

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

LIVING ENVIRONMENT

Tuesday, August 17, 2004 — 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.

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

Part A

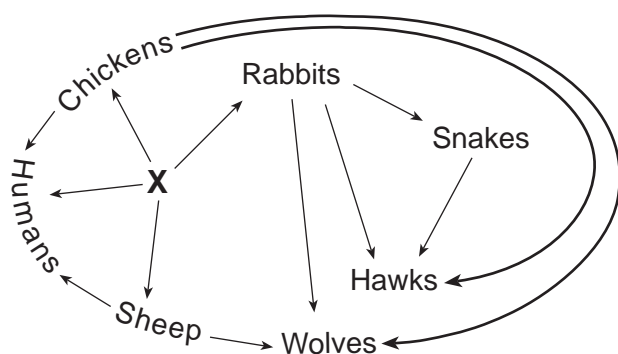
Answer all questions in this part. [30]

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

- 1 A scientist is planning to carry out an experiment on the effect of heat on the function of a certain enzyme. Which would *not* be an appropriate first step?

- (1) doing research in a library
- (2) having discussions with other scientists
- (3) completing a data table of expected results
- (4) using what is already known about the enzyme

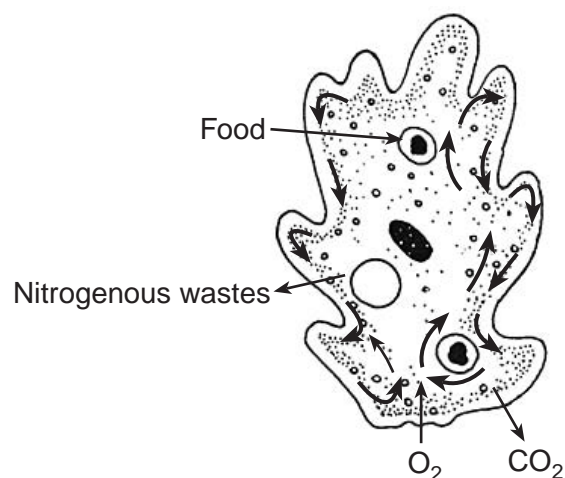
- 2 A partial food web is represented in the diagram below.



Letter X most likely represents

- (1) autotrophs
 - (2) carnivores
 - (3) decomposers
 - (4) parasites
- 3 The size of a mouse population in a natural ecosystem tends to remain relatively constant due to
- (1) the carrying capacity of the environment
 - (2) the lack of natural predators
 - (3) cycling of energy
 - (4) increased numbers of decomposers
- 4 A single gene mutation results from
- (1) a change in a base sequence in DNA
 - (2) recombination of traits
 - (3) the failure of chromosomes to separate
 - (4) blocked nerve messages

- 5 In the diagram of a single-celled organism shown below, the arrows indicate various activities taking place.



Which systems perform these same activities in humans?

- (1) digestive, circulatory, and immune
 - (2) excretory, respiratory, and reproductive
 - (3) respiratory, excretory, and digestive
 - (4) respiratory, nervous, and endocrine
- 6 Muscle cells in athletes often have more mitochondria than muscle cells in nonathletes. Based on this observation, it can be inferred that the muscle cells in athletes
- (1) have a smaller demand for cell proteins than the muscle cells of nonathletes
 - (2) reproduce less frequently than the muscle cells of nonathletes
 - (3) have nuclei containing more DNA than nuclei in the muscle cells of nonathletes
 - (4) have a greater demand for energy than the muscle cells of nonathletes

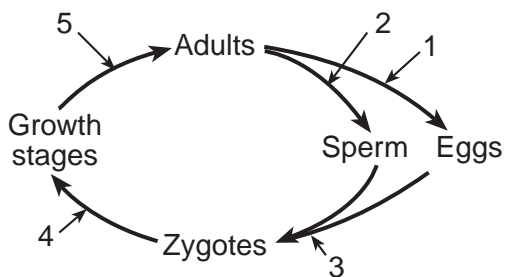
7 Some mammals have genes for fur color that produce pigment only when the outside temperature is above a certain level. This pigment production is an example of how the environment of an organism can

- (1) destroy certain genes
- (2) cause new mutations to occur
- (3) stop the process of evolution
- (4) influence the expression of certain genes

8 Most of the hereditary information that determines the traits of an organism is located in

- (1) only those cells of an individual produced by meiosis
- (2) the nuclei of body cells of an individual
- (3) certain genes in the vacuoles of body cells
- (4) the numerous ribosomes in certain cells

9 The arrows in the diagram below illustrate processes in the life of a species that reproduces sexually.



Which processes result directly in the formation of cells with half the amount of genetic material that is characteristic of the species?

- (1) 1 and 2
- (2) 2 and 3
- (3) 3 and 4
- (4) 4 and 5

10 Changes in the genetic code of a human can be transmitted to offspring if they occur in

- (1) cancer cells
- (2) gametes
- (3) cell membranes
- (4) antibodies

11 The development of specialized tissues and organs in a multicellular organism directly results from

- (1) cloning
- (2) differentiation
- (3) meiosis
- (4) evolution

12 A gene that codes for resistance to glyphosate, a biodegradable weedkiller, has been inserted into certain plants. As a result, these plants will be more likely to

- (1) produce chemicals that kill weeds growing near them
- (2) die when exposed to glyphosate
- (3) convert glyphosate into fertilizer
- (4) survive when glyphosate is applied to them

13 A biotechnology firm has produced tobacco plants that synthesize human antibodies that prevent bacterial diseases. One of the first steps in the production of these plants required

- (1) using natural selection to increase the survival of antibody-producing tobacco plants
- (2) inserting human DNA segments into the cells of tobacco plants
- (3) using selective breeding to increase the number of antibody genes in tobacco plants
- (4) growing tobacco plants in soil containing a specific fertilizer

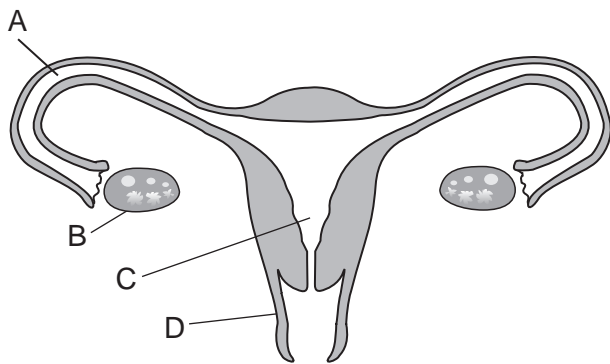
14 Which characteristics of a population would most likely indicate the lowest potential for evolutionary change in that population?

