The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, August 16, 2007 — 12:30 to 3:30 p.m., only

Student Name _____

School Name _____

Print your name and the name of your school on the lines above. Then turn to the last page of this booklet, which is the answer sheet for Part A and Part B–1. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

You are to answer all questions in all parts of this examination. Write your answers to the Part A and Part B–1 multiple-choice questions on the separate answer sheet. Write your answers for the questions in Parts B–2, C, and D directly in this examination booklet. All answers should be written in pen, except for graphs and drawings which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on the answer sheet and in this examination booklet.

When you have completed the examination, you must sign the statement printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

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

Part A

Answer all questions in this part. [30]

Directions (1–30): For *each* statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

1 Which condition would most likely upset the stability of an ecosystem?

(1) a cycling of elements between organisms and the environment
(2) energy constantly entering the environment
(3) green plants incorporating sunlight into organic compounds
(4) a greater mass of animals than plants

2 In 1910, Thomas Morgan discovered a certain pattern of inheritance in fruit flies known as sex linkage. This discovery extended the ideas of inheritance that Gregor Mendel had discovered while working with garden peas in 1865. Which principle of scientific inquiry does this illustrate?

(1) A control group must be part of a valid experiment.
(2) Scientific explanations can be modified as new evidence is found.
(3) The same experiment must be repeated many times to validate the results.
(4) Values can be used to make ethical decisions about scientific discovery.

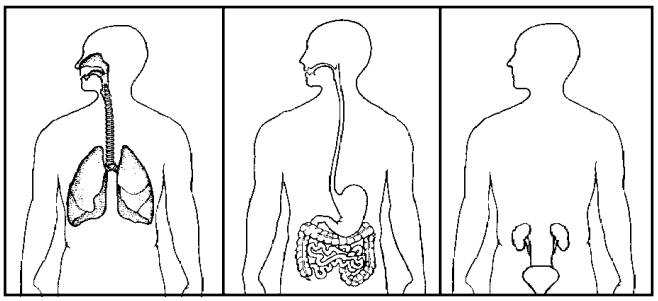
3 As a human red blood cell matures, it loses its nucleus. As a result of this loss, a mature red blood cell lacks the ability to

(1) take in material from the blood
(2) release hormones to the blood
(3) pass through artery walls
(4) carry out cell division

4 Enzyme molecules normally interact with substrate molecules. Some medicines work by blocking enzyme activity in pathogens. These medicines are effective because they

(1) are the same size as the enzyme
(2) are the same size as the substrate molecules
(3) have a shape that fits into the enzyme
(4) have a shape that fits into all cell receptors

5 The diagram below represents three human body systems.



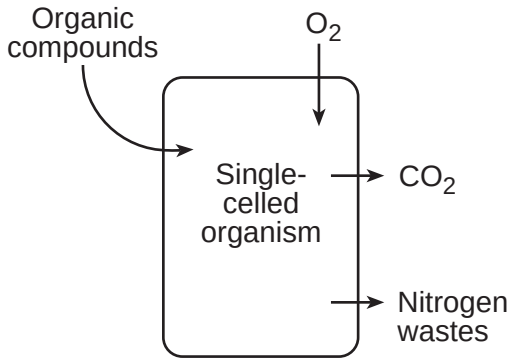
Which row in the chart below correctly shows what systems *A*, *B*, and *C* provide for the human body?

Row	System A	System B	System C
(1)	blood cells	glucose	hormones
(2)	oxygen	absorption	gametes
(3)	gas exchange	nutrients	waste removal
(4)	immunity	coordination	carbon dioxide

6 Which statement describes one function of the placenta in mammals?

(1) It allows blood of the mother to mix with the blood of the fetus.
(2) It contains fluid that protects the embryo from harm.
(3) It removes waste products that are produced in the cells of the fetus.
(4) It synthesizes food for the embryo.

7 The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



The movements indicated by all the arrows are directly involved in

(1) the maintenance of homeostasis
(2) respiration, only
(3) excretion, only
(4) the digestion of proteins

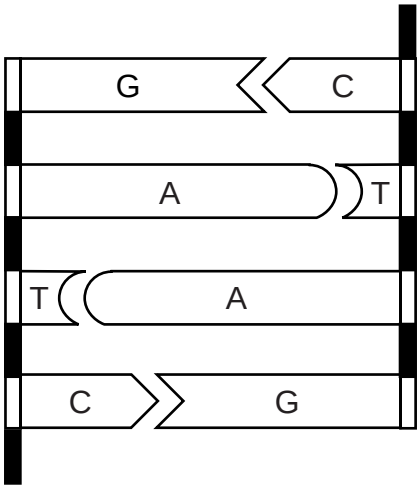
8 The brown summer feathers of ptarmigans, small Arctic birds, are replaced by white feathers after winter arrives. Which statement best explains this observation?

