

LIVING ENVIRONMENT

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

LIVING ENVIRONMENT

Wednesday, June 20, 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

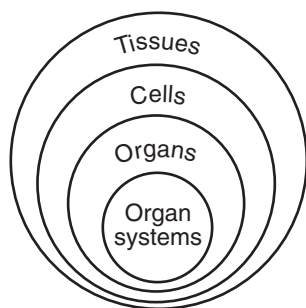
Answer all questions in this part. [30]

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.

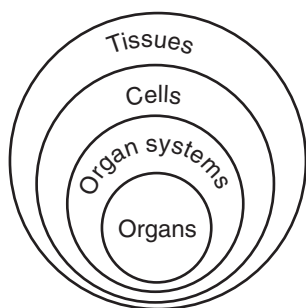
1 Which statement describes a role of fungi in an ecosystem?

- (1) They transfer energy to decaying matter.
- (2) They release oxygen into the ecosystem.
- (3) They recycle chemicals from dead organisms.
- (4) They synthesize organic nutrients from inorganic substances.

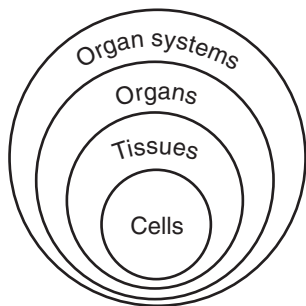
2 Which diagram best represents the levels of organization in the human body?



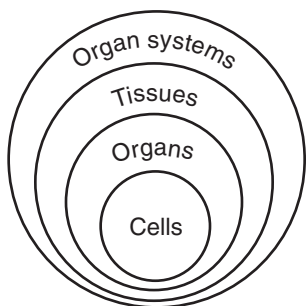
(1)



(3)



(2)



(4)

3 Which situation indicates that a disruption of homeostasis has taken place?

- (1) the presence of hormones that keep the blood sugar level steady
- (2) the maintenance of a constant body temperature
- (3) cell division that is involved in normal growth
- (4) a rapid rise in the number of red blood cells

4 A protein on the surface of HIV can attach to proteins on the surface of healthy human cells. These attachment sites on the surface of the cells are known as

- (1) receptor molecules
- (2) genetic codes
- (3) molecular bases
- (4) inorganic catalysts

5 Contractile vacuoles maintain water balance by pumping excess water out of some single-celled pond organisms. In humans, the kidney is chiefly involved in maintaining water balance. These facts best illustrate that

- (1) tissues, organs, and organ systems work together to maintain homeostasis in all living things
- (2) interference with nerve signals disrupts cellular communication and homeostasis within organisms
- (3) a disruption in a body system may disrupt the homeostasis of a single-celled organism
- (4) structures found in single-celled organisms can act in a manner similar to tissues and organs in multicellular organisms

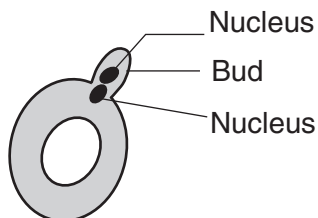
6 Which statement best explains the observation that clones produced from the same organism may *not* be identical?

- (1) Events in meiosis result in variation.
- (2) Gene expression can be influenced by the environment.
- (3) Differentiated cells have different genes.
- (4) Half the genetic information in offspring comes from each parent.

7 A change in the base subunit sequence during DNA replication can result in

- (1) variation within an organism
- (2) rapid evolution of an organism
- (3) synthesis of antigens to protect the cell
- (4) recombination of genes within the cell

8 The diagram below represents a yeast cell that is in the process of budding, a form of asexual reproduction.



Which statement describes the outcome of this process?

- (1) The bud will develop into a zygote.
- (2) The two cells that result will each contain half the species number of chromosomes.
- (3) The two cells that result will have identical DNA.
- (4) The bud will start to divide by the process of meiotic cell division.

9 Two proteins in the same cell perform different functions. This is because the two proteins are composed of

- (1) chains folded the same way and the same sequence of simple sugars
- (2) chains folded the same way and the same sequence of amino acids
- (3) chains folded differently and a different sequence of simple sugars
- (4) chains folded differently and a different sequence of amino acids

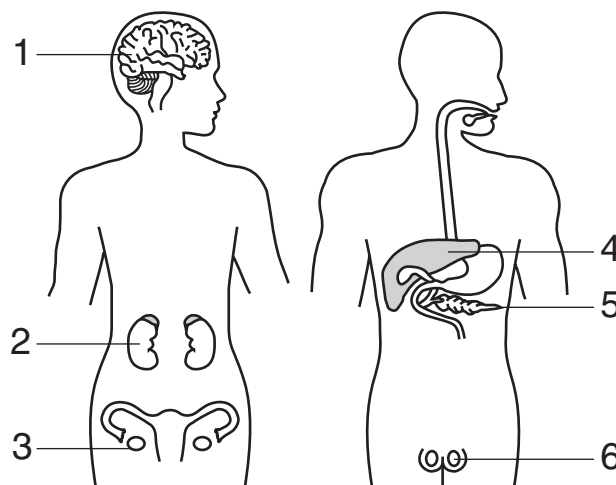
10 Even though each body cell in an individual contains the same DNA, the functions of muscle cells and liver cells are *not* the same because

- (1) mutations usually occur in genes when muscle cells divide
- (2) liver tissue develops before muscle tissue
- (3) liver cells produce more oxygen than muscle cells
- (4) liver cells use different genes than muscle cells

11 The flounder is a species of fish that can live in very cold water. The fish produces an “antifreeze” protein that prevents ice crystals from forming in its blood. The DNA for this protein has been identified. An enzyme is used to cut and remove this section of flounder DNA that is then spliced into the DNA of a strawberry plant. As a result, the plant can now produce a protein that makes it more resistant to the damaging effects of frost. This process is known as

- (1) sorting of genes
- (2) genetic engineering
- (3) recombination of chromosomes
- (4) mutation by deletion of genetic material

12 Some human body structures are represented in the diagram below.



In which structures would the occurrence of mutations have the greatest effect on human evolution?

