

LIVING ENVIRONMENT

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

LIVING ENVIRONMENT

Friday, January 26, 2007 — 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 When brown tree snakes were accidentally introduced onto the island of Guam, they had no natural predators. These snakes sought out and ate many of the eggs of insect-eating birds. What probably occurred following the introduction of the brown tree snakes?

- (1) The bird population increased.
- (2) The insect population increased.
- (3) The bird population began to seek a new food source.
- (4) The insect population began to seek a new food source.

2 What will most likely happen to wastes containing nitrogen produced as a result of the breakdown of amino acids within liver cells of a mammal?

- (1) They will be digested by enzymes in the stomach.
- (2) They will be removed by the excretory system.
- (3) They will be destroyed by specialized blood cells.
- (4) They will be absorbed by mitochondria in nearby cells.

3 Which sequence represents the correct order of organization in complex organisms?

- (1) tissues → organs → systems → cells
- (2) organs → tissues → systems → cells
- (3) systems → organs → cells → tissues
- (4) cells → tissues → organs → systems

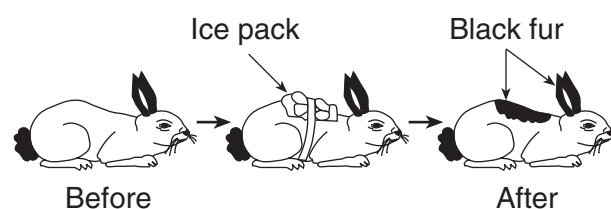
4 Which organelle is correctly paired with its specific function?

- (1) cell membrane—storage of hereditary information
- (2) chloroplast—transport of materials
- (3) ribosome—synthesis of proteins
- (4) vacuole—production of ATP

5 Homeostasis in unicellular organisms depends on the proper functioning of

- (1) organelles
- (2) insulin
- (3) guard cells
- (4) antibodies

6 Which statement best explains the change shown in the diagram below?



- (1) Gene expression in an organism can be modified by interactions with the environment.
- (2) Certain rabbits produce mutations that affect genes in specific areas of the body.
- (3) Sorting and recombination of genes can be influenced by very cold temperatures.
- (4) Molecular arrangement in existing proteins can be altered by environmental factors.

7 After a rabbit population reaches the carrying capacity of its habitat, the population of rabbits will most likely

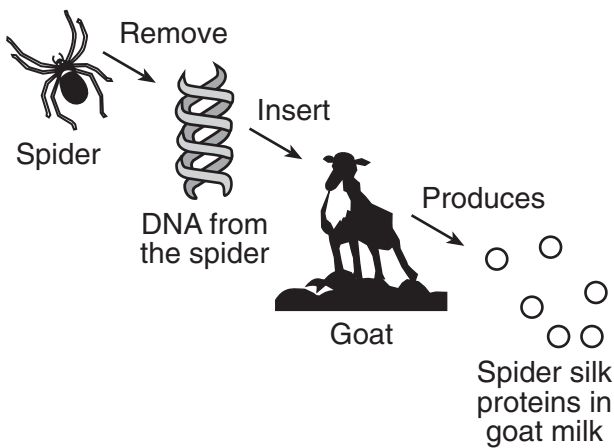
- (1) decrease, only
- (2) increase, only
- (3) alternately increase and decrease
- (4) remain unchanged

8 Variation in the offspring of sexually reproducing organisms is the direct result of

- (1) sorting and recombining of genes
- (2) replication and cloning
- (3) the need to adapt and maintain homeostasis
- (4) overproduction of offspring and competition

- 9 An error in genetic information present in a body cell of a mammal would most likely produce
- (1) rapid evolution of the organism in which the cell is found
 - (2) a mutation that will affect the synthesis of a certain protein in the cell
 - (3) an adaptation that will be passed on to other types of cells
 - (4) increased variation in the type of organelles present in the cell

10 Which process is illustrated in the diagram below?



- (1) chromatography
 - (2) direct harvesting
 - (3) meiosis
 - (4) genetic engineering
- 11 Which statement is most closely related to the modern theory of evolution?
- (1) Characteristics that are acquired during life are passed to offspring by sexual reproduction.
 - (2) Evolution is the result of mutations and recombination, only.
 - (3) Organisms best adapted to a changed environment are more likely to reproduce and pass their genes to offspring.
 - (4) Asexual reproduction increases the survival of species.

