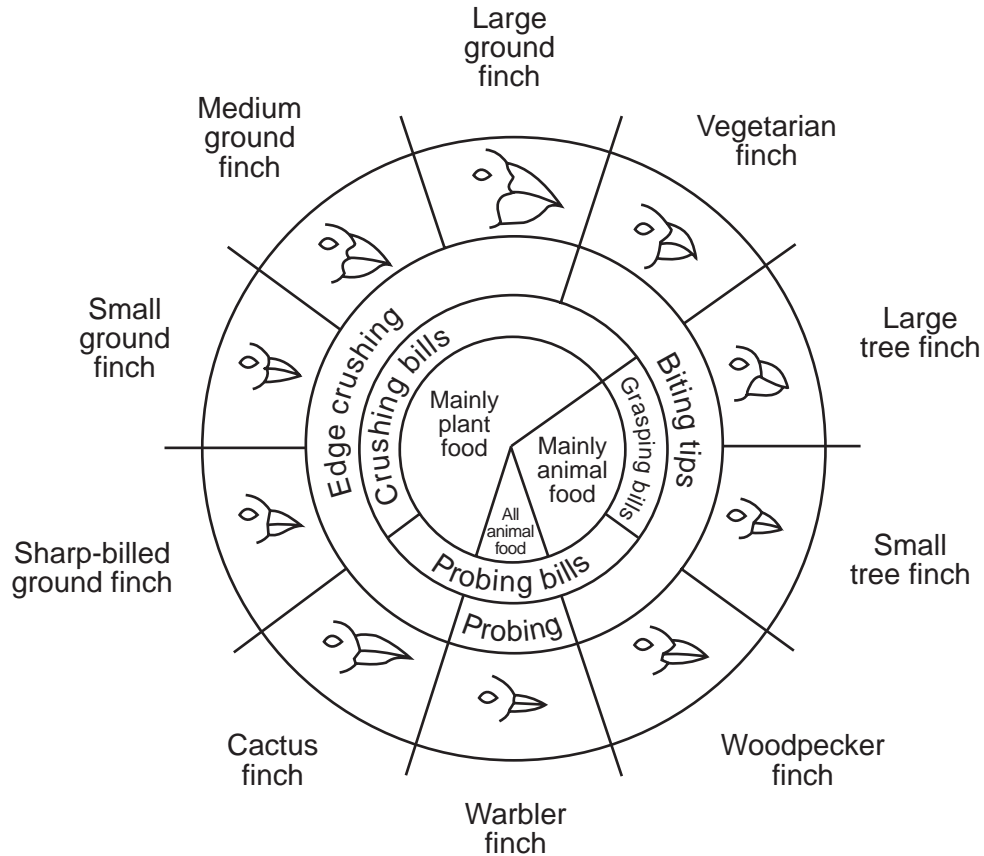
Note: The answer to question 74 should be recorded on your separate answer sheet.

74 Structure X is a

- (1) mitochondrion
- (2) vacuole
- (3) nucleus
- (4) ribosome

Base your answers to questions 75 through 77 on the diagram below and on your knowledge of biology.

Variations in Beaks of Galapagos Islands Finches



from: *Galapagos: A Natural History Guide*

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

- 75 A finch that picks small insects out from cracks in the bark of trees would most likely have a beak that is
- (1) sharp and thin
 - (2) sharp and thick
 - (3) rounded and thin
 - (4) rounded and thick

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

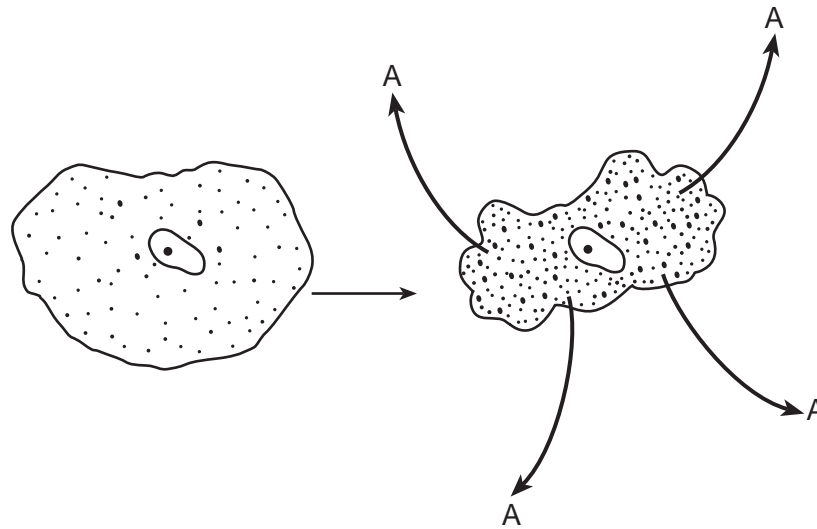
- 76 Which statement is a basic assumption from *The Beaks of Finches* lab?
- (1) The type of beak indicates the type of food the finch eats.
 - (2) Different birds have different songs.
 - (3) Birds with larger beaks can find mates more easily.
 - (4) Nesting behavior of finches is an inherited trait.

