

LIVING ENVIRONMENT

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

LIVING ENVIRONMENT

Wednesday, August 16, 2006 — 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.

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 best completes the statement or answers the question.

1 The levels of organization for structure and function in the human body from least complex to most complex are

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

2 Genes are inherited, but their expressions can be modified by the environment. This statement explains why

- (1) some animals have dark fur only when the temperature is within a certain range
- (2) offspring produced by means of sexual reproduction look exactly like their parents
- (3) identical twins who grow up in different homes have the same characteristics
- (4) animals can be cloned, but plants cannot

3 Meat tenderizer contains an enzyme that interacts with meat. If meat is coated with tenderizer and then placed in a refrigerator for a short time, how would the enzyme be affected?

- (1) It would be broken down.
- (2) Its activity would slow down.
- (3) Its shape would change.
- (4) It would no longer act as an enzyme.

4 Which row in the chart below contains correct information concerning synthesis?

| Row | Building Blocks | Substance Synthesized Using the Building Blocks |
|-----|-------------------|---|
| (1) | glucose molecules | DNA |
| (2) | simple sugars | protein |
| (3) | amino acids | enzyme |
| (4) | molecular bases | starch |

5 Molecule X moves across a cell membrane by diffusion. Which row in the chart below best indicates the relationship between the relative concentrations of molecule X and the use of ATP for diffusion?

| Row | Movement of Molecule X | Use of ATP |
|-----|--|------------|
| (1) | high concentration → low concentration | used |
| (2) | high concentration → low concentration | not used |
| (3) | low concentration → high concentration | used |
| (4) | low concentration → high concentration | not used |

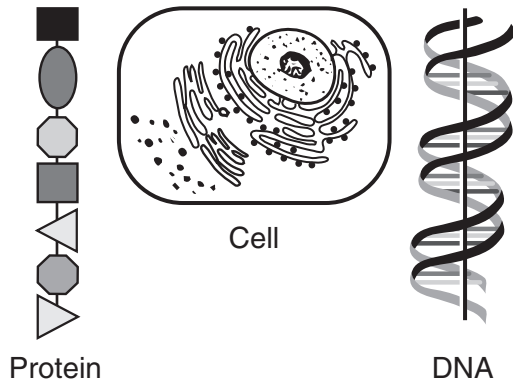
6 Which statement best compares a multicellular organism to a single-celled organism?

- (1) A multicellular organism has organ systems that interact to carry out life functions, while a single-celled organism carries out life functions without using organ systems.
- (2) A single-celled organism carries out fewer life functions than each cell of a multicellular organism.
- (3) A multicellular organism always obtains energy through a process that is different from that used by a single-celled organism.
- (4) The cell of a single-celled organism is always much larger than an individual cell of a multicellular organism.

7 Which statement indicates that different parts of the genetic information are used in different kinds of cells, even in the same organism?

- (1) The cells produced by a zygote usually have different genes.
- (2) As an embryo develops, various tissues and organs are produced.
- (3) Replicated chromosomes separate during gamete formation.
- (4) Offspring have a combination of genes from both parents.

8 Three structures are represented in the diagram below.



What is the relationship between these three structures?

- (1) DNA is made up of proteins that are synthesized in the cell.
 - (2) Protein is composed of DNA that is stored in the cell.
 - (3) DNA controls the production of protein in the cell.
 - (4) The cell is composed only of DNA and protein.
- 9 In a group of mushrooms exposed to a poisonous chemical, only a few of the mushrooms survived. The best explanation for the resistance of the surviving mushrooms is that the resistance
- (1) was transmitted to the mushrooms from the poisonous chemical
 - (2) resulted from the presence of mutations in the mushrooms
 - (3) was transferred through the food web to the mushrooms
 - (4) developed in response to the poisonous chemical
- 10 Which statement correctly describes the genetic makeup of the sperm cells produced by a human male?
- (1) Each cell has pairs of chromosomes and the cells are usually genetically identical.
 - (2) Each cell has pairs of chromosomes and the cells are usually genetically different.
 - (3) Each cell has half the normal number of chromosomes and the cells are usually genetically identical.
 - (4) Each cell has half the normal number of chromosomes and the cells are usually genetically different.

