

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

LIVING ENVIRONMENT

Thursday, January 29, 2004 — 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. 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.

This examination has three parts. You must answer all questions in this examination. Write your answers to the Part A multiple-choice questions on the separate answer sheet. Write your answers for the questions in Parts B and C 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 the Part A 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.

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

Part A

Answer all questions in this part. [35]

Directions (1–35): 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.

- 1 The analysis of data gathered during a particular experiment is necessary in order to
- (1) formulate a hypothesis for that experiment
 - (2) develop a research plan for that experiment
 - (3) design a control for that experiment
 - (4) draw a valid conclusion for that experiment

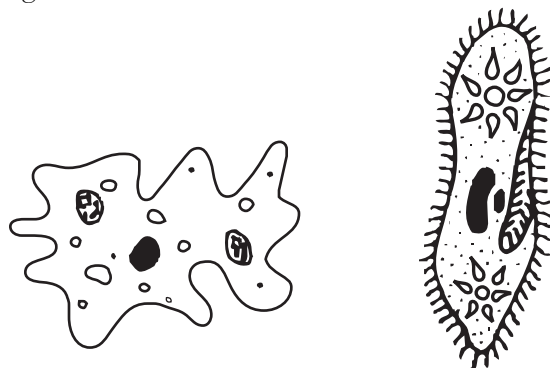
- 2 A student could best demonstrate knowledge of how energy flows throughout an ecosystem by
- (1) drawing a food web using specific organisms living in a pond
 - (2) conducting an experiment that demonstrates the process of photosynthesis
 - (3) labeling a diagram that illustrates ecological succession
 - (4) making a chart to show the role of bacteria in the environment

- 3 In most habitats, the removal of predators will have the most immediate impact on a population of
- (1) producers
 - (2) decomposers
 - (3) herbivores
 - (4) microbes

- 4 Hormones and secretions of the nervous system are chemical messengers that
- (1) store genetic information
 - (2) carry out the circulation of materials
 - (3) extract energy from nutrients
 - (4) coordinate system interactions

- 5 Which statement concerning simple sugars and amino acids is correct?
- (1) They are both wastes resulting from protein synthesis.
 - (2) They are both building blocks of starch.
 - (3) They are both needed for the synthesis of larger molecules.
 - (4) They are both stored as fat molecules in the liver.

- 6 The diagram below represents two single-celled organisms.



These organisms carry out the activities needed to maintain homeostasis by using specialized internal

- (1) tissues
 - (2) organelles
 - (3) systems
 - (4) organs
- 7 The sequence of subunits in a protein is most directly dependent on the
- (1) region in the cell where enzymes are produced
 - (2) DNA in the chromosomes in a cell
 - (3) type of cell in which starch is found
 - (4) kinds of materials in the cell membrane
- 8 Fruit flies with the curly-wing trait will develop straight wings if kept at a temperature of 16°C during development and curly wings if kept at 25°C. The best explanation for this change in the shape of wings is that the
- (1) genes for curly wings and genes for straight wings are found on different chromosomes
 - (2) type of genes present in the fruit fly is dependent on environmental temperature
 - (3) environment affects the expression of the genes for this trait
 - (4) higher temperature produces a gene mutation

9 The genetic code of a DNA molecule is determined by a specific sequence of

- (1) ATP molecules
- (2) sugar molecules
- (3) chemical bonds
- (4) molecular bases

10 To produce large tomatoes that are resistant to cracking and splitting, some seed companies use the pollen from one variety of tomato plant to fertilize a different variety of tomato plant. This process is an example of

- (1) selective breeding
- (2) DNA sequencing
- (3) direct harvesting
- (4) cloning

11 The cells that make up the skin of an individual have some functions different from the cells that make up the liver because

- (1) all cells have a common ancestor
- (2) different cells have different genetic material
- (3) environment and past history have no influence on cell function
- (4) different parts of genetic instructions are used in different types of cells

