

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

LIVING ENVIRONMENT

Wednesday, June 22, 2005 — 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

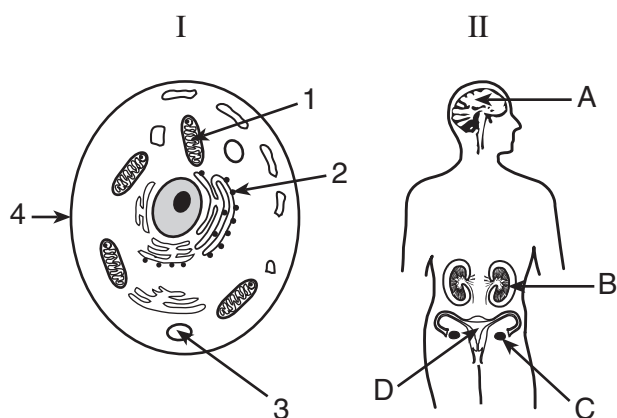
Answer all questions in this part. [30]

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 Researchers performing a well-designed experiment should base their conclusions on
- (1) the hypothesis of the experiment
 - (2) data from repeated trials of the experiment
 - (3) a small sample size to insure a reliable outcome of the experiment
 - (4) results predicted before performing the experiment

- 2 In plants, simple sugars are *least* likely to be
- (1) linked together to form proteins
 - (2) broken down into carbon dioxide and water
 - (3) used as a source of energy
 - (4) stored in the form of starch molecules

- 3 Which structures in diagram I and diagram II carry out a similar life function?



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

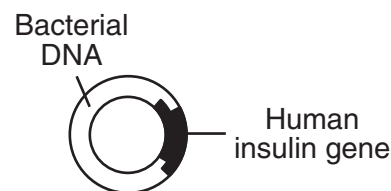
- 4 Plants inherit genes that enable them to produce chlorophyll, but this pigment is not produced unless the plants are exposed to light. This is an example of how the environment can
- (1) cause mutations to occur
 - (2) influence the expression of a genetic trait
 - (3) result in the appearance of a new species
 - (4) affect one plant species, but not another

- 5 Synthesis of a defective protein may result from an alteration in
- (1) vacuole shape
 - (2) the number of mitochondria
 - (3) a base sequence code
 - (4) cellular fat concentration

- 6 One variety of strawberry is resistant to a damaging fungus, but produces small fruit. Another strawberry variety produces large fruit, but is not resistant to the same fungus. The two desirable qualities may be combined in a new variety of strawberry plant by
- (1) cloning
 - (2) asexual reproduction
 - (3) direct harvesting
 - (4) selective breeding

- 7 The largest amount of DNA in a plant cell is contained in
- (1) a nucleus
 - (2) a chromosome
 - (3) a protein molecule
 - (4) an enzyme molecule

- 8 A product of genetic engineering technology is represented below.



Which substance was needed to join the insulin gene to the bacterial DNA as shown?

- (1) a specific carbohydrate
- (2) a specific enzyme
- (3) hormones
- (4) antibodies

9 Which factor could be the cause of the other three in an animal species?

- (1) the inability of the species to adapt to changes
- (2) a lack of genetic variability in the species
- (3) extinction of the species
- (4) a decrease in the survival rate of the species

10 Natural selection and its evolutionary consequences provide a scientific explanation for each of the following *except*

- (1) the fossil record
- (2) protein and DNA similarities between different organisms
- (3) similar structures among different organisms
- (4) a stable physical environment

11 Which factor contributed most to the extinction of many species?

- (1) changes in the environment
- (2) lethal mutations
- (3) inability to evolve into simple organisms
- (4) changes in migration patterns

12 Meiosis and fertilization are important for the survival of many species because these two processes result in

- (1) large numbers of gametes
- (2) increasingly complex multicellular organisms
- (3) cloning of superior offspring
- (4) genetic variability of offspring

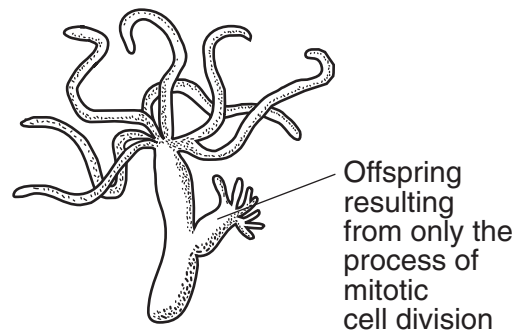
13 Reproduction in humans usually requires

- (1) the process of cloning
- (2) mitotic cell division of gametes
- (3) gametes with chromosomes that are not paired
- (4) the external fertilization of sex cells

14 The human reproductive system is regulated by

- (1) restriction enzymes
- (2) antigens
- (3) complex carbohydrates
- (4) hormones

15 The organism represented below is multicellular, heterotrophic, and completely aquatic.



Which other characteristics could be used to describe this organism?

