The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, August 13, 2009 — 12:30 to 3:30 p.m., only

Student Name _____

School Name _____

Print your name and the name of your school on the lines above. Then turn to the last page of this booklet, which is the answer sheet for Part A and Part B–1. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

You are to answer all questions in all parts of this examination. Write your answers to the Part A and Part B–1 multiple-choice questions on the separate answer sheet. Write your answers for the questions in Parts B–2, C, and D directly in this examination booklet. All answers 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 and in this examination booklet.

When you have completed the examination, you must sign the statement 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.

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

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, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

1 Organisms that are able to manufacture organic nutrients from substances in the abiotic environment are classified as

(1) heterotrophs
(2) fungi
(3) predators
(4) autotrophs

2 Which factor would have the greatest effect on the flow of energy into an ecosystem?

(1) a large decrease in the amount of sunlight available
(2) a large increase in the number of carnivores
(3) a small increase in the number of decomposers
(4) a small decrease in the amount of minerals available

3 Which structures carry out life functions within cells?

(1) tissues
(2) organ systems
(3) organelles
(4) organs

4 Which process is most directly responsible for maintaining internal stability in an organism when its environment is constantly changing?

(1) digestion
(2) feedback
(3) reproduction
(4) evolution

5 The function of a cell depends primarily on its

(1) life span
(2) color
(3) structure
(4) movement

6 In some cases, humans have chosen to mate certain individual farm animals within a species. For example, by allowing only the largest cattle to reproduce over many generations, strains of very large cattle have been produced. This process is known as

(1) natural selection
(2) direct harvesting
(3) selective breeding
(4) dynamic equilibrium

7 A boy inherits genes for tallness, but his growth is limited as a result of poor nutrition. This is an example of

(1) an inherited disorder
(2) environmental influence on gene expression
(3) expression of a hidden trait
(4) a characteristic controlled by more than one pair of genes

8 The sickle-cell trait is an inherited condition resulting from the presence of abnormal molecules of the protein hemoglobin in red blood cells. A person with the sickle-cell trait may have a child with the same condition because the child receives from the parent

(1) abnormal red blood cells
(2) abnormal hemoglobin molecules
(3) a code for the production of abnormal hemoglobin
(4) a code for the production of abnormal amino acids

9 The sorting and recombining of genes during meiosis and fertilization usually leads to the production of

(1) gametes with many copies of the same chromosome
(2) embryos with traits identical to those of all other members of the species
(3) zygotes with the genetic information to produce only females
(4) offspring with some traits that did not appear in their parents

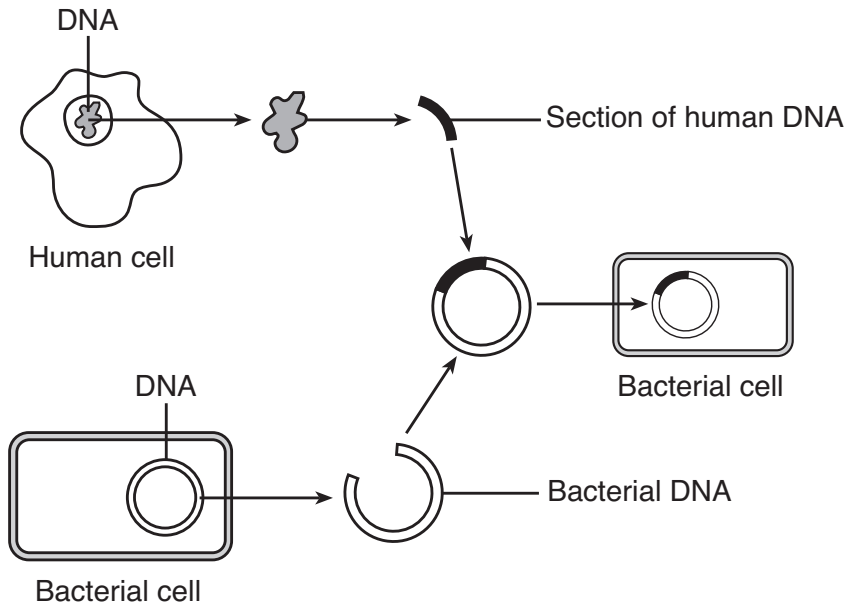
10 Which situation would most likely produce a gene mutation in a squirrel?

(1) The squirrel stops using its claws for digging.
(2) The squirrel is exposed to radiation for several days.
(3) Oak trees gradually become less common.
(4) The weather becomes wetter for a short period of time.

11 Which row in the chart below best describes what happens when some DNA bases are deleted from a gene?

Row	Gene	Trait Controlled By the Original DNA
(1)	is not changed	is never changed
(2)	is not changed	may be changed
(3)	is changed	is never changed
(4)	is changed	may be changed

12 The diagram below represents a technique currently used by scientists in the field of biotechnology.



Which statement describes a possible outcome of this technique?

(1) The bacterium is able to produce a human hormone.
(2) It allows the bacterium to grow in humans, since it contains a human gene.
(3) It allows humans to become immune to an infection from this type of bacteria.
(4) The bacterium can now produce human cells identical to cells of the DNA donor.

13 When antibiotics were first developed, most infectious diseases could be controlled by them. Today, certain bacteria are resistant to many antibiotics. One possible explanation for this change is that

(1) the antibiotics killed most of the bacteria that did not have a genetic variation for resistance
(2) the bacteria needed to change in order to produce more antibiotics
(3) some of the bacteria learned how to resist the antibiotics
(4) antibiotics have become weaker over the years

14 Thousands of genetically identical trees have been discovered growing in a remote, undisturbed mountain area in Colorado. These trees are most likely the result of

(1) genetic engineering
(2) asexual reproduction
(3) meiotic cell division
(4) biotechnology

15 The ability of the human body to keep blood-sugar levels within a fairly narrow range, despite the intake of meals high in carbohydrates, is an example of

(1) active transport
(2) genetic recombination
(3) homeostasis
(4) digestion

16 A large number of sperm cells are produced by males every day. This large number of sperm cells increases the chance that

(1) at least one sperm cell will be reached when the eggs swim toward the sperm cells in the ovary
(2) several sperm cells will unite with an egg so the fertilized egg will develop properly
(3) some of the sperm cells will survive to reach the egg
(4) enough sperm cells will be present to transport the egg from where it is produced to where it develops into a fetus

17 Which statement best describes the relationship between the blood of a human fetus and the blood of the mother?

(1) Their blood systems are separate only at certain times in development and connected at other times.
(2) The blood flows directly from the mother into the fetus.
(3) Their blood systems are separate and no materials are exchanged.
(4) Their blood systems are separate, but certain materials pass from one to the other.