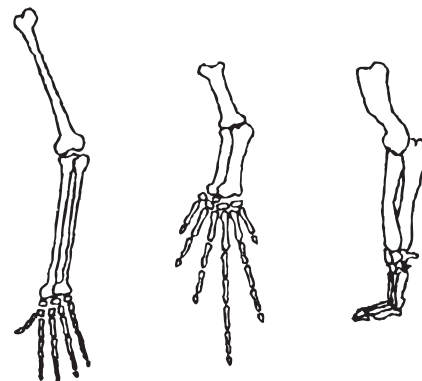
12 The production of certain human hormones by genetically engineered bacteria results from

- (1) inserting a specific group of amino acids into the bacteria
- (2) combining a portion of human DNA with bacterial DNA and inserting this into bacteria
- (3) crossing two different species of bacteria
- (4) deleting a specific amino acid from human DNA and inserting it into bacterial DNA

13 Which statement best describes a current understanding of natural selection?

- (1) Natural selection influences the frequency of an adaptation in a population.
- (2) Natural selection has been discarded as an important concept in evolution.
- (3) Changes in gene frequencies due to natural selection have little effect on the evolution of species.
- (4) New mutations of genetic material are due to natural selection.

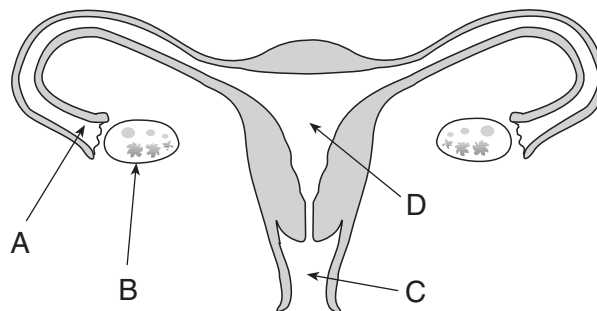
14 The bones in the forelimbs of three mammals are shown below.



For these mammals, the number, position, and shape of the bones most likely indicates that they may have

- (1) developed in a common environment
- (2) developed from the same earlier species
- (3) identical genetic makeup
- (4) identical methods of obtaining food

Base your answers to questions 15 and 16 on the diagram below, which represents the human female reproductive system.



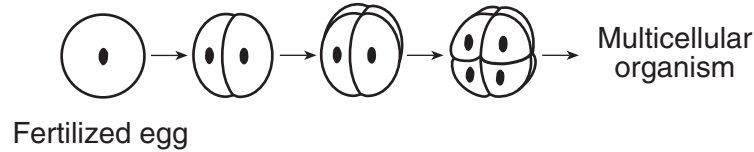
15 New inherited characteristics may appear in offspring as a result of new combinations of existing genes or may result from mutations in genes contained in cells produced by structure

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

16 In which part of this system does a fetus usually develop?

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

17 Which phrase best describes a process represented in the diagram below?



- (1) a zygote dividing by mitosis
- (2) a zygote dividing by meiosis
- (3) a gamete dividing by mitosis
- (4) a gamete dividing by meiosis

18 Which species is most likely to survive changing environmental conditions?

- (1) a species that has few variations
- (2) a species that reproduces sexually
- (3) a species that competes with similar species
- (4) a species that has a limited life span

19 Organisms that have the ability to use an atmospheric gas to produce an organic nutrient are known as

- (1) herbivores
- (2) decomposers
- (3) carnivores
- (4) autotrophs

20 Which phrase does *not* describe cells cloned from a carrot?

- (1) they are genetically identical
- (2) they are produced sexually
- (3) they have the same DNA codes
- (4) they have identical chromosomes

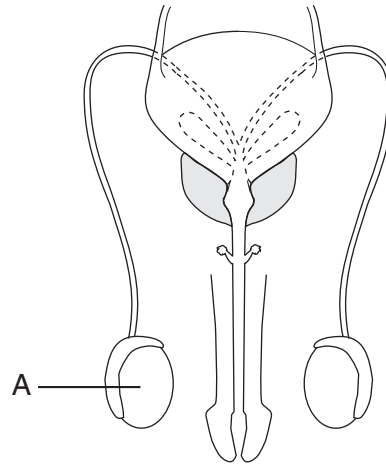
21 Human egg cells are most similar to human sperm cells in their

- (1) degree of motility
- (2) amount of stored food
- (3) chromosome number
- (4) shape and size

22 One arctic food chain consists of polar bears, fish, seaweed, and seals. Which sequence demonstrates the correct flow of energy between these organisms?