- (1) carries out photosynthesis and needs oxygen
- (2) deposits cellular wastes on land and decomposes dead organisms
- (3) reproduces asexually and is a consumer
- (4) reproduces in a water habitat and is a producer

16 Which statement describes asexual reproduction?

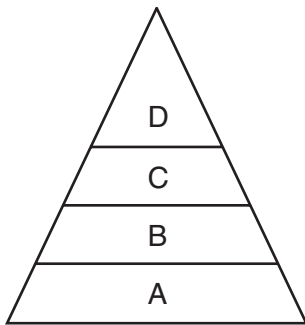
- (1) Adaptive traits are usually passed from parent to offspring without genetic modification.
- (2) Mutations are not passed from generation to generation.
- (3) It always enables organisms to survive in changing environmental conditions.
- (4) It is responsible for many new variations in offspring.

17 Which group contains only molecules that are each assembled from smaller organic compounds?

- (1) proteins, water, DNA, fats
- (2) proteins, starch, carbon dioxide, water
- (3) proteins, DNA, fats, starch
- (4) proteins, carbon dioxide, DNA, starch

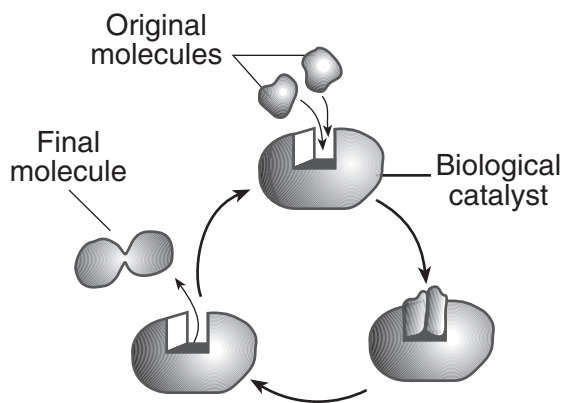
- 18 Most mammals have adaptations for
- (1) internal fertilization and internal development of the fetus
 - (2) internal fertilization and external development of the fetus
 - (3) external fertilization and external development of the fetus
 - (4) external fertilization and internal development of the fetus

- 19 Which process provides the initial energy to support all the levels in the energy pyramid shown below?



- (1) circulation
- (2) photosynthesis
- (3) active transport
- (4) digestion

- 20 The diagram below represents a series of reactions that can occur in an organism.

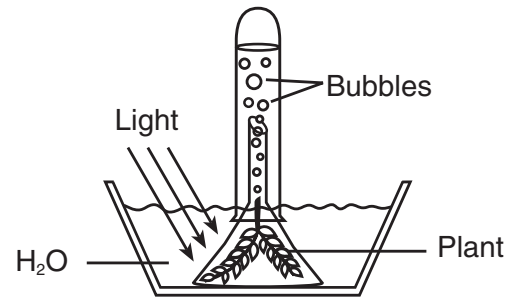


This diagram best illustrates the relationship between

- (1) enzymes and synthesis
- (2) amino acids and glucose
- (3) antigens and immunity
- (4) ribosomes and sugars

- 21 The interaction between guard cells and a leaf opening would *not* be involved in
- (1) diffusion of carbon dioxide
 - (2) maintaining homeostasis
 - (3) heterotrophic nutrition
 - (4) feedback mechanisms

- 22 The green aquatic plant represented in the diagram below was exposed to light for several hours.



Which gas would most likely be found in the greatest amount in the bubbles?

- (1) oxygen
- (2) nitrogen
- (3) ozone
- (4) carbon dioxide

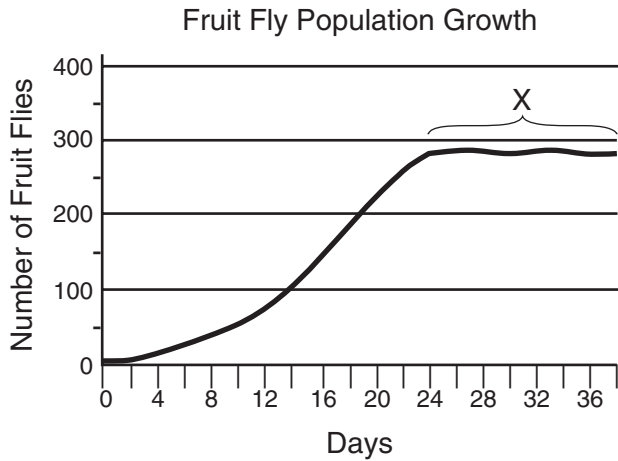
- 23 The production of energy-rich ATP molecules is the direct result of

- (1) recycling light energy to be used in the process of photosynthesis
- (2) releasing the stored energy of organic compounds by the process of respiration
- (3) breaking down starch by the process of digestion
- (4) copying coded information during the process of protein synthesis

- 24 Water from nearby rivers or lakes is usually used to cool down the reactors in nuclear power plants. The release of this heated water back into the river or lake would most likely result in

