

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

LIVING ENVIRONMENT

Friday, January 27, 2006 — 9:15 a.m. to 12:15 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.

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.

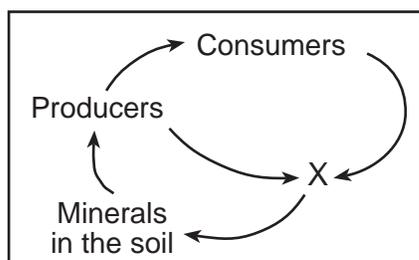
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part. [30]

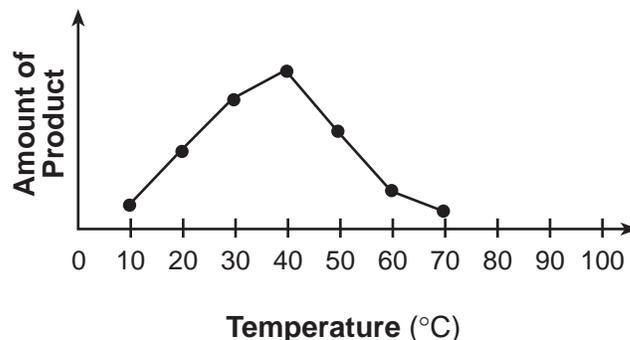
Directions (1–30): For each statement or question, write on your separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question.

- 1 In the diagram below, what does X most likely represent?



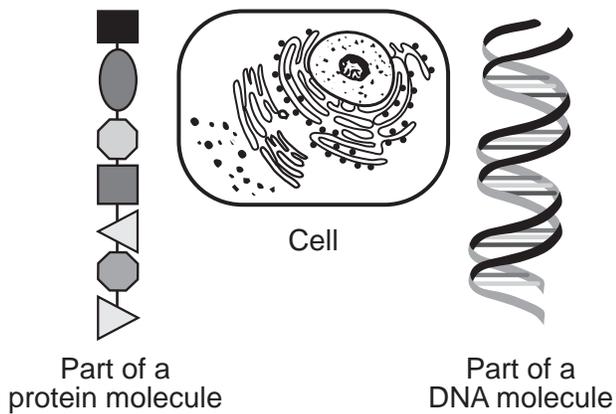
- (1) autotrophs (3) decomposers
(2) herbivores (4) carnivores
- 2 Two closely related species of birds live in the same tree. Species A feeds on ants and termites, while species B feeds on caterpillars. The two species coexist successfully because
- (1) each occupies a different niche
(2) they interbreed
(3) they use different methods of reproduction
(4) birds compete for food
- 3 After a hormone enters the bloodstream, it is transported throughout the body, but the hormone affects only certain cells. The reason only certain cells are affected is that the membranes of these cells have specific
- (1) receptors (3) antibodies
(2) tissues (4) carbohydrates
- 4 A characteristic of a DNA molecule that is *not* characteristic of a protein molecule is that the DNA molecule
- (1) can replicate itself
(2) can be very large
(3) is found in nuclei
(4) is composed of subunits

- 5 The graph below illustrates the relative amounts of product formed by the action of an enzyme in a solution with a pH of 6 at seven different temperatures.



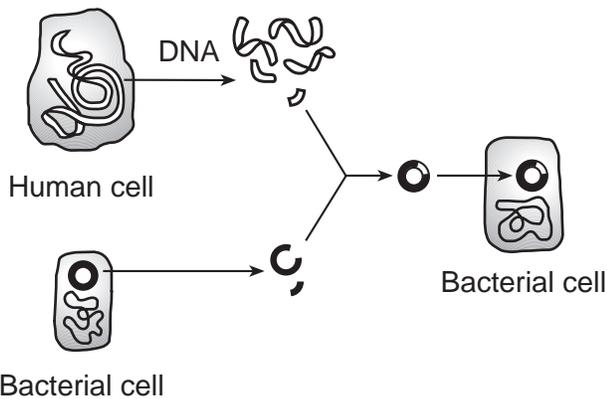
- Which statement best expresses the amount of product that will be formed at each temperature if the experiment is repeated at a pH of 4?
- (1) The amount of product formed will be equal to that produced at pH 6.
(2) The amount of product formed will be greater than that produced at pH 6.
(3) The amount of product formed will be less than that produced at pH 6.
(4) The amount of product formed can *not* be accurately predicted.
- 6 Which statement best explains the fact that some identical twins appear different from one another?
- (1) Their DNA is essentially the same and the environment plays little or no role in the expression of their genes.
(2) Their DNA is very different and the environment plays a significant role in the expression of their genes.
(3) Their DNA is very different and the environment plays little or no role in the expression of their genes.
(4) Their DNA is essentially the same and the environment plays a significant role in the expression of their genes.

7 Which statement best expresses the relationship between the three structures represented below?



- (1) DNA is produced from protein absorbed by the cell.
- (2) Protein is composed of DNA that is produced in the cell.
- (3) DNA controls the production of protein in the cell.
- (4) Cells make DNA by digesting protein.

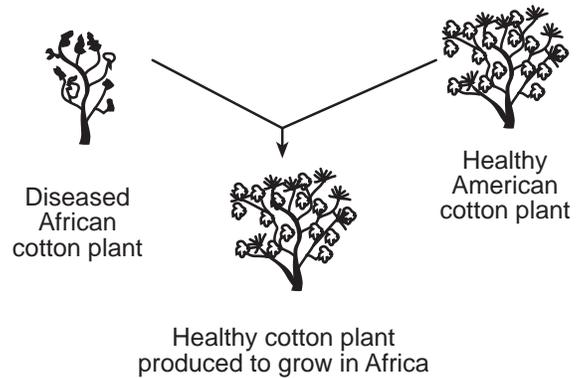
8 The diagram below represents a common laboratory technique in molecular genetics.



One common use of this technology is the

- (1) production of a human embryo to aid women who are unable to have children
- (2) change of single-celled organisms to multicellular organisms
- (3) introduction of a toxic substance to kill bacterial cells
- (4) production of hormones or enzymes to replace missing human body chemicals

9 Which statement provides accurate information about the technique illustrated below?



- (1) This technique results in offspring that are genetically identical to the parents.
- (2) New varieties of organisms can be developed by this technique known as selective breeding.
- (3) This technique is used by farmers to eliminate mutations in future members of the species.
- (4) Since the development of cloning, this technique is no longer used in agriculture.