- (1) seals → seaweed → fish → polar bears
- (2) fish → seaweed → polar bears → seals
- (3) seaweed → fish → seals → polar bears
- (4) polar bears → fish → seals → seaweed

23 The diagram below represents the reproductive system of a mammal.



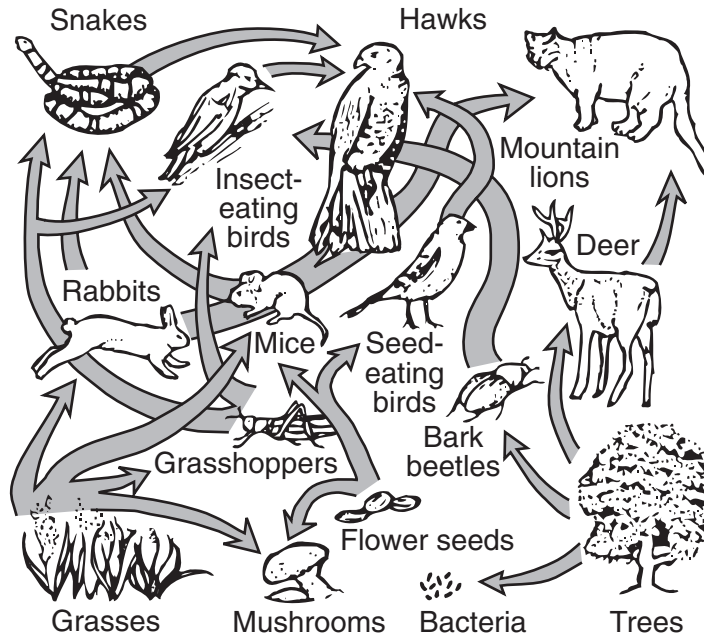
The hormone produced in structure A most directly brings about a change in

- (1) blood sugar concentration
- (2) physical characteristics
- (3) the rate of digestion
- (4) the ability to carry out respiration

24 Leaves of green plants contain openings known as stomates, which are opened and closed by specialized cells allowing for gas exchange between the leaf and the outside environment. Which phrase best represents the net flow of gases involved in photosynthesis into and out of the leaf through these openings on a sunny day?

- (1) carbon dioxide moves in; oxygen moves out
- (2) carbon dioxide and oxygen move in; ozone moves out
- (3) oxygen moves in; nitrogen moves out
- (4) water and ozone move in; carbon dioxide moves out

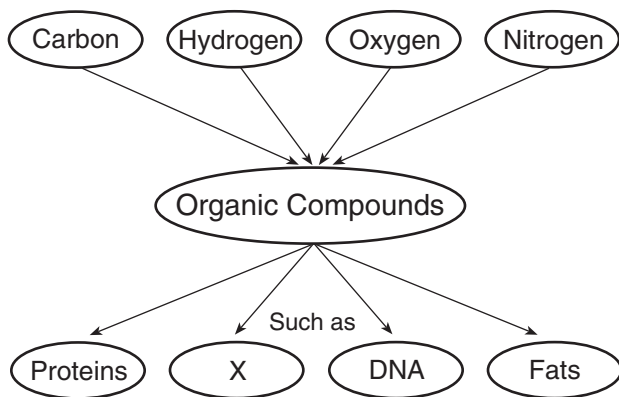
25 A food web is represented in the diagram below.



Which organisms are correctly paired with their roles in this food web?

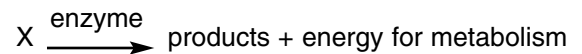
- | | |
|--|-----------------------------------|
| (1) mountain lions, bark beetles — producers | (3) all birds, deer — consumers |
| hawks, mice — heterotrophs | grasses, trees — producers |
| (2) snakes, grasshoppers — consumers | (4) seeds, bacteria — decomposers |
| mushrooms, rabbits — autotrophs | mice, grasses — heterotrophs |

26 What substance could be represented by the letter X in the diagram below?



- | | |
|-------------------|--------------------|
| (1) carbohydrates | (3) carbon dioxide |
| (2) ozone | (4) water |

27 Information concerning a metabolic activity is shown below.



Substance X is most likely

- | | |
|------------|-----------------|
| (1) DNA | (3) ATP |
| (2) oxygen | (4) chlorophyll |