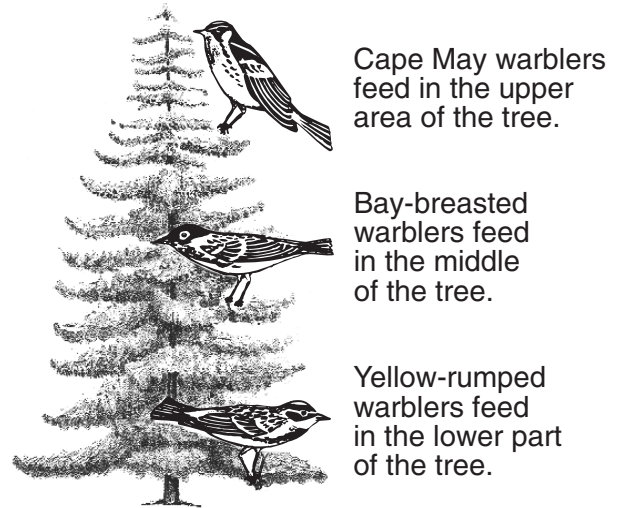
- (1) an increase in the sewage content in the water
- (2) a change in the biodiversity in the water
- (3) a change in the number of mutations in plants growing near the water
- (4) a decrease in the amount of sunlight necessary for photosynthesis in the water

- 25 Which statement best describes the fruit fly population in the part of the curve labeled X in the graph shown below?



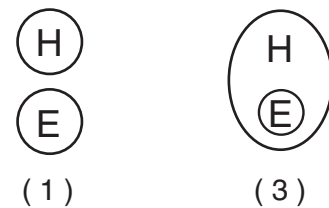
- (1) The fruit fly population has reached the number of organisms the habitat can support.
 - (2) The fruit fly population can no longer mate and produce fertile offspring.
 - (3) The fruit fly population has an average life span of 36 days.
 - (4) The fruit fly population is no longer able to adapt to the changing environmental conditions.
- 26 Lichens and mosses are the first organisms to grow in an area. Over time, grasses and shrubs will grow where these organisms have been. The grasses and shrubs are able to grow in the area because the lichens and mosses
- (1) synthesize food needed by producers in the area
 - (2) are at the beginning of every food chain in a community
 - (3) make the environment suitable for complex plants
 - (4) provide the enzymes needed for plant growth
- 27 The *negative* effect humans have on the stability of the environment is most directly linked to an increase in
- (1) recycling activities by humans
 - (2) supply of finite resources
 - (3) predation and disease
 - (4) human population size

- 28 The ecological niches of three bird species are shown in the diagram below.

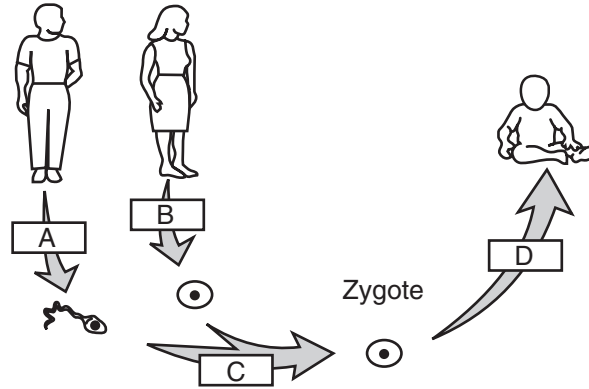


What is the advantage of each bird species having a different niche?

- (1) As the birds feed higher in the tree, available energy increases.
 - (2) More abiotic resources are available for each bird.
 - (3) Predators are less likely to feed on birds in a variety of locations.
 - (4) There is less competition for food.
- 29 Which diagram best illustrates the relationship between humans (*H*) and ecosystems (*E*)?



30 The diagram below represents processes involved in human reproduction.



Which row in the chart below correctly identifies the processes represented by the letters in the diagram?

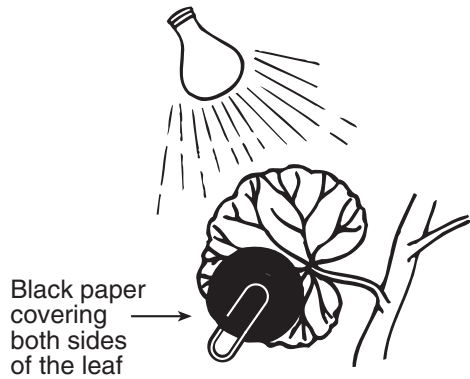
Row	A	B	C	D
(1)	mitosis	meiosis	fertilization	differentiation
(2)	meiosis	meiosis	fertilization	differentiation
(3)	meiosis	mitosis	differentiation	fertilization
(4)	mitosis	mitosis	differentiation	fertilization

Part B-1

Answer all questions in this part. [8]

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

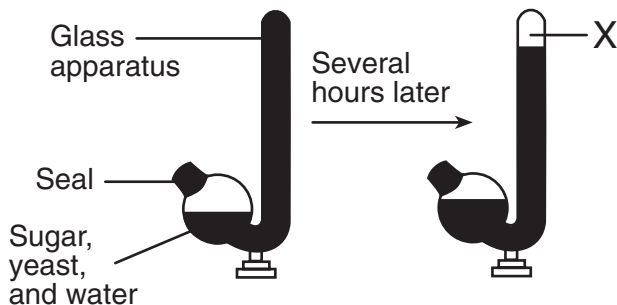
31 An experimental setup is shown below.



Which hypothesis would most likely be tested using this setup?

- (1) Light is needed for the process of reproduction.
- (2) Glucose is not synthesized by plants in the dark.
- (3) Protein synthesis takes place in leaves.
- (4) Plants need fertilizers for proper growth.