18 To replace burned skin, doctors can successfully transplant replacement skin taken from another part of the body of the burn victim. Which statement best explains why the transplanted skin is *not* rejected?

(1) The transplanted skin is damaged, making the immune system nonfunctional.
(2) The antigens of the replacement skin are the same as those of the damaged skin.
(3) Burn victims lose so much blood that white blood cells cannot cause an immune response.
(4) There is no blood supply to the skin, so mixing of antigens does not occur.

19 The soil on a farm can very quickly become depleted of the minerals essential to plants because harvesting of crops can interfere with the

(1) reproductive cycles of animals
(2) recycling of inorganic compounds
(3) flow of energy
(4) transport of groundwater

20 A vaccine used against an infectious disease may contain

(1) specialized blood cells
(2) toxic enzymes
(3) a variety of antibiotics
(4) weakened pathogens

21 What will most likely occur if two different plant species compete for the same requirements in an ecosystem?

(1) They will usually develop different requirements.
(2) One species may adapt to a different environment.
(3) One species may be eliminated from that ecosystem.
(4) They will alter the environment so that they can both survive in that ecosystem.

22 Some of the energy taken in by an organism is not available to other organisms in a food web. Energy that is *not* available to other organisms in a food web is energy that is

(1) stored in the remains of a dead animal
(2) lost to the environment as heat
(3) stored in eggs produced during sexual reproduction
(4) produced in muscle tissue during the growth of an organism

23 The relationship that exists when athlete's foot fungus grows on a human is an example of

(1) predator/prey
(2) producer/consumer
(3) parasite/host
(4) decomposer/autotroph

24 If an ecosystem is changed through a natural disaster, organisms will have the best chance of survival if

(1) their environment has few abiotic factors
(2) the organisms are large
(3) the population size is small
(4) their species exhibits genetic variation

25 In state forests and parks containing varieties of flowering trees and shrubs, there are signs that say "Take nothing but pictures, leave nothing but footprints." These signs are necessary because

(1) humans can destroy habitats by removing flowering trees and shrubs
(2) all animals feed directly on flowering shrubs that may be removed by people
(3) removal of flowering trees and shrubs will increase biodiversity
(4) flowering shrubs grow best in state forests and parks

26 Which human activity creates the *least* threat to global stability?

(1) overuse of resources
(2) pollution of water with heavy metals
(3) pollution of air with sulfur gases
(4) reuse of plastic bags

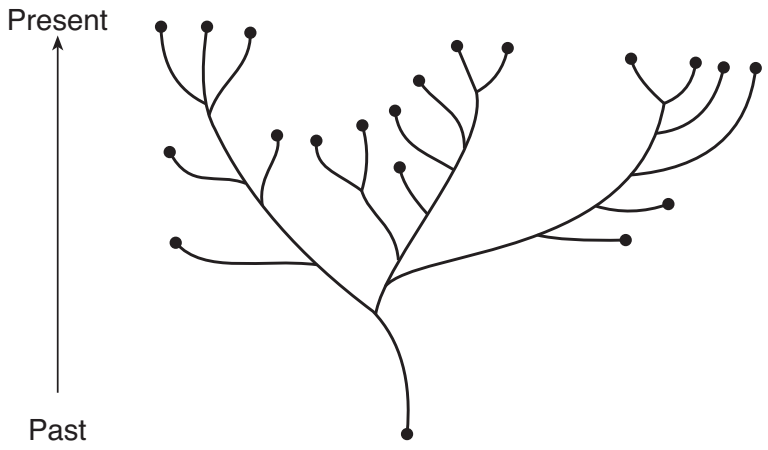
27 Which change is a cause of the other three?

(1) increased fossil fuel consumption
(2) destruction of the ozone shield
(3) increased industrialization
(4) destruction of natural habitats

28 In an attempt to improve environmental quality, local officials in a county in New York State want to build a garbage-to-steam plant. At the plant, garbage would be burned to produce energy, but air pollution would also be produced. In order to decide whether or not to build this plant, the community must consider

(1) the trade-offs involved
(2) new genetic technology
(3) the natural process of succession
(4) energy flow between organisms

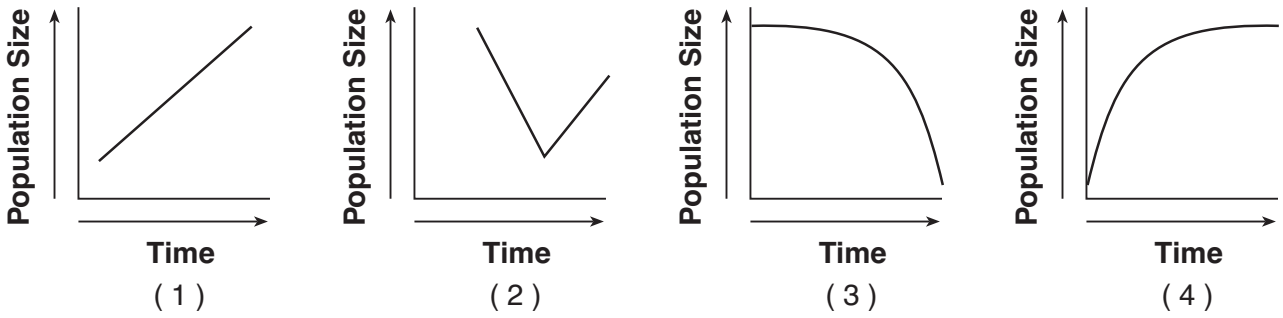
29 An evolutionary pathway is represented below.



Which statement about evolutionary pathways is most accurate?

(1) All evolutionary pathways show that life began with autotrophic organisms that soon evolved into heterotrophic organisms.
(2) Two organisms on the same branch of an evolutionary pathway are more closely related to each other than to those on distant branches.
(3) All the organisms shown at the ends of evolutionary pathway branch tips are alive today.
(4) Evolutionary pathways show that evolution is a short-term process.