(1) The expression of genes can be modified by the environment.
(2) Holes in the ozone layer vary in size depending on the season.
(3) Acids in rain bleach the brown feathers of the birds.
(4) Mutations occur only during certain seasons.

9 A child has brown hair and brown eyes. His father has brown hair and blue eyes. His mother has red hair and brown eyes. The best explanation for the child having brown hair and brown eyes is that

(1) a gene mutation occurred that resulted in brown hair and brown eyes
(2) gene expression must change in each generation so evolution can occur
(3) the child received genetic information from each parent
(4) cells from his mother's eyes were present in the fertilized egg

10 The diagram below represents a portion of a type of organic molecule present in the cells of organisms.



What will most likely happen if there is a change in the base sequence of this molecule?

(1) The molecule will be converted into an inorganic compound.
(2) The amino acid sequence may be altered during protein synthesis.
(3) The chromosome number will decrease in future generations.
(4) The chromosome number may increase within the organisms.

11 All cells in an embryo have the same DNA. However, the embryonic cells form organs, such as the brain and the kidneys, which have very different structures and functions. These differences are the result of

(1) having two types of cells, one type from each parent
(2) rapid mitosis causing mutations in embryo cells
(3) new combinations of cells resulting from meiosis
(4) certain genes being expressed in some cells and not in others

12 Viruses frequently infect bacteria and insert new genes into the genetic material of the bacteria. When these infected bacteria reproduce asexually, which genes would most likely be passed on?

(1) only the new genes
(2) only the original genes
(3) both the original and the new genes
(4) neither the original nor the new genes

13 A mutation changes a gene in a cell in the stomach of an organism. This mutation could cause a change in

(1) both the organism and its offspring
(2) the organism, but not its offspring
(3) its offspring, but not the organism itself
(4) neither the organism nor its offspring

14 A certain protein is found in mitochondria, chloroplasts, and bacteria. This provides evidence that plants and bacteria

(1) have some similar DNA base sequences
(2) can use carbon dioxide to make proteins
(3) digest proteins into simple sugars
(4) contain certain pathogenic microbes

15 Extinction of a species could result from

(1) evolution of a type of behavior that produces greater reproductive success
(2) synthesis of a hormone that controls cellular communication
(3) limited genetic variability in the species
(4) fewer unfavorable mutations in the species

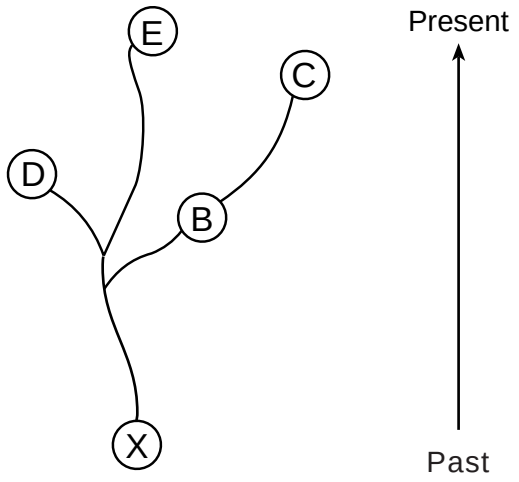
16 The rate at which all organisms obtain, transform, and transport materials depends on an immediate supply of

(1) ATP and enzymes
(2) solar energy and carbon dioxide
(3) carbon dioxide and enzymes
(4) ATP and solar energy

17 As women age, their reproductive cycles stop due to decreased

(1) digestive enzyme production
(2) production of ATP
(3) levels of specific hormones
(4) heart rate

18 The evolutionary pathways of five species are represented in the diagram below.



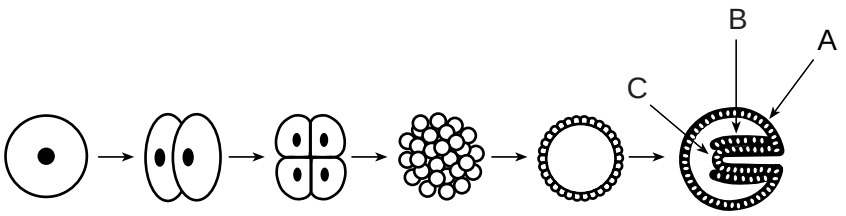
Which statement is supported by the diagram?

(1) Species *C* is the ancestor of species *B*.
(2) Species *D* and *E* evolved from species *B*.
(3) Species *X* evolved later than species *D* but before species *B*.
(4) Both species *C* and species *D* are related to species *X*.