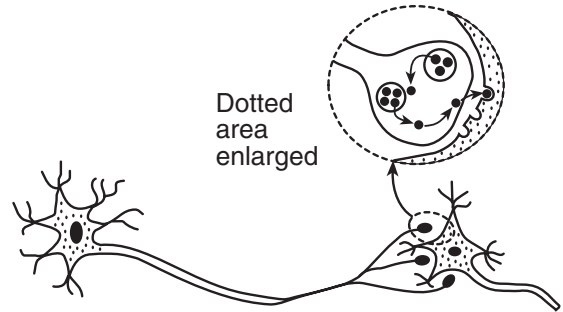
32 An investigation was carried out and the results are shown below. Substance X resulted from a metabolic process that produces ATP in yeast (a single-celled fungus).



Which statement best describes substance X?

- (1) It is oxygen released by protein synthesis.
- (2) It is glucose that was produced in photosynthesis.
- (3) It is starch that was produced during digestion.
- (4) It is carbon dioxide released by respiration.

33 A process that occurs in the human body is represented in the diagram below.



Which statement is most closely associated with the diagram?

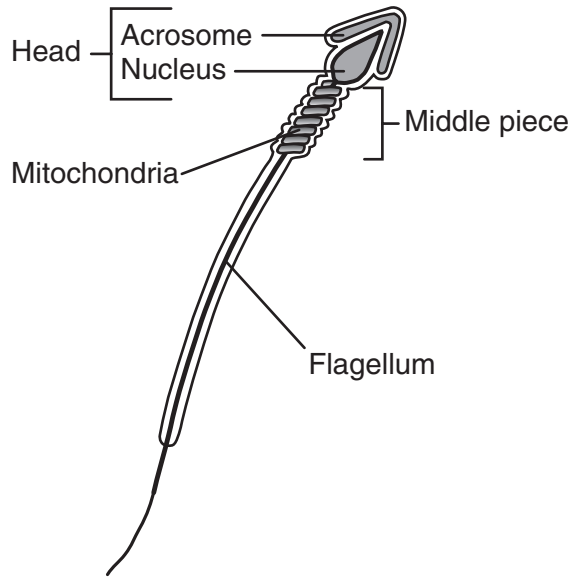
- (1) Small molecules are obtained from large molecules during digestion.
- (2) Certain molecules are replicated by means of a template.
- (3) Receptor molecules play an important role in communication between cells.
- (4) Energy from nutrients is utilized for waste disposal.

34 Which information concerning a desert is provided by the quotation below?

“The desert is arid, with less than 25 cm of rain per year. The plants are spaced far apart, or are grouped around water sources. Most of the animals are active at night.”

- (1) daily temperature range and types of autotrophs
- (2) time of rainy season and type of food used by heterotrophs
- (3) identity of a limiting factor and behavior of heterotrophs
- (4) type of nutrition in animals and distribution of autotrophs

35 A sperm cell from an organism is represented in the diagram below.



Which statement regarding this sperm cell is *not* correct?

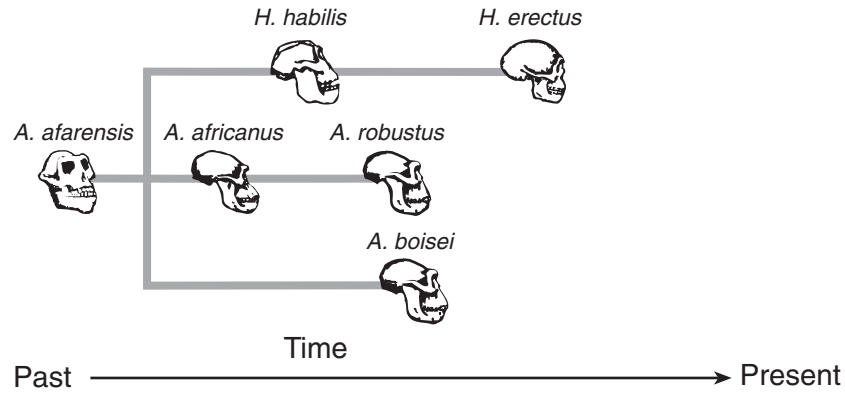
- (1) The acrosome contains half the normal number of chromosomes.
- (2) Energy to move the flagellum originates in the middle piece.
- (3) The head may contain a mutation.
- (4) This cell can unite with another cell resulting in the production of a new organism.

36 Which statement describes the ecosystem represented in the diagram below?



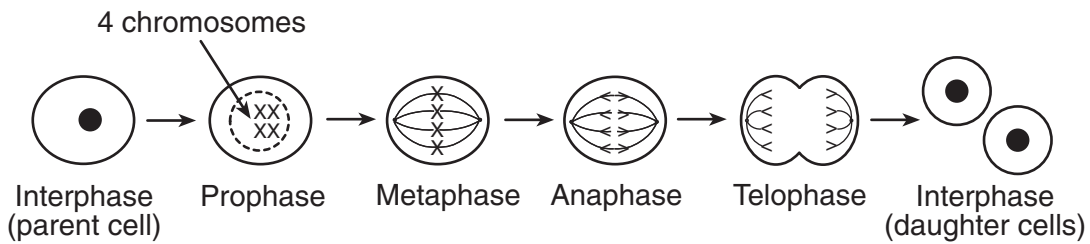
- (1) This ecosystem would be the first stage in ecological succession.
- (2) This ecosystem would most likely lack decomposers.
- (3) All of the organisms in this ecosystem are producers.
- (4) All of the organisms in this ecosystem depend on the activities of biological catalysts.