- (1) sexual reproduction and few mutations
- (2) sexual reproduction and many mutations
- (3) asexual reproduction and few mutations
- (4) asexual reproduction and many mutations

15 The theory of biological evolution includes the concept that

- (1) species of organisms found on Earth today have adaptations not always found in earlier species
- (2) fossils are the remains of present-day species and were all formed at the same time
- (3) individuals may acquire physical characteristics after birth and pass these acquired characteristics on to their offspring
- (4) the smallest organisms are always eliminated by the larger organisms within the ecosystem

- 16 A diagram of human female reproductive structures is shown below.



Which structure is correctly paired with its function?

- (1) A — releases estrogen and progesterone
 - (2) B — produces and releases the egg
 - (3) C — provides the usual site for fertilization
 - (4) D — nourishes a developing embryo
- 17 The use of a vaccine to stimulate the immune system to act against a specific pathogen is valuable in maintaining homeostasis because
- (1) once the body produces chemicals to combat one type of virus, it can more easily make antibiotics
 - (2) the body can digest the weakened microbes and use them as food
 - (3) the body will be able to fight invasions by the same type of microbe in the future
 - (4) the more the immune system is challenged, the better it performs
- 18 Some homeowners mow their lawns during the summer, collect the grass clippings and dispose of them in a landfill. Instead of taking the clippings to a landfill, a more ecologically sound procedure would be to
- (1) leave the clippings to decompose in the lawn to form materials that enrich the soil
 - (2) spray the clippings in the lawn with imported microbes that use them for food
 - (3) burn the clippings and add the ashes to the soil
 - (4) throw the clippings into a stream or river to provide extra food for organisms living there

- 19 Which statement does *not* describe an example of a feedback mechanism that maintains homeostasis?

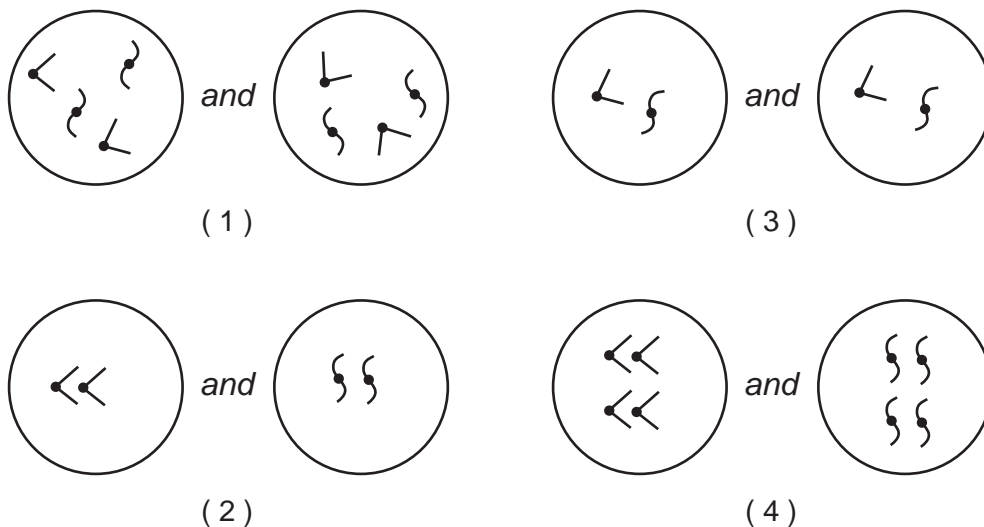
- (1) The guard cells close the openings in leaves, preventing excess water loss from a plant.
 - (2) White blood cells increase the production of antigens during an allergic reaction.
 - (3) Increased physical activity increases heart rate in humans.
 - (4) The pancreas releases insulin, helping humans to keep blood sugar levels stable.
- 20 Cattail plants in freshwater swamps in New York State are being replaced by purple loosestrife plants. The two species have very similar environmental requirements. This observation best illustrates
- (1) variations within a species
 - (2) dynamic equilibrium
 - (3) random recombination
 - (4) competition between species
- 21 One biotic factor that limits the carrying capacity of any habitat is the
- (1) availability of water
 - (2) level of atmospheric oxygen
 - (3) activity of decomposers
 - (4) amount of soil erosion
- 22 A greater stability of the biosphere would most likely result from
- (1) decreased finite resources
 - (2) increased deforestation
 - (3) increased biodiversity
 - (4) decreased consumer populations
- 23 Which factor is primarily responsible for the destruction of the greatest number of habitats?
- (1) human population growth
 - (2) decreased use of renewable resources
 - (3) spread of predatory insects
 - (4) epidemic diseases

- 24 When a particular white moth lands on a white birch tree, its color has a high adaptive value. If the birch trees become covered with black soot, the white color of this particular moth in this environment would most likely
- (1) retain its adaptive value
 - (2) increase in adaptive value
 - (3) change to a more adaptive black color
 - (4) decrease in adaptive value
- 25 A variation causes the production of an improved variety of apple. What is the best method to use to obtain additional apple trees of this variety in the shortest period of time?
- (1) selective breeding
 - (2) natural selection
 - (3) asexual reproduction
 - (4) hormone therapy
- 26 A new automobile manufacturing plant is opening in a certain town. It will have some negative environmental impacts. This is a trade-off that the town officials had to consider carefully before giving final approval. They most likely gave their approval because the negative impacts would be offset by the
- (1) release of pollutants into the environment
 - (2) creation of new employment opportunities
 - (3) decrease of property values in the area around the plant
 - (4) increase of automobile traffic in the area around the plant
- 27 In most states, automobiles must be inspected every year to make sure that the exhaust fumes they emit do not contain high levels of pollutants such as carbon monoxide. This process is a way humans attempt to
- (1) control the water cycle
 - (2) recycle nutrients from one ecosystem to another
 - (3) control energy flow in natural ecosystems
 - (4) maintain the quality of the atmosphere
- 28 The characteristics of a developing fetus are most influenced by
- (1) gene combinations and their expression in the embryo
 - (2) hormone production by the father
 - (3) circulating levels of white blood cells in the placenta
 - (4) milk production in the mother
- 29 The importation of organisms such as the Japanese beetle and gypsy moth to areas where they have no natural enemies best illustrates
- (1) the use of abiotic factors to reduce pest species
 - (2) the selection of species to mate with each other to produce a new variety
 - (3) attempts by humans to protect extinct species
 - (4) a human activity that disrupts existing ecosystems

30 The chromosome content of a skin cell that is about to form two new skin cells is represented in the diagram below.



Which diagram best represents the chromosomes that would be found in the two new skin cells produced as a result of this process?



Part B-1

Answer all questions in this part. [6]

Directions (31–36): 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.