11 In an environment that undergoes frequent change, species that reproduce sexually may have an advantage over species that reproduce asexually because the sexually reproducing species produce

- (1) more offspring in each generation
 - (2) identical offspring
 - (3) offspring with more variety
 - (4) new species of offspring in each generation
- 12 Mutations that occur in skin or lung cells have little effect on the evolution of a species because mutations in these cells
- (1) usually lead to the death of the organism
 - (2) cannot be passed on to offspring
 - (3) are usually beneficial to the organism
 - (4) lead to more serious mutations in offspring
- 13 The teeth of carnivores are pointed and are good for puncturing and ripping flesh. The teeth of herbivores are flat and are good for grinding and chewing. Which statement best explains these observations?
- (1) Herbivores have evolved from carnivores.
 - (2) Carnivores have evolved from herbivores.
 - (3) The two types of teeth most likely evolved as a result of natural selection.
 - (4) The two types of teeth most likely evolved as a result of the needs of an organism.
- 14 What would most likely happen if most of the bacteria and fungi were removed from an ecosystem?
- (1) Nutrients resulting from decomposition would be reduced.
 - (2) Energy provided for autotrophic nutrition would be reduced.
 - (3) The rate of mutations in plants would increase.
 - (4) Soil fertility would increase.
- 15 A certain bacterial colony originated from the division of a single bacterial cell. Each cell in this colony will most likely
- (1) express adaptations unlike those of the other cells
 - (2) replicate different numbers of genes
 - (3) have a resistance to different antibiotics
 - (4) synthesize the same proteins and enzymes

16 Removal of one ovary from a human female would most likely

- (1) affect the production of eggs
- (2) make fertilization impossible
- (3) make carrying a fetus impossible
- (4) decrease her ability to provide essential nutrients to an embryo

17 Which substance usually passes in the greatest amount through the placenta from the blood of the fetus to the blood of the mother?

- (1) oxygen
- (2) carbon dioxide
- (3) amino acids
- (4) glucose

18 An enzyme known as rubisco enables plants to use large amounts of carbon dioxide. This enzyme is most likely active in the

- (1) nucleus
- (2) vacuoles
- (3) mitochondria
- (4) chloroplasts

19 Starch molecules present in a maple tree are made from materials that originally entered the tree from the external environment as

- (1) enzymes
- (2) simple sugars
- (3) amino acids
- (4) inorganic compounds

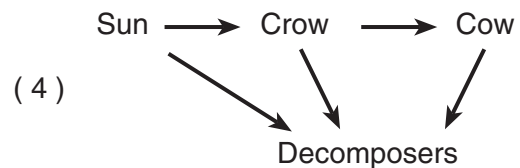
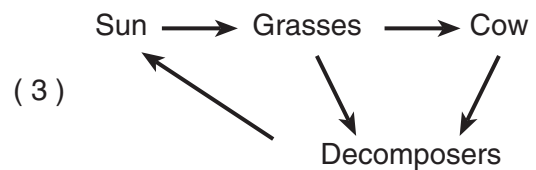
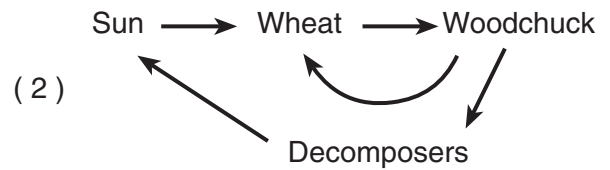
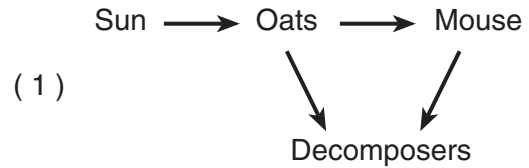
20 Which change in a sample of pond water could indicate that heterotrophic microbes were active?

- (1) increase in ozone level
- (2) increase in glucose level
- (3) decrease in oxygen level
- (4) decrease in carbon dioxide level

21 Some human white blood cells help destroy pathogenic bacteria by

- (1) causing mutations in the bacteria
- (2) engulfing and digesting the bacteria
- (3) producing toxins that compete with bacterial toxins
- (4) inserting part of their DNA into the bacterial cells

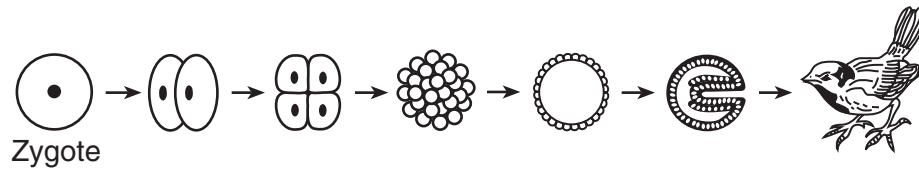
22 Four students each drew an illustration to show the flow of energy in a field ecosystem. Which illustration is *most* accurate?