37 According to the diagram below, which three species lived on Earth during the same time period?



- (1) *robustus*, *africanus*, *afarensis*
- (2) *habilis*, *erectus*, *afarensis*
- (3) *habilis*, *robustus*, *boisei*
- (4) *africanus*, *boisei*, *erectus*

38 The diagram below illustrates the process of cell division.



What is the significance of anaphase in this process?

- (1) Anaphase usually ensures that each daughter cell has the same number of chromosomes as the parent cell.
- (2) Anaphase usually ensures that each daughter cell has twice as many chromosomes as the parent cell.
- (3) In anaphase, the cell splits in half.
- (4) In anaphase, the DNA is being replicated.

Part B-2

**For Teacher
Use Only**

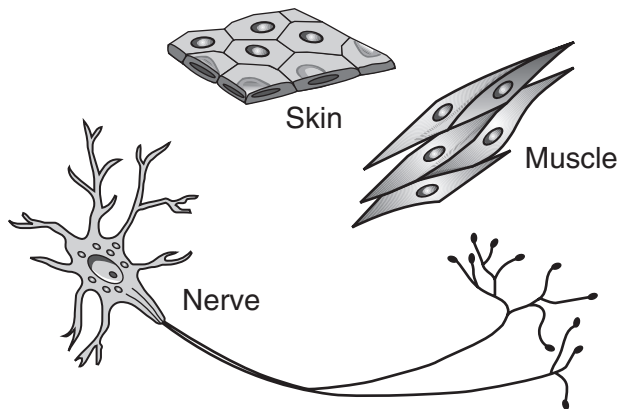
Answer all questions in this part. [17]

Directions (39–55): 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.

39 Sexually produced offspring often resemble, but are not identical to, either of their parents. Explain why they resemble their parents but are *not* identical to either parent. [1]

39

40 The types of human cells shown below are different from one another, even though they all originated from the same fertilized egg and contain the same genetic information.



Explain why these genetically identical cells can differ in structure and function. [1]

40

41 Oak trees in the northeastern United States have survived for hundreds of years, in spite of attacks by native insects. Recently, the gypsy moth, which has a caterpillar stage that eats leaves, was imported from Europe. The gypsy moth now has become quite common in New England ecosystems. As a result, many oak trees are being damaged more seriously than ever before.

State *one* biological reason that this imported insect is a more serious problem for the trees than other insects that have been present in the area for hundreds of years. [1]

**For Teacher
Use Only**

41

42 Certain insects are kept under control by sterilizing the males with x rays so that sperm production stops. Explain how this technique reduces the survival of this insect species. [1]

42

Base your answers to questions 43 through 45 on the information and table below and on your knowledge of biology.

**For Teacher
Use Only**

The variety of organisms known as plankton contributes to the unique nutritional relationships in an ocean ecosystem. Phytoplankton include algae and other floating organisms that perform photosynthesis. Plankton that cannot produce food are known as zooplankton. Some nutritional relationships involving these organisms and several others are shown in the table below.

Nutritional Relationships in a North Atlantic Ocean Community

Animals in Community	Food Eaten by Animals in Community				
	Codfish	Phytoplankton	Small Fish	Squid	Zooplankton
codfish			X		
sharks	X			X	
small fish		X			X
squid	X		X		
zooplankton		X			

43 Humans are currently overfishing codfish in the North Atlantic. Explain why this could endanger *both* the shark population and the squid population in this community. [1]