10 Thousands of years ago, giraffes with short necks were common within giraffe populations. Nearly all giraffe populations today have long necks. This difference could be due to

- (1) giraffes stretching their necks to keep their heads out of reach of predators
- (2) giraffes stretching their necks so they could reach food higher in the trees
- (3) a mutation in genetic material controlling neck size occurring in some skin cells of a giraffe
- (4) a mutation in genetic material controlling neck size occurring in the reproductive cells of a giraffe

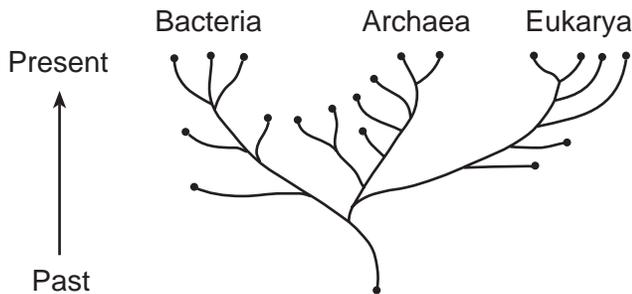
11 Estrogen has a direct effect on the

- (1) formation of a zygote
- (2) changes within the uterus
- (3) movement of an egg toward the sperm
- (4) development of a placenta within the ovary

12 A new chemical was discovered and introduced into a culture containing one species of bacteria. Within a day, most of the bacteria were dead, but a few remained alive. Which statement best explains why some of the bacteria survived?

- (1) They had a genetic variation that gave them resistance to the chemical.
- (2) They were exposed to the chemical long enough to develop a resistance to it.
- (3) They mutated and became a different species after exposure to the chemical.
- (4) They absorbed the chemical and broke it down in their digestive systems.

13 A current proposal in the field of classification divides life into three broad categories called domains. This idea is illustrated below.



Which concept is best supported by this diagram?

- (1) Evolutionary pathways proceed only in one set direction over a short period of time.
- (2) All evolutionary pathways will eventually lead to present-day organisms.
- (3) All evolutionary pathways are the same length and they all lead to present-day organisms.
- (4) Evolutionary pathways can proceed in several directions with only some pathways leading to present-day organisms.

14 After the union of sperm and egg, the single-celled zygote develops into a multicellular organism with specialized cells by the processes of

- (1) meiosis and replication
- (2) mitosis and differentiation
- (3) cloning and growth
- (4) fertilization and gamete production

15 A certain plant species, found only in one particular stream valley in the world, has a very shallow root system. An earthquake causes the stream to change its course so that the valley in which the plant species lives becomes very dry. As a result, the species dies out completely. The effect of this change on this plant species is known as

- (1) evolution
- (2) extinction
- (3) mutation
- (4) succession

16 When a planarian (a type of worm) is cut in half, each half usually grows back into a complete worm over time. This situation most closely resembles

- (1) asexual reproduction in which a mutation has occurred
- (2) sexual reproduction in which each half represents one parent
- (3) asexual reproduction of a single-celled organism
- (4) sexual reproduction of a single-celled organism

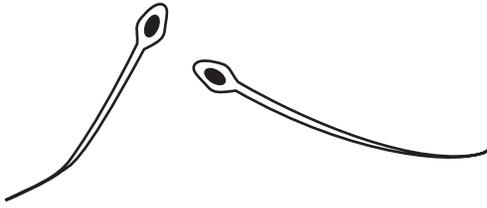
17 Which statement describes the reproductive system of a human male?

- (1) It releases sperm that can be used only in external fertilization.
- (2) It synthesizes progesterone that regulates sperm formation.
- (3) It produces gametes that transport food for embryo formation.
- (4) It shares some structures with the excretory system.

18 The immune system of humans may respond to chemicals on the surface of an invading organism by

- (1) releasing hormones that break down these chemicals
- (2) synthesizing antibodies that mark these organisms to be destroyed
- (3) secreting antibiotics that attach to these organisms
- (4) altering a DNA sequence in these organisms

19 Which statement about the gametes represented in the diagram below is correct?



- (1) They are produced by females.
- (2) They are fertilized in an ovary.
- (3) They transport genetic material.
- (4) They are produced by mitosis.

20 The dissolved carbon dioxide in a lake is used directly by

- (1) autotrophs
- (2) parasites
- (3) fungi
- (4) decomposers

21 Which transplant method would prevent the rejection of tissue after an organ transplant?

- (1) using organs cloned from the cells of the patient
- (2) using organs produced by genetic engineering to get rid of all proteins in the donated organs
- (3) using organs only from pigs or monkeys
- (4) using an organ donated by a close relative because the proteins will always be identical to those of the recipient

22 Ten breeding pairs of rabbits are introduced onto an island with no natural predators and a good supply of water and food. What will most likely happen to the rabbit population?

- (1) It will remain relatively constant due to equal birth and death rates.
- (2) It will die out due to an increase in the mutation rate.
- (3) It will increase until it exceeds carrying capacity.
- (4) It will decrease and then increase indefinitely.

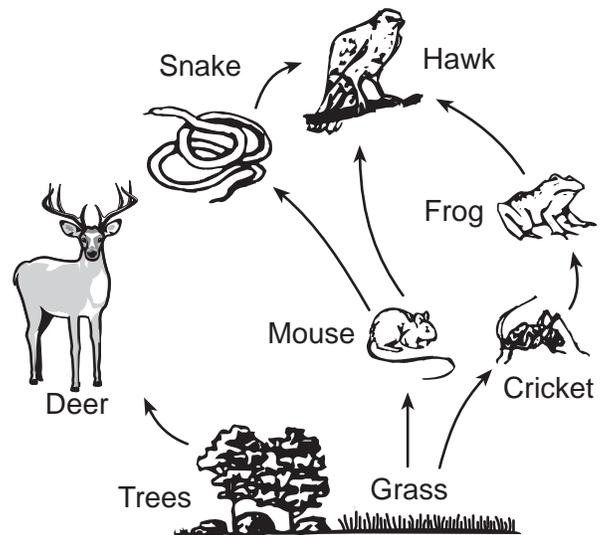
23 Vaccinations help prepare the body to fight invasions of a specific pathogen by

- (1) inhibiting antigen production
- (2) stimulating antibody production
- (3) inhibiting white blood cell production
- (4) stimulating red blood cell production

24 All cells of an organism are engaged in many different chemical reactions. This fact is best supported by the presence in each cell of thousands of different kinds of