28 A part of the Hepatitis B virus is synthesized in the laboratory. This viral particle can be identified by the immune system as a foreign material but the viral particle is not capable of causing disease. Immediately after this viral particle is injected into a human it

- (1) stimulates the production of enzymes that are able to digest the Hepatitis B virus
- (2) triggers the formation of antibodies that protect against the Hepatitis B virus
- (3) synthesizes specific hormones that provide immunity against the Hepatitis B virus
- (4) breaks down key receptor molecules so that the Hepatitis B virus can enter body cells

29 Which phrase would be appropriate for area A in the chart below?

Technological Device	Positive Impact	Negative Impact
Nuclear power plant	Provides efficient, inexpensive energy	A

- (1) produces radioactive waste
(2) results in greater biodiversity
(3) provides light from radioactive substances
(4) reduces dependence on fossil fuels

30 Which situation is *not* an example of the maintenance of a dynamic equilibrium in an organism?

- (1) Guard cells contribute to the regulation of water content in a geranium plant.
(2) Water passes into an animal cell causing it to swell.
(3) The release of insulin lowers the blood sugar level in a human after eating a big meal.
(4) A runner perspires while running a race on a hot summer day.

31 Which statement best describes what happens to energy and molecules in a stable ecosystem?

- (1) Both energy and molecules are recycled in an ecosystem.
(2) Neither energy nor molecules are recycled in an ecosystem.
(3) Energy is recycled and molecules are continuously added to the ecosystem.
(4) Energy is continuously added to the ecosystem and molecules are recycled.

32 Methods used to reduce sulfur dioxide emissions from smokestacks are an attempt by humans to

- (1) lessen the amount of insecticides in the environment
(2) eliminate diversity in wildlife
(3) lessen the environmental impact of acid rain
(4) use nonchemical controls on pest species

33 Deforestation will most directly result in an immediate increase in

- (1) atmospheric carbon dioxide
(2) atmospheric ozone
(3) wildlife populations
(4) renewable resources

34 Which statement concerning ecosystems is correct?

- (1) Stable ecosystems that are changed by natural disaster will slowly recover and may again become stable if left alone for a long period of time.
(2) Competition does not influence the number of organisms that live in ecosystems.
(3) Climatic change is the principal cause of habitat destruction in ecosystems in the last fifty years.
(4) Stable ecosystems, once changed by natural disaster, will never recover and become stable again, even if left alone for a long period of time.

35 Which human activity would be *least* likely to disrupt the stability of an ecosystem?

- (1) disposing of wastes in the ocean
(2) using fossil fuels
(3) increasing the human population
(4) recycling bottles and cans

Part B

Answer all questions in this part. [30]

Directions (36–62): For those questions that are followed by four choices, circle the number of the choice that best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answers in the spaces provided.

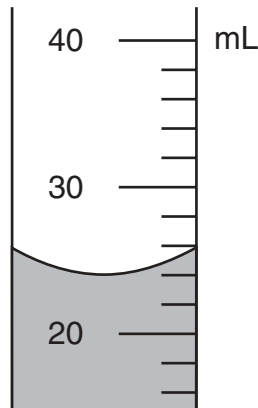
36 After switching from the high-power to the low-power objective lens of a compound light microscope, the area of the low-power field will appear

- (1) larger and brighter
- (2) smaller and brighter
- (3) larger and darker
- (4) smaller and darker

**For Teacher
Use Only**

36

37 The diagram below shows a portion of a graduated cylinder.



What is the volume of the liquid in this cylinder?

- (1) 22 mL
- (2) 24 mL
- (3) 25 mL
- (4) 26 mL

37

38 A mutation occurs in a cell. Which sequence best represents the correct order of the events involved for this mutation to affect the traits expressed by this cell?