Base your answers to questions 31 through 33 on the information and chart below and on your knowledge of biology.

It has been hypothesized that a chemical known as BW prevents colds. To test this hypothesis, 20,000 volunteers were divided into four groups. Each volunteer took a white pill every morning for one year. The contents of the pill taken by the members of each group are shown in the chart below.

Group	Number of Volunteers	Contents of Pill	% Developing Colds
1	5,000	5 grams of sugar	20
2	5,000	5 grams of sugar 1 gram of BW	19
3	5,000	5 grams of sugar 3 grams of BW	21
4	5,000	5 grams of sugar 9 grams of BW	15

31 Which factor most likely had the greatest influence on these experimental results?

- (1) color of the pills
- (2) amount of sugar added
- (3) number of volunteers in each group
- (4) health history of the volunteers

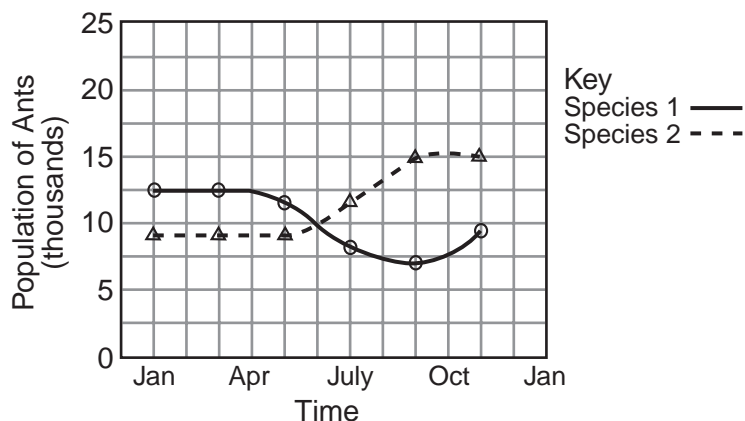
32 Which statement is a valid inference based on the results?

- (1) Sugar reduced the number of colds.
- (2) Sugar increased the number of colds.
- (3) BW is always effective in the prevention of colds.
- (4) BW may not be effective in the prevention of colds.

33 Which group served as the control in this investigation?

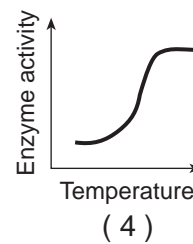
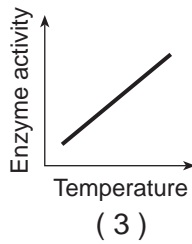
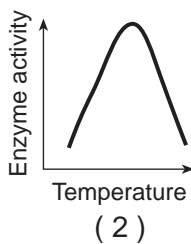
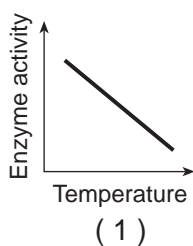
- (1) 1
 - (2) 2
 - (3) 3
 - (4) 4
-

- 34 The graph below shows the populations of two species of ants. Ants of species 2 have a thicker outer covering than the ants of species 1. The outer covering of an insect helps prevent excessive evaporation of water.

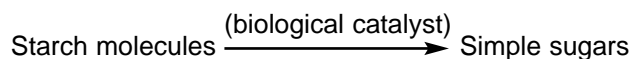


Which statement would best explain the population changes shown in the graph?

- (1) The food sources for species 1 increased while the food sources for species 2 decreased from January through November.
 - (2) Disease killed off species 1 beginning in May.
 - (3) The weather was hotter and dryer than normal from April through September.
 - (4) Mutations occurred from April through September in both species, resulting in both species becoming better adapted to the environment.
- 35 Enzymes have an optimum temperature at which they work best. Temperatures above and below this optimum will decrease enzyme activity. Which graph best illustrates the effect of temperature on enzyme activity?



- 36 A word equation is shown below.



This reaction is most directly involved in the process of

- (1) reproduction
- (2) protein synthesis
- (3) replication
- (4) heterotrophic nutrition

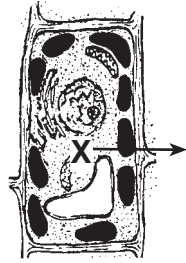
Part B-2

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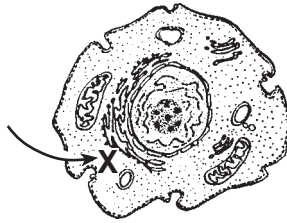
Answer all questions in this part. [19]

Directions (37-52): For those questions that are followed by four choices, circle the number of the choice that 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 37 through 39 on the two different cells shown below. Only cell A produces substance X. Both cells A and B use substance X.



Cell A



Cell B

37 Identify substance X. [1]

37

38 Identify the type of organelle in cell A that produces substance X. [1]

38

39 Identify the type of organelle found in both cell A and cell B that uses substance X. [1]

39

Base your answers to questions 40 through 43 on the information and data table below and on your knowledge of biology.

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A student added two species of single-celled organisms, *Paramecium caudatum* and *Didinium nasutum*, to the same culture medium. Each day, the number of individuals of each species was determined and recorded. The results are shown in the data table below.

Culture Population

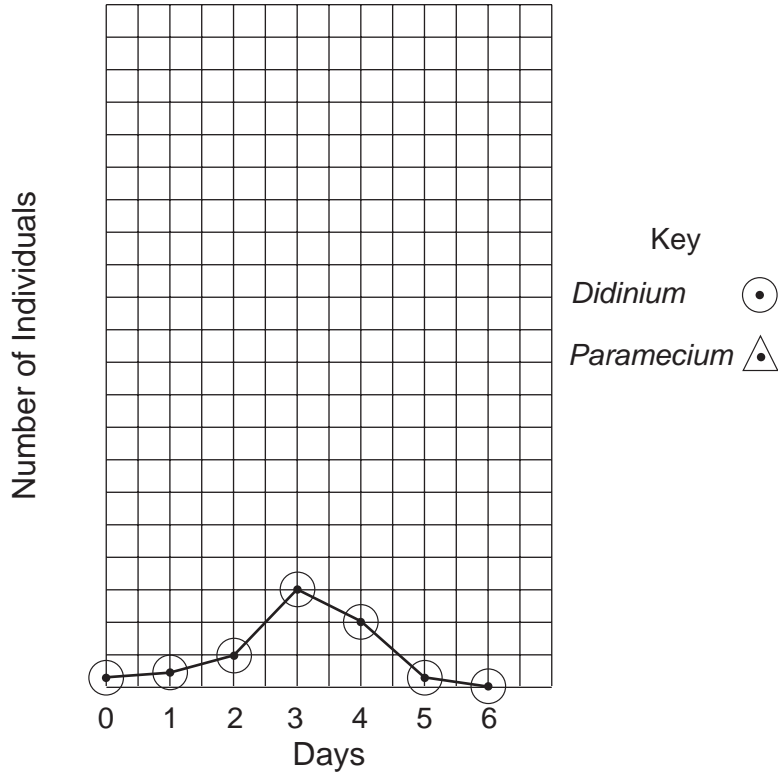
Day	Number of <i>Paramecium</i>	Number of <i>Didinium</i>
0	25	2
1	60	5
2	150	10
3	50	30
4	25	20
5	0	2
6	0	0

Directions (40–41): Using the information in the data table, construct a line graph on the grid provided on the next page, following the directions below.