77 State *two* reasons why the large ground finch and sharp-billed ground finch could live on the same island but not compete for food, even though they both eat mainly plant food. [1]

Reason 1: _____

Reason 2: _____

Base your answers to questions 79 and 80 on the diagram below, which represents the shrinking of a cell in response to an increase in the concentration of a substance outside of the cell.



79 Identify substance A. [1]

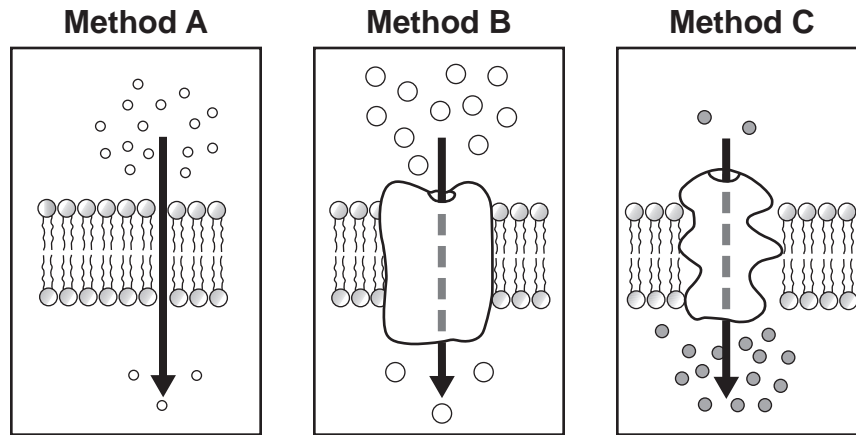
80 Identify *one* likely substance in the environment of the cell that caused this response. [1]

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

81 A student lifted weights after school and found that his muscles started to burn. He couldn't continue to lift the weights after prolonged exercising. This muscle fatigue is most likely due to

- (1) the heart beating too fast and tiring out
- (2) the lungs accumulating oxygen
- (3) lack of oxygen and build up of waste in the muscles
- (4) lack of carbon dioxide in the muscles

Base your answers to questions 82 and 83 on the diagram below and on your knowledge of biology. The diagram represents three sections of a cell membrane showing three different methods involved in the transport of various molecules across the membrane.



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

82 Methods A and B are classified as methods of passive transport because they do not require

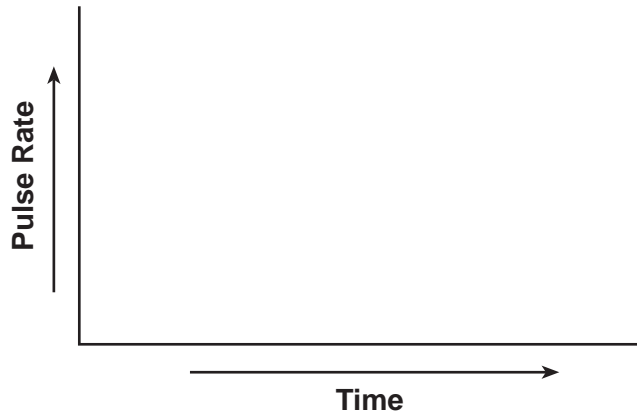
- (1) ATP
- (2) carbon dioxide
- (3) light
- (4) DNA

83 Using information from the diagram, state *one* reason why the movement of molecules in method C represents active transport. [1]

84 State *one* reason why some species might have similar body structures even if they are *not* closely related. [1]

85 A student went out to the school track and walked two laps, ran two laps, and then walked two more laps. On the grid below, draw a line that shows what most likely happened to the pulse rate of the student during these activities. [1]

Effect of Activity on Pulse Rate



LIVING ENVIRONMENT

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FOR TEACHERS ONLY

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

LIVING ENVIRONMENT

Thursday, August 18, 2016 — 12:30 to 3:30 p.m., only

SCORING KEY AND 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: <http://www.p12.nysed.gov/assessment/> 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.