19 Which cell is normally produced as a direct result of meiosis?

(1) a uterine cell having half the normal species number of chromosomes
(2) an egg having the full species number of chromosomes
(3) a zygote having the full species number of chromosomes
(4) a sperm having half the normal species number of chromosomes

20 The diagram and chart below represent some of the changes a zygote undergoes during its development.

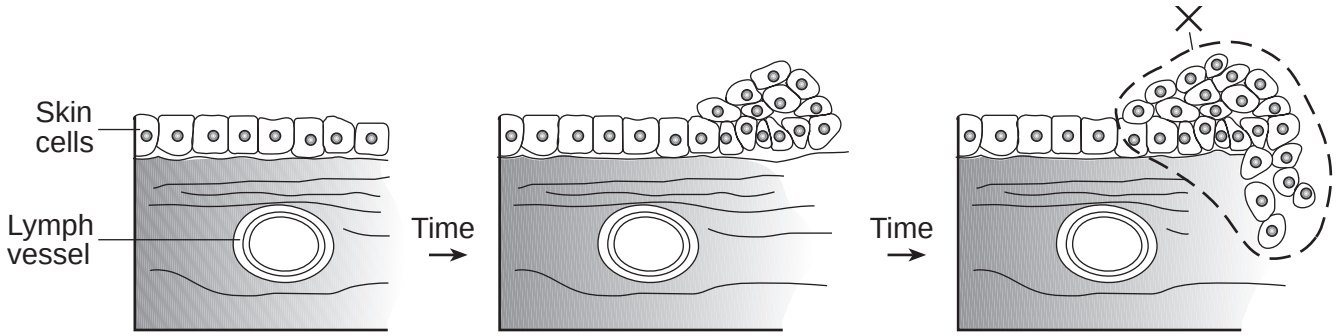


Layer	Develops Into
A	skin and nervous system
B	muscles and blood vessels
C	digestive and respiratory systems

The processes that are most directly responsible for these changes are

(1) sorting and recombination of genetic information
(2) mitosis and differentiation
(3) meiosis and adaptation
(4) fertilization and cycling of materials

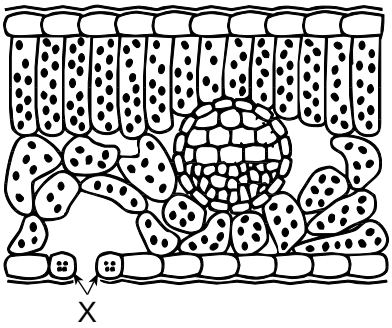
21 The diagram below shows the growth pattern of some skin cells in the human body after they have been exposed to ultraviolet radiation.



The cells in area *X* are most likely

(1) red blood cells
(2) cancer cells
(3) white blood cells
(4) sex cells

22 The diagram below represents a cross section of part of a leaf.



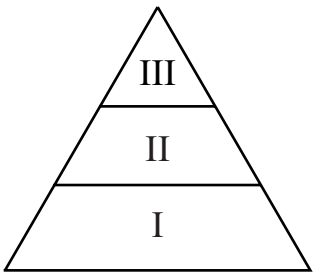
Which life functions are directly regulated through feedback mechanisms associated with the actions of the structures labeled *X*?

(1) excretion and immunity
(2) digestion and coordination
(3) circulation and reproduction
(4) respiration and photosynthesis

23 One irreversible effect of both deforestation and water pollution on the environment is the

(1) extinction of species
(2) thinning of the ozone shield
(3) depletion of atmospheric carbon dioxide levels
(4) increase in renewable resources

24 An energy pyramid containing autotrophs and other organisms from a food chain is represented below.



Carnivores would most likely be located in

(1) level I, only
(2) level I and level II
(3) level III, only
(4) level II and level III

25 Which statement describes a situation that leads to stability within an ecosystem?

(1) Carbon dioxide and water are released only by abiotic sources in the ecosystem.
(2) Interactions between biotic and abiotic components regulate carbon dioxide and water levels.
(3) Animals provide the oxygen used by plants, and plants provide the nitrogen needed by animals.
(4) Organisms provide all the necessary energy for the maintenance of this ecosystem.

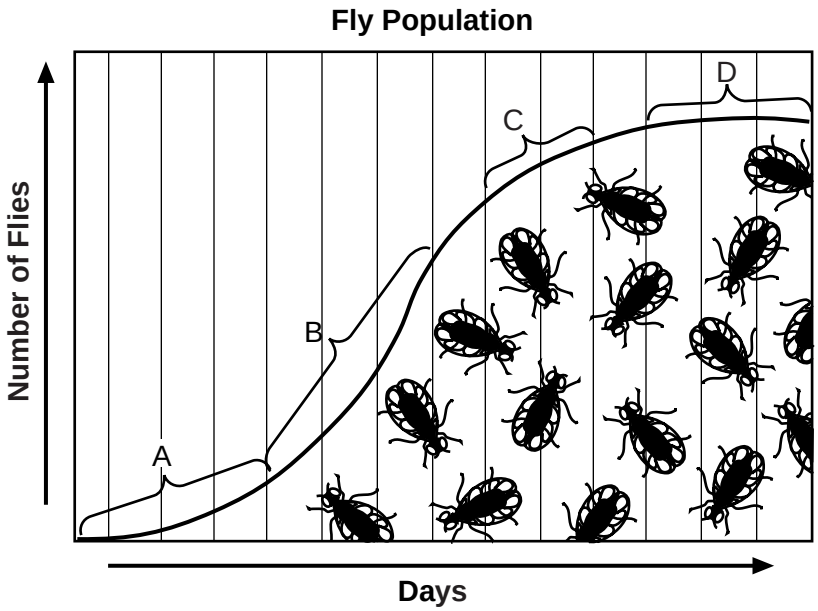
26 Worms that had been invaded by bacteria were eaten by a species of bird. Many of these birds died as a result. The most likely explanation for this is that the