30 Which graph represents a population that grew and is maintained at the carrying capacity of its ecosystem?



Part B–1

Answer all questions in this part. [13]

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

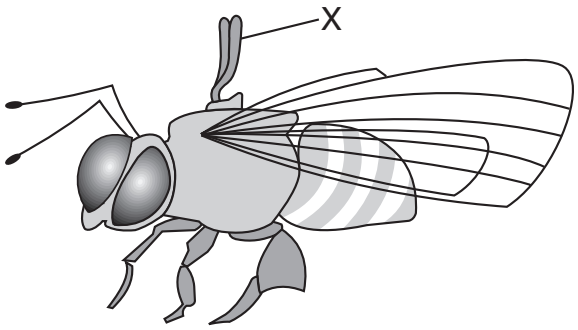
31 A laboratory procedure calls for heating 50 milliliters of a sugar solution to 60°C. Which piece of laboratory equipment will *not* be needed?

(1) protective eyewear
(2) ruler
(3) thermometer
(4) graduated cylinder

32 Which statement best describes a hypothesis?

(1) A hypothesis is the process of making careful observations.
(2) The conclusion drawn from the results of an experiment is part of a hypothesis.
(3) A hypothesis serves as a basis for determining what data to collect when designing an experiment.
(4) The facts collected from an experiment are written in the form of a hypothesis.

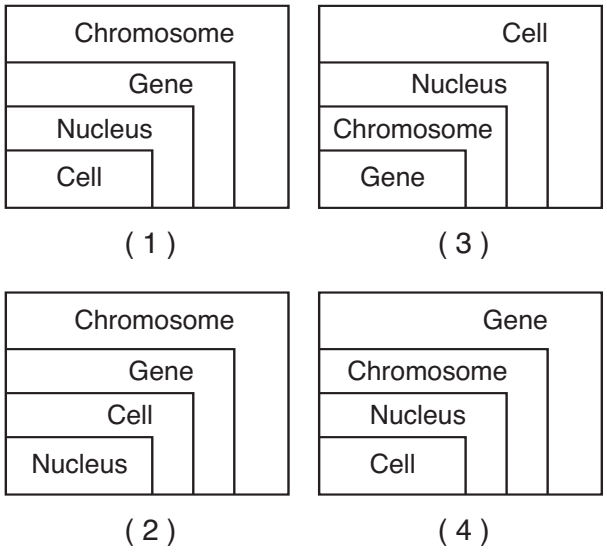
33 The diagram below represents a species of bee that helps one type of orchid plant reproduce by carrying pollen on structure *X* from one orchid flower to another. Pollination by this species of bee is the only way the orchid can reproduce.



If this bee species dies out, this orchid species would most likely

(1) cease to exist
(2) find another animal to carry the pollen
(3) flower at a different time of year
(4) develop another way to reproduce

34 Which model best represents the relationship between a cell, a nucleus, a gene, and a chromosome?



35 A researcher recently discovered a new species of bacteria in the body of a tubeworm living near a hydrothermal vent. He compared the DNA of this new bacterial species to the DNA of four other species of bacteria. The DNA sequences came from the same part of the bacterial chromosome of all four species.

Species	DNA Sequence
unknown species	ACT GCA CCC
species I	ACA GCA CCG
species II	ACT GCT GGA
species III	ACA GCA GGG
species IV	ACT GCA CCG

According to these data, the unknown bacterial species is most closely related to

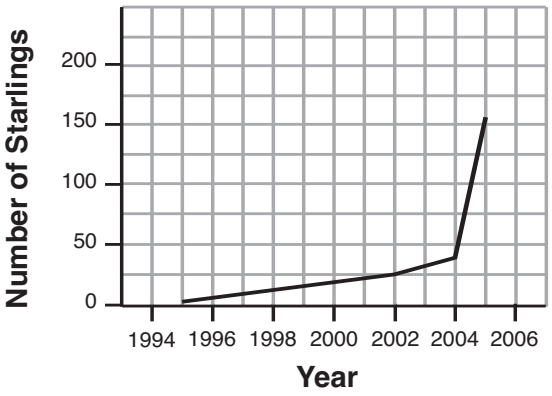
(1) species I
(2) species II
(3) species III
(4) species IV

Base your answers to questions 36 and 37 on the passage below and on your knowledge of biology.

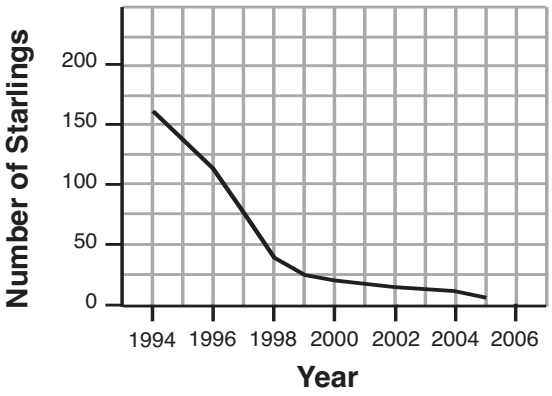
Alaska: Anchorage — Birders noted a sharp increase in European starlings in the 2005 Anchorage Christmas Bird Count. The sometimes aggressive species is relatively new to Alaska. Only three starlings were spotted during the 1995 Christmas bird count. Last year, there were 35. This year, birders counted 156.

Source: *USA Today*, 12/28/05

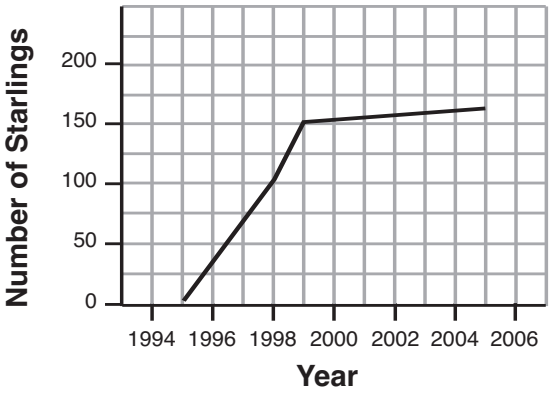
36 Which graph best represents the change in the number of starlings seen in the Anchorage area?