- 40 Mark a scale on the axis labeled “Number of Individuals” that is appropriate for the plotted *Didinium* population and for plotting the *Paramecium* population. [1]
- 41 Plot the data for *Paramecium* on the grid. Surround each data point with a small triangle and connect the points. [1]



Culture Population



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40

41

42 What evidence in the data indicates that *Didinium* could be a predator of the *Paramecium*? [1]

42

43 State *two* possible reasons that the two populations died off between days 4 and 6. [2]

(1) _____

(2) _____

43

Base your answers to questions 44 through 47 on the passage below and on your knowledge of biology.

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Fighting Pollution with Bacteria

You may think that all bacteria are harmful. Think again! Some bacteria are working to clean up the damage humans have caused to the environment.

In 1989, the oil tanker *Exxon Valdez* hit ground and a hole was ripped in its hull. Millions of gallons of crude oil spread along the coast of Alaska. In some places, the oil soaked 2 feet deep into the beaches. There seemed to be no way to clean up the spill. Then scientists decided to enlist the help of bacteria that are found naturally on Alaskan beaches. Some of these bacteria break down hydrocarbons (molecules found in oil) into simpler, less harmful substances such as carbon dioxide and water.

The problem was that there were not enough of these bacteria to handle the huge amount of oil. To make the bacteria multiply faster, the scientists sprayed a chemical that acted as a fertilizer along 70 miles of coastline. Within 15 days, the number of bacteria had tripled. The beaches that had been treated with the chemical were much cleaner than those that had not. Without this bacterial activity, Alaska's beaches might still be covered with oil.

This process of using organisms to eliminate toxic materials is called bioremediation. Bioremediation is being used to clean up gasoline that leaks into the soil under gas stations. At factories that process wood pulp, scientists are using microorganisms to break down phenols (a poisonous by-product of the process) into harmless salts. Bacteria also can break down acid drainage that seeps out of abandoned coal mines, and explosives, such as TNT. Bacteria are used in sewage treatment plants to clean water. Bacteria also reduce acid rain by removing sulfur from coal before it is burned.

Because Americans produce more than 600 million tons of toxic waste a year, bioremediation may soon become a big business. If scientists can identify microorganisms that attack all the kinds of waste we produce, expensive treatment plants and dangerous toxic dumps might be put out of business.

44 The chemical was sprayed along the Alaskan coastline in order to

- (1) introduce new bacteria to the beaches
- (2) dissolve oil that was spilled on the shore
- (3) increase the population of bacteria
- (4) wash away oil that had been spilled

44



45 Which statement does *not* represent an example of bioremediation?

- (1) Duckweed removes heavy metals from ponds and lakes.
- (2) Ladybugs eliminate insect pests from plants.
- (3) Bacteria break down hydrocarbons in oil.
- (4) Ragweed plants remove lead from the ground around factory sites.

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45

46 State one economic advantage of bioremediation. [1]

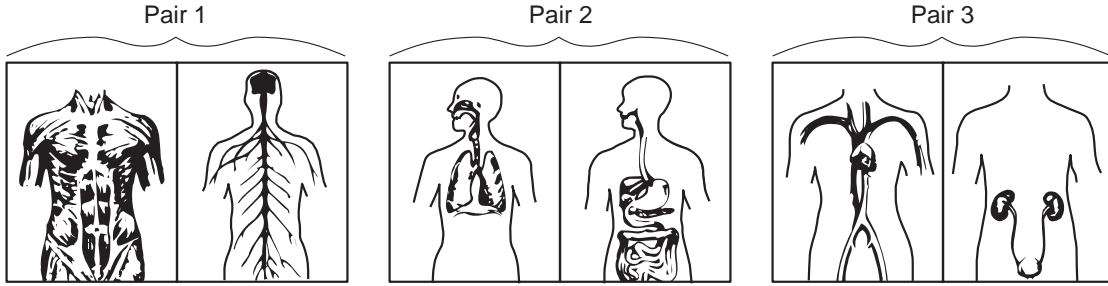
46

47 Describe one biological problem that may possibly result from using microorganisms to fight pollution. [1]

47

48 The diagrams below represent some of the systems that make up the human body.

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Select one of the pairs of systems and write its number below. For the pair selected, identify each system and state one function of that system. Explain how the two systems work together to help maintain homeostasis in an individual. [3]

Pair _____

48

Base your answers to questions 49 and 50 on the information below and on your knowledge of biology.

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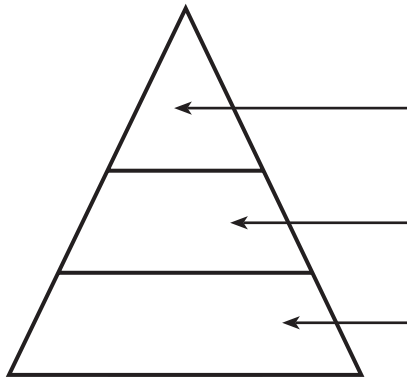
Thirty grams of hay (dried grasses) were boiled in 500 milliliters of water, placed in a culture dish, and allowed to stand. The next day, a small sample of pond water was added to the mixture of boiled hay and water. The dish was then covered and its contents observed regularly. Bacteria fed on the nutrients from the boiled hay. As the populations of bacteria increased rapidly, the clear mixture soon became cloudy. One week later, microscopic examination of samples from the culture showed various types of protozoa (single-celled organisms) eating the bacteria.