- 12 In 1993, there were only 30 panthers in Florida. They were all closely related and many had reproductive problems. To avoid extinction and restore health to the population, biologists introduced 8 female panthers from Texas. Today, there are more than 80 panthers in Florida and most individuals have healthy reproductive systems. The success of this program was most likely due to the fact that the introduced females
- (1) produced more reproductive cells than the male panthers in Texas
 - (2) solved the reproductive problems of the species by asexual methods
 - (3) increased the genetic variability of the panther population in Florida
 - (4) mated only with panthers from Texas

- 13 The *least* genetic variation will probably be found in the offspring of organisms that reproduce using
- (1) mitosis to produce a larger population
 - (2) meiosis to produce gametes
 - (3) fusion of eggs and sperm to produce zygotes
 - (4) internal fertilization to produce an embryo

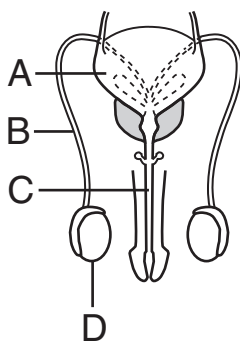
- 14 Woolly mammoths became extinct thousands of years ago, while other species of mammals that existed at that time still exist today. These other species of mammals most likely exist today because, unlike the mammoths, they
- (1) produced offspring that all had identical inheritable characteristics
 - (2) did not face a struggle for survival
 - (3) learned to migrate to new environments
 - (4) had certain inheritable traits that enabled them to survive

- 15 Marine sponges contain a biological catalyst that blocks a certain step in the separation of chromosomes. Which cellular process would be directly affected by this catalyst?
- | | |
|---------------|--------------------|
| (1) mitosis | (3) respiration |
| (2) diffusion | (4) photosynthesis |

16 A tree produces only seedless oranges. A small branch cut from this tree produces roots after it is planted in soil. When mature, this new tree will most likely produce

- (1) oranges with seeds, only
- (2) oranges without seeds, only
- (3) a majority of oranges with seeds and only a few oranges without seeds
- (4) oranges and other kinds of fruit

17 The diagram below represents a human reproductive system.



Meiosis occurs within structure

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

18 Which statement about embryonic organ development in humans is accurate?

- (1) It is affected primarily by the eating habits and general health of the father.
- (2) It may be affected by the diet and general health of the mother.
- (3) It will not be affected by any medication taken by the mother in the second month of pregnancy.
- (4) It is not affected by conditions outside the embryo.

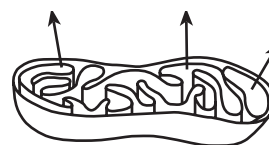
19 Experiments revealed the following information about a certain molecule:

- It can be broken down into amino acids.
- It can break down proteins into amino acids.
- It is found in high concentrations in the small intestine of humans.

This molecule is most likely

- (1) an enzyme
- (2) an inorganic compound
- (3) a hormone
- (4) an antigen

20 The diagram below represents a structure involved in cellular respiration.



Mitochondrion

The release of which substance is represented by the arrows?

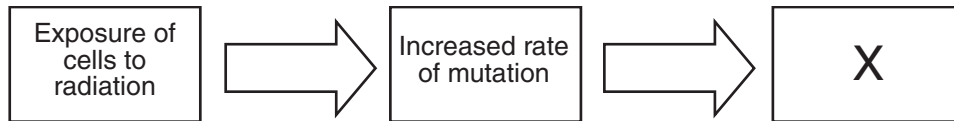
- (1) glucose
- (2) oxygen
- (3) carbon dioxide
- (4) DNA