- | | |
|-------------|-------------|
| (1) 1 and 3 | (3) 3 and 6 |
| (2) 2 and 5 | (4) 4 and 6 |

13 A single pair of goldfish in an aquarium produced a large number of offspring. These offspring showed variations in body shape and coloration. The most likely explanation for these variations is that the

- (1) offspring were adapting to different environments
- (2) offspring were produced from different combinations of genes
- (3) parent fish had not been exposed to mutagenic agents
- (4) parent fish had not reproduced sexually

14 A certain species has little genetic variation. The rapid extinction of this species would most likely result from the effect of

- (1) successful cloning
- (2) gene manipulation
- (3) environmental change
- (4) genetic recombination

15 Which two structures of a frog would most likely have the same chromosome number?

- (1) skin cell and fertilized egg cell
- (2) zygote and sperm cell
- (3) kidney cell and egg cell
- (4) liver cell and sperm cell

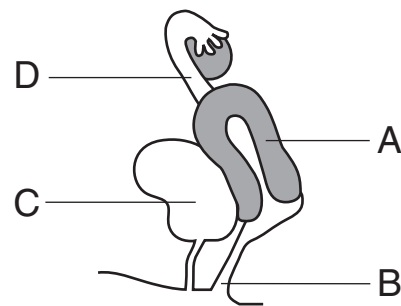
16 Tissues develop from a zygote as a direct result of the processes of

- (1) fertilization and meiosis
- (2) fertilization and differentiation
- (3) mitosis and meiosis
- (4) mitosis and differentiation

17 The human female reproductive system is adapted for

- (1) production of zygotes in ovaries
- (2) external fertilization of gametes
- (3) production of milk for a developing embryo
- (4) transport of oxygen through a placenta to a fetus

18 The letters in the diagram below represent structures in a human female.



Estrogen and progesterone increase the chance for successful fetal development by regulating activities within structure

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

19 Which part of a molecule provides energy for life processes?

- (1) carbon atoms
- (2) oxygen atoms
- (3) chemical bonds
- (4) inorganic nitrogen

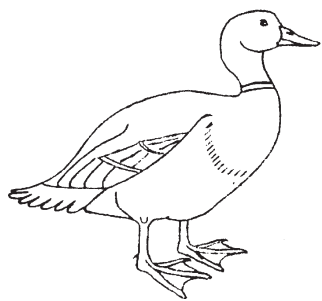
20 Energy from organic molecules can be stored in ATP molecules as a direct result of the process of

- (1) cellular respiration
- (2) cellular reproduction
- (3) diffusion
- (4) digestion

21 Which statement best describes how a vaccination can help protect the body against disease?

- (1) Vaccines directly kill the pathogen that causes the disease.
- (2) Vaccines act as a medicine that cures the disease.
- (3) Vaccines cause the production of specific molecules that will react with and destroy certain microbes.
- (4) Vaccines contain white blood cells that engulf harmful germs and prevent them from spreading throughout the body.

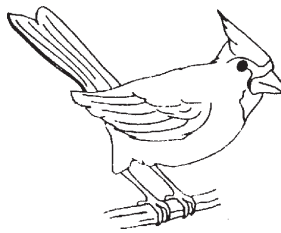
22 The diagram below represents four different species of wild birds. Each species has feet with different structural adaptations.



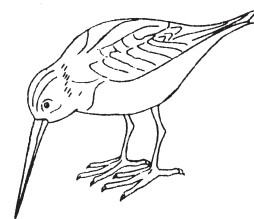
Mallard duck



Redheaded woodpecker



Northern cardinal



Common snipe

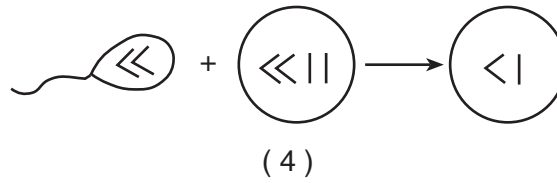
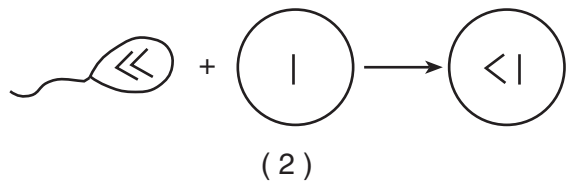
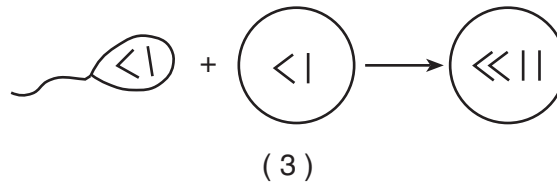
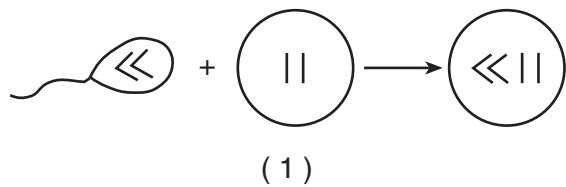
The development of these adaptations can best be explained by the concept of