(1) bacteria interfered with normal life functions of the birds
(2) disease that killed the birds was inherited
(3) gene alterations in the bacterial cells killed the birds
(4) birds produced antigens in response to the bacteria

27 Which action illustrates an increased understanding and concern by humans for ecological interrelationships?

(1) importing organisms in order to stabilize existing ecosystems
(2) eliminating pollution standards for industries that promote technology
(3) removing natural resources at a rate equal to the needs of the population
(4) implementing laws to regulate the number of animals hunted and killed each year

28 The graph below represents the growth of a population of flies in a jar.



Which letter indicates the part of the graph that represents the carrying capacity of the environment in the jar?

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

29 One likely reason some experimental automobiles have been developed to use electricity rather than gasoline is that

(1) gasoline is made from petroleum, a nonrenewable resource
(2) Earth has an unlimited supply of fossil fuels
(3) the use of electricity will eliminate the need for all antipollution laws
(4) the use of electricity will increase the manufacture of antipollution devices for cars

30 Ecosystems will have a greater chance of maintaining equilibrium over a long period of time if they have

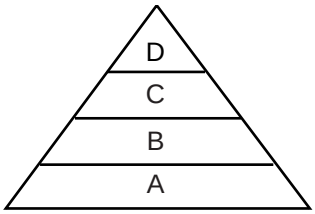
(1) organisms imported by humans from other environments
(2) a sudden change in climate
(3) a diversity of organisms
(4) predators eliminated from the food chains

Part B–1

Answer all questions in this part. [10]

Directions (31–40): For *each* statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

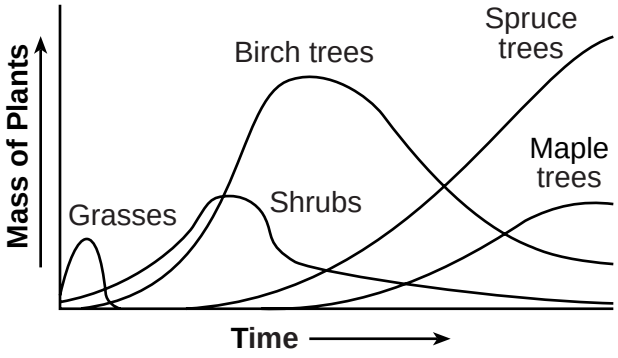
31 The diagram below represents a food pyramid.



The concentration of the pesticide DDT in individual organisms at level *D* is higher than the concentration in individuals at level *A* because DDT is

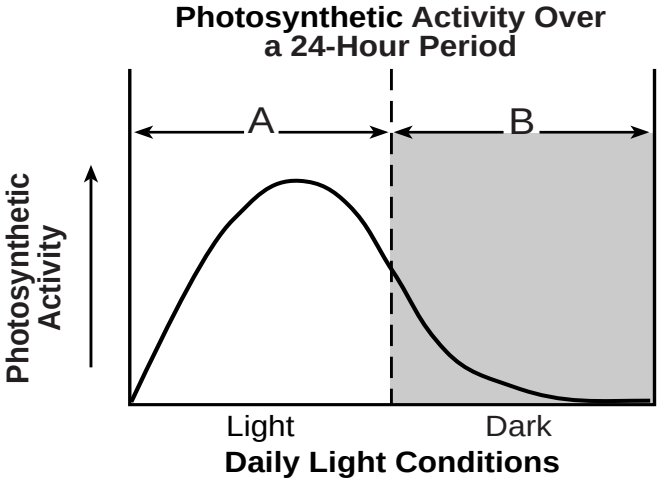
(1) synthesized by organisms at level *D*
(2) excreted by organisms at level *A* as a toxic waste
(3) produced by organisms at level *C* which are eaten by organisms at level *D*
(4) passed through levels *A*, *B*, and *C* to organisms at level *D*

32 Which concept is represented in the graph below?



(1) ecological succession in a community
(2) cycling of carbon and nitrogen in a forest
(3) energy flow in a food chain over time
(4) negative human impact on the environment

33 The graph below shows photosynthetic activity in an ecosystem over a 24-hour period.



Data for a study on respiration in this ecosystem should be collected during

(1) interval *A*, from only the producers in the ecosystem
(2) intervals *A* and *B*, from only the consumers in the ecosystem
(3) intervals *A* and *B*, from both the producers and consumers in the ecosystem
(4) interval *A* only, from abiotic but not biotic components of the ecosystem

Base your answers to questions 34 and 35 on the information and data table below and on your knowledge of biology.