49 The protozoa that fed on the bacteria can best be described as

- (1) producers
- (2) herbivores
- (3) parasites
- (4) consumers

49

50 Label each level of the energy pyramid below with an organism mentioned in the paragraph that belongs at that level. [1]



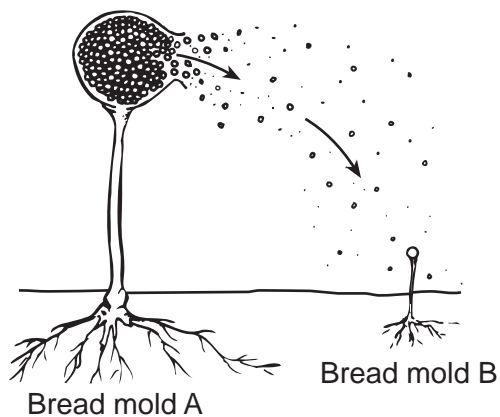
50

51 A scientist conducted an experiment in which he fed mice large amounts of the amino acid cysteine. He observed that this amino acid protected mouse chromosomes from damage by toxic chemicals. The scientist then claimed that cysteine, added to the diet of all animals, will protect their chromosomes from damage. State whether or not this is a valid claim. Support your answer. [1]

51

52 The diagram below illustrates asexual reproduction in bread mold. Reproductive structures known as spores were released from bread mold A. One of these spores developed into bread mold B.

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State how the genetic information in the nuclei of cells in bread mold B compares to the genetic information in the nuclei of cells in bread mold A. [1]

52



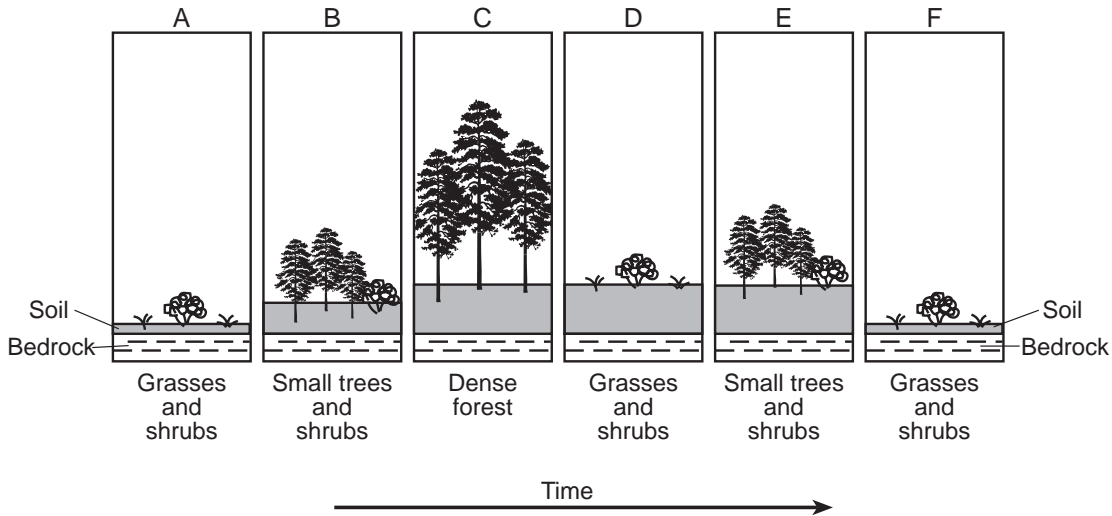
Part C

Answer all questions in this part. [17]

**For Teacher
Use Only**

Directions (53–61): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 53 through 55 on the diagram below, which represents the changes in an ecosystem over a period of 100 years, and on your knowledge of biology.



53 State one biological explanation for the changes in types of vegetation observed from A through C. [1]

53

54 Identify one human activity that could be responsible for the change from C to D. [1]

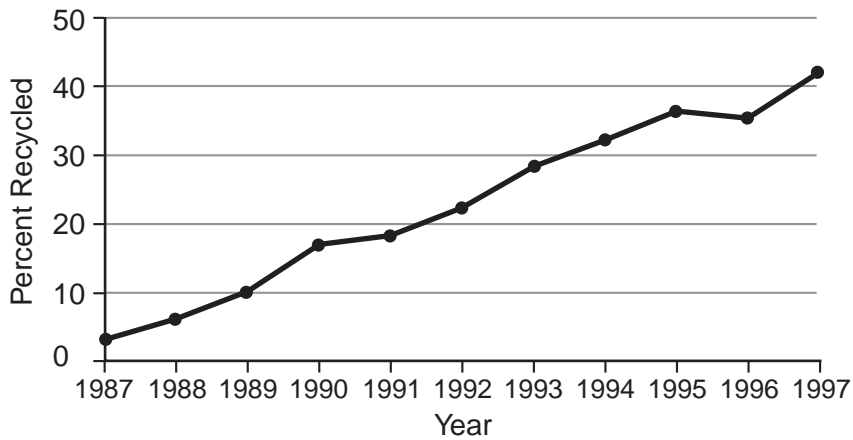
54

55 Predict what would happen to the soil *and* vegetation of this ecosystem after stage F, assuming no natural disaster or human interference. [2]

55

56 The graph below shows the percentage of solid wastes recycled in New York State between 1987 and 1997.

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Use Only**



Discuss the impacts of recycling. In your answer be sure to:

- explain what recycling is and provide one example of a material that is often recycled [2]
- state one specific positive effect recycling has on the environment [1]
- state one specific reason that the percentage of solid wastes recycled increased between 1987 and 1997 [1]

56

Base your answers to questions 57 and 58 on the information below and on your knowledge of biology.

Carbon exists in a simple organic molecule in a leaf and in an inorganic molecule in the air humans exhale.

57 Identify the simple organic molecule formed in the leaf and the process that produces it. [2]

57

58 Identify the carbon-containing molecule that humans exhale and the process that produces it. [2]

58

Base your answers to questions 59 and 60 on the information below and on your knowledge of biology.

Cell communication involves a cell detecting and responding to signals from other cells. Receptor molecules play an important role in these reactions. Human cells have insulin receptors that are needed for the movement of glucose out of the blood.

59 State one way that the shape of the insulin receptor is related to its role in cell communication. [1]

59

60 A typical human liver cell can have over 90,000 insulin receptors. If a genetic error occurred, resulting in each liver cell in a person having only 1,000 insulin receptors, what specific effect would this have on the liver cells? [1]

60

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Use Only**

61 Animal cells utilize many different proteins. Discuss the synthesis of proteins in an animal cell. Your answer must include at least:

- the identity of the building blocks required to synthesize these proteins [1]
- the identity of the sites in the cell where the proteins are assembled [1]
- an explanation of the role of DNA in the process of making proteins in the cell [1]

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Use Only**

61

Part D

Answer all questions in this part. [13]

**For Teacher
Use Only**

Directions (62–72): Record your answers in the spaces provided in this examination booklet.