23 As succession proceeds from a shrub community to a forest community, the shrub community modifies its environment, eventually making it

- (1) more favorable for itself and less favorable for the forest community
- (2) more favorable for itself and more favorable for the forest community
- (3) less favorable for itself and more favorable for the forest community
- (4) less favorable for itself and less favorable for the forest community

24 The diagram below represents a series of events in the development of a bird.



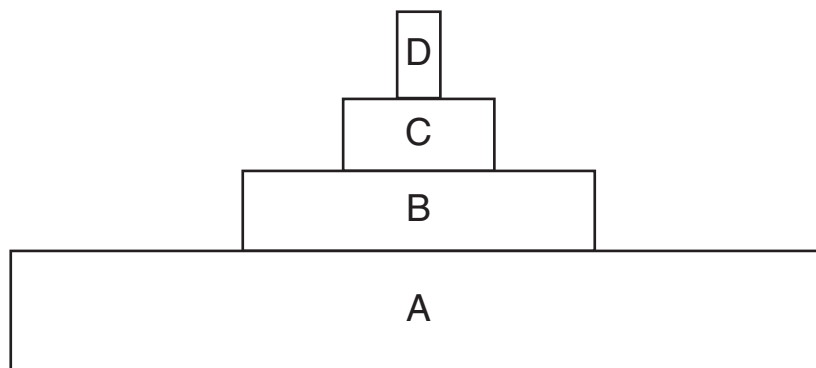
Which series of terms best represents the sequence of processes shown?

- (1) meiosis → growth → differentiation
- (2) meiosis → differentiation → growth
- (3) mitosis → meiosis → differentiation
- (4) mitosis → differentiation → growth

25 Bacteria that are removed from the human intestine are genetically engineered to feed on organic pollutants in the environment and convert them into harmless inorganic compounds. Which row in the table below best represents the most likely negative and positive effects of this technology on the ecosystem?

| Row | Negative Effect | Positive Effect |
|-----|---|---|
| (1) | Inorganic compounds interfere with cycles in the environment. | Human bacteria are added to the environment. |
| (2) | Engineered bacteria may out-compete native bacteria. | The organic pollutants are removed. |
| (3) | Only some of the pollutants are removed. | Bacteria will make more organic pollutants. |
| (4) | The bacteria will cause diseases in humans. | The inorganic compounds are buried in the soil. |

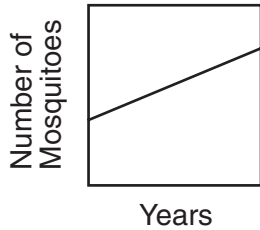
26 An energy pyramid is represented below.



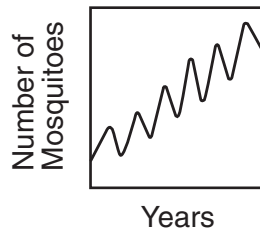
How much energy would be available to the organisms in level C?

- (1) all of the energy in level A, plus the energy in level B
- (2) all of the energy in level A, minus the energy in level B
- (3) a percentage of the energy contained in level B
- (4) a percentage of the energy synthesized in level B and level D

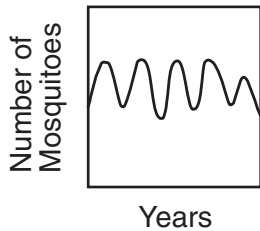
27 Which graph illustrates changes that indicate a state of dynamic equilibrium in a mosquito population?



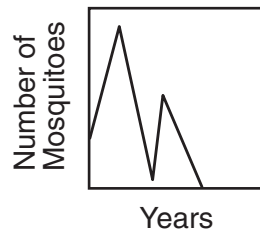
(1)



(3)



(2)



(4)

28 Which condition is necessary for enzymes and hormones to function properly in the human body?

- (1) These chemicals must have a specific shape.
- (2) These chemicals must be able to replicate.
- (3) Body temperature must be above 40°C.
- (4) Body pH must be above 10.

29 Four environmental factors are listed below.

- A. energy
- B. water
- C. oxygen
- D. minerals

Which factors limit environmental carrying capacity in a land ecosystem?

- (1) A, only
- (2) B, C, and D, only
- (3) A, C, and D, only
- (4) A, B, C, and D

30 Which human activity would have the *least* negative impact on the quality of the environment?

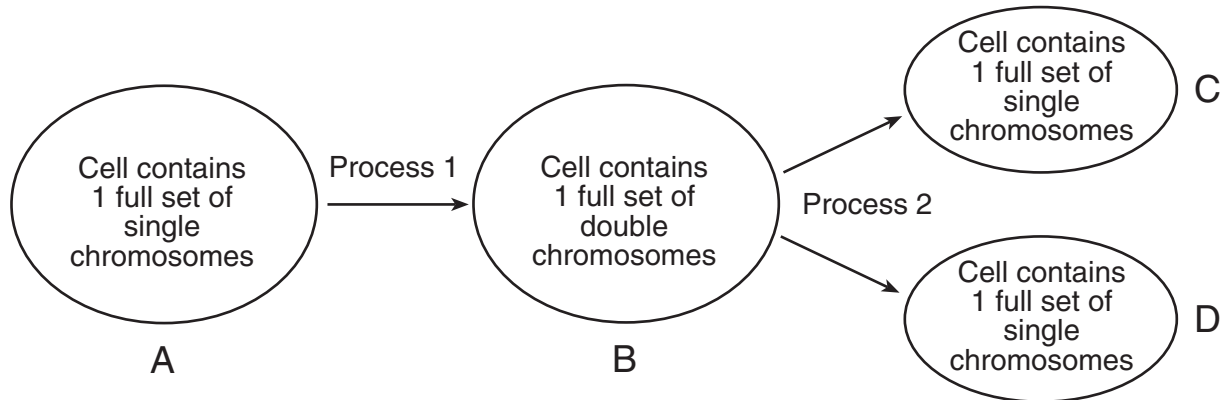
- (1) adding animal wastes to rivers
- (2) cutting down tropical rain forests for plywood
- (3) using species-specific sex attractants to trap and kill insect pests
- (4) releasing chemicals into the groundwater