A student studied the location of single-celled photosynthetic organisms in a lake for a period of several weeks. The depth at which these organisms were found at different times of the day varied greatly. Some of the data collected are shown in the table below.

Data Table

Light Conditions at Different Times of the Day	**Average Depth of Photosynthetic Organisms** (cm)
full light	150
moderate light	15
no light	10

34 A valid inference based on these data is that

(1) most photosynthetic organisms live below a depth of 150 centimeters
(2) oxygen production increases as photosynthetic organisms move deeper in the lake
(3) photosynthetic organisms respond to changing light levels
(4) photosynthetic organisms move up and down to increase their rate of carbon dioxide production

35 Which materials would the student most likely have used in this investigation?

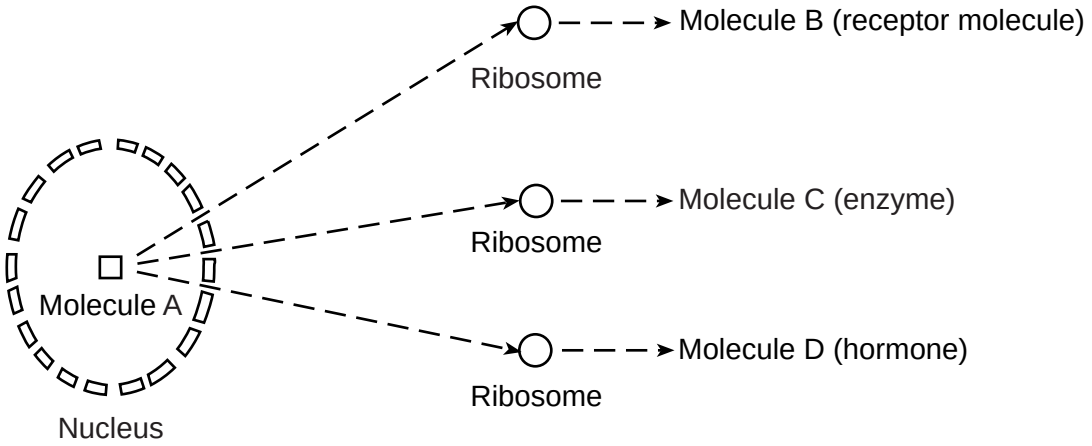
(1) microscope, pipette, and slides with coverslips
(2) graduated cylinder, triple-beam balance, and chromatography paper
(3) thermometer, electric balance, and biological stains
(4) computer, pH paper, and gel electrophoresis apparatus

36 A student prepared a slide of pollen grains from a flower. First the pollen was viewed through the low-power objective lens and then, without moving the slide, viewed through the high-power objective lens of a compound light microscope.

Which statement best describes the relative number and appearance of the pollen grains observed using these two objectives?

(1) low power: 25 small pollen grains
high power: 100 large pollen grains
(2) low power: 100 small pollen grains
high power: 25 large pollen grains
(3) low power: 25 large pollen grains
high power: 100 small pollen grains
(4) low power: 100 large pollen grains
high power: 25 small pollen grains

Base your answers to questions 37 and 38 on the diagram below, which represents a sequence of events in a biological process that occurs within human cells and on your knowledge of biology.



37 Molecule *A* contains the

(1) starch necessary for ribosome synthesis in the cytoplasm
(2) organic substance that is broken down into molecules *B*, *C*, and *D*
(3) proteins that form the ribosome in the cytoplasm
(4) directions for the synthesis of molecules *B*, *C*, and *D*

38 Molecules *B*, *C*, and *D* are similar in that they are usually

(1) composed of genetic information
(2) involved in the synthesis of antibiotics
(3) composed of amino acids
(4) involved in the diffusion of oxygen into the cell

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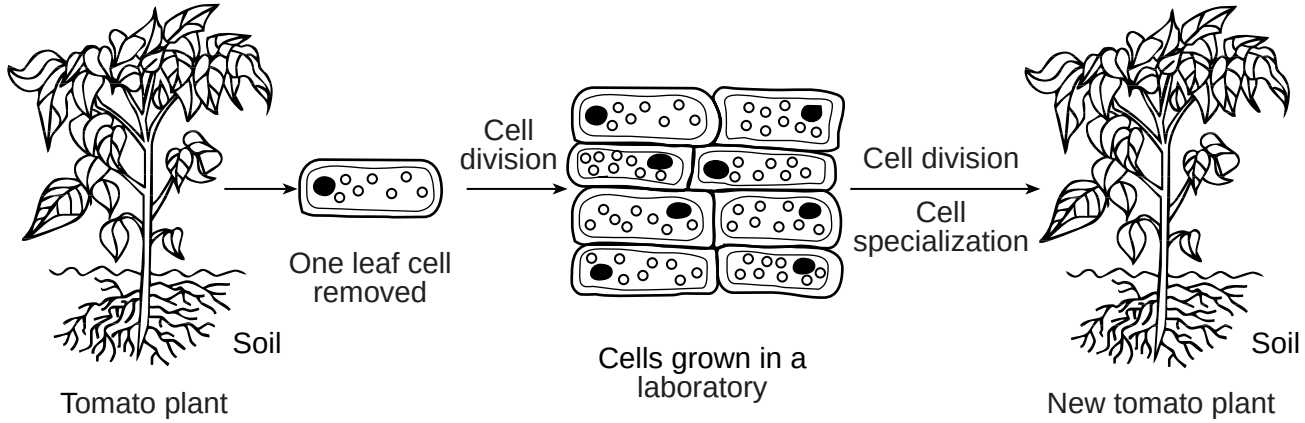
39 A technique used to produce new plants is represented in the diagram below.