- (1) enzymes
- (2) nuclei
- (3) chloroplasts
- (4) organelles

25 Nutritional relationships between organisms are shown in the diagram below.



The mouse population would most likely *decrease* if there were

- (1) an increase in the frog and tree populations
- (2) a decrease in the snake and hawk populations
- (3) an increase in the number of decomposers in the area
- (4) a decrease in the amount of available sunlight

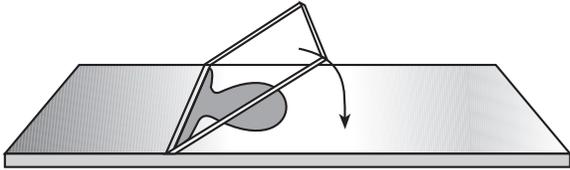
- 26 Even before a flower bud opens, certain plant chemicals have colored the flower in patterns particularly attractive to specific insects. At the same time, these chemicals protect the plant's reproductive structures by killing or inhibiting pathogens and insects that may feed on the plant. Which statement about the plant and the other organisms mentioned is correct?
- (1) Chemicals affect plants but not animals.
 - (2) Organisms of every niche may be preyed on by herbivores.
 - (3) Any chemical produced in a plant can protect against insects.
 - (4) Organisms may interact with other organisms in both positive and negative ways.
- 27 A fire burns an oak forest down to bare ground. Over the next 150 years, if the climate remains constant, this area will most likely
- (1) remain bare ground
 - (2) return to an oak forest
 - (3) become a rain forest
 - (4) become a wetland
- 28 Continued depletion of the ozone layer will most likely result in
- (1) an increase in skin cancer among humans
 - (2) a decrease in atmospheric pollutants
 - (3) an increase in marine ecosystem stability
 - (4) a decrease in climatic changes
- 29 A change in the acidity of mountain lakes would most likely be a result of
- (1) ecological succession of the area at the top of the mountain
 - (2) the introduction of new species into the lakes
 - (3) air pollution from smoke stacks miles away
 - (4) planting grasses and shrubs around the lakes
- 30 A forest is cut down and is replaced by a cornfield. A *negative* consequence of this practice is
- (1) an increase in the carbon dioxide released into the atmosphere
 - (2) an increase in the size of predators
 - (3) a decrease in biodiversity
 - (4) a decrease in the amount of soil that is washed away during rainstorms
-

Part B-1

Answer all questions in this part. [8]

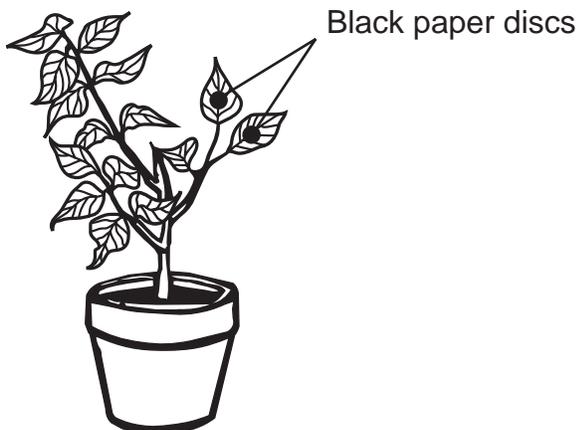
Directions (31–38): For each statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

- 31 The diagram below shows how a coverslip should be lowered onto some single-celled organisms during the preparation of a wet mount.



Why is this a preferred procedure?

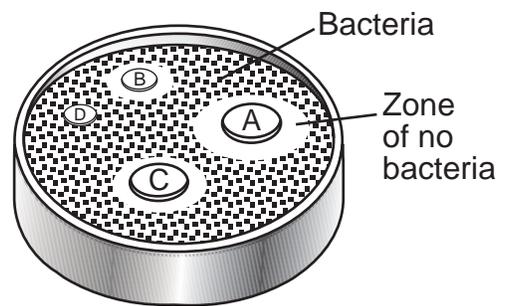
- (1) The coverslip will prevent the slide from breaking.
 - (2) The organisms will be more evenly distributed.
 - (3) The possibility of breaking the coverslip is reduced.
 - (4) The possibility of trapping air bubbles is reduced.
- 32 The diagram below represents the setup for an experiment. Two black paper discs are opposite each other on both sides of each of two leaves.



This experimental setup would most likely be used to show that

- (1) glucose is necessary for photosynthesis
- (2) protein is a product of photosynthesis
- (3) light is necessary for photosynthesis
- (4) carbon dioxide is a product of photosynthesis

- 33 An experiment was carried out to determine which mouthwash was most effective against bacteria commonly found in the mouth. Four paper discs were each dipped into a different brand of mouthwash. The discs were then placed onto the surface of a culture plate that contained food, moisture, and bacteria commonly found in the mouth. The diagram below shows the growth of bacteria on the plate after 24 hours.



Which change in procedure would have improved the experiment?

- (1) using a smaller plate with less food and moisture
- (2) using bacteria from many habitats other than the mouth
- (3) using the same size paper discs for each mouthwash
- (4) using the same type of mouthwash on each disc

Base your answers to questions 34 and 35 on the information below and on your knowledge of biology.

Analysis of a sample taken from a pond showed variety in both number and type of organisms present. The data collected are shown in the table below.

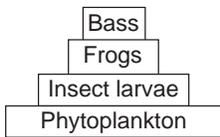
Data Table

Type of Organisms	Number Present
bass	two
frogs	forty
phytoplankton	thousands
insect larvae	hundreds

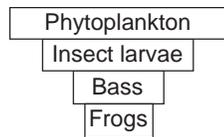
34 If the frogs feed on insect larvae, what is the role of the frogs in this pond ecosystem?

- (1) herbivore
- (2) parasite
- (3) consumer
- (4) host

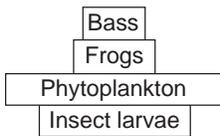
35 Which diagram best represents the organisms arranged as an energy pyramid?



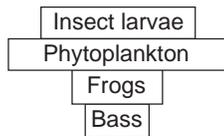
(1)



(3)



(2)



(4)

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

Lichens are composed of two organisms, a fungus that cannot make its own food and algae that contain chlorophyll. Lichens may live on the bark of trees or even on bare rock. They secrete acids that tend to break up the rock they live on, helping to produce soil. As soil accumulates from the broken rock and dead lichens, other organisms, such as plants, may begin to grow.