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 best completes the statement or answers the question.

Base your answers to questions 31 through 34 on the diagram below and on your knowledge of biology. The diagram represents a single-celled organism, such as an amoeba, undergoing the changes shown.



31 As a result of these processes, the single-celled organism accomplishes

- (1) gamete production
- (2) energy production
- (3) sexual reproduction
- (4) asexual reproduction

32 Process 1 is known as

- (1) replication
- (2) meiosis
- (3) differentiation
- (4) digestion

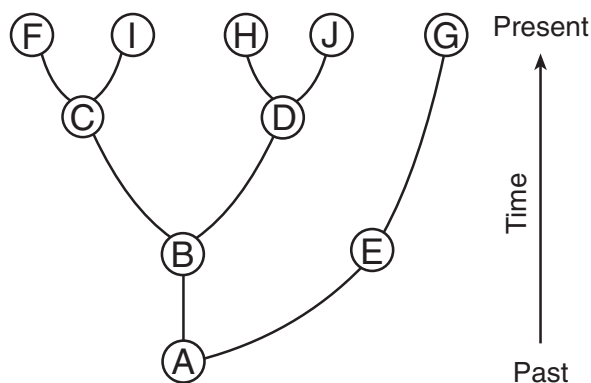
33 Process 1 and process 2 are directly involved in

- (1) meiotic cell division
- (2) mitotic cell division
- (3) fertilization
- (4) recombination

34 The genetic content of *C* is usually identical to the genetic content of

- (1) *B* but not *D*
 - (2) both *B* and *D*
 - (3) *D* but not *A*
 - (4) both *A* and *D*
-

Base your answers to questions 35 through 37 on the diagram below that shows some evolutionary pathways. Each letter represents a different species.



35 Which two organisms are most closely related?

- (1) *F* and *I*
- (2) *F* and *H*
- (3) *A* and *G*
- (4) *G* and *J*

36 The most recent ancestor of organisms *D* and *F* is

- (1) *A*
- (2) *B*
- (3) *C*
- (4) *I*

37 If *A* represents a simple multicellular heterotrophic organism, *B* would most likely represent

- (1) a single-celled photosynthetic organism
- (2) an autotrophic mammal
- (3) a complex multicellular virus
- (4) another type of simple multicellular heterotroph

38 A scientist studied iguanas inhabiting a chain of small ocean islands. He discovered two species that live in different habitats and display different behaviors. His observations are listed in the table below.

Observations of Two Species of Iguanas

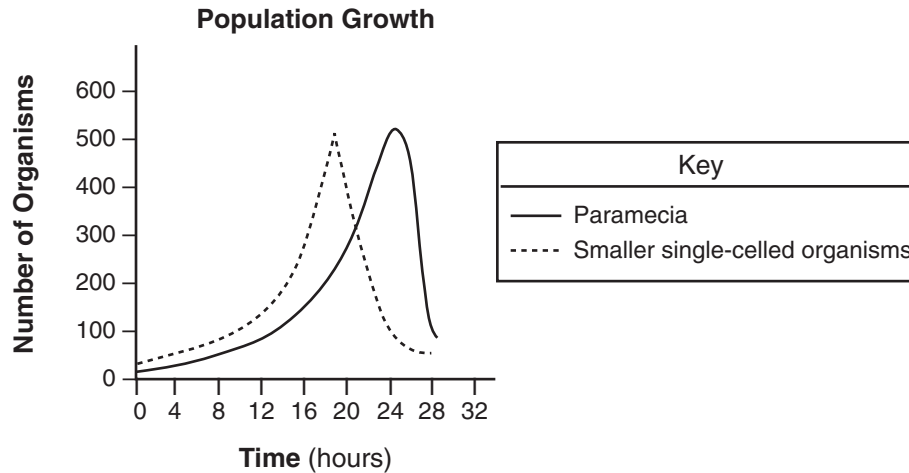
| Species A | Species B |
|--|--|
| spends most of its time in the ocean | spends most of its time on land |
| is rarely found more than 10 meters from shore | is found many meters inland from shore |
| eats algae | eats cactus and other land plants |

Which statement best describes these two species of iguanas?