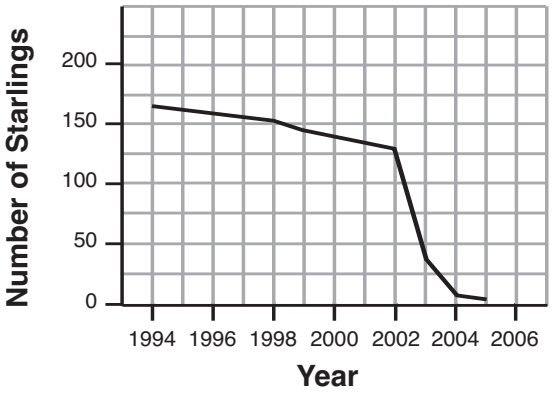
(1)



(3)



(2)

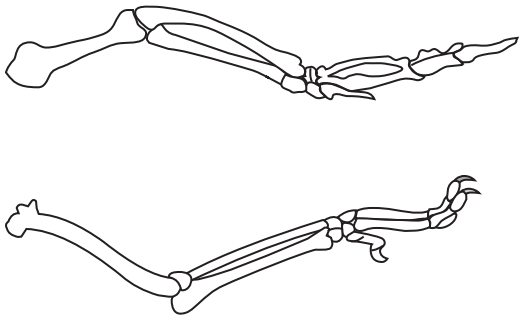


(4)

37 The change in the starling population in Anchorage from 1995 to 2005 could have been due to the presence of

(1) a large population of competing species
(2) a wide variety of predators
(3) an abundant food supply
(4) very few flowering plants

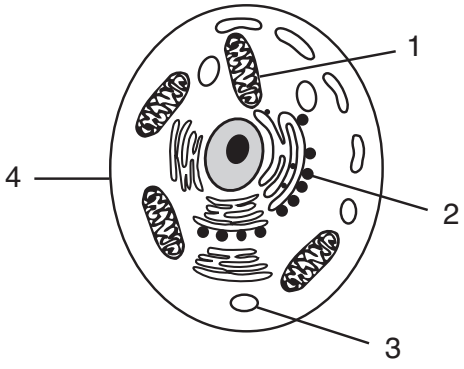
38 The diagram below represents the bones of the forelimbs of two animals alive today that most likely evolved from a common ancestor. Members of the original ancestral population were isolated into two groups by natural events.



If these two animals did have a common ancestor, which statement would best explain why there are differences in the bones?

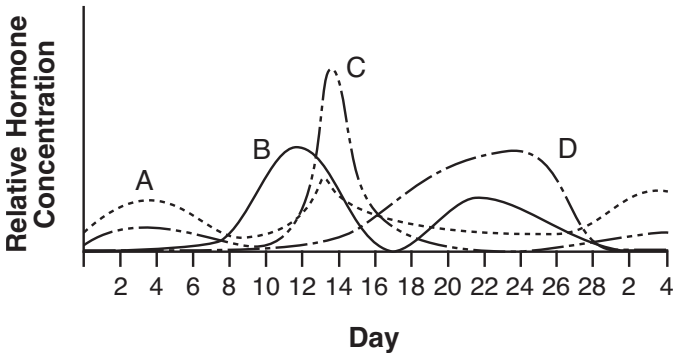
(1) Changes occurred to help the animals return to their original environment.
(2) Changes contributed to the survival of the organisms in their new environment.
(3) Changes helped reduce competition within each group.
(4) Changes indicate the species are evolving to be more like the ancestral species.

39 Within which structure shown in the diagram below are energy-rich organic compounds used to produce ATP?



(1) 1
(2) 2
(3) 3
(4) 4

40 The graph below shows the relative concentrations of certain hormones in the blood during the human female reproductive cycle.



Which hormone has the lowest concentration on which day?

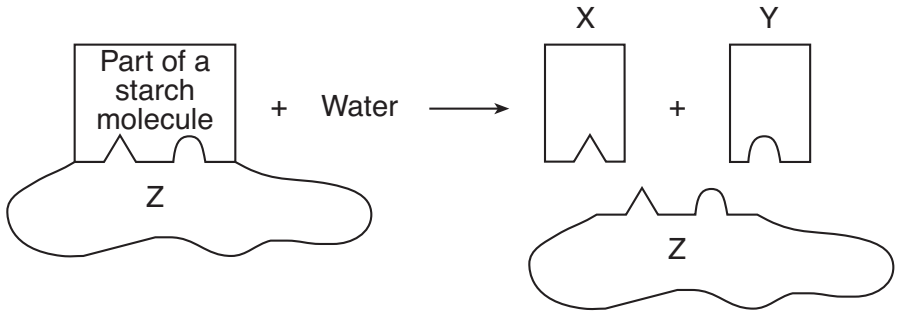
(1) hormone *A* on day 4
(2) hormone *B* on day 2
(3) hormone *C* on day 12
(4) hormone *D* on day 20

41 Which statement best describes the starch content of two leaves taken from the same plant shown in the chart below?

Leaf A	taken from plant in the dark for 48 hours
Leaf B	taken from plant in bright light for 48 hours

(1) Neither leaf contains starch.
(2) Both leaves contain the same amount of starch.
(3) Leaf *A* contains more starch than leaf *B*.
(4) Leaf *B* contains more starch than leaf *A*.

Base your answers to questions 42 and 43 on the diagram below, which represents a chemical reaction that occurs in the human body, and on your knowledge of biology.



42 Substances *X* and *Y* are examples of which kind of molecule?

(1) simple sugar
(2) amino acid
(3) fat
(4) hormone

43 Which statement describes a characteristic of molecule Z?

(1) Molecule Z will function at any temperature above 20°C.
(2) Molecule Z is composed of a string of molecular bases represented by A, T, G, and C.
(3) Molecule Z will function best at a specific pH.
(4) Molecule Z is not specific, so this reaction can be controlled by any other chemical in the body.

Part B–2

Answer all questions in this part. [12]

Directions (44–55): For those questions that are followed by four choices, circle the *number* preceding 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 in the question and record your answers in the spaces provided.

Base your answers to questions 44 through 46 on the passage below and on your knowledge of biology.

For Teacher Use Only

> To most people, using maggots (fly larvae) for a medical treatment is not a great idea. However, to many doctors, fly larvae do have a place in medicine, and that place is inside open wounds.
>
> In maggot debridement therapy, live fly larvae are mixed into a dressing for a wound and the area is covered with gauze. Maggots, which will only eat dead tissue, feed on damaged flesh and leave the healthy tissue behind. In the process, the maggots excrete an antimicrobial chemical that helps cleanse the wound of pathogens. When the dressing is cut away two or three days later, the maggots, now up to 10 times their original size, are easily removed.
>
> People with diabetes often have impaired wound healing. This could lead to infection. Maggot therapy has been used to clean these types of wounds.