21 Scientists have genetically altered a common virus so that it can destroy the most lethal type of brain tumor without harming the healthy tissue nearby. This technology is used for all of the following *except*

- (1) treating the disease
- (2) curing the disease
- (3) controlling the disease
- (4) diagnosing the disease

- 22 Many species of plants interact with harmless underground fungi. The fungi enable the plants to absorb certain essential minerals and the plants provide the fungi with carbohydrates and other nutrients. This describes an interaction between a
- (1) parasite and its host
 - (2) predator and its prey
 - (3) scavenger and a decomposer
 - (4) producer and a consumer
- 23 In an ocean, the growth and survival of seaweed, small fish, and sharks depends on abiotic factors such as
- (1) sunlight, temperature, and minerals
 - (2) sunlight, pH, and type of seaweed
 - (3) number of decomposers, carbon dioxide, and nitrogen
 - (4) number of herbivores, carbon, and food
- 24 A basketball player develops speed and power as a result of practice. This athletic ability will *not* be passed on to her offspring because
- (1) muscle cells do not carry genetic information
 - (2) mutations that occur in body cells are not inherited
 - (3) gametes do not carry complete sets of genetic information
 - (4) base sequences in DNA are not affected by this activity
- 25 Carbon dioxide containing carbon-14 is introduced into a balanced aquarium ecosystem. After several weeks, carbon-14 will most likely be present in
- (1) the plants, only
 - (2) the animals, only
 - (3) both the plants and animals
 - (4) neither the plants nor animals
- 26 Which situation is a result of human activities?
- (1) decay of leaves in a forest adds to soil fertility
 - (2) acid rain in an area kills fish in a lake
 - (3) ecological succession following volcanic activity reestablishes an ecosystem
 - (4) natural selection on an island changes gene frequencies
- 27 Which human activity will most likely have a *negative* effect on global stability?
- (1) decreasing water pollution levels
 - (2) increasing recycling programs
 - (3) decreasing habitat destruction
 - (4) increasing world population growth
- 28 Which process helps reduce global warming?
- (1) decay
 - (2) industrialization
 - (3) photosynthesis
 - (4) burning

29 Which phrase belongs in box X of the flowchart below?



- (1) Increased chance of cancer
- (2) Increase in the production of functional gametes
- (3) Decrease in genetic variability of offspring
- (4) Decreased number of altered genes

30 The data in the table below indicate the presence of specific reproductive hormones in blood samples taken from three individuals. An X in the hormone column indicates a positive lab test for the appropriate levels necessary for normal reproductive functioning in that individual.

Data Table

Individuals	Hormones Present		
	Testosterone	Progesterone	Estrogen
1		X	X
2			X
3	X		

Which processes could occur in individual 3?

- (1) production of sperm, only
 - (2) production of sperm and production of eggs
 - (3) production of eggs and embryonic development
 - (4) production of eggs, only
-

Part B-1

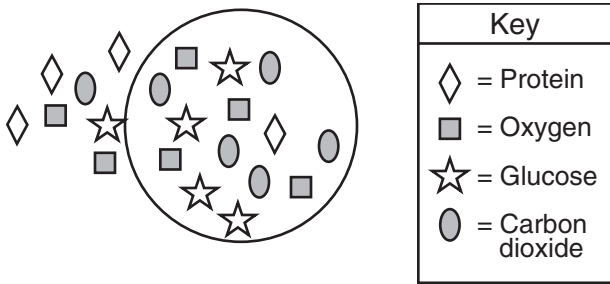
Answer all questions in this part. [10]

Directions (31–40): 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 While viewing a specimen under high power of a compound light microscope, a student noticed that the specimen was out of focus. Which part of the microscope should the student turn to obtain a clearer image under high power?

- (1) eyepiece
- (2) coarse adjustment
- (3) fine adjustment
- (4) nosepiece

32 The diagram below shows the relative concentration of molecules inside and outside of a cell.



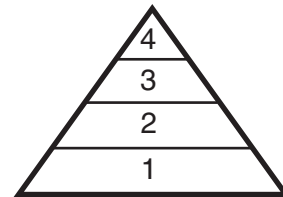
Which statement best describes the general direction of diffusion across the membrane of this cell?