Which statement is best supported by the information in the diagram?

(1) The one leaf cell removed formed a zygote that developed into a new plant by mitotic cell division.
(2) This procedure is used to produce new tomato plants that are clones of the original tomato plant.
(3) The cell taken from the leaf produced eight cells, each having one-half of the genetic information of the original leaf cell.
(4) The new tomato plant will not be able to reproduce sexually because it was produced by mitotic cell division.

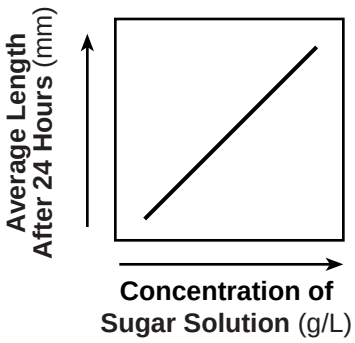
Base your answer to question 40 on the information below and on your knowledge of biology.

Students cut 20 rod-shaped pieces of potato of the same diameter and length. Five pieces of potato were placed into each of four beakers containing different concentrations of sugar solutions. Each potato piece was measured again after 24 hours. The table below shows the results of their experiment.

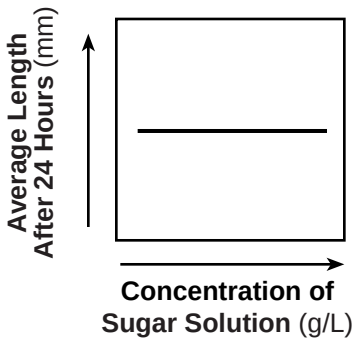
Change in Length

Concentration of Sugar Solution (grams per liter)	**Original Length of Potato Pieces** (mm)	**Average Length After 24 Hours** (mm)
0	50.0	52.0
5	50.0	44.0
8	50.0	43.5
10	50.0	42.5

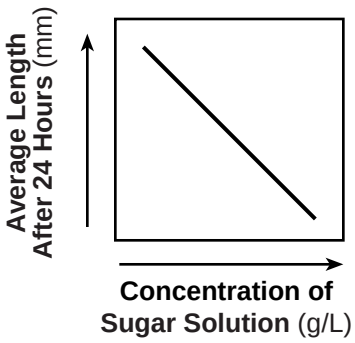
40 Which graph best represents the information in the data table?



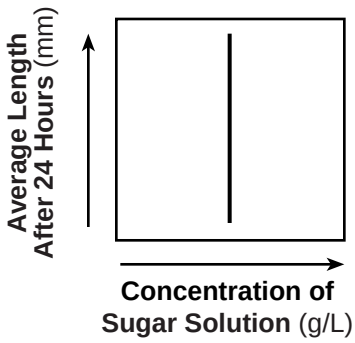
(1)



(3)



(2)



(4)

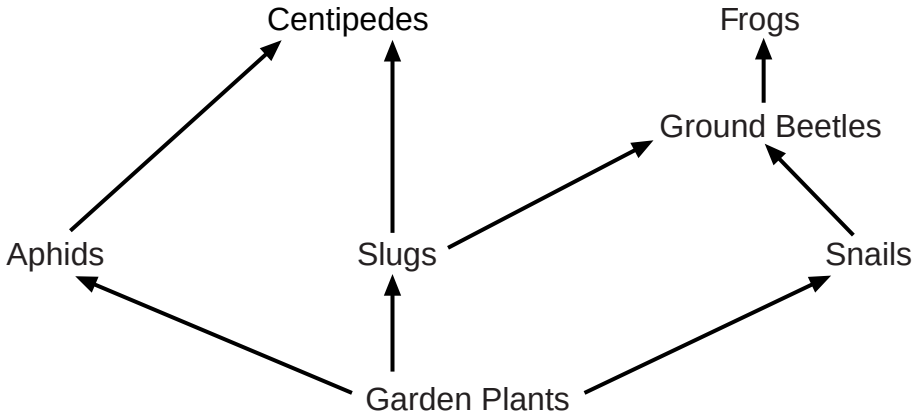
Part B–2

Answer all questions in this part. [15]

Directions (41–54): 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.