- (1) Both species evolved through the process of ecological succession.
- (2) Each species occupies a different niche.
- (3) The two species can interbreed.
- (4) Species *A* is a scavenger and species *B* is a carnivore.

Base your answers to questions 39 and 40 on the information and graph below and on your knowledge of biology.

A population of paramecia (single-celled aquatic organisms) was grown in a 200-mL beaker of water containing some smaller single-celled organisms. Population growth of the organisms for 28 hours is shown in the graph below.



- 39 Which factor most likely accounts for the change in the paramecium population from 8 to 20 hours?
- (1) an increase in the nitrogen content of water
 - (2) an increase in wastes produced
 - (3) an increase in available food
 - (4) an increase in water pH
- 40 One likely explanation for the change in the paramecium population from 26 hours to 28 hours is that the
- (1) carrying capacity of the beaker was exceeded
 - (2) rate of reproduction increased
 - (3) time allowed for growth was not sufficient
 - (4) oxygen level was too high
-

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 questions and record your answers in the spaces provided.

Base your answers to questions 41 through 45 on the passage below and on your knowledge of biology.

**For Teacher
Use Only**

Better Rice

The production of new types of food crops will help raise the quantity of food grown by farmers. Research papers released by the National Academy of Sciences announced the development of two new superior varieties of rice—one produced by selective breeding and the other by biotechnology.

One variety of rice, called Nerica (New Rice for Africa), is already helping farmers in Africa. Nerica combines the hardiness and weed resistance of rare African rice varieties with the productivity and faster maturity of common Asian varieties.

Another variety, called Stress-Tolerant Rice, was produced by inserting a pair of bacterial genes into rice plants for the production of trehalose (a sugar). Trehalose helps plants maintain healthy cell membranes, proteins, and enzymes during environmental stress. The resulting plants survive drought, low temperatures, salty soils, and other stresses better than standard rice varieties.

41 Why is the production of new varieties of food crops necessary?

- (1) Essential food crops are rapidly becoming extinct.
- (2) Technology for producing fresh water for agriculture has improved.
- (3) Burning fossil fuels has decreased agricultural areas.
- (4) World population continues to increase.

41

42 Which substance from bacteria was most likely inserted into rice plants in the development of the trehalose-producing rice?

- (1) sugar
- (2) enzymes
- (3) DNA
- (4) trehalose

42

43 Nerica was most likely produced by

- (1) crossing a variety of African rice with a variety of Asian rice
- (2) cloning genes for hardiness and weed resistance from Asian rice
- (3) using Asian rice to compete with rare African varieties
- (4) inserting genes for productivity and faster maturity into Asian rice

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43

44 Which strain of rice was produced as a result of genetic engineering? Support your answer. [1]

44

45 State *one* reason that further testing must be done before rice plants that produce trehalose are approved for human consumption. [1]

45

Base your answers to questions 46 through 49 on the information and data table below and on your knowledge of biology.

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Use Only**

A number of bean seeds planted at the same time produced plants that were later divided into two groups, A and B. Each plant in group A was treated with the same concentration of gibberellic acid (a plant hormone). The plants in group B were not treated with gibberellic acid. All other growth conditions were kept constant. The height of each plant was measured on 5 consecutive days, and the average height of each group was recorded in the data table below.

Data Table

| | Average Plant Height (cm) | | | | |
|---------|---------------------------|-------|-------|-------|-------|
| | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
| Group A | 5 | 7 | 10 | 13 | 15 |
| Group B | 5 | 6 | 6.5 | 7 | 7.5 |