- (1) Glucose would diffuse into the cell.
- (2) Protein would diffuse out of the cell.
- (3) Carbon dioxide would diffuse out of the cell.
- (4) Oxygen would diffuse into the cell.

33 Which statement most accurately describes scientific inquiry?

- (1) It ignores information from other sources.
- (2) It does not allow scientists to judge the reliability of their sources.
- (3) It should never involve ethical decisions about the application of scientific knowledge.
- (4) It may lead to explanations that combine data with what people already know about their surroundings.

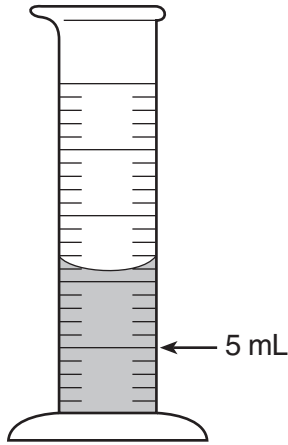
34 The diagram below represents a pyramid of energy that includes both producers and consumers.



The greatest amount of available energy is found at level

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

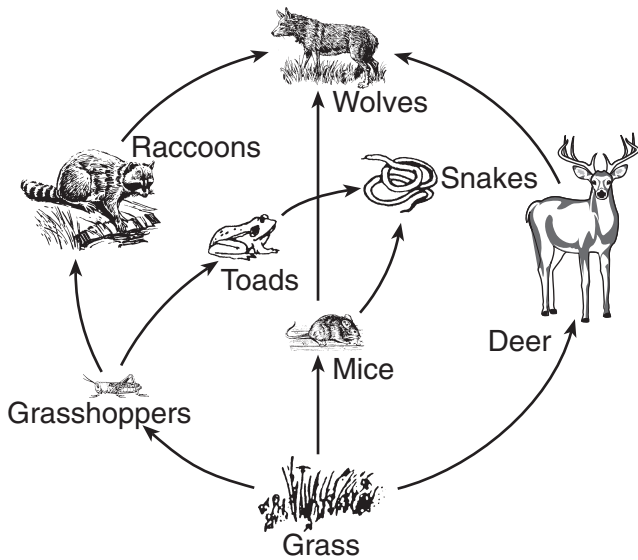
35 How much water should be removed from the graduated cylinder shown below to leave 5 milliliters of water in the cylinder?



- (1) 6 mL
- (2) 7 mL
- (3) 11 mL
- (4) 12 mL

36 The diagram below represents a food web.

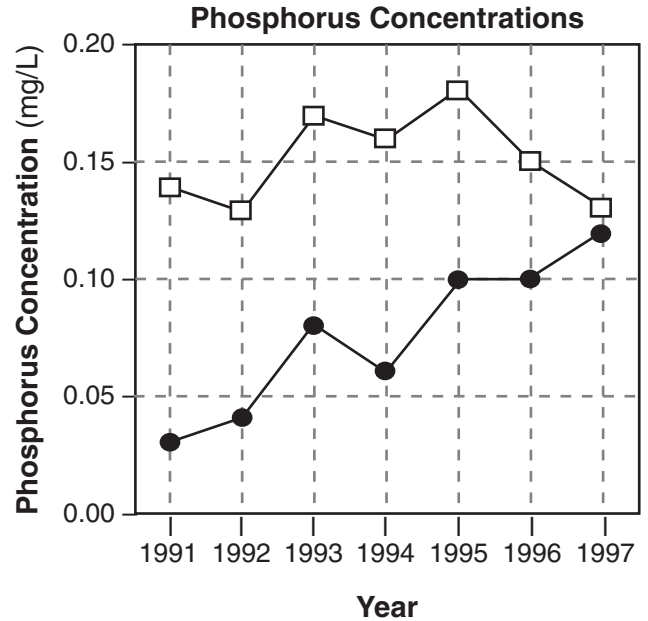
A Meadow Environment



Two of the herbivores represented in this food web are

- (1) toads and snakes
- (2) deer and mice
- (3) wolves and raccoons
- (4) grasshoppers and toads

37 Compounds containing phosphorus that are dumped into the environment can upset ecosystems because phosphorus acts as a fertilizer. The graph below shows measurements of phosphorus concentrations taken during the month of June at two sites from 1991 to 1997.