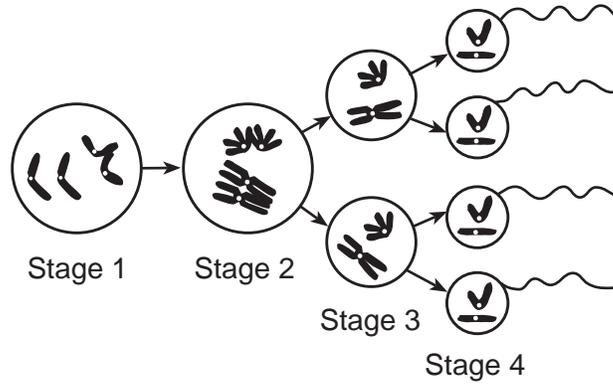
36 The ability of lichens to alter their environment, enabling other organisms to grow and take their places in that environment, is one step in the process of

- (1) biological evolution
- (2) ecological succession
- (3) maintenance of cellular communication
- (4) differentiation in complex organisms

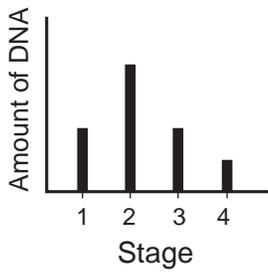
37 What is the role of the algae component of a lichen in an ecosystem?

- (1) decomposer
- (2) parasite
- (3) herbivore
- (4) producer

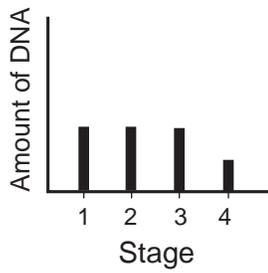
38 The diagram below illustrates some of the changes that occur during gamete formation.



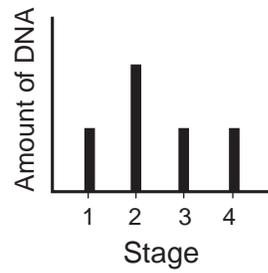
Which graph best represents the changes in the amount of DNA in one of the cells at each stage?



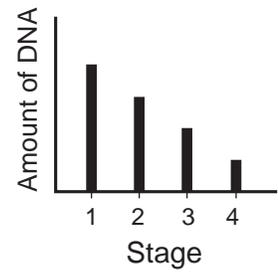
(1)



(2)



(3)



(4)

Part B–2

Answer all questions in this part. [17]

Directions (39–54): 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 answer in the spaces provided.

Base your answers to questions 39 through 43 on the information and data table below and on your knowledge of biology.

**For Teacher
Use Only**

The results of blood tests for two individuals are shown in the data table below. The blood glucose level before breakfast is normally 80–90 mg/100 mL of blood. A blood glucose level above 110 mg/100 mL of blood indicates a failure in a feedback mechanism.

Injection of chemical X, a chemical normally produced in the body, may be required to correct this problem.

Data Table

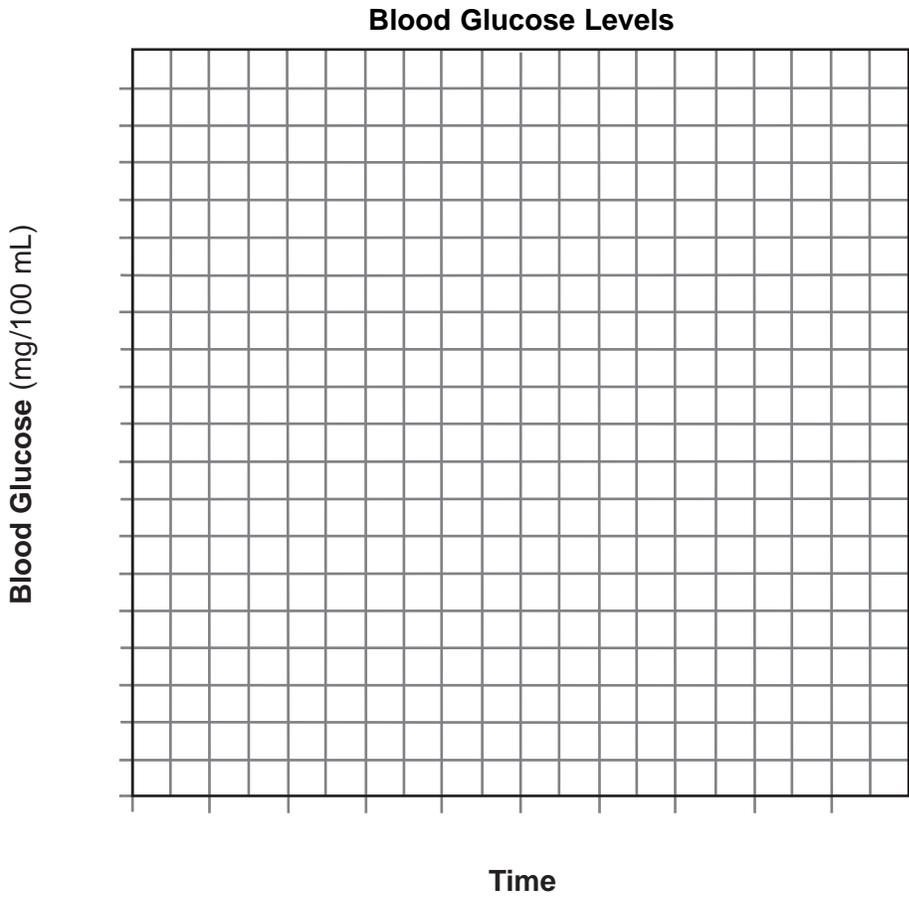
Time	Blood Glucose (mg/100 mL)	
	Individual 1	Individual 2
7:00 a.m.	90	150
7:30 a.m.	120	180
8:00 a.m.	140	220
8:30 a.m.	110	250
9:00 a.m.	90	240
9:30 a.m.	85	230
10:00 a.m.	90	210
10:30 a.m.	85	190
11:00 a.m.	90	170

Directions (39–40): Using the information in the data table, construct a line graph on the grid on page 11, following the directions below.