- (1) inheritance of resistance to diseases that affect all these species
- (2) inheritance of characteristics acquired after the birds hatched from the egg
- (3) natural selection
- (4) selective breeding

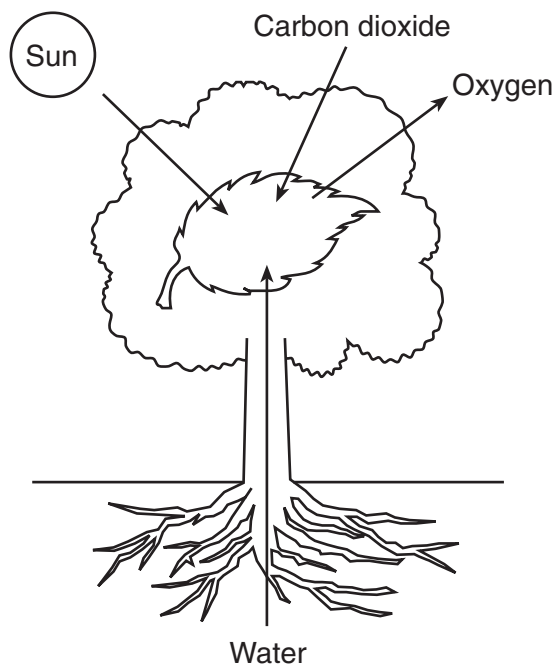
23 The diagram below represents a nucleus containing the normal chromosome number for a species.



Which diagram best illustrates the normal formation of a cell that contains all of the genetic information needed for growth, development, and future reproduction of this species?



24 The diagram below represents events associated with a biochemical process that occurs in some organisms.



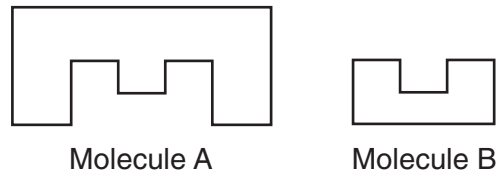
Which statement concerning this process is correct?

- (1) The process represented is respiration and the primary source of energy for the process is the Sun.
- (2) The process represented is photosynthesis and the primary source of energy for the process is the Sun.
- (3) This process converts energy in organic compounds into solar energy which is released into the atmosphere.
- (4) This process uses solar energy to convert oxygen into carbon dioxide.

25 In the transfer of energy from the Sun to ecosystems, which molecule is one of the first to store this energy?

- | | |
|-------------|-------------|
| (1) protein | (3) DNA |
| (2) fat | (4) glucose |

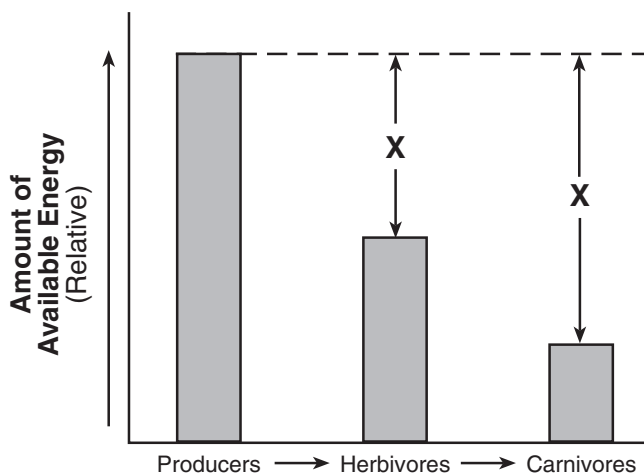
26 The diagram below represents two molecules that can interact with each other to cause a biochemical process to occur in a cell.



Molecules A and B most likely represent

- (1) a protein and a chromosome
- (2) a receptor and a hormone
- (3) a carbohydrate and an amino acid
- (4) an antibody and a hormone

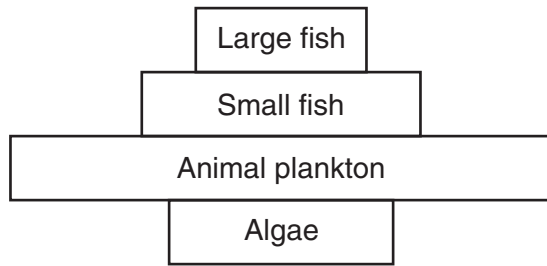
27 The graph below represents the amount of available energy at successive nutrition levels in a particular food web.



The Xs in the diagram represent the amount of energy that was most likely

- (1) changed into inorganic compounds
- (2) retained indefinitely by the herbivores
- (3) recycled back to the producers
- (4) lost as heat to the environment

28 The diagram below represents an energy pyramid constructed from data collected from an aquatic ecosystem.



Which statement best describes this ecosystem?

- (1) The ecosystem is most likely unstable.
- (2) Long-term stability of this ecosystem will continue.
- (3) The herbivore populations will continue to increase in size for many years.
- (4) The producer organisms outnumber the consumer organisms.

29 In order to reduce consumption of nonrenewable resources, humans could

- (1) burn coal to heat houses instead of using oil
- (2) heat household water with solar radiation
- (3) increase industrialization
- (4) use a natural-gas grill to barbecue instead of using charcoal

30 In 1859, a small colony of 24 rabbits was brought to Australia. By 1928 it was estimated that there were 500 million rabbits in a 1-million square mile section of Australia. Which statement describes a condition that probably contributed to the increase in the rabbit population?