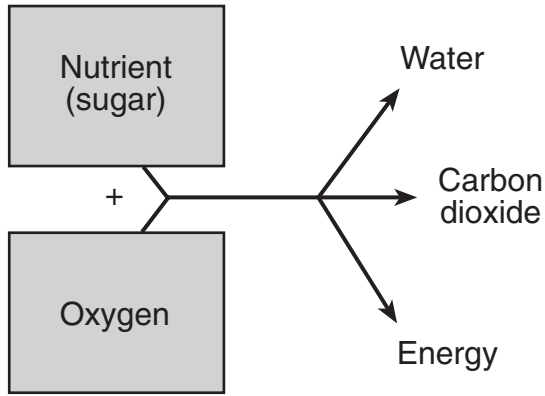


Key	
Site 1	—□—
Site 2	—●—

Which statement represents a valid inference based on information in the graph?

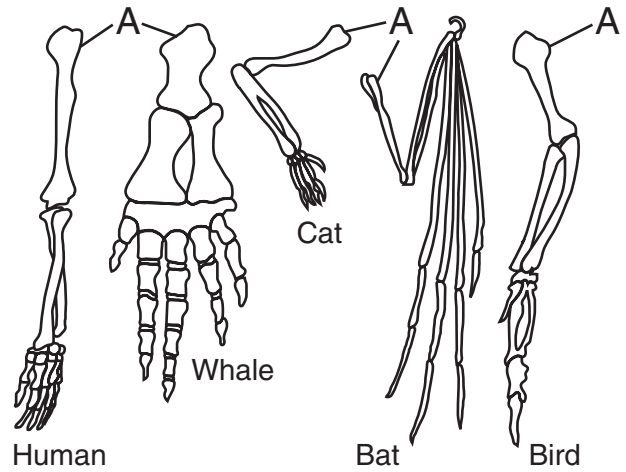
- (1) There was no decrease in the amount of compounds containing phosphorus dumped at site 2 during the period from 1991 to 1997.
- (2) Pollution controls may have been put into operation at site 1 in 1995.
- (3) There was most likely no vegetation present near site 2 from 1993 to 1994.
- (4) There was a greater variation in phosphorous concentration at site 1 than there was at site 2.

Base your answers to questions 38 and 39 on the diagram below and on your knowledge of biology. The diagram illustrates a process by which energy is released in organisms.



- 38 Cells usually transfer the energy that is released directly to
- (1) glucose
 - (2) ATP
 - (3) oxygen
 - (4) enzymes
- 39 The energy released in this process was originally present in
- (1) sunlight and then transferred to sugar
 - (2) sunlight and then transferred to oxygen
 - (3) the oxygen and then transferred to sugar
 - (4) the sugar and then transferred to oxygen

Base your answer to question 40 on the diagram below and on your knowledge of biology.



- 40 The similarities of the bones labeled A provide evidence that
- (1) the organisms may have evolved from a common ancestor
 - (2) all species have one kind of bone structure
 - (3) the cells of the bones contain the same type of mutations
 - (4) all structural characteristics are the same in animals

Part B-2

Answer all questions in this part. [15]

Directions (41–55): 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 41 and 42 on the information below and on your knowledge of biology.

A biology student was given three unlabeled jars of pond water from the same source, each containing a different type of mobile unicellular organism: euglena, ameba, and paramecium. The only information the student has is that the ameba and paramecium are both heterotrophs and the euglena can be either heterotrophic or autotrophic, depending on its environment.