39 Mark an appropriate scale on each labeled axis. [1]

40 Plot the blood glucose levels for the individual who will most likely need injections of chemical X. Surround each point with a small circle and connect the points. [2]

Example: 



39

40

41 Identify chemical X. [1]

41

42 State *one* reason for the change in blood glucose level between 7:00 a.m. and 8:00 a.m. [1]

42

43 What term refers to the relatively constant level of blood glucose of individual 1 between 9:00 a.m. and 11:00 a.m.? [1]

43

44 Acetylcholine is a chemical secreted at the ends of nerve cells. This chemical helps to send nerve signals across synapses (spaces between nerve cells). After the signal passes across a synapse, an enzyme breaks down the acetylcholine. LSD is a drug that blocks the action of this enzyme. Describe *one* possible effect of LSD on the action of acetylcholine. [1]

**For Teacher
Use Only**

44

45 Mice store only a small amount of the energy they obtain from plants they eat. State what might happen to some of the remaining energy they obtain from the plants. [1]

45

46 State *one* reason that most foods must be digested before they can enter a cell. [1]

46

Base your answers to questions 47 through 49 on the information below and on your knowledge of biology.

**For Teacher
Use Only**

Sickle-cell anemia is an inherited disease that occurs mainly in people from parts of Africa where malaria is common. It is caused by a gene mutation that may be harmful or beneficial.

A person with two mutant genes has sickle-cell disease. The hemoglobin of a person with sickle-cell disease twists red blood cells into a crescent shape. These blood cells cannot circulate normally. Symptoms of the disease include bleeding and pain in bones and muscles. People with sickle-cell disease suffer terribly in childhood and, until modern medicine offered treatment, most of them died before reproducing. An individual who has one mutant gene is protected from malaria because the gene changes the hemoglobin structure in a way that speeds removal of malaria-infected cells from circulation. A person with two normal genes has perfectly good red blood cells, but lacks resistance to malaria.

47 Define the term *mutation*. [1]

47

48 Which statement about having one sickle-cell gene is correct?

- (1) It is fatal to anyone who inherits the gene.
- (2) It is beneficial to anyone who inherits the gene.
- (3) It is beneficial in certain environments.
- (4) It is beneficial or harmful depending on whether it is common or rare.

48

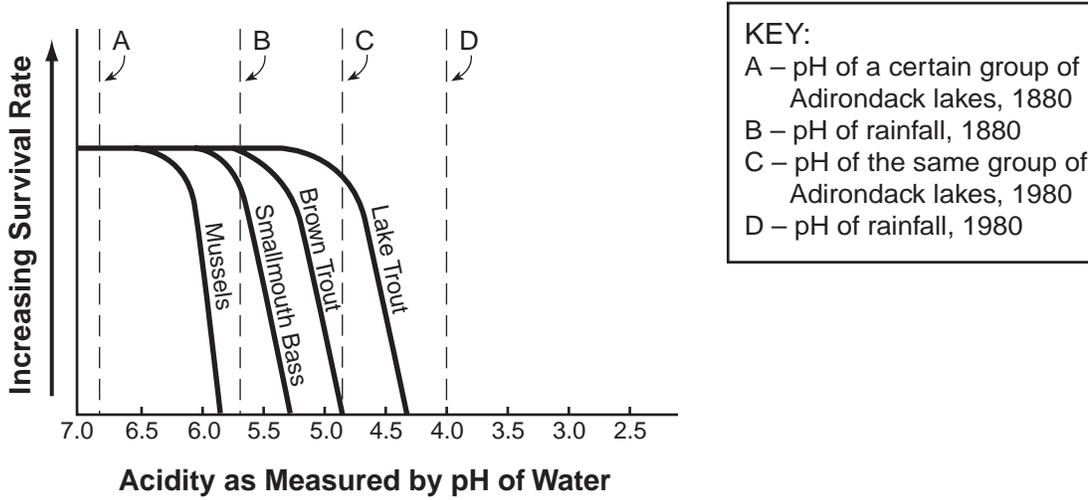
49 Explain why the percentage of the population with one mutant sickle-cell gene is higher in areas where malaria is common. [1]

49

Base your answers to questions 50 and 51 on the information and graph below and on your knowledge of biology.

**For Teacher
Use Only**

The Effect of pH on Survival Rates of Selected Species in Certain Adirondack Lakes



50 State how the pH of these Adirondack lakes changed between 1880 and 1980. [1]

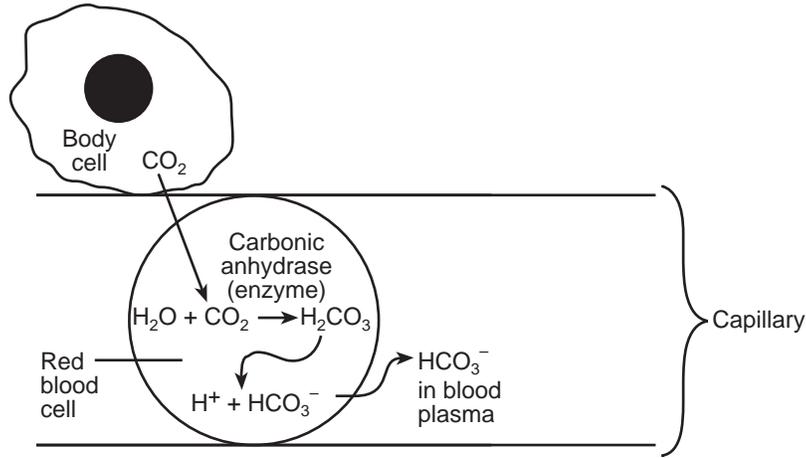
50

51 State the effect that the pH change in these Adirondack lakes had on lake trout, brown trout, smallmouth bass, and mussels. [1]

51

Base your answers to questions 52 through 54 on the diagram below, which illustrates a transport pathway of CO₂ in the human body, and on your knowledge of biology.

**For Teacher
Use Only**



52 Identify the cellular process that most likely produced the CO₂ in the body cell. [1]

52

53 Explain why carbon dioxide moves into red blood cells by diffusion rather than by active transport. [1]

53

54 State what would happen to the production of bicarbonate ions (HCO₃⁻) if the carbonic anhydrase were *not* present in red blood cells. [1]

54

Part C

Answer all questions in this part. [17]

Directions (55–61): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 55 through 58 on the information below and on your knowledge of biology.

**For Teacher
Use Only**

Where is the Beef? Out Being Irradiated

E. coli bacteria in food cause an estimated 73,000 cases of infection leading to some deaths in the United States each year. Until recently, the only way to guarantee meat free of *E. coli* was to heat it to 160°F, which kills *E. coli*. The rare hamburgers preferred by many people are not heated to this temperature, and just a few *E. coli* may cause severe illness.

Recently, ground beef has been decontaminated by irradiation using electron beam technology. The packaged ground beef is scanned by an electron beam that disrupts the genetic structure of the pathogens. This kills them or leaves them unable to reproduce.