Directions (46–48): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

46 Mark an appropriate scale on the axis labeled “Average Plant Height (cm).” [1]

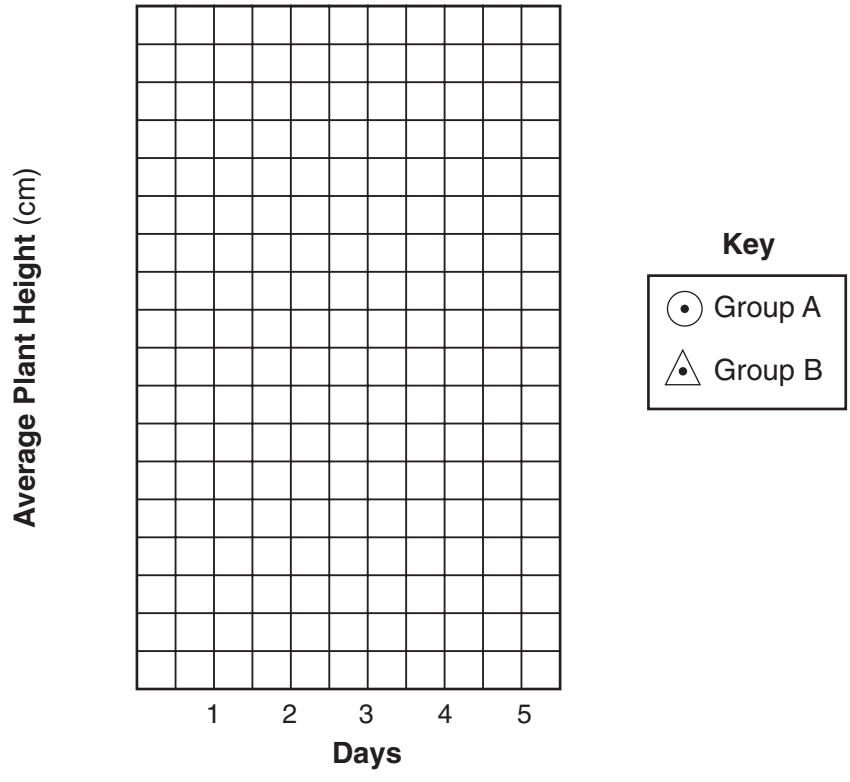
47 Plot the data for the average height of the plants in group A. Surround each point with a small circle and connect the points. [1]



48 Plot the data for the average height of the plants in group B. Surround each point with a small triangle and connect the points. [1]



Plant Height



**For Teacher
Use Only**

46

47

48

49 State a valid conclusion that can be drawn concerning the effect of gibberellic acid on bean plant growth. [1]

49

Base your answers to questions 50 through 55 on the data table below and on your knowledge of biology. The table contains information about glucose production in a species of plant that lives in the water of a salt marsh.

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| Temperature (°C) | Glucose Production (mg/hr) |
|------------------|----------------------------|
| 10 | 5 |
| 20 | 10 |
| 30 | 15 |
| 40 | 5 |

50 Which terms describe temperature in this investigation?

- (1) abiotic factor and independent variable
- (2) abiotic factor and dependent variable
- (3) biotic factor and independent variable
- (4) biotic factor and dependent variable

50

51 What evidence from the data table shows that a salt-marsh plant is sensitive to its environment? [1]

51

52 At which temperature would the plants most likely use the greatest amount of carbon dioxide?

- (1) 10°C
- (2) 20°C
- (3) 30°C
- (4) 40°C

52

53 How much oxygen will plants that live in water at 10°C most likely produce?

- (1) twice the amount of oxygen produced at 20°C
- (2) the same amount of oxygen produced at 40°C
- (3) the most oxygen produced at any temperature
- (4) more oxygen than is produced at 30°C

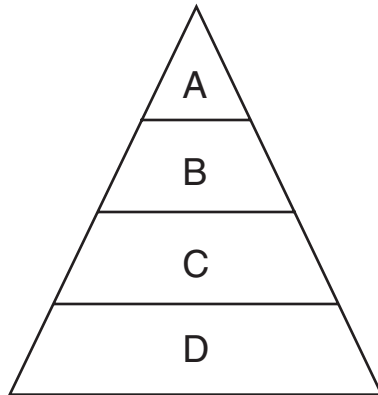
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53

54 State *one* possible reason for the change in glucose production when the temperature was increased from 30°C to 40°C. [1]

54

55 Which level of the energy pyramid below would contain the plant species of this salt marsh?



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

55

Part C

Answer all questions in this part. [17]

Directions (56–59): Record your answers in the spaces provided in this examination booklet.

56 A scientist wants to determine the best conditions for hatching brine shrimp eggs. In a laboratory, brine shrimp hatch at room temperature in glass containers of salt water. The concentration of salt in the water is known to affect how many brine shrimp eggs will hatch.

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Design an experiment to determine which of three saltwater concentrations (2%, 4%, or 6%) is best for hatching brine shrimp eggs. In your experimental design, be sure to:

- state how many containers to use in the experiment, and describe what would be added to each container in addition to the eggs [1]
- state *two* factors that must be kept constant in all the containers [1]
- state what data must be collected during this experiment [1]
- state *one* way to organize the data so that they will be easy to analyze [1]
- describe a result that would indicate the best salt solution for hatching brine shrimp eggs [1]

56

58 Describe how *two* of the cell structures listed below interact to help maintain a balanced internal environment in a cell.

mitochondrion
ribosome
cell membrane
nucleus
vacuole

In your answer be sure to:

- select *two* of these structures, write their names, and state *one* function of each [2]
- describe how each structure you selected contributes to the functioning of the other [2]