44 What is the meaning of the term *debridement*?

(1) excretions of pathogens

(2) impaired wound healing

(3) removal of dead tissue

(4) destruction of antimicrobial chemicals

44 ☐

45 Which group of terms best describes a maggot?

(1) decomposer, prey, host

(2) scavenger, heterotroph, consumer

(3) producer, predator, parasite

(4) pathogen, carnivore, autotroph

45 ☐

46 State *one* possible reason why slow healing of wounds can lead to infection. [1]

_____

_____

46 ☐

Base your answers to questions 47 through 50 on the information below and on your knowledge of biology.

For Teacher Use Only

Hydrogen peroxide is a toxic substance produced in an organism as a result of certain metabolic processes. Catalase, a biological catalyst produced by cells, speeds the breakdown of hydrogen peroxide into less harmful substances.

In an investigation, 2-gram pieces of liver (which contains catalase) were added to separate dishes. Each dish contained the same amount of a 3% solution of hydrogen peroxide, but at different temperatures. The relative activity of the catalase was determined. The results were recorded and are shown in the data table below.

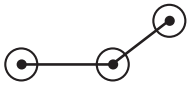
The Effect of Temperature on Catalase Activity

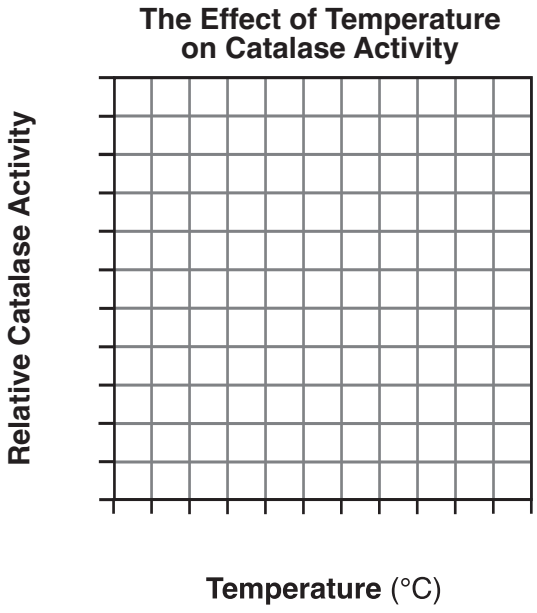
Temperature (°C)	**Relative Catalase Activity**
20	17
25	22
30	33
35	43
40	37
45	24
50	12

Directions (47–48): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

47 Mark an appropriate scale on each axis. [1]

48 Plot the data, surround each point with a small circle, and connect the points. [1]

Example: 



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47 ☐

48 ☐

49 At which temperature does catalase work most effectively? Support your answer. [1]

_____

_____

49 ☐

50 What type of organic substance is catalase? [1]

_____

50 ☐

Base your answers to questions 51 through 53 on the diagram of nerve cells below and on your knowledge of biology.

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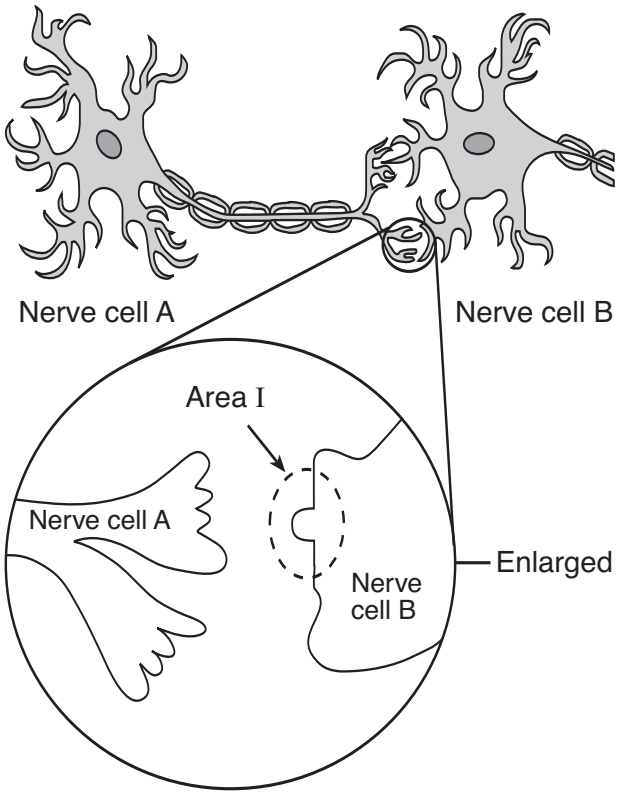

51 In the space below, sketch a chemical molecule that might be released from nerve cell *A* and be recognized and bind to area I of nerve cell *B*. [1]

51 ☐

52 Describe what would happen if a drug molecule shaped like  were introduced into this nerve pathway. [1]

_____

_____

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52 ☐

53 Identify *one* substance, other than the secretions from nerve cells, used in cell communication. [1]

_____

53 ☐

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

If farm fields in the Piedmont region of North Carolina are abandoned, there is a regular sequence of plant species that will inhabit the field. The data table below shows a typical sequence of dominant plant species.

Changes in Dominant Plant Species

Years After Last Cultivation	Dominant Plant Species
0	crabgrass
1	horseweed
2	aster
3	broomsedge
5–15	shortleaf pine
50–150	oak trees

54 This regular sequence of plant species over the 150-year period is known as

(1) degrading of the ecosystem

(2) loss of biodiversity

(3) ecological succession

(4) biological evolution

54 ☐

55 If the oak forest is destroyed by fire and no other disturbances occur, which dominant plant species would most likely be found in the region 70 years after the fire? [1]

_____

55 ☐

Part C

Answer all questions in this part. [17]

Directions (56–65): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 56 through 58 on the information below and on your knowledge of biology.

A park with a small lake is home to a population of ducks. The building of a housing complex eliminates a nearby pond. Soon other ducks and waterbirds like geese and egrets come to live at this small lake.