This process is considered safe and has been endorsed by various governmental groups in this country as well as the World Health Organization. Irradiation is effective in preserving only certain foods, such as herbs, wheat flour, fresh fruits, vegetables, and some meats. Although some methods of irradiation can change the taste of some foods, this is not an effect of electron beam technology on ground beef.

Opponents of irradiating food are concerned that the process may result in the formation of chemicals that may be harmful or result in a loss of vitamins. Supporters claim that irradiation is safe and should be considered as just another technique for preservation of food.

55 Identify *one* specific pathogen found in ground beef. [1]

55

56 Identify the specific group of molecules in bacteria whose function would be interfered with by heating them to 160°F. [1]

56

57 Explain how irradiation helps preserve meat. [1]

57

Part D

Answer all questions in this part. [13]

Directions (62–73): 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.

Base your answers to questions 62 through 64 on the information below and on your knowledge of biology.

Scientists found members of a plant species they did not recognize. They wanted to determine if the unknown species was related to one or more of four known species, *A*, *B*, *C*, and *D*.

The relationship between species can be determined most accurately by comparing the results of gel electrophoresis of the DNA from different species.

The chart below represents the results of gel electrophoresis of the DNA from the unknown plant species and the four known species.

Results of Gel Electrophoresis of DNA from Five Plant Species

Unknown Species	Species A	Species B	Species C	Species D
— —		—	— —	— —
— — —		— —	—	
— —	— —		—	—

Key
— = Band in the gel

For Teacher Use Only

62 The unknown species is most closely related to which of the four known species? Support your answer. [1]

62

63 Identify *one* physical characteristic of plants that can be readily observed and compared to help determine the relationship between two different species of plants. [1]

63

64 Explain why comparing the DNA of the unknown and known plant species is probably a more accurate method of determining relationships than comparing only the physical characteristic you identified in question 63. [1]

**For Teacher
Use Only**

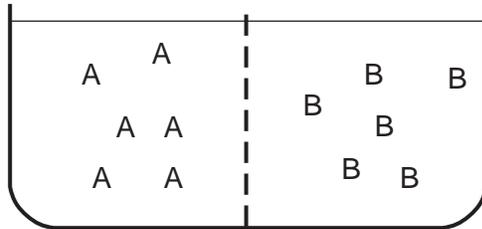
64

65 Scientists hypothesize that cabbage, broccoli, cauliflower, and radishes developed along a common evolutionary pathway. Which observation would best support this hypothesis?

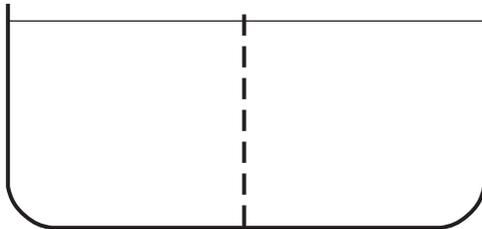
- (1) Fossils of these plants were found in the same rock layer.
- (2) Chloroplasts of these plants produce a gas.
- (3) These plants live in the same environment.
- (4) These plants have similar proteins.

65

66 The diagram below represents a container of water and two different kinds of molecules, A and B, separated into two chambers by a membrane through which only water and molecule A can pass.



On the diagram of the container below, indicate the distribution of molecules A and B after the net movement of these molecules stops. [2]



66

Base your answers to questions 67 through 70 on the data table below and on your knowledge of biology.

**For Teacher
Use Only**

A group of students obtained the following data:

Data Table

Student Tested	Pulse Rate at Rest	Pulse Rate After Exercising
1	70	97
2	75	106
3	84	120
4	60	91
5	78	122

67 The activity of which body system was measured to obtain these data? [1]

67

68 The activity of which other body system would be altered as a direct result of the exercise? [1]

68

69 What effect would exercise have on the system you identified in question 68? [1]

69

70 Explain how this change in pulse rate helps maintain homeostasis in muscle cells. [1]

70

71 A student hypothesizes that the pulse rate of a person and background music that is playing are related. The student designs an experiment to test this hypothesis. What would be an appropriate control for this experiment? [1]

**For Teacher
Use Only**

71

Base your answers to questions 72 and 73 on the information below and on your knowledge of biology.

Students prepared four models of cells by using dialysis tubing containing the same blue solution. Each of the model cells originally weighed 10 grams. They then placed each model cell in a beaker containing a different concentration of water. After 24 hours, they recorded the mass of the model cells as shown in the data table below.

Data Table

Concentration of Water Surrounding the Model Cell	Mass of Model Cell
100%	12 grams
90%	11 grams
80%	10 grams
70%	9 grams

72 Why did the model cell that was placed in 100% water increase in mass? [1]

72

73 What was the concentration of water in the original blue solution? State evidence in support of your answer. [1]

73

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, January 27, 2006 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student Sex: Female
 Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	
B-1	8	
B-2	17	
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 | 35 |
| 32 | 36 |
| 33 | 37 |
| 34 | 38 |

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

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

LE

LIVING ENVIRONMENT

Friday, January 27, 2006 — 9:15 a.m. to 12:15 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 response.

Part A			Part B-1	
1 3	11 2	21 1	31 4	35 1
2 1	12 1	22 3	32 3	36 2
3 1	13 4	23 2	33 3	37 4
4 1	14 2	24 1	34 3	38 1
5 4	15 2	25 4		
6 4	16 3	26 4		
7 3	17 4	27 2		
8 4	18 2	28 1		
9 2	19 3	29 3		
10 4	20 1	30 3		

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 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 checkmark 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 Friday, January 27, 2006. 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