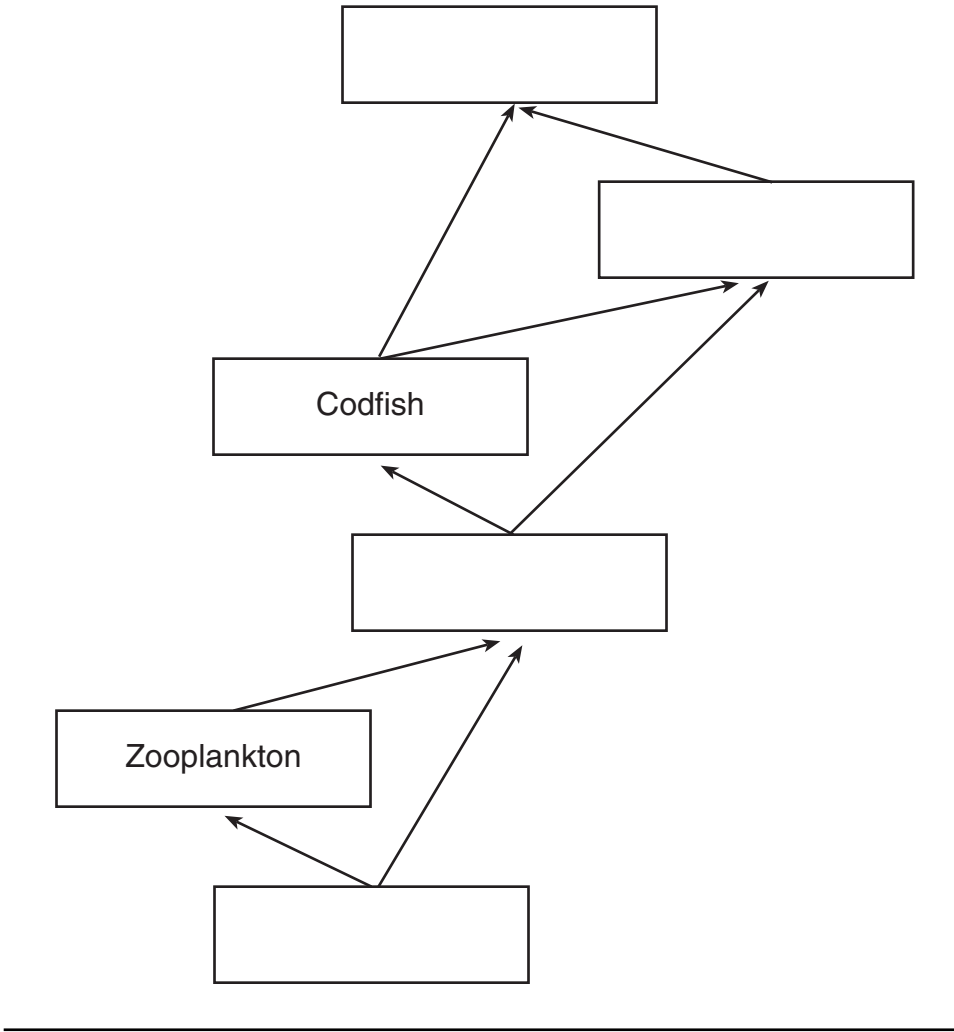
43

44 According to the table, which organism can be classified as both an herbivore and a carnivore? [1]

44

45 Complete the food web below by placing the names of the organisms in the correct locations. [1]

**For Teacher
Use Only**



45

Base your answers to questions 46 through 50 on the information and data table below and on your knowledge of biology.

**For Teacher
Use Only**

The effect of temperature on the action of pepsin, a protein-digesting enzyme present in stomach fluid, was tested. In this investigation, 20 milliliters of stomach fluid and 10 grams of protein were placed in each of five test tubes. The tubes were then kept at different temperatures. After 24 hours, the contents of each tube were tested to determine the amount of protein that had been digested. The results are shown in the table below.

Protein Digestion at Different Temperatures

Tube #	Temperature (°C)	Amount of Protein Digested (grams)
1	5	0.5
2	10	1.0
3	20	4.0
4	37	9.5
5	85	0.0

46 The dependent variable in this investigation is the

- (1) size of the test tube
- (2) time of digestion
- (3) amount of stomach fluid
- (4) amount of protein digested

46

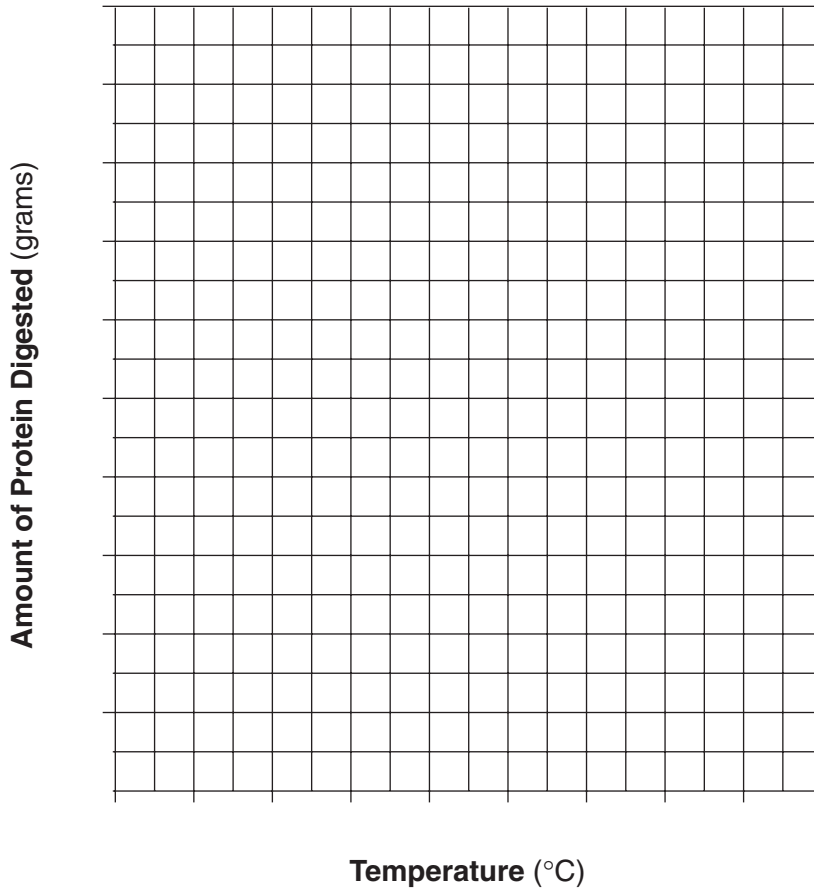
Directions (47–48): Using the information in the data table, construct a line graph on the grid on page 15, following the directions below.