For Teacher Use Only

Base your answers to questions 41 through 43 on the information below and on your knowledge of biology



Gardeners sometimes use slug traps to capture and kill slugs. These traps were tested in a garden with a large slug population. Organisms found in the trap after one week are shown in the table below.

Organisms in Trap

Organism	Number in Trap
slugs	8
snails	1
aphids	13
centipedes	1
ground beetles	98

41 How many organisms in the trap were herbivores?

(1) 5

(2) 9

(3) 22

(4) 99

41 ☐

42 State *one* reason the slug traps are *not* the best method to control slugs. [1]

_____

_____

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42 ☐

43 In a process known as biological control, natural predators that prey on plant or animal pests are used to control the populations of the pests. Identify *one* organism shown in this food web that could be used as a biological control to replace the slug traps. [1]

_____

_____

43 ☐

44 Write the structures listed below in order from least complex to most complex. [1]

organ
cell
organism
organelle
tissue

Least complex: _____

_____

_____

_____

Most complex: _____

44 ☐

45 To prevent harm to the fetus, women should avoid tobacco, alcohol, and certain medications during pregnancy. State *one* specific way that *one* of these substances could harm the fetus. [1]

_____

_____

45 ☐

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

For Teacher Use Only

Arsenic and Old Glucocorticoids

Constant exposure to small amounts of arsenic in drinking water has been found to increase the risk of cancer and other diseases. In January of 2001, the EPA (Environmental Protection Agency) lowered the acceptable levels of arsenic in drinking water from 50 ppb (parts per billion) to 10 ppb.

Researchers are now trying to determine how arsenic affects the body. Recent experiments suggest that arsenic may block the activity of hormones. One group of hormones affected by arsenic is glucocorticoids, which are responsible for activating many genes that appear to suppress cancer.

Rat tumor cells were used to determine the effect of arsenic on glucocorticoids. One group of cells was treated with a solution of synthetic glucocorticoid and arsenic, another with a solution of synthetic glucocorticoid and water, and a third group with a solution containing only water. Researchers then measured the activity of one of the genes that is usually activated by glucocorticoids. The genes in the cells treated with the hormone and arsenic mixture and those treated with just water did not become activated. The genes in the cells treated with the hormone and water mixture were activated. Researchers concluded that arsenic blocked the normal activity of the hormone. They are now extending their studies to determine if arsenic acts in a similar manner in other types of cells and in entire organisms.

46 Research suggests that a buildup of arsenic in the cells of humans may be harmful because

(1) synthetic arsenic can be formed by the breakdown of glucocorticoids in the body

(2) arsenic prevents the action of genes that are important in reactions that suppress cancer

(3) arsenic prevents the reaction in which water and hormones bond and attach to cancer cells

(4) glucocorticoids can build up in tissues and cause an increase in the absorption of arsenic

46 ☐

47 State *one* reason this study should be extended to other cells or to other complex organisms. [1]

_____

_____

47 ☐

48 Identify *one* specific hormone in the body, other than glucocorticoid. Explain how disruption of the activity of the hormone you identified might upset a feedback mechanism in the body. [2]

For Teacher Use Only

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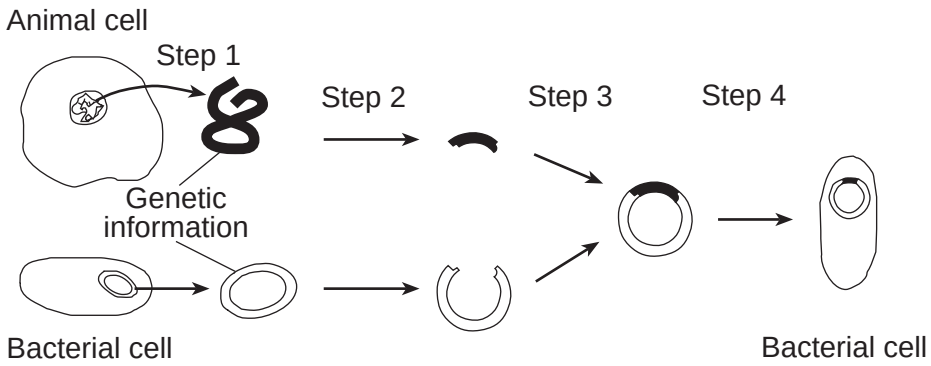
_____

_____ 48 ☐

Base your answers to questions 49 and 50 on the diagram below, which illustrates some steps in genetic engineering and on your knowledge of biology.



49 What is the result of step 3?

(1) a new type of molecular base is formed

(2) different types of minerals are joined together

(3) DNA from the bacterial cell is cloned

(4) DNA from different organisms is joined together 49 ☐

50 State *one* way that enzymes are used in step 2. [1]

_____

_____ 50 ☐

Base your answers to questions 51 through 54 on the information and data table below and on your knowledge of biology.