Multiple Choice for Parts A, B-1, B-2, and D
Allow 1 credit for each correct response.

Part A			
1 4	9 1	17 2	25 4
2 3	10 3	18 4	26 1
3 3	11 1	19 2	27 4
4 1	12 1	20 3	28 2
5 2	13 3	21 2	29 2
6 2	14 3	22 4	30 3
7 1	15 2	23 4	
8 4	16 3	24 3	
Part B-1			
31 1	35 4	39 1	43 4
32 1	36 2	40 1	
33 2	37 1	41 2	
34 3	38 2	42 3	
Part B-2			
47 3	49 4	50 1	
Part D			
73 4	75 1	81 3	
74 4	76 1	82 1	

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*.

Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Allow 1 credit for each correct response.

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 Scoring Key and 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. 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: <http://www.p12.nysed.gov/assessment/> on Thursday, August 18, 2016. 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.

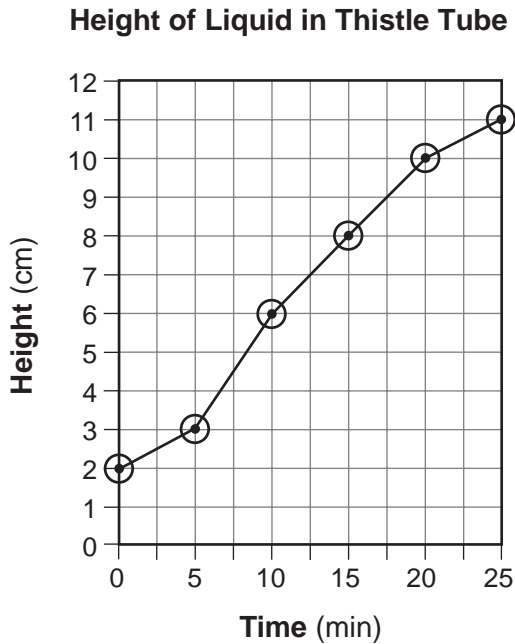
Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

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, without any breaks in the data, on each labeled axis.
- 45 [1] Allow 1 credit for correctly plotting the data, connecting the points, and surrounding each point with a small circle.

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



Note: Allow credit if points are correctly plotted, but not circled.

Do *not* assume that the intersection of the x - and y -axes is the origin $(0,0)$, unless it is labeled. An appropriate scale only needs to include the data range in the data table.

Do *not* allow credit if points are plotted that are not in the data table, e.g., $(0,0)$, or for extending lines beyond the data points.

- 46 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Water diffused (moved) into the thistle tube.
 - Water went from an area of high concentration to an area of low concentration.
 - Osmosis took place.
 - Water diffused through the membrane.

47 MC on scoring key

- 48 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Other species lack the receptors for the chemical.
 - The alarm chemicals are specific to the species.
 - Other species lack the ability to sense/recognize the chemical.

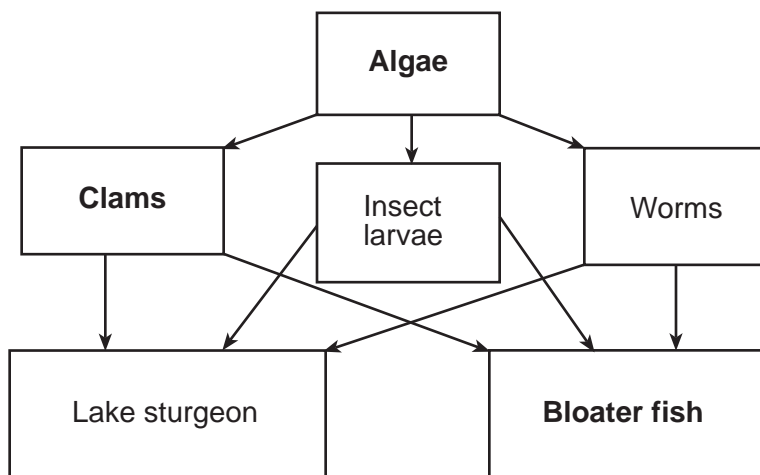
49 MC on scoring key

50 MC on scoring key

- 51 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The bacteria will produce the human hormone quickly.
 - to increase the production of insulin or some other hormone
 - The human hormone produced can be given to people who need it, and the number of allergic reactions will be reduced.
 - to get the bacteria to produce a human hormone