- (1) a change in the sequence of DNA bases → joining amino acids in sequence → appearance of characteristic
- (2) joining amino acids in sequence → a change in the sequence of DNA bases → appearance of characteristic
- (3) appearance of characteristic → joining amino acids in sequence → a change in the sequence of DNA bases
- (4) a change in the sequence of DNA bases → appearance of characteristic → joining amino acids in sequence

38

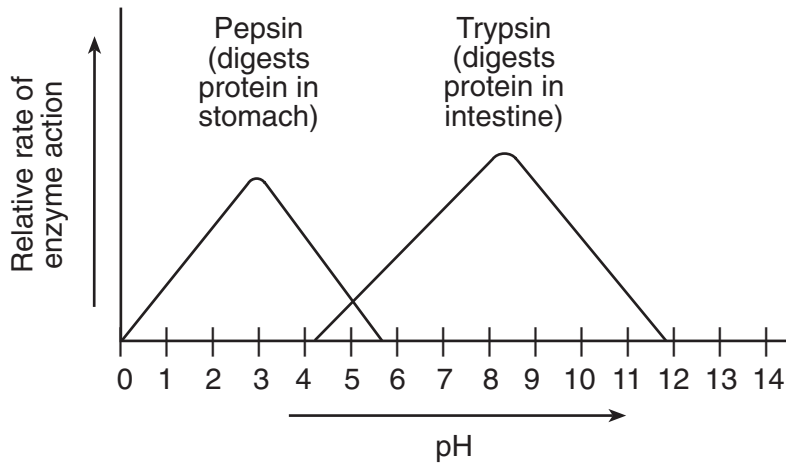
39 Recently, scientists noted that stained chromosomes from rapidly dividing cells, such as human cancer cells, contain numerous dark, dotlike structures. Chromosomes from older human cells that have stopped dividing have very few, if any, dotlike structures. The best generalization regarding these dotlike structures is that they

- (1) will always be present in cells that are dividing
- (2) may increase the rate of mitosis in human cells
- (3) definitely affect the rate of division in all cells
- (4) can cure all genetic disorders

39

Base your answers to questions 40 and 41 on the graph below and on your knowledge of biology.

**For Teacher
Use Only**



40 Pepsin works best in which type of environment?

- (1) acidic, only
- (2) basic, only
- (3) neutral
- (4) sometimes acidic, sometimes basic

40

41 Neither enzyme works at a pH of

- (1) 1
- (2) 5
- (3) 3
- (4) 13

41

Base your answers to questions 42 through 44 on the information below and on your knowledge of biology.

For Teacher Use Only

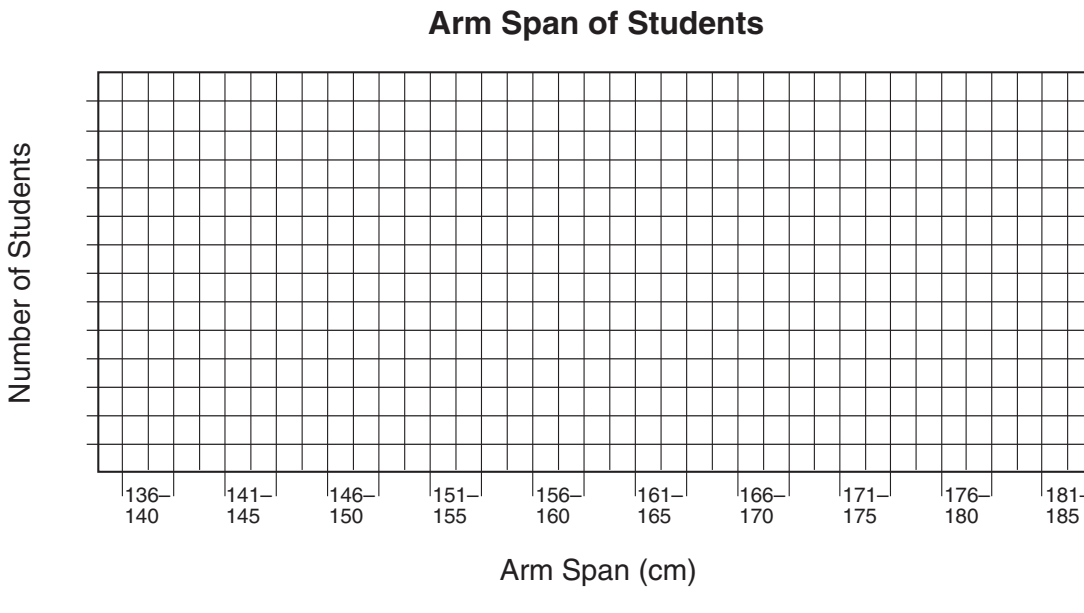
A science class was studying various human physical characteristics in an investigation for a report on human genetics. As part of the investigation, the students measured the arm span of the class members. The data table below summarizes the class results.