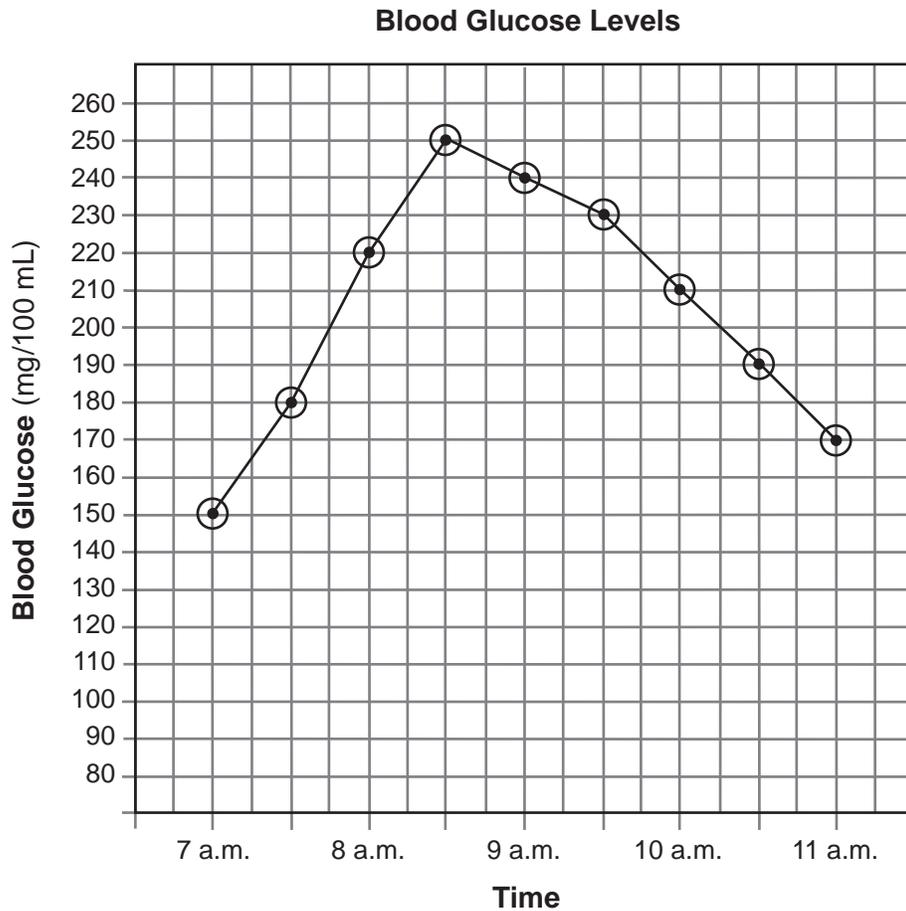
39 Allow 1 credit for marking an appropriate scale on each labeled axis.

40 Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for picking only individual 2 to plot.
- Allow 1 credit for correctly plotting the data *for either individual*, surrounding each point with a small circle, and connecting the points.

Note: Credit may be allowed if data is plotted correctly but the points are not circled.

Example of a 3-credit response for questions 39 and 40:



41 Allow 1 credit for identifying chemical X as insulin.

LIVING ENVIRONMENT – *continued*

- 42** Allow 1 credit for stating one reason for the change in blood glucose level between 7 a.m. and 8 a.m. Acceptable responses include, but are not limited to:
- They had a meal containing carbohydrates.
 - They had breakfast.
 - digestion
 - absorption
- 43** Allow 1 credit for homeostasis *or* steady state *or* dynamic equilibrium.
- 44** Allow 1 credit for describing one possible effect of LSD on the action of acetylcholine. Acceptable responses include, but are not limited to:
- Cell communication would be disrupted.
 - The work of acetylcholine would occur continuously.
 - Nerve signals would not be turned off.
- 45** Allow 1 credit for stating what might happen to some of the remaining energy mice obtain from the plants they eat after they store a small amount of it. Acceptable responses include, but are not limited to:
- Much of the energy is lost as heat (during cellular respiration).
 - Some of the energy is used by the mice for life functions.
- 46** Allow 1 credit for stating one reason that most foods must be digested before they can enter a cell. Acceptable responses include, but are not limited to:
- Food must be digested before it can enter a cell since certain food molecules are too large to pass through the cell membrane.
 - Only small molecules can pass through membrane pores.

LIVING ENVIRONMENT – *continued*

- 47** Allow 1 credit for a correct definition of a mutation. Acceptable responses include, but are not limited to:
- a change in a gene
 - a change in DNA code
 - a change in an allele
- 48** 3
- 49** Allow 1 credit for explaining why the percentage of the population with one mutant sickle-cell gene is higher in areas where malaria is common. Acceptable responses include, but are not limited to:
- The gene is beneficial to people who have only one copy.
 - The allele makes people resistant to malaria.
 - People with one gene survive malaria and pass the gene on to offspring.
- 50** Allow 1 credit for stating how the pH of these Adirondack lakes changed between 1880 and 1980. Acceptable responses include, but are not limited to:
- The pH decreased.
 - The lakes became more acidic.
 - The pH dropped from about 6.8 to about 4.8.
- 51** Allow 1 credit for stating the effect that the pH change in these Adirondack lakes had on lake trout, brown trout, smallmouth bass, and mussels. Acceptable responses include, but are not limited to:
- Their populations decreased.
 - Their survival rate decreased.
 - There are not as many trout, bass, and mussels.
 - They died.

LIVING ENVIRONMENT – *continued*

- 52** Allow 1 credit for identifying the cellular process that most likely produced the CO_2 in the body cell. Acceptable responses include, but are not limited to:
- respiration
 - cellular respiration
- 53** Allow 1 credit for explaining why carbon dioxide moves into red blood cells by diffusion rather than by active transport. Acceptable responses include, but are not limited to:
- Carbon dioxide is moving from high to low concentration.
 - Active transport moves materials from low to high concentration and the CO_2 is moving from high to low.
- 54** Allow 1 credit for stating what would happen to the production of bicarbonate ions (HCO_3^-) if the carbonic anhydrase were *not* present in red blood cells. Acceptable responses include, but are not limited to:
- Bicarbonate ion (HCO_3^-) production would decrease (or stop).
 - CO_2 would not become part of HCO_3^- .

Part C

- 55** Allow 1 credit for identifying one specific pathogen found in ground beef. Acceptable responses include, but are not limited to:
- *E. coli*.
 - bacteria
- 56** Allow 1 credit for identifying the specific group of molecules found in bacteria whose function would be interfered with by heating them to 160° F. Acceptable responses include, but are not limited to:
- enzymes
 - proteins
- 57** Allow 1 credit for explaining how irradiation helps preserve meat. Acceptable responses include, but are not limited to:
- Irradiation kills the bacteria that cause the meat to spoil.
 - disrupts the structure of bacteria that cause the meat to spoil
- 58** Allow 1 credit for explaining how irradiation could interfere with the process of reproduction in bacteria that survive the irradiation. Acceptable responses include, but are not limited to:
- It causes mutations.
 - Essential enzymes are destroyed.
 - Irradiation disrupts the structure of bacterial DNA so that it cannot replicate properly.