41 State *one* way the euglena’s two methods of nutrition provide a survival advantage the other unicellular organisms do *not* have. [1]

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41

42 Which procedure and resulting observation would help identify the jar that contains the euglena?

- (1) Expose only one side of each jar to light. After 24 hours, only in the jar containing euglena will most of organisms be seen on the darker side of the jar.
- (2) Expose all sides of each jar to light. After 48 hours, the jar with the highest dissolved carbon dioxide content will contain the euglena.
- (3) Over a period of one week, determine the method of reproduction used by each type of organism. If mitotic cell division is observed, the jar will contain euglena.
- (4) Prepare a wet-mount slide of specimens from each jar and observe each slide with a compound light microscope. Only the euglena will have chloroplasts.

42

Base your answers to questions 43 through 46 on the passage below and on your knowledge of biology.

Decline of the Salmon Population

Salmon are fish that hatch in a river and swim to the ocean where their body mass increases. When mature, they return to the river where they were hatched and swim up stream to reproduce and die. When there are large populations of salmon, the return of nutrients to the river ecosystem can be huge. It is estimated that during salmon runs in the Pacific Northwest in the 1800s, 500 million pounds of salmon returned to reproduce and die each year. Research estimates that in the Columbia River alone, salmon contributed hundreds of thousands of pounds of nitrogen and phosphorus compounds to the local ecosystem each year. Over the past 100 years, commercial ocean fishing has removed up to two-thirds of the salmon before they reach the river each year.

- 43 Identify the process that releases the nutrients from the bodies of the dead salmon, making the nutrients available for other organisms in the ecosystem. [1]

43

- 44 Identify *one* organism, other than the salmon, that would be present in or near the river that would most likely be part of a food web in the river ecosystem. [1]

44

- 45 Identify *two* nutrients that are returned to the ecosystem when the salmon die. [1]

45

- 46 State *one* impact, other than reducing the salmon population, that commercial ocean fishing has on the river ecosystem. [1]

46

Base your answers to questions 47 through 51 on the information and data table below and on your knowledge of biology.

Biologists investigated the effect of the presence of aluminum ions on root tips of a variety of wheat. They removed 2-mm sections of the tips of roots. Half of the root tips were placed in a nutrient solution with aluminum ions, while the other half were placed in an identical nutrient solution without aluminum ions. The length of the root tips, in millimeters, was measured every hour for seven hours. The results are shown in the data table below.

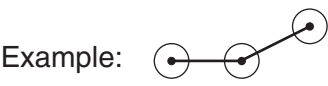
Data Table

Time (hr)	Length of Root Tips in Solution With Aluminum Ions (mm)	Length of Root Tips in Solution Without Aluminum Ions (mm)
0	2.0	2.0
1	2.1	2.2
2	2.2	2.4
3	2.4	2.8
4	2.6	2.9
5	2.7	3.2
6	2.8	3.7
7	2.8	3.9