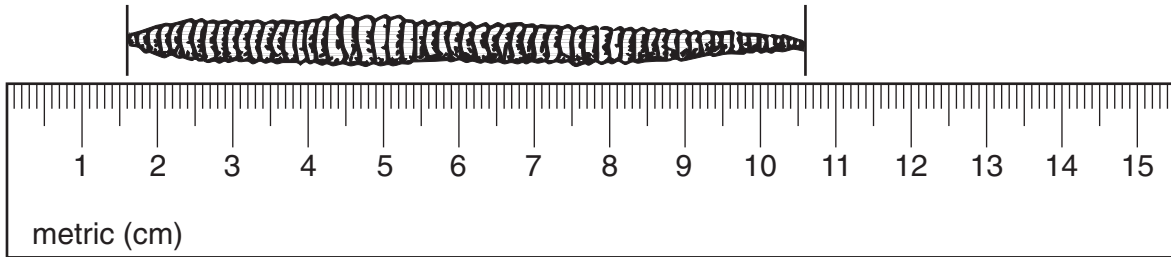
- (1) The rabbits were affected by many limiting factors.
- (2) The rabbits reproduced by asexual reproduction.
- (3) The rabbits were unable to adapt to the environment.
- (4) The rabbits had no natural predators in Australia.

Part B-1

Answer all questions in this part. [12]

Directions (31–42): 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 What is the approximate length of the earthworm shown in the diagram below?



- (1) 9 mm
- (2) 90 mm
- (3) 10.6 cm
- (4) 106 cm

32 Information concerning the diet of crocodiles of different sizes is contained in the table below.

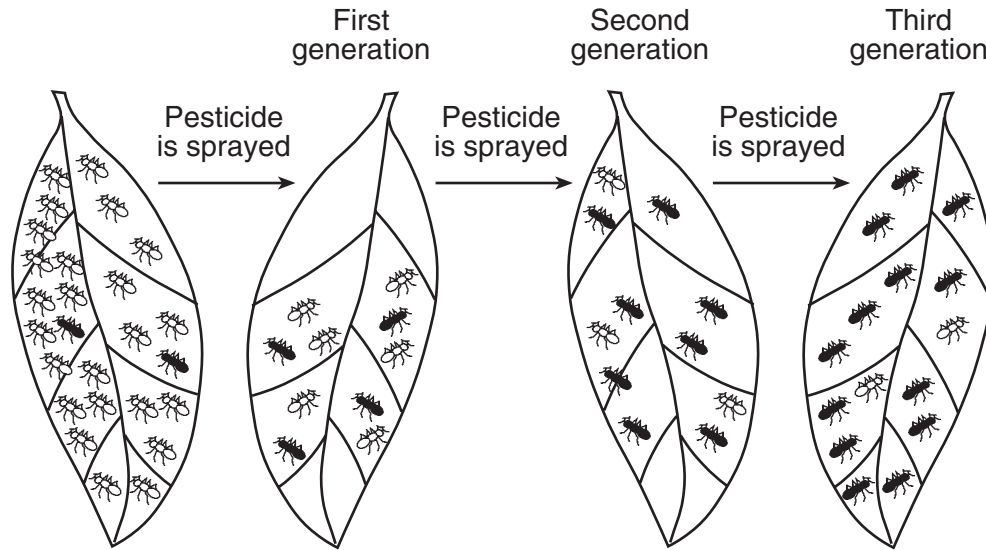
Percentage of Crocodiles of Different Lengths and Their Food Sources

Food Source	Group A 0.3–0.5 Meter	Group B 2.5–3.9 Meters	Group C 4.5–5.0 Meters
mammals	0	18	65
reptiles	0	17	48
fish	0	62	38
birds	0	17	0
snails	0	25	0
shellfish	0	5	0
spiders	20	0	0
frogs	35	0	0
insects	100	2	0

Which statement is *not* a valid conclusion based on the data?

- (1) Overharvesting of fish could have a negative impact on group C.
- (2) The smaller the crocodile is, the larger the prey.
- (3) Group B has no preference between reptiles and birds.
- (4) Spraying insecticides would have the most direct impact on group A.

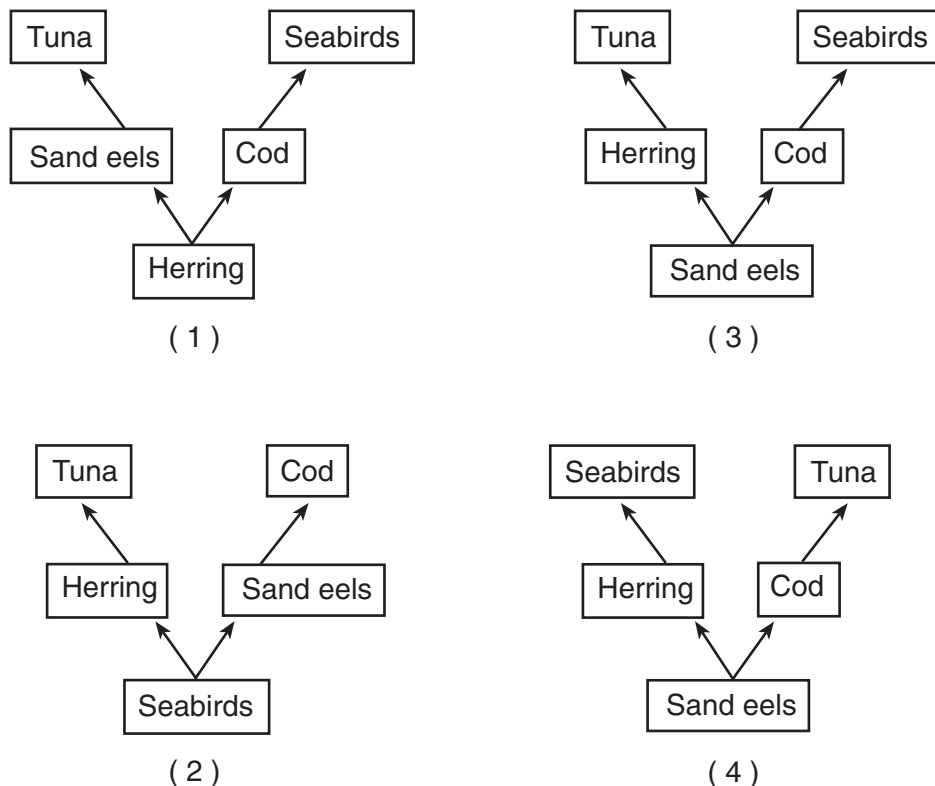
37 The diagram below shows the effect of spraying a pesticide on a population of insects over three generations.