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56 State *one* specific way the new populations of birds may affect the original population of ducks. [1]

_____

_____ 56 ☐

57 State *one* specific way the new populations of birds may change the abiotic factors of the environment in and around the lake. [1]

_____

_____ 57 ☐

58 Predict *one* way the new populations of birds may affect the populations of plants that live in and around the lake. [1]

_____

_____ 58 ☐

59 Two life functions performed by all living organisms are nutrition and respiration. Identify *two* other life functions that are essential for the survival of all living organisms. Explain how each of the two life functions you identified maintains homeostasis. [2]

Life Function: _____

Explanation: _____

_____

Life Function: _____

Explanation: _____

_____ 59

For Teacher Use Only

60 A population of bats feeds on flying insects. Some of these bats have a gene that results in much stronger flight muscles than those of the other bats in the area. Explain how this variation could lead to evolutionary change within this species of bat. In your answer, be sure to include an explanation of:

- competition within the bat population [1]
- survival of various individuals within the bat population [1]
- how the frequency of the trait for stronger flight muscles would be expected to change within the bat population over time [1]

_____

_____

_____

_____

_____

_____ 60

61 Identify *one* activity of a mother that can disrupt fetal development and explain how this activity might affect the development of her fetus. [1]

_____

_____ 61

Base your answer to question 62 on the list below and on your knowledge of biology. The list includes two processes involved in the development of a human fetus.

For Teacher Use Only

Processes

mitosis

differentiation

62 Select *one* process from the list and describe its role in the development of a human fetus. In your answer be sure to:

- identify the process you selected
- state the role of this process in fetal development [1]
- identify the organ in the mother where this process occurs [1]

Process: _____

_____

_____

_____

_____

62

63 Describe the cycling of carbon in an ecosystem. In your answer be sure to:

- identify the inorganic carbon compound that is obtained by plants from the environment [1]
- identify the process plants use to form more complex organic molecules from this carbon compound [1]
- describe how herbivores use these complex organic molecules [1]
- identify the process herbivores use to return carbon to the environment [1]

_____

_____

_____

_____

_____

_____

_____

63

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

For Teacher Use Only

Windmill farms are being developed as alternative energy sources in some areas of the United States. Windmill farms convert energy from the wind into electricity.

64 State *one* reason why some residents might be concerned if windmill farms were planned for their part of the country. [1]

_____

_____ 64 ☐

65 State *one* environmental reason why using windmills for energy might be preferred over using coal for energy. [1]

_____

_____ 65 ☐

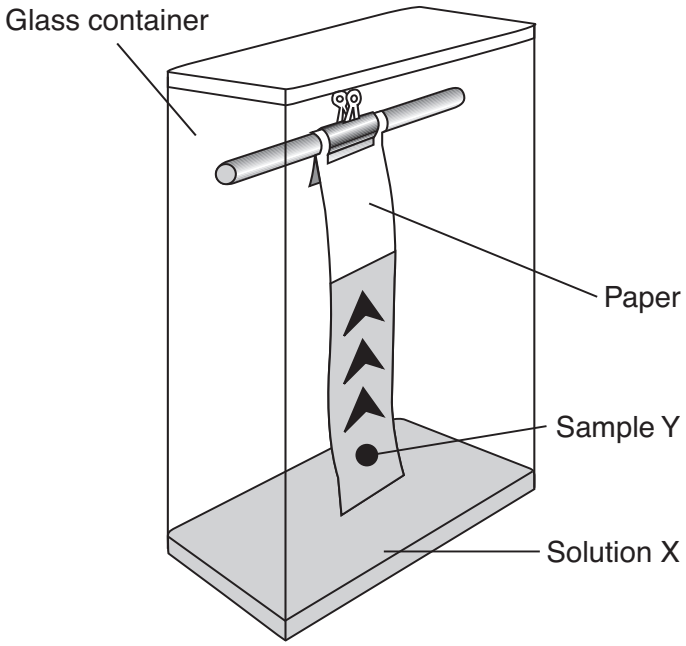
Part D

Answer all questions in this part. [13]

Directions (66–78): For those questions that are followed by four choices, circle 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 in the question and record your answers in the spaces provided.

For Teacher Use Only

66 The diagram below represents a laboratory apparatus.



This apparatus is used to

(1) identify the molecular bases in DNA

(2) detect chemical toxins in the air

(3) stain specimens before observing them with a microscope

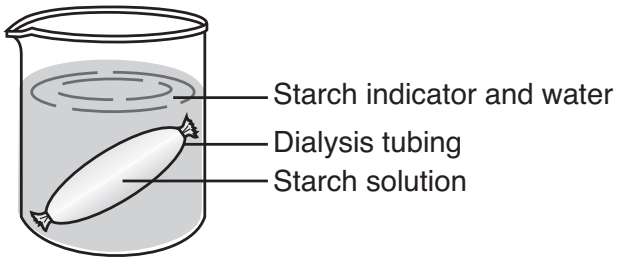
(4) separate a mixture of plant pigments

66 ☐

Base your answers to questions 67 and 68 on the information and diagram below and on your knowledge of biology.

For Teacher Use Only

Starch turns blue black in the presence of a starch indicator. Dialysis tubing tied at both ends and containing starch solution is placed in a beaker of water. Yellowish brown starch indicator is then added to the water.



67 What will the solutions in the beaker and the tubing look like after 20 minutes?

(1) The indicator solution in the beaker will be blue black and the starch solution in the tubing will not change color.

(2) The starch solution in the tubing will be blue black and the indicator solution in the beaker will not change color.

(3) Neither the indicator solution nor the starch solution will be blue black.

(4) Both the indicator solution and the starch solution will be blue black.

67 ☐

68 This laboratory setup would most likely be used to demonstrate the process of

(1) diffusion

(2) active transport

(3) replication

(4) cellular respiration

68 ☐

Base your answers to questions 69 through 71 on the chart below showing mRNA base sequences and the amino acids for which they code.

For Teacher Use Only

Universal Genetic Code Chart
Messenger RNA Codons and the Amino Acids for Which They Code

First Base	Second Base: U	Second Base: C	Second Base: A	Second Base: G	Third Base
U	UUU, UUC: PHE UUA, UUG: LEU	UCU, UCC, UCA, UCG: SER	UAU, UAC: TYR UAA, UAG: STOP	UGU, UGC: CYS UGA: STOP UGG: TRP	U C A G
C	CUU, CUC, CUA, CUG: LEU	CCU, CCC, CCA, CCG: PRO	CAU, CAC: HIS CAA, CAG: GLN	CGU, CGC, CGA, CGG: ARG	U C A G
A	AUU, AUC, AUA: ILE AUG: MET or START	ACU, ACC, ACA, ACG: THR	AAU, AAC: ASN AAA, AAG: LYS	AGU, AGC: SER AGA, AGG: ARG	U C A G
G	GUU, GUC, GUA, GUG: VAL	GCU, GCC, GCA, GCG: ALA	GAU, GAC: ASP GAA, GAG: GLU	GGU, GGC, GGA, GGG: GLY	U C A G

69 Which three codons would code for a different amino acid sequence from that coded for by the mRNA base sequence AGU-UCA-CCA?