- 52 [1] Allow 1 credit for identifying *one* correct population and supporting the answer. Acceptable responses include, but are not limited to:
- Populations of insect larvae [*or* clams *or* worms] will decrease in size because they will be eaten by both lake sturgeon and bloater fish.
 - The bloater fish population will decrease in size because it will have to compete with the lake sturgeon for food resources.
 - clams because they are eaten by the sturgeon

- 53 [1] Allow 1 credit for:



54 [1] Allow 1 credit for algae and supporting the answer. Acceptable responses include, but are not limited to:

- Algae, because there will be fewer organisms that feed on them.
- More algae will survive and reproduce because populations of insect larvae, clams, and worms that eat the algae will decrease in size because they will be eaten by both lake sturgeon and bloater fish.

Note: Allow credit for an answer that is consistent with the student's response to question 53.

55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- The arrows show the direction of energy movement from one organism to another.
- The arrows show the flow of energy.
- movement of nutrients through the food web
- what each organism feeds on

Part C

- 56** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- too hard to track in natural habitat
 - The salamanders are easier to watch.
 - The conditions the salamanders are kept in can be better controlled.
 - to eliminate the possibility of them becoming an invasive species
 - to avoid predators
- 57** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The sample size is small.
 - The environment is artificial.
 - The salamanders are not in their natural habitat.
 - The experiment was not repeated.
- 58** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- New species might compete with native species for limited resources.
 - Native species can have their space, light, and water taken away by invasive plants.
 - New plant species could also have nonnative insects/pathogens on them.
- 59** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Plants take in carbon dioxide to perform photosynthesis.
 - Plants use CO₂ to produce food.
 - Plants take in carbon dioxide.
- 60** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Carbon dioxide adds to the “Greenhouse Effect.”
 - Excessive carbon dioxide increases the temperature.
 - CO₂ has been associated with global warming/global climate change.
- 61** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Green roofs are expensive to install.
 - Green roofs need more maintenance.
 - Green roofs might be too heavy for the building structure.

- 62** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Bacteria exposed to x-ray radiation will show a greater number of mutations than bacteria exposed to natural light.
 - Bacteria exposed to x rays will show less DNA damage than bacteria exposed to natural light.
 - If bacteria are exposed to x rays, they will show more mutations than bacteria not exposed to x rays.
 - The DNA of bacteria exposed to x rays will change more than that of bacteria not exposed to x rays.
 - X rays affect bacterial DNA.

Note: Do *not* allow credit for a hypothesis written in the form of a question.

- 63** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- protects from every known influenza A virus
 - directly injects viral DNA
 - adds years of protection
 - It makes muscle cells produce hemagglutinin.
 - It causes muscle cells to make a protein found on the surface of all flu viruses.

- 64** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Your body responds by making antibodies that protect you from future infections.
 - There are antigens on the surface of the dead virus, which then trigger the body to produce antibodies specific to that antigen.
 - The body makes memory cells that can fight the virus in the future.

- 65** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The access to fish is limited by the amount of ice cover.
 - They have to search for foods other than fish.
 - The ice cover might limit the number of organisms that are available for the eagles to eat.

- 66** [1] Allow 1 credit for stating what inference can be made about the percent ice cover at Croton Reservoir between January and February 2009 and supporting the answer. Acceptable responses include, but are not limited to:
- The ice cover was less in February because there were more eagles.
 - Since there were fewer eagles in January, there must have been more ice.

- 67** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Winter is ending, so the eagles returned to their summer nesting areas.
 - As winter ended, the eagles migrated away.
 - They fly freely between the sites, so their numbers would vary.
 - The number of visits by volunteers varied.
 - There were fewer visits in March than in January or February.
 - There were more late-season storms/ice in March than February.
- 68** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Winter roosts are protected under federal law and managed with a buffer zone to reduce human disturbance.
 - Humans might disturb the eagles.
- 69** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Their role is to convert inorganic (raw) materials into organic matter/food.
 - They capture radiant energy.
 - They serve as the producer in this food web/ecosystem.
 - They serve as food for fish.
 - produce oxygen
- 70** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- temperature: causes a change in currents
 - light: used by plants for photosynthesis
 - ocean currents: carry organisms from one reef to another
 - carbon dioxide: used by plants for photosynthesis
- 71** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- in order to maintain the food webs that exist there
 - because many organisms depend on them for food or shelter
 - to maintain biodiversity
 - keep oceans healthy
 - to prevent extinction of reef species
- 72** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The fish larvae could repair/repopulate the damaged reefs.
 - The reef might become more stable.
 - They might keep the seaweed under control/eat the seaweed.
 - It would provide the fish larvae with food/shelter.
 - The fish larvae would have less competition.