Arm Span of the Students	
Student Arm Span (cm)	Number of Students
136–140	1
141–145	2
146–150	0
151–155	4
156–160	5
161–165	8
166–170	5
171–175	5
176–180	3
181–185	1

Directions (42–43): Using the information in the data table, construct a bar graph on the grid provided, following the directions below.

42 Mark an appropriate scale on the axis labeled “Number of Students.” [1]

43 Construct vertical bars to represent the data. Shade in each bar. [1]



42

43

44 What should be done to provide additional support for the generalization that human arm span is a characteristic that falls within a range of lengths, with most lengths falling in the middle ranges? [1]

**For Teacher
Use Only**

44

45 In an investigation to determine a factor that affects the growth of rats, a student exposed 100 rats of the same age and species to identical conditions, except for the amount of living space and the amount of food each rat received. Each day the student measured and recorded the weight of each rat. State *one* major error that the student made in performing this investigation. [1]

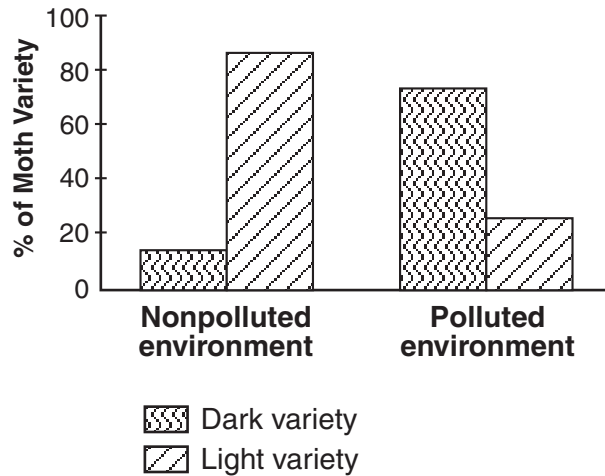
45

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

**For Teacher
Use Only**

Color in peppered moths is controlled by genes. A light-colored variety and a dark-colored variety of a peppered moth species exist in nature. The moths often rest on tree trunks, and several different species of birds are predators of this moth.

Before industrialization in England, the light-colored variety was much more abundant than the dark-colored variety and evidence indicates that many tree trunks at that time were covered with light-colored lichens. Later, industrialization developed and brought pollution which killed the lichens leaving the tree trunks covered with dark-colored soot. The results of a study made in England are shown below.



46 State *one* possible reason that a larger number of the dark-colored variety were present in the polluted environment. [1]

46

47 State *one* possible reason that the light-colored variety was not completely eliminated from the polluted environment. [1]

47

48 During the past few decades, air pollution control laws in many areas of England greatly limited the soot and other air pollutants coming from the burning of coal. State *one* way the decrease in soot and other air pollutants will most likely influence the survival of the light-colored variety of peppered moth. [1]

48

49 The percentage of light-colored moths in the polluted environment was closest to

- (1) 16
- (2) 24
- (3) 42
- (4) 76

49

50 Which conclusion can best be drawn from the information given?

- (1) The trait for dark coloration better suits the peppered moth for survival in non-polluted environments.
- (2) The trait for light coloration better suits the peppered moth for survival in polluted environments.
- (3) The variation of color in the peppered moth has no influence on survival of the moth.
- (4) A given trait may be a favorable adaptation in one environment, but not in another environment.