(1) AGC-UCU-CCU

(2) AGU-UCC-CCG

(3) AGC-UCA-CUU

(4) AGU-UCG-CCC

69 ☐

70 Fill in an mRNA codon that would code for each amino acid shown. [1]

Amino acid:	**ASP**	**TRP**	**CYS**
mRNA codon:	____	____	____

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70 ☐

71 Identify *one* of the mRNA codons that would stop the coding process. [1]

_____

71 ☐

Base your answers to questions 72 through 74 on the information below and on your knowledge of biology.

A scientist conducted an experiment to test the hypothesis that maple seeds exposed to acid rain will take longer to germinate than seeds exposed to normal rain, which has a pH of 5.6. The scientist set up four groups, each containing 200 maple seeds. The water used for each group had a different pH value: 5.6, 4.0, 3.0, and 2.0. All other conditions were kept the same. After ten days, the number of seeds that had germinated in each group was counted.

72 Identify the control group in this experiment. [1]

_____

72 ☐

73 Identify the dependent variable in this experiment. [1]

_____

73 ☐

74 State *one* example of experimental results that would indicate that acid rain, which has a pH between 4.5 and 4.0, could be responsible for a *decrease* in the number of young maple trees in some forest regions. [1]

_____

_____

74 ☐

75 A student squeezes a clothespin as rapidly as possible for one minute. Without stopping to rest, the student continues to squeeze the clothespin for a second minute. At the end of the second minute, the student's fingers and hand feel very cramped and tired. The physical tiredness and cramping in the muscles in the student's hand were most likely due to the increased production of

(1) ATP

(2) waste products

(3) oxygen

(4) glucose

75 ☐

76 A technique that can be used to compare the DNA of two or more plants is

(1) cloning

(2) chromatography

(3) staining

(4) gel electrophoresis

76 ☐

77 Three different species of finch inhabit one particular Galapagos Island. All three species of finch prefer plant food and have edge-crushing bills. Explain how all three species of finch can live successfully on the same island. [1]

_____

_____

77 ☐

78 Describe what will happen to red onion cells in a wet-mount slide when a saltwater solution is added to them. [1]

_____

_____

78 ☐

For Teacher Use Only

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, August 13, 2009 — 12:30 to 3:30 p.m., only

ANSWER SHEET

☐ Female

Student ..... Sex: ☐ Male

Teacher .....

School ..... Grade .....

Part	Maximum Score	Student's Score
A	30	
B–1	13	
B–2	12	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		
Final Score (from conversion chart)		

Raters' Initials

Rater 1 ..... Rater 2 .....

Record your answers to Part A and Part B–1 on this answer sheet.

Part A

1	11	21 .....
2	12	22 .....
3	13	23 .....
4	14	24 .....
5	15	25 .....
6	16	26 .....
7	17	27 .....
8	18	28 .....
9	19	29 .....
10	20	30 .....

Part A Score

Part B–1

31	38 .....
32	39 .....
33	40 .....
34	41 .....
35	42 .....
36	43 .....
37	

Part B–1 Score

The declaration below must be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

Tear Here

LIVING ENVIRONMENT

Tear Here

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Tear Here

FOR TEACHERS ONLY

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

LE

LIVING ENVIRONMENT

Thursday, August 13, 2009 — 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 http://www.emsc.nysed.gov/osa/ and select the link "Examination 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.

Part A and Part B–1
Allow 1 credit for each correct response.

Part A

1 . . . . . **4**	11 . . . . . **4**	21 . . . . . **3**
2 . . . . . **1**	12 . . . . . **1**	22 . . . . . **2**
3 . . . . . **3**	13 . . . . . **1**	23 . . . . . **3**
4 . . . . . **2**	14 . . . . . **2**	24 . . . . . **4**
5 . . . . . **3**	15 . . . . . **3**	25 . . . . . **1**
6 . . . . . **3**	16 . . . . . **3**	26 . . . . . **4**
7 . . . . . **2**	17 . . . . . **4**	27 . . . . . **3**
8 . . . . . **3**	18 . . . . . **2**	28 . . . . . **1**
9 . . . . . **4**	19 . . . . . **2**	29 . . . . . **2**
10 . . . . . **2**	20 . . . . . **4**	30 . . . . . **4**

Part B–1

31 . . . . . **2**	38 . . . . . **2**
32 . . . . . **3**	39 . . . . . **1**
33 . . . . . **1**	40 . . . . . **2**
34 . . . . . **3**	41 . . . . . **4**
35 . . . . . **4**	42 . . . . . **1**
36 . . . . . **1**	43 . . . . . **3**
37 . . . . . **3**	

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*.

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the student's work by making insertions or changes of any kind.

Allow 1 credit for each correct response for multiple-choice questions.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a check mark each incorrect or omitted answer to multiple-choice questions. In the box provided in the upper right corner of the answer sheet, record the number of questions the student answered correctly for each of these parts.

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 all the open-ended questions on a student's answer paper.

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. In the student's examination booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

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.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, Part C, and Part D on the appropriate lines in the box printed on the answer sheet and should add these five scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, August 13, 2009. The student's scaled score should be entered in the box labeled "Final Score" on the student's answer sheet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination 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 3

45 2

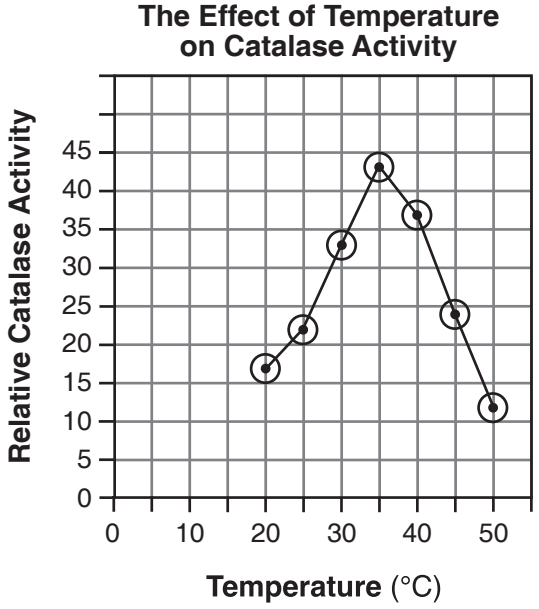
46 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— There would be more time for pathogens to cause infection.
— Slow healing increases exposure time to pathogens.
— An open wound will provide a suitable environment for pathogens.