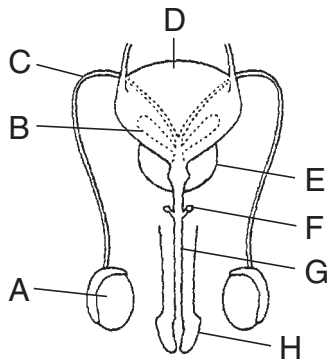
Which concept is represented in the diagram?

- (1) survival of the fittest
- (2) dynamic equilibrium
- (3) succession
- (4) extinction

38 In an ecosystem, the herring population was reduced by fishermen. As a result, the tuna, which feed on the herring, disappeared. The sand eels, which are eaten by herring, increased in number. The fishermen then overharvested the sand eel population. Cod and seabirds then decreased. Which food web best represents the feeding relationships in this ecosystem?



Base your answers to questions 39 through 41 on the diagram below, which represents systems in a human male and on your knowledge of biology.



39 Which sequence represents the path of sperm leaving the body?

- (1) $A \rightarrow C \rightarrow G$ (3) $E \rightarrow F \rightarrow H$
 (2) $A \rightarrow C \rightarrow B$ (4) $D \rightarrow F \rightarrow G$

40 Which structures aid in the transport of sperm by secreting fluid?

- (1) A and H (3) C and D
 (2) B and E (4) D and H

41 Which structure has both reproductive and excretory functions?

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

42 Two food chains are represented below.

Food chain A: aquatic plant \rightarrow insect \rightarrow frog \rightarrow hawk

Food chain B: grass \rightarrow rabbit \rightarrow hawk

Decomposers are important for supplying energy for

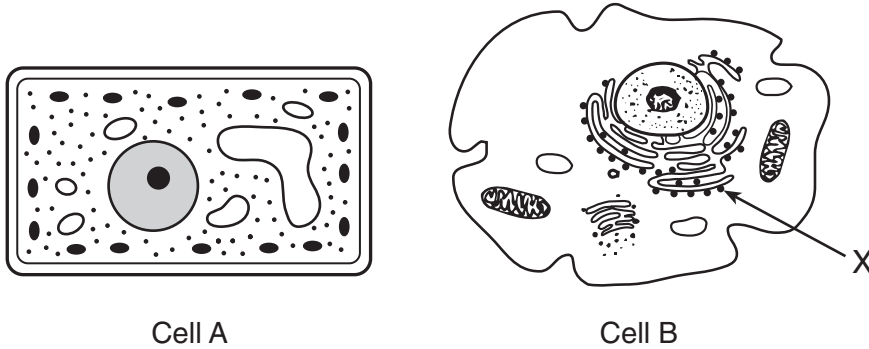
- (1) food chain A, only
 (2) food chain B, only
 (3) both food chain A and food chain B
 (4) neither food chain A nor food chain B

Part B-2

Answer all questions in this part. [13]

Directions (43–55): For those questions that are followed by four choices, circle the *number* of the choice that, of those given, best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answers in the spaces provided.

Base your answers to questions 43 through 45 on the diagrams below and on your knowledge of biology. The diagrams represent two different cells and some of their parts. The diagrams are not drawn to scale.



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43 Identify an organelle in cell A that is the site of autotrophic nutrition. [1]

43

44 Identify the organelle labeled X in cell B. [1]

44

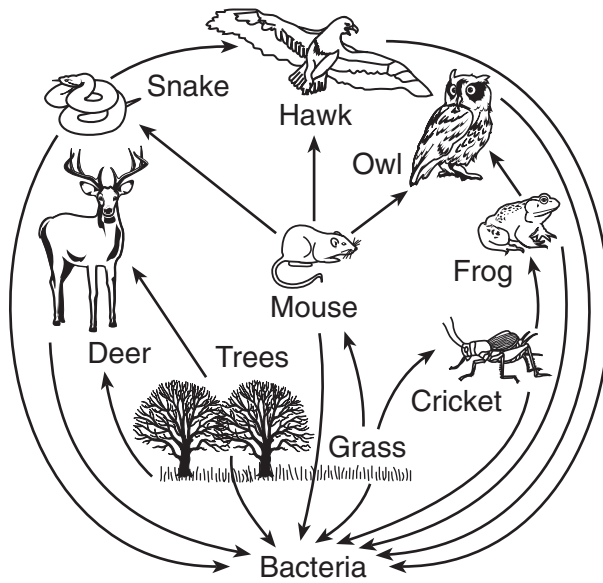
45 Which statement best describes these cells?