Directions (47–49): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

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

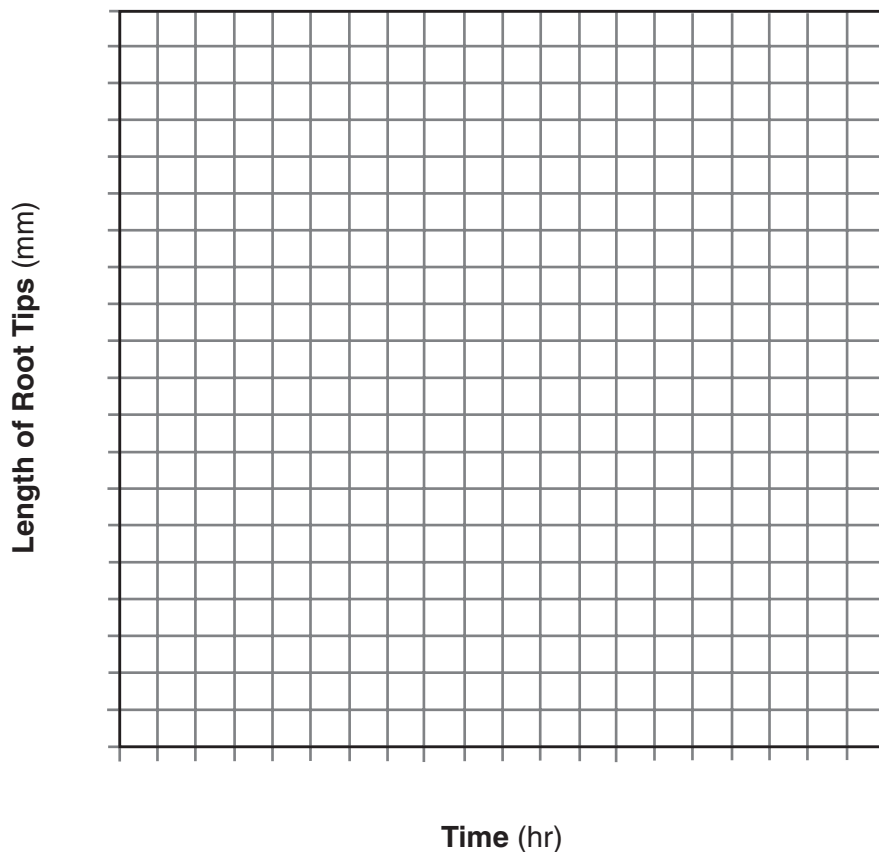
48 Plot the data for root tips in the solution with aluminum ions on the grid. Surround each point with a small circle and connect the points. [1]



49 Plot the data for root tips in the solution without aluminum ions on the grid. Surround each point with a small triangle and connect the points. [1]



Growth of Wheat Root Tips



● = Root tips in solution with aluminum ions
 ▲ = Root tips in solution without aluminum ions

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47

48

49

50 The aluminum ions most likely affected

- (1) photosynthetic rate
- (2) the union of gametes
- (3) mitotic cell division
- (4) starch absorption from the soil

50

51 Describe the effect of aluminum ions on the growth of the root tips of wheat. [1]

51

Base your answers to questions 52 and 53 on the information below and on your knowledge of biology.

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A pond in the Adirondack Mountains of New York State was once a fishing spot visited by many people. It was several acres in size, and fishermen in boats were a common sight. Over time, the pond has become smaller in area and depth. Places where there was once open water are now covered by grasses and shrubs. Around the edges of the pond there are cattails and other wetland plants.

52 Identify the ecological process responsible for the changes to this pond. [1]

52

53 Predict what will most likely happen to this pond area over the next hundred years if this process continues. [1]

53

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

The use of nuclear fuel can have positive and negative effects on an ecosystem.

54 State *one* positive effect on an ecosystem of using nuclear fuel to generate electricity. [1]

54

55 State *one* negative effect on an ecosystem of using nuclear fuel to generate electricity. [1]

55

Part C

Answer all questions in this part. [17]

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

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

Selective breeding has been used to improve the racing ability of horses.

56 Define selective breeding and state how it would be used to improve the racing ability of horses. [2]

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56

57 State *one disadvantage* of selective breeding. [1]

57

58 State *one* specific way the removal of trees from an area has had a *negative* impact on the environment. [1]

58

Base your answers to questions 59 through 61 on the information below and on your knowledge of biology.

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It has been discovered that plants utilize chemical signals for communication. Some of these chemicals are released from leaves, fruits, and flowers and play various roles in plant development, survival, and gene expression. For example, bean plant leaves infested with spider mites release chemicals that result in an increase in the resistance to spider mites in uninfested leaves on the same plant and the expression of self-defense genes in uninfested bean plants nearby.

Plants can also communicate with insects. For example, corn, cotton, and tobacco under attack by caterpillars release chemical signals that simultaneously attract parasitic wasps to destroy the caterpillars and discourage moths from laying their eggs on the plants.

59 Identify the specialized structures in the cell membrane that are involved in communication. [1]

59

60 Explain why chemicals released from one plant species may not cause a response in a different plant species. [1]

60

61 State *two* advantages of relying on chemicals released by plants rather than using man-made chemicals for insect control. [2]

61

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

Cells of the immune system and the endocrine system of the human body contribute to the maintenance of homeostasis. The methods and materials these two systems use as they carry out this critical function are different.