47 [1] Allow 1 credit for marking an appropriate scale on each labeled axis.

48 [1] Allow 1 credit for correctly plotting the data and connecting the points.

Example of a 2-credit graph for questions 47 and 48:



Note: Allow credit if points are plotted correctly but *not* circled.
Make no assumption about the origin unless it is labeled.
Do *not* allow credit for plotting points that are not in the data table, e.g., (0,0).

49 [1] Allow 1 credit for 35°C and supporting the answer. Acceptable responses include, but are not limited to:

— The greatest amount of activity occurs there.

— It is the highest point on the graph.

— The rate is highest at this temperature.

Note: Allow credit for an answer consistent with the student's graph for questions 47 and 48.

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

— an enzyme

— a catalyst

— protein

51 [1] Allow 1 credit.

Examples of 1-credit responses:

Note: Accept any shape with a corresponding section that will fit into the receptor on nerve cell *B*.

52 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Nothing; the shape would not be accepted by receptors on *B*.

— It would not bind with the receptors in area I.

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

— hormones

— antigens

— receptor molecules

54 3

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

— oak trees

— oak

Part C

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

— New populations of waterbirds will compete with the original population of ducks for space/food.

— New individuals of the same species as the original duck population may compete for mates.

— may bring disease with them

— original population may decline

57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Bird waste will pollute the water and make it cloudy.

— Additional waste might change the pH of the lake.

— New birds will decrease the amount of space available to other birds.

Note: Do *not* accept just "pollution." The student's answer must address a specific abiotic factor.

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

— More birds will eat the plants, so the plant populations will decrease in number.

— Some birds will eat organisms that eat plants. Since there will be fewer primary consumers, the plant populations will increase in number.

— Bird wastes will make the soil more fertile so more plants will grow.

— The population of plants will decrease.

Note: Do *not* accept extinction of the plants.

59 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits if *two* life functions are identified *and* the student correctly explains how each function maintains homeostasis.

- Allow 1 credit if *one* life function is identified *and* the student correctly explains how that function maintains homeostasis.

Example of a 2-credit response:

Circulation *or* transport moves essential materials through the cell or organism. Excretion gets rid of potentially harmful wastes.

Note: Do *not* accept digestion (part of nutrition) *or* reproduction (not necessary to maintain homeostasis).

60 [3] Allow a maximum of 3 credits, allocated as follows:

- Allow 1 credit for an explanation of competition within the bat population. Acceptable responses include, but are not limited to:

  — Bats with the variation for stronger flight muscles would most likely catch more flying insects than bats without the gene.

- Allow 1 credit for an explanation of survival of various individuals within the bat population. Acceptable responses include, but are not limited to:

  — More bats possessing the gene for stronger flight muscles would survive than those without.

- Allow 1 credit for an explanation of how the frequency of the trait for stronger flight muscles would be expected to change within the bat population over time. Acceptable responses include, but are not limited to:

  — Over time, more bats would possess the variation for stronger flight muscles.

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

— Having x rays can result in defects in the genes of the fetus.

— Smoking may cause low birth weight.

62 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for stating the role of the student-selected process in fetal development. Acceptable responses include, but are not limited to:

  — Mitosis produces more cells, causing the fetus to grow.

  — Differentiation causes individual cells to have specialized functions, resulting in the formation of tissues and organs.

- Allow 1 credit for identifying the organ in the mother where the student-selected process occurs. Acceptable responses include, but are not limited to:

  Mitosis

  — uterus

  Differentiation

  — uterus

63 [4] Allow a maximum of 4 credits, allocated as follows:

- Allow 1 credit for identifying the inorganic carbon compound that is obtained by plants from the environment as carbon dioxide (CO_2).

- Allow 1 credit for identifying the process plants use to form more complex organic molecules from this carbon compound as photosynthesis.

- Allow 1 credit for describing how herbivores use these complex organic molecules. Acceptable responses include, but are not limited to:

  — as a source of energy

  — as a source of nutrients

  — as a source of materials to synthesize other molecules

- Allow 1 credit for identifying the process herbivores use to return carbon to the environment. Acceptable responses include, but are not limited to:

  — respiration

  — breathing

  — excretion

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

— It might block their scenic view.
— interrupt bird flight paths
— They think they will be too noisy.
— decrease the amount of open space

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

— Windmill farms reduce air pollution.
— Wind power is a renewable energy source.
— Energy doesn't need to be imported.

Part D

66 4

67 2

68 1

69 3

70 [1] Allow 1 credit for:

Amino acid:	**ASP**	**TRP**	**CYS**
mRNA codon:	GAU *or* GAC	UGG	UGU *or* UGC

71 [1] Allow 1 credit for UAA *or* UAG *or* UGA.

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

— group with normal rainwater
— group with water of pH 5.6

73 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— number of seeds that germinated at different pHs
— how many seeds grew
— germination of seeds

74 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The control group had 190 seeds germinate, while the experimental group had only 150 seeds germinate.
— If fewer seeds germinate at a pH of 4.0, then this result would support the hypothesis that acid rain could be responsible for a decrease in the number of trees.

75 2

76 4

77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The finches may eat different-size seeds or plant parts.

— They may not compete for the same food.

— They may live on different parts of the island.

— They may have different niches.

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

— Water will move out of the cell (diffuse).

— The cell contents will shrink.

The *Chart for Determining the Final Examination Score for the August 2009 Regents Examination in Living Environment* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, August 13, 2009. 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 www.emsc.nysed.gov/osa/exameval/.
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 2009 Living Environment

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

Part D 66–78	
Lab 1	66, 69, 70, 71, 76
Lab 2	72, 73, 74, 75
Lab 3	77
Lab 5	67, 68, 78

University of the State of New York
State Education Department

Regents Examination in Living Environment
August 2009

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

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 "Final Score" on the student's answer sheet.

All student answer papers that receive a scale score of 60 through 64 **must** be scored a second time to ensure the accuracy of the score. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate and reliable scoring of the student's answer paper.

Because scale scores corresponding to raw scores in the conversion chart change from one examination 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 Living Environment Examination.