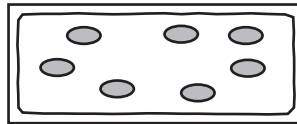
- 62 Molecules *A* and *B* are both organic molecules found in many cells. When tested, it is found that molecule *A* cannot pass through a cell membrane, but molecule *B* easily passes through. State one way the two molecules could differ, that would account for the difference in the ability to pass through the cell membrane. [1]

62

- 63 If vegetables become wilted, they can often be made crisp again by soaking them in water. However, they may lose a few nutrients during this process. Using the concept of diffusion and concentration, state why some nutrients would leave the plant cell. [1]

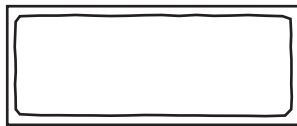
63

- 64 *Elodea* is a plant that lives in freshwater. The diagram below represents one *Elodea* leaf cell in its normal freshwater environment.



Elodea cell in freshwater

Predict how the contents of the *Elodea* cell would change if the cell was placed in saltwater for several minutes by completing the diagram, “*Elodea* cell in saltwater” below. Label the location of the cell membrane. [2]



Elodea cell in saltwater

64

Base your answers to questions 65 through 67 on the information provided and on your knowledge of biology.

**For Teacher
Use Only**

A student observed the physical characteristics of seven organisms and prepared the data table below.

Organism Comparison

Organism	Internal Skeleton Present	Legs Present	Wings Present	Fur Present	Moist Body Covering Present
Earthworm	no	no	no	no	yes
Fish	yes	no	no	no	yes
Fly	no	yes	yes	no	no
Gorilla	yes	yes	no	yes	no
Jellyfish	no	no	no	no	yes
Parrot	yes	yes	yes	no	no
Snake	yes	no	no	no	no

One of the student's classmates sorted the seven organisms into two groups as shown below.

Group 1	Group 2
fly parrot	earthworm gorilla snake fish jellyfish

65 Which characteristic from the data table did the student use to group the organisms? [1]

65

66 Another classmate suggested that the earthworm is more closely related to the jellyfish than to any other organism observed. State the evidence from the data table that the student most likely used for this suggested relationship. [1]

66

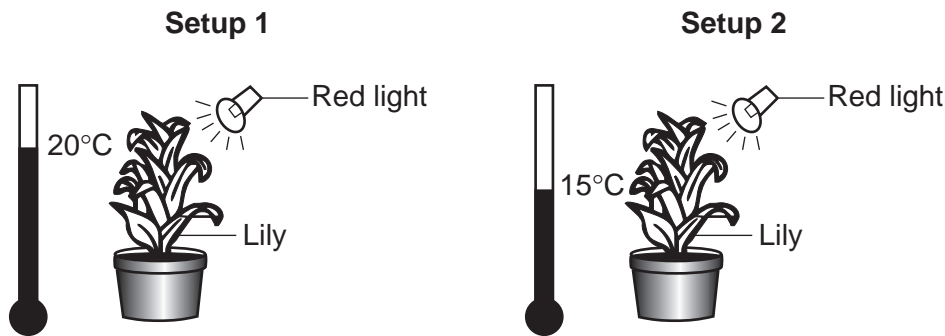
67 Fish and snakes are very different organisms, yet they have many similarities. Provide a biological explanation for the fact that fish and snakes have so many characteristics in common. [1]

**For Teacher
Use Only**

67

Base your answers to questions 68 through 70 on the information and diagram below.

An investigation was carried out using the two setups shown below. Other than the difference shown in the diagram, all other conditions were identical.



68 State one possible hypothesis that could be tested using these setups. [1]

68

69 What data should be collected in order to test the hypothesis stated in question 68? [1]

69

70 Describe one change that could be made in the investigation to improve it. [1]

70

71 *R*, *S*, and *T* are three species of birds. Species *S* and *T* show similar coloration. The enzymes found in species *R* and *T* show similarities. Species *R* and *T* also exhibit many of the same behavioral patterns.

Show the relationship between species *R*, *S*, and *T* by placing the letter representing each species at the top of the appropriate branch on the diagram below. [1]



**For Teacher
Use Only**

71

72 An experiment was designed to see what effects ibuprofen would have on laboratory mice. Large numbers of male mice and an equal number of female mice were used in this investigation. The male mice were placed in an area with food and water. The female mice were placed in a separate area of the same size. The female mice were given additional food and water. The males were each given 100 milligrams of ibuprofen each day, mixed with their food, and the females were each given 50 milligrams of ibuprofen each day, mixed with their food.

Identify *two* errors in the design of this investigation. [2]

(1) _____

(2) _____

72

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Tuesday, August 17, 2004 — 12:30 to 3:30 p.m., only

ANSWER SHEET

Student Sex: Female
 Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	_____
B-1	6	_____
B-2	19	_____
C	17	_____
D	13	_____
Total Raw Score (maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
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 | 34 |
| 32 | 35 |
| 33 | 36 |

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

Tear Here

LIVING ENVIRONMENT

FOR TEACHERS ONLY

LE

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

LIVING ENVIRONMENT

Tuesday, August 17, 2004 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 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. Visit the site <http://www.emsc.nysed.gov/osa/> and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

Part A and Part B-1

Allow 1 credit for each correct answer.

Part A			Part B-1	
1 3	11 2	21 3	31 4	34 3
2 1	12 4	22 3	32 4	35 2
3 1	13 2	23 1	33 1	36 4
4 1	14 3	24 4		
5 3	15 1	25 3		
6 4	16 2	26 2		
7 4	17 3	27 4		
8 2	18 1	28 1		
9 1	19 2	29 4		
10 2	20 4	30 1		

LIVING ENVIRONMENT – *continued*

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 Administering and 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.

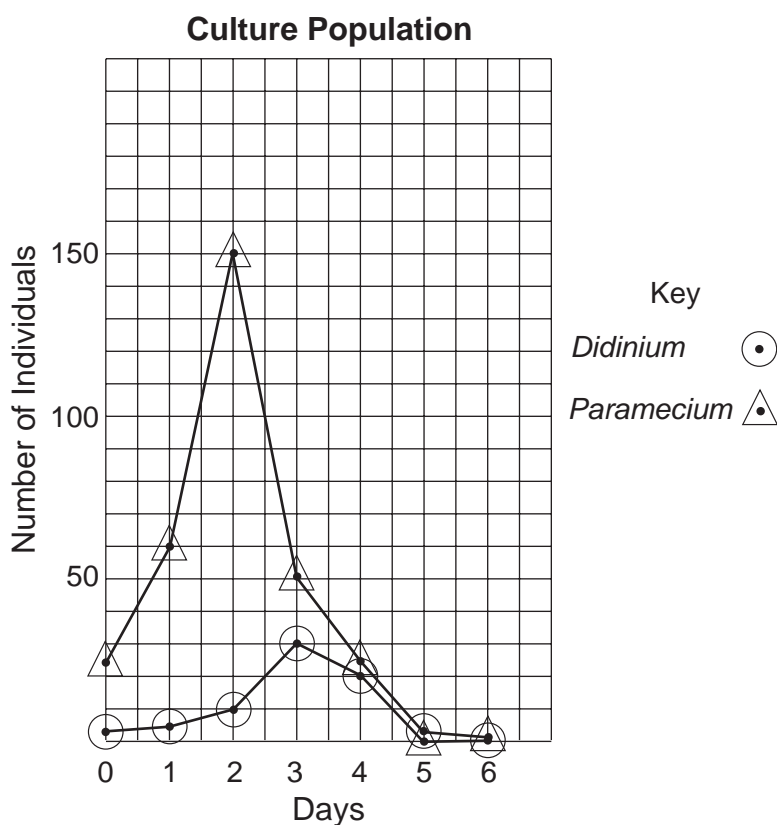
Raters should enter the scores earned for Part A, Part B–1, Part B–2, Part C, and Part D on the appropriate lines in the box printed on the answer sheet and should add these 5 scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Tuesday, August 17, 2004. The student's scaled score should be entered in the box labeled "Final Score" on the student's answer booklet. 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