- (1) Cell B lacks vacuoles while cell A has them.
- (2) DNA would not be found in either cell A or cell B.
- (3) Both cell A and cell B use energy released from ATP.
- (4) Both cell A and cell B produce antibiotics.

45

Base your answers to questions 46 through 48 on the diagram below and on your knowledge of biology.

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46 What is an appropriate title for this diagram?

- (1) Energy Flow in a Community
- (2) Ecological Succession
- (3) Biological Evolution
- (4) A Food Chain

46

47 Which organism carries out autotrophic nutrition?

- (1) hawk
- (2) cricket
- (3) grass
- (4) deer

47

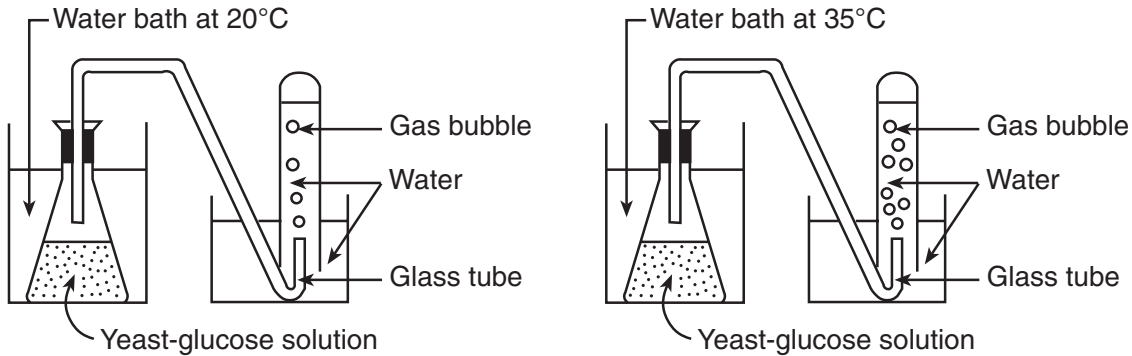
48 State what would most likely happen to the cricket population if all of the grasses were removed. [1]

48

Base your answers to questions 49 through 53 on the information and diagrams below and on your knowledge of biology.

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The laboratory setups represented below were used to investigate the effect of temperature on cellular respiration in yeast (a single-celled organism). Each of two flasks containing equal amounts of a yeast-glucose solution was submerged in a water bath, one kept at 20°C and one kept at 35°C. The number of gas bubbles released from the glass tube in each setup was observed and the results were recorded every 5 minutes for a period of 25 minutes. The data are summarized in the table below.



Data Table

Time (minutes)	Total Number of Bubbles Released	
	20°C	35°C
5	0	5
10	5	15
15	15	30
20	30	50
25	45	75

Directions (49–51): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

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

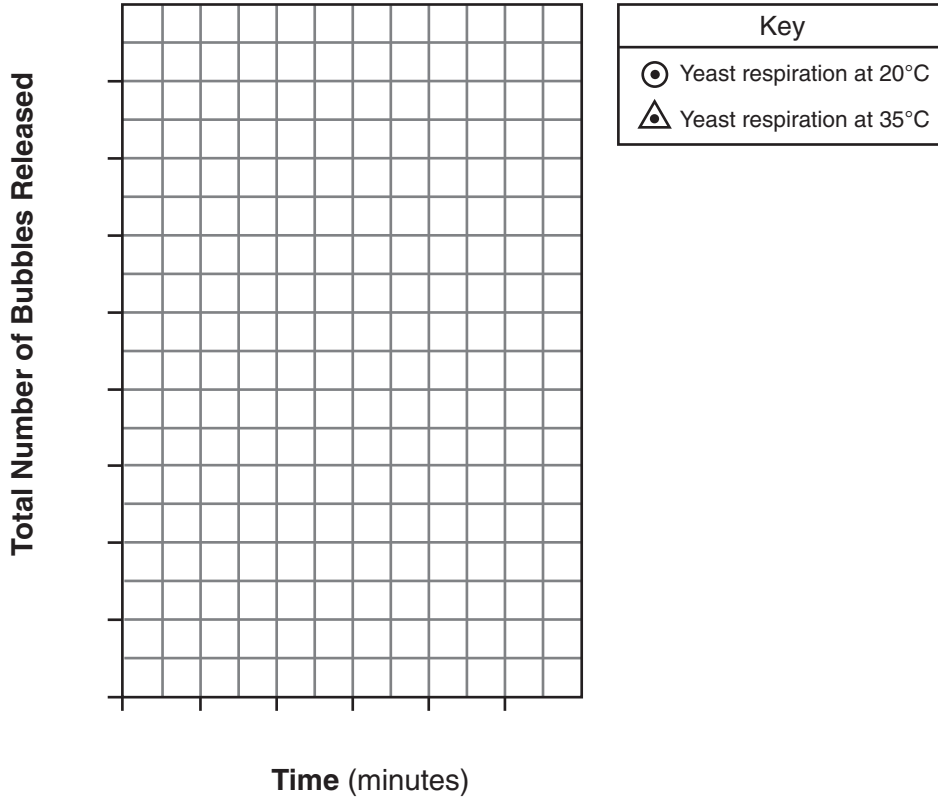
50 Plot the data for the total number of bubbles released at 20°C on the grid on the next page. Surround each point with a small circle and connect the points. [1]



51 Plot the data for the total number of bubbles released at 35°C on the grid. Surround each point with a small triangle and connect the points. [1]