50

51 Humans require multiple systems for various life functions. Two vital systems are the circulatory system and the respiratory system. Select *one* of these systems, write its name in the chart below, then identify *two* structures that are part of that system, and state how each structure you identified functions as part of the system. [2]

System:	
Structure	Function
(1)	
(2)	

51

52 What is the role of bacteria and fungi in an ecosystem? [1]

**For Teacher
Use Only**

52

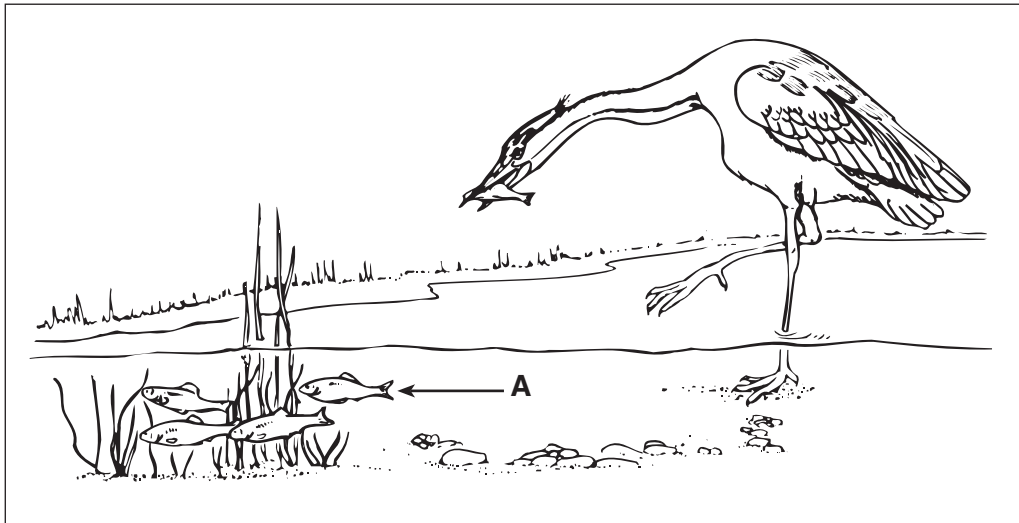
53 Arrange the following structures from largest to smallest. [1]

- a chromosome
- a nucleus
- a gene

Largest _____
↓
Smallest _____

53

54 Identify *one* abiotic factor that would directly affect the survival of organism A shown in the diagram below. [1]



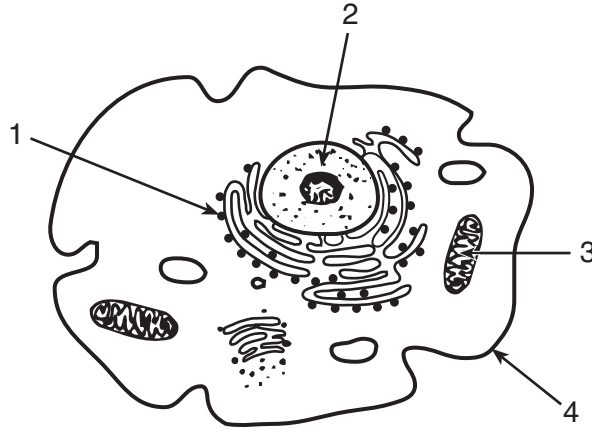
54

55 Explain why most ecologists would agree with the statement “A forest ecosystem is more stable than a cornfield.” [1]

**For Teacher
Use Only**

55

Base your answers to questions 56 and 57 on the diagram of a cell below.



56 Describe how structures 1 and 2 interact in the process of protein synthesis. [1]

56

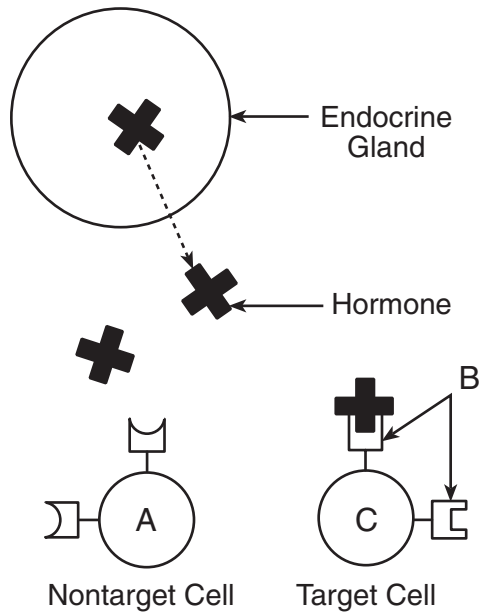
57 Choose either structure 3 *or* structure 4, write the number of the structure on the line below, and describe how it aids the process of protein synthesis. [1]

Structure: _____

57

Base your answers to questions 58 and 59 on the diagram below which illustrates a role of hormones.