- 37 Allow 1 credit for identifying substance *X* as **oxygen (O₂)** or **glucose (C₆H₁₂O₆)** or **sugar**.
- 38 Allow 1 credit for **chloroplast**.
- 39 Allow 1 credit for **mitochondrion**.
- 40 Allow 1 credit for marking a scale on the axis labeled “Number of Individuals” that is appropriate for the plotted *Didinium* population and for plotting the *Paramecium* population.
- 41 Allow 1 credit for plotting the data for *Paramecium* correctly (based on the student’s axes), surrounding each point with a triangle, and connecting the points.
- Note:** Allow credit only if points are surrounded by a triangle.

Example of a 2-Credit Graph

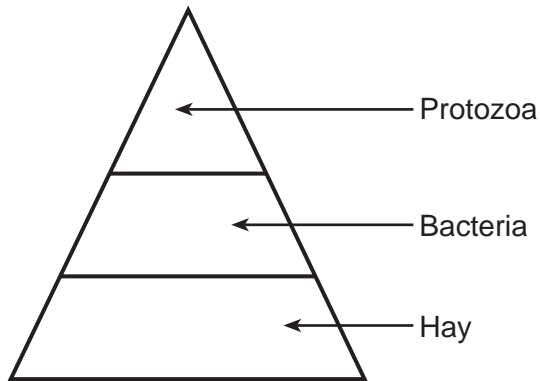
- 42 Allow 1 credit for describing evidence in the data that indicates *Didinium* could be a predator of the *Paramecium*. Acceptable responses include, but are not limited to:
- Changes in the size of the *Didinium* population lag behind changes in the *Paramecium* population.
 - The predator population is usually smaller than the prey population.
 - *Didinium* died out after the *Paramecium*, implying that the *Didinium* ran out of food.

LIVING ENVIRONMENT – *continued*

- 43** Allow a maximum of 2 credits, 1 for each of two possible reasons that the populations died off. Acceptable responses include, but are not limited to:
- They ran out of food.
 - waste buildup
 - disease
 - not enough oxygen
 - no reproduction
- 44** 3
- 45** 2
- 46** Allow 1 credit for stating one economic advantage of bioremediation. Acceptable responses include, but are not limited to:
- Bioremediation is much less expensive than many other methods used to clean up the environment.
 - New businesses can be formed to perform bioremediation.
- 47** Allow 1 credit for describing one biological problem that may possibly result from using microorganisms to fight pollution. Acceptable responses include, but are not limited to:
- Some microorganisms may be harmful to people (or other organisms).
 - Some microorganisms might damage the environment.
 - The introduction of nonnative organisms could upset the balance of an ecosystem.
- 48** Allow a maximum of 3 credits, 1 credit each for identifying and stating the function of each system in the pair chosen and 1 credit for explaining how the systems in the pair chosen work together to maintain homeostasis in an individual. Acceptable responses include, but are not limited to:
- Pair 1 — The muscular system enables an organism to move. The nervous system detects stimuli and sends messages. The muscles receive messages carried by nerves and contract, resulting in movement.
 - Pair 2 — The respiratory system brings in oxygen and the digestive system breaks down food so that both substances are available to cells to make ATP.
 - Pair 3 — The circulatory system carries wastes. The excretory system removes wastes from the blood and excretes them.
- 49** 4

LIVING ENVIRONMENT – *continued*

50 Allow 1 credit for labeling the energy pyramid as shown below.



51 Allow 1 credit for stating whether or not the claim is valid and supporting the answer. Acceptable responses include, but are not limited to:

- The claim is not valid. All species of animals have different chromosomal makeups.
- The claim is not valid because only one experiment was performed.
- The claim is not valid because the results in one species (mice) cannot be used to make generalizations that apply to all animals.
- not valid because different organisms are genetically different

52 Allow 1 credit for indicating that the nuclei of cells in mold *B* are genetically identical to the nuclei of cells in mold *A*.

Part C

- 53** Allow 1 credit for one biological explanation for the changes in types of vegetation observed from A through C. Acceptable responses include, but are not limited to:
- As more soil accumulated (from the decomposition of dead vegetation), plants with deeper root systems could live there and shade out the earlier plants.
 - ecological succession
- 54** Allow 1 credit for identifying one human activity that could be responsible for the change from C to D. Acceptable responses include, but are not limited to:
- cutting the forest
 - clearing the land for crops
 - controlled burn
 - causing forest fires
 - pollution
- 55** Allow a maximum of 2 credits, 1 for predicting what would happen to the soil and 1 for predicting what would happen to the vegetation. Acceptable responses include, but are not limited to:
- The soil depth will increase and trees will be present.
 - The soil will change in composition and the plant species will change.

56 Allow a maximum of 4 credits for discussing the impacts of recycling, allocated as follows:

Allow 1 credit for indicating that recycling is producing new products from old products or putting materials into a new form that is useable.

- Allow 1 credit for one example of a material that is often recycled. Acceptable responses include, but are not limited to:
 - glass
 - metals
 - plastic
 - paper
- Allow 1 credit for stating one specific positive effect recycling has on the environment. Acceptable responses include, but are not limited to:
 - decreased solid waste in landfills
 - energy savings
 - less litter
 - less use of natural resources
 - saves nonrenewable resources
- Allow 1 credit for stating one specific reason that the percentage of solid wastes recycled increased between 1987 and 1997. Acceptable responses include, but are not limited to:
 - easier to participate (more facilities available)
 - enactment of laws
 - community recycling programs
 - public awareness
 - increase in type of recyclable materials
 - economic benefits

Example of a 4-Credit Response

- Recycling involves the use of materials such as glass, plastic, and aluminum cans to produce other products. The trend may be due to the awareness of the need to recycle to improve the environment. Recycling has decreased the amount of solid wastes being dumped into landfills.