The Effect of Temperature on Respiration in Yeast



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49

50

51

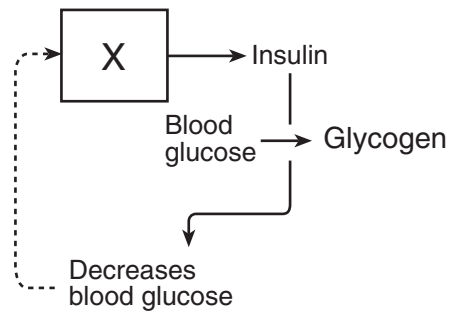
52 State *one* relationship between temperature and the rate of gas production in yeast. [1]

52

53 Identify the gas that would be produced by the process taking place in both laboratory setups. [1]

53

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



54 Identify the organ labeled X. [1]

55 The dashed line in the diagram represents

- (1) a digestive process
- (2) a feedback mechanism
- (3) cellular differentiation
- (4) recycling of organic chemicals

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54

55

59 Knowledge of human genes gained from research on the structure and function of human genetic material has led to improvements in medicine and health care for humans.

- state *two* ways this knowledge has improved medicine and health care for humans [2]
- identify *one* specific concern that could result from the application of this knowledge [1]

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59

Base your answers to questions 60 and 61 on the information below and on your knowledge of biology.

You are the owner of a chemical company. Many people in your community have been complaining that rabbits are getting into their gardens and eating the flowering plants and vegetables they have planted. Your company is developing a new chemical product called Bunny Hop-Away that repels rabbits. This product would be sprayed on the plants to prevent the rabbits from eating them. Certain concerns need to be considered before you make the product available for public use.

60 State *two* environmental concerns that should be considered before the product is sold and used by the public. [2]

60

61 State *one* safety procedure that should be followed when the product is sprayed on plants. [1]

61

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, of those given, 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.

62 Students were asked to determine if they could squeeze a clothespin more times in a minute after resting than after exercising. An experiment that accurately tests this question should include all of the following *except*

- (1) a hypothesis on which to base the design of the experiment
- (2) a large number of students
- (3) two sets of clothespins, one that is easy to open and one that is more difficult to open
- (4) a control group and an experimental group with equal numbers of students of approximately the same age

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62

63 Which statement best describes a controlled experiment?

- (1) It eliminates the need for dependent variables.
- (2) It shows the effect of a dependent variable on an independent variable.
- (3) It avoids the use of variables.
- (4) It tests the effect of a single independent variable.

63

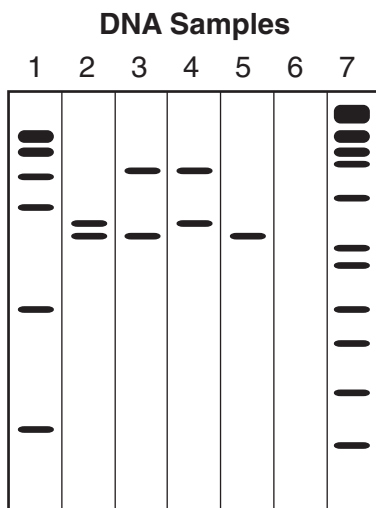
64 Which statement best describes a change that usually takes place in the human body when the heart rate increases as a result of exercise?

- (1) More oxygen is delivered to muscle cells.
- (2) Blood cells are excreted at a faster rate.
- (3) The rate of digestion increases.
- (4) No hormones are produced.

64

Base your answers to questions 65 through 67 on the diagram below and on your knowledge of biology. The diagram shows the results of a technique used to analyze DNA.

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65 This technique used to analyze DNA directly results in

- (1) synthesizing large fragments of DNA
- (2) separating DNA fragments on the basis of size
- (3) producing genetically engineered DNA molecules
- (4) removing the larger DNA fragments from the samples

65

66 This laboratory technique is known as

- (1) gel electrophoresis
- (2) DNA replication
- (3) protein synthesis
- (4) genetic recombination