For Teacher Use Only



58 Letter *B* indicates

- (1) ribosomes
- (2) receptor molecules
- (3) tissues
- (4) inorganic substances

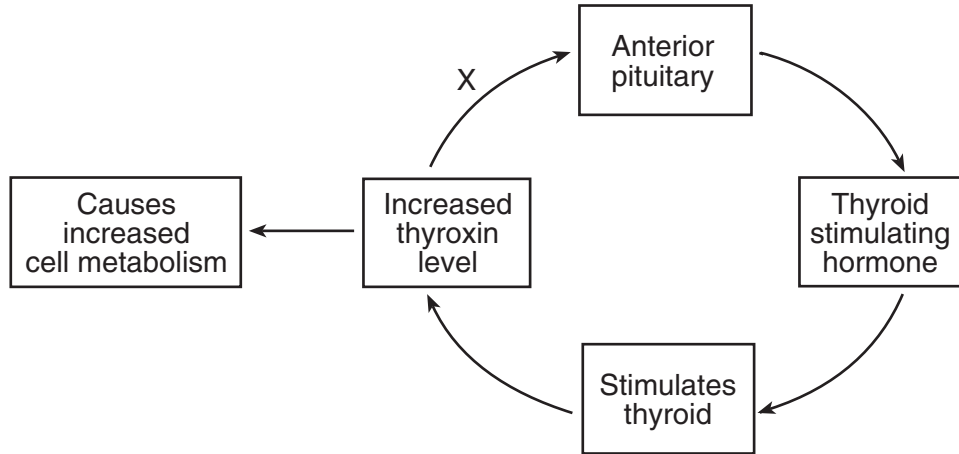
58

59 Explain why cell *A* is a nontarget cell for the hormone illustrated in the diagram. [1]

59

Base your answers to questions 60 through 62 on the diagram below of activities in the human body.

**For Teacher
Use Only**



60 This diagram illustrates part of

- (1) a feedback mechanism
- (2) an enzyme pathway
- (3) a digestive mechanism
- (4) a pattern of learned behavior

60

61 Describe the action represented by the arrow labeled X in the diagram and state *one* reason that this action is important. [2]

61

62 Identify *one* hormone involved in another biological relationship and an organ that is directly affected by the hormone you identified. [2]

62

Part C

Answer all questions in this part. [20]

Directions (63–66): Record your answers in the spaces provided in this examination booklet.

- 63 Plants respond to their environment in many different ways. Design a controlled experiment to test the effect of *one* environmental factor (such as light, acidity of precipitation, etc.) on some aspect of plant growth. In your experimental design be sure to:
- state the hypothesis [1]
 - list the steps of the procedure [2]
 - identify the control setup for the experiment [1]
 - include an appropriate data table with column headings for the collection of data [1]
 - identify the independent variable in the experiment [1]

**For Teacher
Use Only**

63

64 Compare asexual reproduction to sexual reproduction. In your comparison, be sure to include:

- which type of reproduction results in offspring that are usually genetically identical to the previous generation and explain why this occurs [2]
- *one* other way these methods of reproduction differ [1]

**For Teacher
Use Only**

64

66 A tropical rain forest in the country of Belize contains over 100 kinds of trees as well as thousands of species of mammals, birds, and insects. Dozens of species living there have not yet been classified and studied. The rain forest could be a commercial source of food as well as a source of medicinal and household products. However, most of this forested area is not accessible because of a lack of roads and therefore, little commercial use has been made of this region. The building of paved highways into and through this rain forest has been proposed.

Discuss some aspects of carrying out this proposal to build paved highways. In your answer be sure to:

- state *one* possible impact on biodiversity and *one* reason for this impact [2]
- state *one* possible reason for an increase in the number of some producers as a result of road building [1]
- identify *one* type of consumer whose population would most likely increase as a direct result of an increase in a producer population [1]
- state *one* possible action the road builders could take to minimize human impact on the ecology of this region [1]

66

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, January 29, 2004 — 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	35	_____
B	30	_____
C	20	_____
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 on this answer sheet.

Part A

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

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

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

Signature

Tear Here

Tear Here

Tear Here