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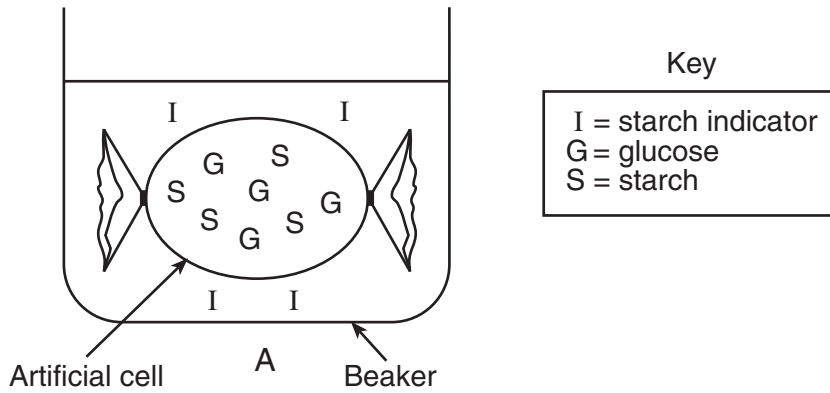
58

Part D

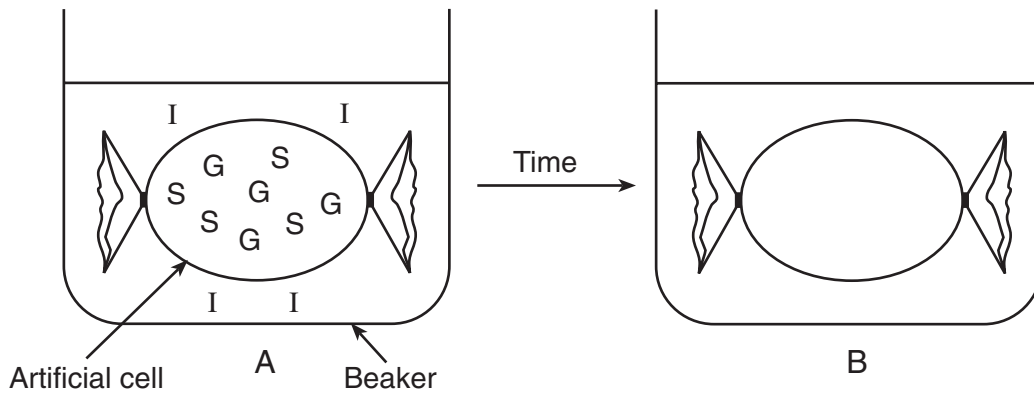
Answer all questions in this part. [13]

Directions (60–69): 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 questions and record your answers in the spaces provided.

Base your answers to questions 60 and 61 on the information and diagram below and on your knowledge of biology. The diagram illustrates an investigation carried out in a laboratory activity on diffusion. The beaker and the artificial cell also contain water.



60 Predict what would happen over time by showing the location of molecules *I*, *G*, and *S* in diagram *B* below. [3]



61 State what is observed when there is a positive test for starch using the starch indicator. [1]

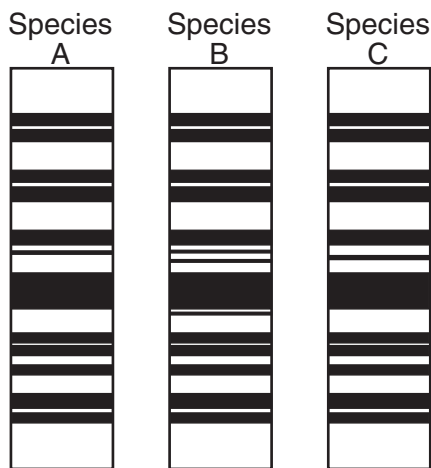
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60

61

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

The DNA of three different species of birds was analyzed to help determine if there is an evolutionary relationship between these species. The diagram shows the results of this analysis.



62 Identify the technique normally used to separate the DNA fragments to produce the patterns shown in the diagram. [1]

62

63 The chart below contains amino acid sequences for part of a protein that is found in the feathers on each of these three species of birds.

| Species | Amino Acid Sequence |
|---------|-------------------------------------|
| A | Arg-Leu-Glu-Gly-His-His-Pro-Lys-Arg |
| B | Arg-Gly-Glu-Gly-His-His-Pro-Lys-Arg |
| C | Arg-Leu-Glu-Gly-His-His-Pro-Lys-Arg |

State *one* way this data supports the inference that these three bird species may be closely related. [1]