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

48 Plot the data on the grid. Surround each point with a small circle and connect the points. [1]



Protein Digestion at Different Temperatures



For Teacher
Use Only

47

48

49 If a sixth test tube identical to the other tubes was kept at a temperature of 30°C for 24 hours, the amount of protein digested would most likely be

- (1) less than 1.0 gram
- (2) between 1.0 and 4.0 grams
- (3) between 4.0 and 9.0 grams
- (4) more than 9.0 grams

49

50 This investigation was repeated using 10 grams of starch instead of protein in each test tube. The contents of each tube were tested to determine the amount of starch that had been digested. The test results showed that no starch digestion occurred. Explain why no starch was digested. [1]

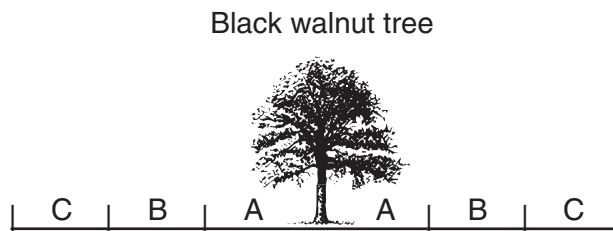
50

Base your answers to questions 51 through 55 on the passage below and on your knowledge of biology.

**For Teacher
Use Only**

Research indicates that many plants prevent the growth of other plants in their habitat by releasing natural herbicides (chemicals that kill plants). These substances are known as allelochemicals and include substances such as quinine, caffeine, and digitalis. Experiments have confirmed that chemicals in the bark and roots of black walnut trees are toxic, and when released into the soil they limit the growth of crop plants such as tomatoes, potatoes, and apples. Allelochemicals can alter growth and enzyme action, injure the outer cover of a seed so the seed dies, or stimulate seed growth at inappropriate times of the year. Studies on allelochemical effects help explain the observation that almost nothing grows under a black walnut tree even though light and moisture levels are adequate for growth.

51 Which phrase best predicts the relative numbers of different plant species in regions A, B, and C in the diagram shown below?



- (1) greater in C than B
- (2) greater in A than C
- (3) greater in A than B
- (4) greater in B than C

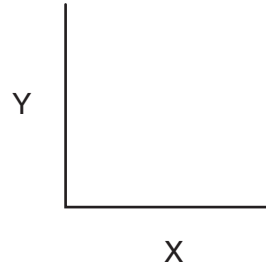
51

52 The release of allelochemicals into the soil under a black walnut tree will result in

- (1) a decrease in biodiversity and a competitive advantage for the tree
- (2) an increase in biodiversity and a competitive advantage for the tree
- (3) a decrease in biodiversity and a competitive disadvantage for the tree
- (4) an increase in biodiversity and a competitive disadvantage for the tree

52

53 A set of axes is shown below.



When using this set of axes to show the effect of black walnut allelochemicals on the number of plants, which labels would be appropriate for axis X and axis Y?

- (1) X — Number of Plants
Y — Distance from Walnut Tree Trunk (meters)
- (2) X — Distance from Walnut Tree Trunk (meters)
Y — Number of Plants
- (3) X — Number of Plants
Y — Time (days)
- (4) X — Time (days)
Y — Number of Plants

**For Teacher
Use Only**

53

54 Explain why stimulation of seed growth by allelochemicals at inappropriate times of the year is considered a *disadvantage*. [1]

54

55 State *one* possible use of allelochemicals in agriculture. [1]

55

Base your answers to questions 59 through 62 on the information below and on your knowledge of biology.

**For Teacher
Use Only**

A student uses a covered aquarium to study the interactions of biotic and abiotic factors in an ecosystem. The aquarium contains sand, various water plants, algae, small fish, snails, and decomposers. The water contains dissolved oxygen and carbon dioxide, as well as tiny amounts of minerals and salts.

59 Explain how oxygen is cycled between organisms in this ecosystem. [2]

59

60 Describe *one* specific way the fish population changes the amount of *one* specific abiotic factor (other than oxygen) in this ecosystem. [1]

60

61 Identify *one* source of food for the decomposers in this ecosystem. [1]

61

62 Describe *one* specific way the use of this food by the decomposers benefits the other organisms in the aquarium. [1]

62

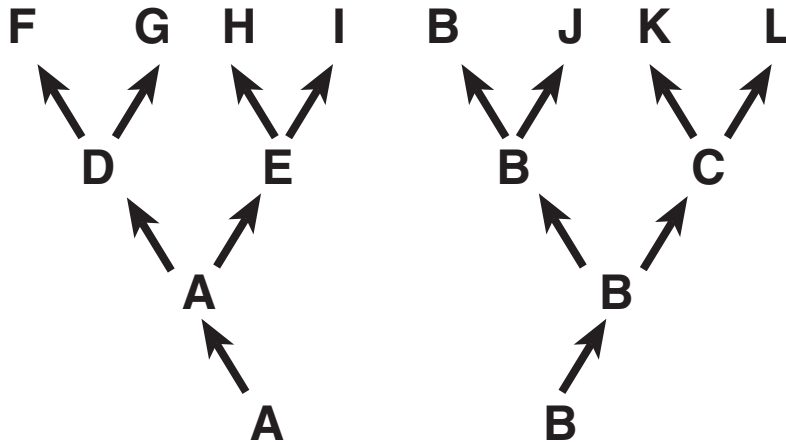
Part D

**For Teacher
Use Only**

Answer all questions in this part. [13]