62 State *two* ways cells of the immune system fight disease. [2]

62

63 Identify the substance produced by the cells of all the endocrine glands that helps maintain homeostasis. [1]

63

64 Identify *one* specific product of one of the endocrine glands and state how it aids in the maintenance of homeostasis. [1]

64

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Part D

Answer all questions in this part. [13]

Directions (66–76): 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 66 and 67 on the information and data table below and on your knowledge of biology

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Two students collected data on their pulse rates while performing different activities. Their average results are shown in the data table below.

Data Table

Activity	Average Pulse Rate (beats/min)
sitting quietly	70
walking	98
running	120

66 State the relationship between activity and pulse rate. [1]

66

67 State *one* way that this investigation could be improved. [1]

67

Base your answers to questions 68 through 71 on the information below and on your knowledge of biology.

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To demonstrate techniques used in DNA analysis, a student was given two paper strip samples of DNA. The two DNA samples are shown below.

Sample 1: ATTCCGGTAATCCCGTAATGCCGGATAATACTCCGGTAATATC

Sample 2: ATTCCGGTAATCCCGTAATGCCGGATAATACTCCGGTAATATC

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

68 The action of what kind of molecules was being demonstrated when the DNA samples were cut? [1]

68

69 Identify the technique that was being demonstrated when the fragments were arranged on the gel model. [1]

69

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

- (1) the number of DNA molecules in an organism
- (2) if two species are closely related
- (3) the number of mRNA molecules in DNA
- (4) if two organisms contain carbohydrate molecules

70

71 State *one* way that the arrangement of the two samples on the gel model would differ. [1]

71

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

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In birds, the ability to crush and eat seeds is related to the size, shape, and thickness of the beak. Birds with larger, thicker beaks are better adapted to crush and open seeds that are larger.

One species of bird found in the Galapagos Islands is the medium ground finch. It is easier for most of the medium ground finches to pick up and crack open smaller seeds rather than larger seeds. When food is scarce, some of the birds have been observed eating larger seeds.

72 Describe *one* change in beak characteristics that would most likely occur in the medium ground finch population after many generations when an environmental change results in a permanent shortage of small seeds. [1]

72

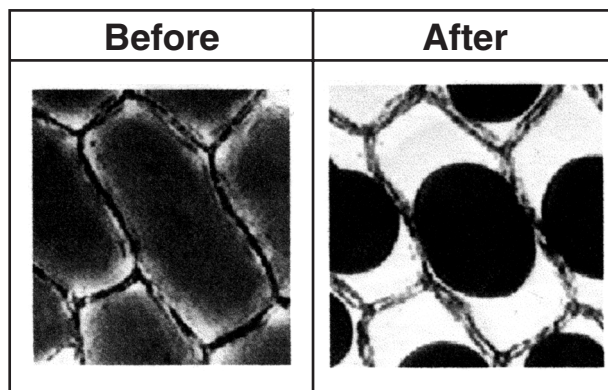
73 Explain this long-term change in beak characteristics using the concepts of:

- competition [1]
- survival of the fittest [1]
- inheritance [1]

73

Base your answers to questions 74 and 75 on the information and diagram below and on your knowledge of biology. The diagram represents some cells on a microscope slide before and after a substance was added to the slide.

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74 Identify a substance that was most likely added to the slide to cause the change observed. [1]

74

75 Describe a procedure that could be used to add this substance to the cells on the slide without removing the coverslip. [1]

75

76 In the *Diffusion Through a Membrane* lab, the model cell membranes allowed certain substances to pass through based on which characteristic of the diffusing substance?

- (1) size
 - (2) shape
 - (3) color
 - (4) temperature
- _____

76

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, January 26, 2007 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Female

Student Sex: Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	
B-1	10	
B-2	15	
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 | 36 |
| 32 | 37 |
| 33 | 38 |
| 34 | 39 |
| 35 | 40 |

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