Part D

73 MC on scoring key

74 MC on scoring key

75 MC on scoring key

76 MC on scoring key

77 [1] Allow 1 credit for stating *two* reasons. Acceptable responses include, but are not limited to:

- They have different beak structures.
- They might eat different types of plants.
- They might eat at different times of day or night.
- They might live in different areas of the island.

78 [1] Allow 1 credit for tree 2 and supporting the answer. Acceptable responses include, but are not limited to:

- Species *B* has enzyme *Y*, which is not present in either species *A* or *C*.
- Enzyme *W* (and/or *X*) is present in species *A* and *C*, but not in *B*.
- *A* and *C* have enzymes *W*, *X*, and *Z*, but *B* doesn't.
- *A* and *C* have 3 enzymes in common: *W*, *X*, and *Z*.
- *A* and *C* have more in common.

79 [1] Allow 1 credit for water.

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

- salt
- sugar
- seawater

81 MC on scoring key

82 MC on scoring key

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

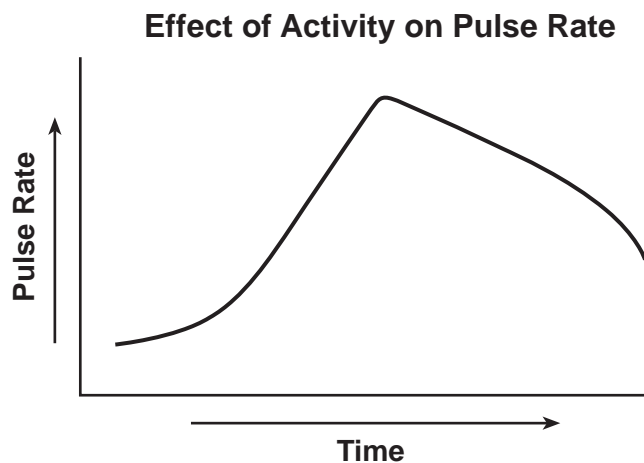
- C shows the transport of molecules from an area of low concentration to an area of higher concentration.
- The molecules are moving against the concentration gradient.

84 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- They may have evolved in the same or similar environments, and these structures and traits were advantageous adaptations.
- They have two separate mutations that produce the same appearance.
- These structures might help them use similar food sources/adapt to their environment.
- The species inhabit similar environments.
- They occupy similar niches.
- natural selection
- convergent evolution

85 [1] Allow 1 credit.

Example of a 1-credit response:



Note: Allow credit for a graph that shows a gradual increase followed by a gradual decrease.

The *Chart for Determining the Final Examination Score for the August 2016 Regents Examination in Living Environment* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Thursday, August 18, 2016. 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 <http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
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

August 2016 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		39	47	
Key Idea 2				56, 57, 62
Key Idea 3		33, 36, 38	44, 45	
Appendix A (Laboratory Checklist)		32		
Standard 4				
Key Idea 1	1, 14	31, 40	46, 48, 52, 53, 54, 55	69
Key Idea 2	4, 5, 8, 11	35	49, 50, 51	
Key Idea 3	9, 13, 15, 16, 17, 18	37		
Key Idea 4	12, 19, 20, 21, 22			
Key Idea 5	2, 7, 10, 23, 24, 25	41, 42, 43		63, 64
Key Idea 6	26, 27, 28			65, 66, 67, 70, 71, 72
Key Idea 7	3, 6, 29, 30	34		58, 59, 60, 61, 68

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

Regents Examination in Living Environment – August 2016

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

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
85	100	56	78	27	50
84	98	55	77	26	48
83	97	54	76	25	47
82	96	53	75	24	46
81	95	52	75	23	44
80	95	51	74	22	43
79	94	50	73	21	41
78	93	49	73	20	40
77	92	48	72	19	38
76	91	47	71	18	37
75	91	46	70	17	35
74	90	45	69	16	33
73	89	44	68	15	32
72	88	43	68	14	30
71	88	42	67	13	28
70	87	41	66	12	26
69	86	40	65	11	24
68	86	39	64	10	22
67	85	38	63	9	20
66	84	37	62	8	18
65	84	36	61	7	16
64	83	35	59	6	14
63	82	34	58	5	12
62	82	33	57	4	10
61	81	32	56	3	7
60	80	31	55	2	5
59	80	30	54	1	3
58	79	29	52	0	0
57	78	28	51		

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.