Directions (63–75): 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 63 through 65 on the diagram below and on your knowledge of biology. Letters *A* through *L* represent different species of organisms. The arrows represent long periods of geologic time.



63 Which two species are the most closely related?

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

63

64 Which species was best adapted to changes that occurred in its environment over the longest period of time?

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

64

65 Which two species would most likely show the greatest similarity of DNA and proteins?

- (1) *B* and *J*
 - (2) *G* and *I*
 - (3) *J* and *K*
 - (4) *F* and *L*
-

**For Teacher
Use Only**

65

66 When a person exercises, changes occur in muscle cells as they release more energy. Explain how increased blood flow helps these muscle cells release more energy. [1]

66

67 State *one* factor that influences which molecules can pass through the cell membrane of a human cell. [1]

67

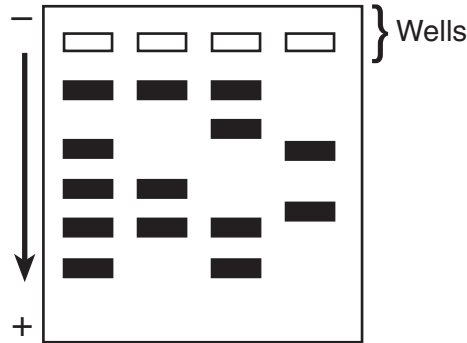
68 An indicator for a protein is added to a solution that contains protein and to a solution that does *not* contain protein. State *one* way, other than the presence or absence of protein, that the two solutions may differ after the indicator has been added to both. [1]

68

Base your answers to questions 69 through 72 on the information and diagram below and on your knowledge of biology.

**For Teacher
Use Only**

The four wells represented in the diagram were each injected with fragments that were prepared from DNA samples using identical techniques.



69 This laboratory procedure is known as

- (1) cloning
- (2) gel electrophoresis
- (3) chromatography
- (4) use of a dichotomous key

69

70 The arrow represents the direction of the movement of the DNA fragments. What is responsible for the movement of the DNA in this process? [1]

70

71 The four samples of DNA were taken from four different individuals. Explain how this is evident from the results shown in the diagram. [1]

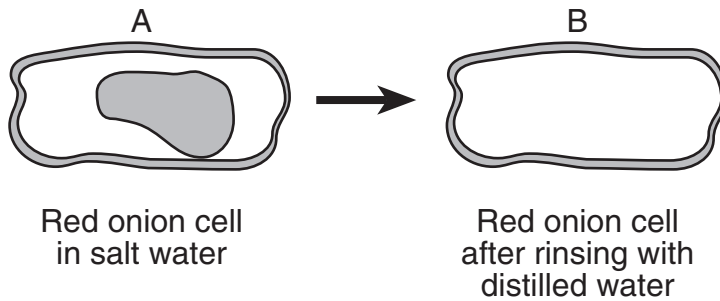
71

72 Identify the substance that was used to treat the DNA to produce the fragments that were put into the wells. [1]

72

73 A student prepared a wet-mount slide of some red onion cells and then added some salt water to the slide. The student observed the slide using a compound light microscope. Diagram A is typical of what the student observed after adding salt water.

Complete diagram B to show how the contents of the red onion cells should appear if the cell were then rinsed with distilled water for several minutes. [1]



73

74 In members of a bird species living on a remote island, the greatest number of beak variations in the population would most likely be found when

- (1) there is a high level of competition for limited resources
- (2) homeostasis is limited by a severe climate
- (3) they have a large and varied food supply
- (4) they are prey for a large number of predators

74

75 The different tools used during the beaks of finches lab represented

- (1) feeding adaptations in finches
 - (2) nest construction adaptations
 - (3) variations in seed size
 - (4) variations in ecosystems
-

75

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Wednesday, June 22, 2005 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student Sex: Female
 Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	
B-1	8	
B-2	17	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
Raters' Initials		
Rater 1		Rater 2

Record your answers to Part A and Part B-1 on this answer sheet.

Part A

- | | | |
|----------|----------|----------|
| 1 | 11 | 21 |
| 2 | 12 | 22 |
| 3 | 13 | 23 |
| 4 | 14 | 24 |
| 5 | 15 | 25 |
| 6 | 16 | 26 |
| 7 | 17 | 27 |
| 8 | 18 | 28 |
| 9 | 19 | 29 |
| 10 | 20 | 30 |

Part A Score

Part B-1

- | | |
|----------|----------|
| 31 | 35 |
| 32 | 36 |
| 33 | 37 |
| 34 | 38 |

Part B-1 Score

The declaration below must be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

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