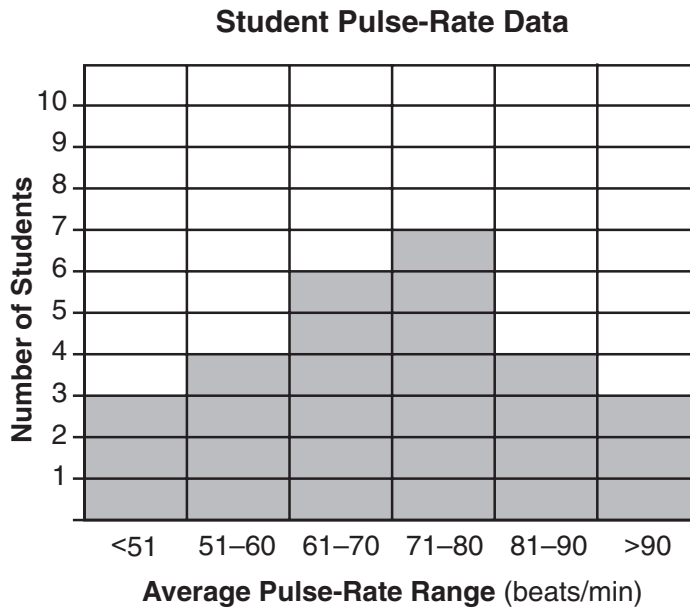
63

64 State *one* type of additional information that could be used to determine if these three species are closely related. [1]

64

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

Pulse-rate data were collected from some students during their lunch time for the lab activity, *Making Connections*. The data are represented in the histogram below.



65 The histogram includes data from a total of how many students?

- (1) 6
- (2) 7
- (3) 10
- (4) 27

65

66 Describe *one* way in which a pulse rate below 45 would disrupt homeostasis in an individual whose average resting pulse rate falls in the range of 71–80. [1]

66

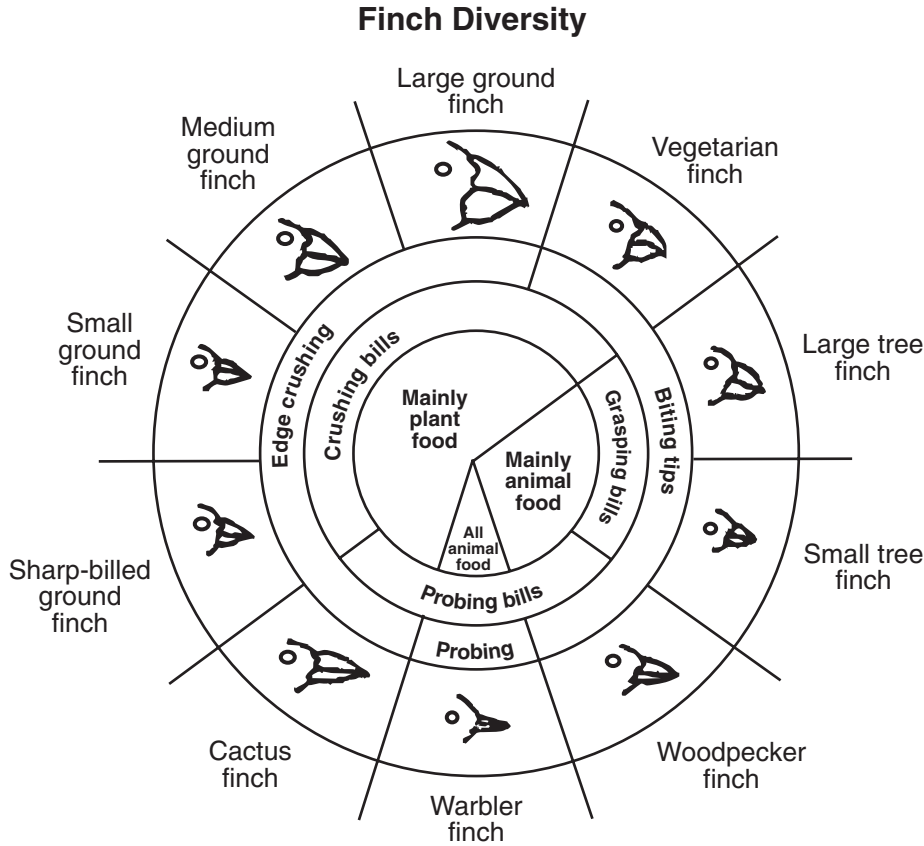
67 State *one* way the data would most likely be different if the pulse rates were collected immediately after exercising instead of during lunch. [1]

67

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Base your answers to questions 68 and 69 on the finch diversity chart below, which contains information concerning the finches found on the Galapagos Islands.

For Teacher Use Only



68 Identify *one* bird that would most likely compete for food with the large tree finch. Support your answer. [1]

68

69 Identify *one* trait, other than beak characteristics, that would contribute to the survival of a finch species and state *one* way this trait contributes to the success of this species. [2]

69

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Wednesday, August 16, 2006 — 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 | 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

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Tear Here

Tear Here

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