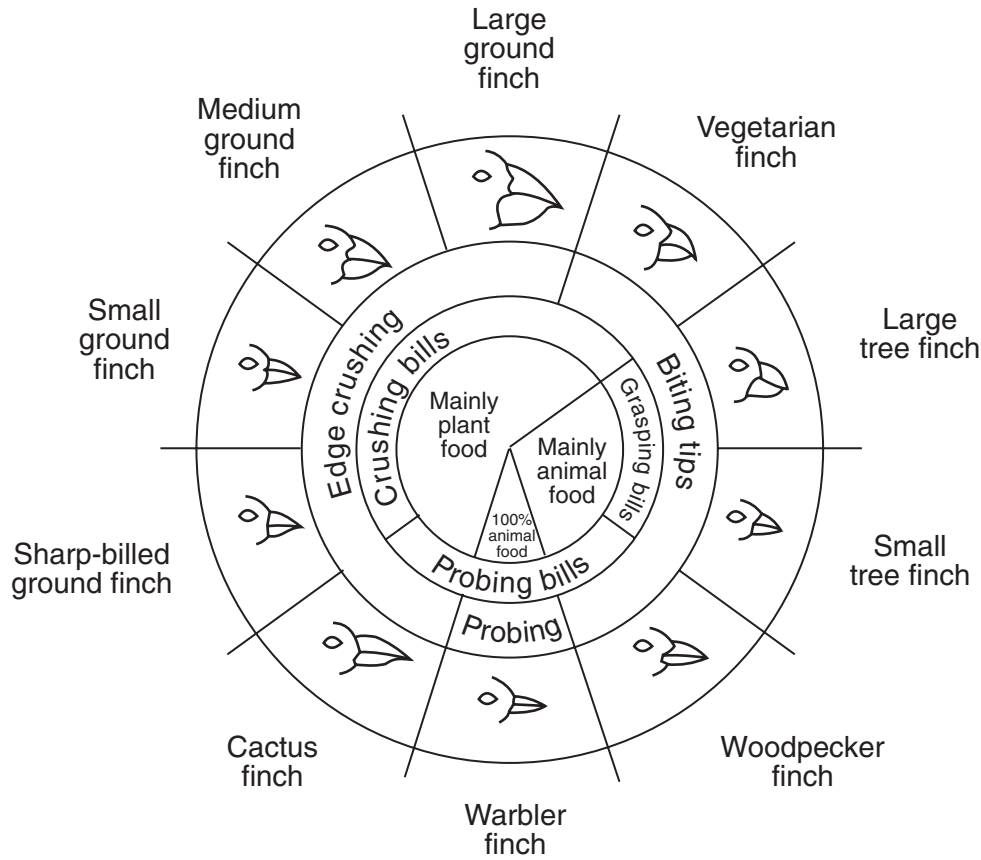
66

67 State *one* specific way the results of this laboratory technique could be used. [1]

67

68 The cactus finch, warbler finch, and woodpecker finch all live on one island. Based on the information in the diagram below, which one of these finches is *least* likely to compete with the other two for food? Support your answer with an explanation. [1]

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From: *Galapagos: A Natural History Guide*

Variations in Beaks of Galapagos Islands Finches

68



Base your answers to questions 69 and 70 on the information below and on your knowledge of biology.

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Evolutionary changes have been observed in beak size in a population of medium ground finches in the Galapagos Islands. Given a choice of small and large seeds, the medium ground finch eats mostly small seeds, which are easier to crush. However, during dry years, all seeds are in short supply. Small seeds are quickly consumed, so the birds are left with a diet of large seeds. Studies have shown that this change in diet may be related to an increase in the average size of the beak of the medium ground finch.

69 The most likely explanation for the increase in average beak size of the medium ground finch is that the

- (1) trait is inherited and birds with larger beaks have greater reproductive success
- (2) birds acquired larger beaks due to the added exercise of feeding on large seeds
- (3) birds interbred with a larger-beaked species and passed on the trait
- (4) lack of small seeds caused a mutation which resulted in a larger beak

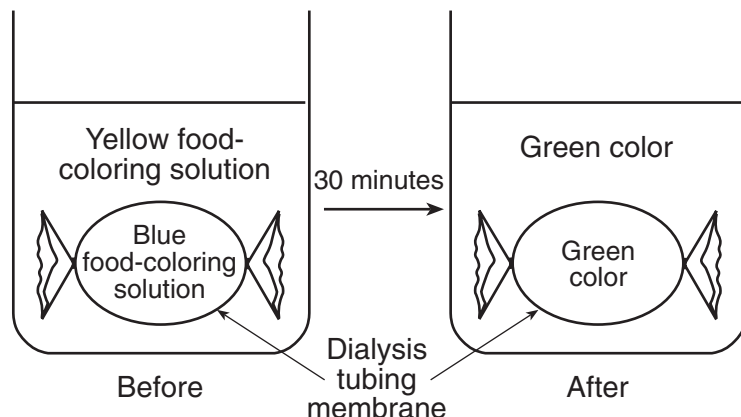
69

70 In exceptionally dry years, what most likely happens in a population of medium ground finches?

- (1) There is increased cooperation between the birds.
 - (2) Birds with large beaks prey on birds with small beaks.
 - (3) The finches develop parasitic relationships with mammals.
 - (4) There is increased competition for a limited number of small seeds.
-

70

Base your answers to questions 71 and 72 on the diagram below and on your knowledge of biology. The diagram shows the changes that occurred in a beaker after 30 minutes. The beaker contained water, food coloring, and a bag made from dialysis tubing membrane.



71 When the colors yellow and blue are combined, they produce a green color. Which statement most likely describes the relative sizes of the yellow and blue food-coloring molecules in the diagram?

- (1) The yellow food-coloring molecules are small, while the blue food-coloring molecules are large.
- (2) The yellow food-coloring molecules are large, while the blue food-coloring molecules are small.
- (3) Both the yellow food-coloring molecules and the blue food-coloring molecules are large.
- (4) Both the yellow food-coloring molecules and the blue food-coloring molecules are small.

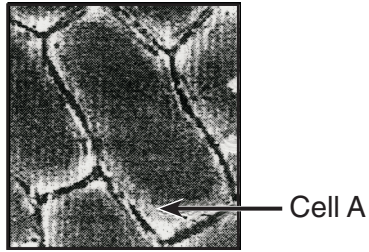
71

72 Which statement best explains the changes shown?

- (1) Molecular movement was aided by the presence of specific carbohydrate molecules on the surface of the membrane.
- (2) Molecular movement was aided by the presence of specific enzyme molecules on the surface of the membrane.
- (3) Molecules moved across the membrane without additional energy being supplied.
- (4) Molecules moved across the membrane only when additional energy was supplied.

72

73 Cell A shown below is a typical red onion cell in water on a slide viewed with a compound light microscope.



Draw a diagram of how cell A would most likely look after salt water has been added to the slide and label the cell membrane in your diagram. [2]



**For Teacher
Use Only**

73

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Wednesday, June 20, 2007 — 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	12	
B-2	13	
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 | 37 |
| 32 | 38 |
| 33 | 39 |
| 34 | 40 |
| 35 | 41 |
| 36 | 42 |

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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