57 Allow a maximum of 2 credits, 1 for **glucose or sugar** and 1 for **photosynthesis**.

58 Allow a maximum of 2 credits, 1 for **carbon dioxide** and 1 for **respiration**.

LIVING ENVIRONMENT – *continued*

- 59** Allow 1 credit for stating one way that the shape of the insulin receptor is related to its role in cell communication. Acceptable responses include, but are not limited to:
- The shape of the receptor molecule is specific for a specific molecule.
 - The shape determines what signals (chemical) it can respond to.
 - The shape is specific for the chemical with which it can interact.
- 60** Allow 1 credit for stating the specific effect this genetic error would have on the liver cells. Acceptable responses include, but are not limited to:
- The liver would receive less insulin.
 - It would take more time for a given amount of glucose to enter liver cells.
 - It would affect the ability of the liver to regulate the level of sugar in the blood.
- 61** Allow a maximum of 3 credits for discussing the synthesis of proteins in an animal cell, allocated as follows:
- Allow 1 credit for identifying amino acids as the building blocks required to synthesize these proteins.
 - Allow 1 credit for identifying ribosomes as the sites in the cell where the proteins are assembled.
 - Allow 1 credit for an explanation of the role of DNA in the process of making proteins in the cell. Acceptable responses include, but are not limited to:
 - DNA codes for the amino acid sequence.
 - DNA provides instructions for making proteins.

Part D

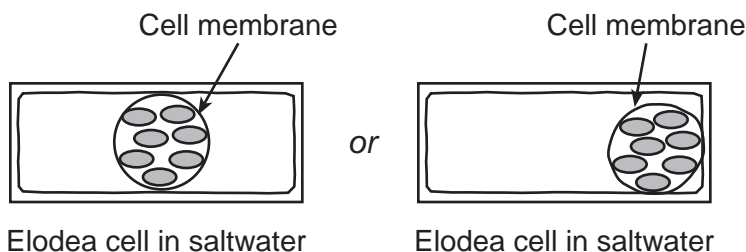
62 Allow 1 credit for stating one way molecules *A* and *B* could differ that would account for the difference in the ability to pass through the cell membrane. Acceptable responses include, but are not limited to:

- Molecule *A* is larger than molecule *B*.
- Molecule *A* is too large to pass through membrane pores.
- One molecule is larger than the other.
- shape
- charge
- solubility

63 Allow 1 credit for indicating that nutrients would move (diffuse) from an area of high concentration of the nutrient to an area of low concentration of that nutrient.

64 Allow a maximum of 2 credits, 1 for showing a cell with shrunken contents and 1 for labeling the cell membrane.

Examples of 2-Credit Responses



Note: The diagram *must* show the cell membrane.

65 Allow 1 credit for indicating that the student used the presence (or absence) of wings to group the organisms.

66 Allow 1 credit for indicating that the earthworm and jellyfish have all (or the most) observed characteristics in common.

67 Allow 1 credit for a biological explanation for the fact that fish and snakes have so many characteristics in common. Acceptable responses include, but are not limited to:

- They may have a common ancestor.
- Both snakes and fish have similar DNA.

LIVING ENVIRONMENT – *continued*

- 68 Allow 1 credit for stating one hypothesis that could be tested using the setups given. Acceptable responses include, but are not limited to:
- Lily plants grow faster at 20°C than at 15°C.
 - Temperature affects plant growth.
 - Lily plants produce more flowers at higher temperatures.

Note: Do *not* accept a hypothesis written in the form of a question.

- 69 Allow 1 credit for describing specific data that should be collected in order to test the hypothesis the student stated in response to question 68. Acceptable responses include, but are not limited to:
- height
 - mass
 - number of leaves
 - number of flowers

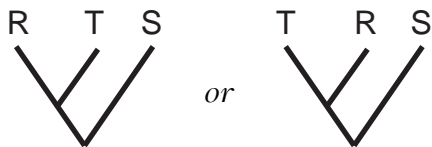
Note: Do *not* allow credit for just “growth” or “appearance” without a reference to the data collected.

- 70 Allow 1 credit for describing one change that could be made in the investigation to improve it. Acceptable responses include, but are not limited to:
- more lily plants in each setup
 - Conduct repeated trials.
 - Increase the sample size.
 - wider range of temperatures

Allow credit for an answer that is consistent with the student’s response to question 68. If the hypothesis includes lilies specifically, then it would not be appropriate to state that using other plants in both setups is a way to improve the experiment.

- 71 Allow 1 credit for placing the letters of the species at the top of the appropriate branches.

Examples of Acceptable Responses



LIVING ENVIRONMENT – *concluded*

72 Allow a maximum of 2 credits, 1 credit for each of two errors in the design of the experiment. Acceptable responses include, but are not limited to:

- no mention of type of data to be collected
- The two groups of mice were not given the same quantity of food and water.
- Equal numbers of males and females should receive the same doses of ibuprofen.
- no control group
- Treatment groups should contain equal numbers of males and females.
- no hypothesis stated
- more than one variable

Regents Examination in Living Environment

August 2004

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

The *Chart for Determining the Final Examination Score for the August 2004 Regents Examination in Living Environment*, normally located on this page, will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Tuesday, August 17, 2004. 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.

Map to Core Curriculum

August 2004 Living Environment

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

Part D 62-72	
Lab 1	65,66,67,71
Lab 2	68,69,70,72
Lab 5	62,63,64

Regents Examination in Living Environment

August 2004

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

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	56	79	27	52
84	99	55	78	26	50
83	98	54	78	25	49
82	97	53	77	24	48
81	96	52	76	23	46
80	95	51	76	22	45
79	94	50	75	21	43
78	94	49	74	20	42
77	93	48	73	19	40
76	92	47	73	18	39
75	92	46	72	17	37
74	91	45	71	16	35
73	90	44	70	15	34
72	90	43	69	14	32
71	89	42	68	13	30
70	88	41	68	12	28
69	88	40	67	11	26
68	87	39	66	10	24
67	86	38	65	9	22
66	86	37	64	8	20
65	85	36	62	7	18
64	84	35	61	6	16
63	84	34	60	5	13
62	83	33	59	4	11
61	82	32	58	3	8
60	82	31	57	2	6
59	81	30	56	1	3
58	80	29	54	0	0
57	80	28	53		

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 scaled score that corresponds to that raw score. The scaled 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 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. The chart above is usable only for this administration of the living environment examination.