59 Allow of maximum of 5 credits for discussing photosynthesis or respiration, allocated as follows:

- Allow 1 credit for identifying the organelle where the process occurs.

Photosynthesis: — chloroplast

Respiration: — mitochondrion

- Allow 1 credit for identifying two raw materials necessary for the process. Acceptable responses include, but are not limited to:

Photosynthesis:

— CO_2 and H_2O

Respiration:

— organic molecules and O_2

— sugar and oxygen

- Allow 1 credit for identifying one energy-rich molecule that is produced by the process. Acceptable responses include, but are not limited to:

Photosynthesis:

— glucose

Respiration:

— ATP

- Allow 1 credit for stating how organisms use the energy-rich molecule that is produced. Acceptable responses include, but are not limited to:

Glucose:

— to produce ATP

— to produce starch

ATP:

— to provide energy for metabolism

- Allow 1 credit for stating how a gas produced by the process is recycled in nature. Acceptable responses include, but are not limited to:

Photosynthesis:

— The gas is used for respiration.

— provides O_2 for respiration

Respiration:

— provides CO_2 for photosynthesis

— The gas is used for photosynthesis.

LIVING ENVIRONMENT – *continued*

- 60** Allow a maximum of 3 credits for discussing the use of pesticides to control the mosquito population, allocated as follows:
- Allow 1 credit for stating one advantage of killing all of the mosquitoes. Acceptable responses include, but are not limited to:
 - Killing all the mosquitoes will end the West Nile virus infections of people.
 - People will get fewer mosquito bites.
 - Allow 1 credit for stating one disadvantage of killing all of the mosquitoes. Acceptable responses include, but are not limited to:
 - Killing all the mosquitoes will reduce the food supply for bats and birds.
 - Fish that rely on mosquito larvae for food will have less food.
 - Allow 1 credit for stating one danger to humans of spraying pesticides into the air. Acceptable responses include, but are not limited to:
 - Pesticides can enter food and water supplies (causing illness).
 - People may breathe in the pesticide.

61 Allow a maximum of 5 credits for discussing the issues the farmer should take into account before making a decision, allocated as follows:

- Allow 1 credit for stating how a cloned flock would be different from a noncloned flock. Acceptable responses include, but are not limited to:
 - There would be no variation.
 - All would be identical genetic copies, unlike noncloned herds, where much genetic diversity would be present.
 - All sheep would be the same.
- Allow 1 credit for stating one advantage of having a cloned flock. Acceptable responses include, but are not limited to:
 - All sheep would have one or more desired traits (that the original individual possessed).
- Allow 1 credit for stating one disadvantage of having a cloned flock. Acceptable responses include, but are not limited to:
 - Since all are the same, the entire flock could be lost if a disease to which they have no resistance were to infect them.
 - The sheep may have a genetic flaw.
 - shorter life span
- Allow 1 credit for stating that they would all be the same sex, so they could not mate with each other.
- Allow 1 credit for stating one reason that the offspring resulting from breeding these sheep with an unrelated sheep would not all be the same. Acceptable responses include, but are not limited to:
 - Both parents contribute genes to the offspring.
 - Different gene combinations will result.

Part D

62 Allow 1 credit for stating that the unknown plant species is most closely related to species *C* and supporting that answer. Acceptable responses include, but are not limited to:

— It is most closely related to species *C*. The bands from the DNA of species *C* are the closest match to those of the unknown species.

63 Allow 1 credit for identifying one physical characteristic of plants that can be readily observed and compared to help determine the relationship between two different species of plants. Acceptable responses include, but are not limited to:

- structure of flowers
- structure of leaves
- structure of stems
- structure of seeds
- structure of pollen

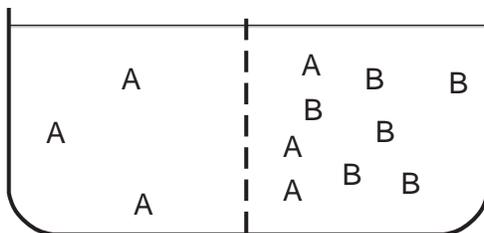
64 Allow 1 credit for explaining why comparing the DNA of the unknown and known plant species is probably a more accurate method of determining relationships than comparing only the physical characteristic identified in question 63. Acceptable responses include, but are not limited to:

— The physical characteristic chosen may be the only characteristic the organisms have in common, while the more similar the DNA, the more characteristics the organisms have in common.

65 4

66 Allow a maximum of 2 credits, 1 for indicating that there will be three molecules of *A* in each chamber and 1 for indicating that there will be six molecules of *B* in the right chamber.

Example of a 2-credit response



LIVING ENVIRONMENT – *concluded*

- 67** Allow 1 credit for circulatory system.
- 68** Allow 1 credit for identifying another body system that would have its activity altered. Acceptable responses include, but are not limited to:
- respiratory system
 - excretory system
- 69** Allow 1 credit for stating the effect exercise would have on the system identified in question 68. Acceptable responses include, but are not limited to:
- Respiratory:
- increased breathing rate
- Excretory:
- increased perspiration
- 70** Allow 1 credit for explaining how the change in pulse rate helps maintain homeostasis in muscle cells. Acceptable responses include, but are not limited to:
- An increased pulse rate indicates an increased blood flow that carries excess carbon dioxide away from the muscle cells.
 - More oxygen is carried to the muscle cells.
 - The increased blood flow carries excess heat away from the muscle cells.
- 71** Allow 1 credit for stating an appropriate control for the experiment. Acceptable responses include, but are not limited to:
- no music being played while the pulse is being taken
 - silence while the pulse is being taken
- 72** Allow 1 credit for explaining that the model cell that was placed in 100% water increased in mass because water diffused into the model cell.
- 73** Allow 1 credit for stating that the concentration of water in the original blue solution was 80% and for stating evidence in support of this answer. Acceptable responses include, but are not limited to:
- 80%, because the model cell did not increase in mass
 - 80%, because the model cell did not change
 - According to the table, when the mass of the model cell is 10 grams, the concentration of water outside the model cell is 80%. This would be the same as the concentration of water inside the model cell.

The *Chart for Determining the Final Examination Score for the January 2006 Regents Examination in Living Environment* will be posted on the Department's web site <http://www.emsc.nysed.gov/osa> on Friday, January 27, 2006. 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

January 2006 Living Environment

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

Part D 62–73	
Lab 1	62,63,64,65
Lab 2	67,68,69,70,71
Lab 3	
Lab 5	66,72,73



Regents Examination in Living Environment January 2006

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

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.