For Teacher Use Only

Tooth decay occurs when bacteria living in the mouth produce an acid that dissolves tooth enamel (the outer, protective covering of a tooth).

The Effect of Sugar Intake on Tooth Decay

World Regions	**Average Sugar Intake per Person** (kg/year)	**Average Number of Teeth with Decay per Person**
Americas	40	3.0
Africa	18	1.7
Southeast Asia	14	1.6
Europe	36	2.6

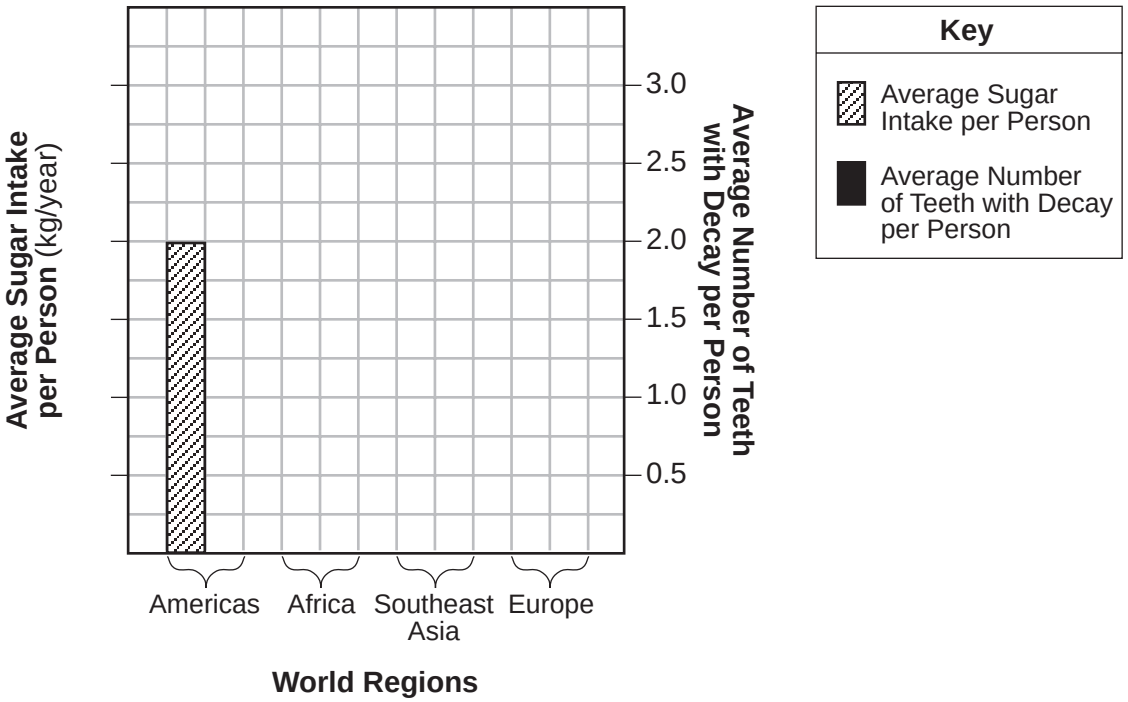
Directions (51–53): Using the information in the data table, construct a bar graph on the grid on page 17, following the directions below.

51 Mark an appropriate scale on the axis labeled "Average Sugar Intake per Person." [1]

52 Construct vertical bars in the bracketed area for each world region to represent the "Average Sugar Intake per Person." Place the bars on the left side of each bracketed region and shade the bars as shown below. (The bar for Americas has been done for you.) [1]

53 Construct vertical bars in the bracketed area for each world region to represent the "Average Number of Teeth with Decay per Person." Place the bars on the right side of each bracketed region and shade in each bar as shown below. [1]

Effect of Sugar Intake on Tooth Decay



54 Which statement is a valid conclusion regarding tooth decay?

(1) As sugar intake increases, the acidity in the mouth decreases, reducing tooth decay.

(2) As sugar intake increases, tooth decay increases in Europe and the Americas, but not in Africa and Southeast Asia.

(3) The greater the sugar intake, the greater the average number of decayed teeth.

(4) The greater the sugar intake, the faster a tooth decays.

For Teacher Use Only

51 ☐

52 ☐

53 ☐

54 ☐

Part C

Answer all questions in this part. [17]

Directions (55–62): Record your answers in the spaces provided in this examination booklet.

For Teacher Use Only

Base your answer to question 55 on the information below and on your knowledge of biology.

> Until the middle of the 20th century, transplanting complex organs, such as kidneys, was rarely successful. The first transplant recipients did not survive. It was not until 1954 that the first successful kidney transplant was performed. Success with transplants increased as research scientists developed techniques such as tissue typing and the use of immunosuppressant drugs. These are drugs that suppress the immune system to prevent the rejection of a transplanted organ. In 2002, there were nearly 15,000 kidney transplants performed in the United States with a greater than 95% success rate.

55 Describe the relationship of the immune system to organ transplants and the use of immunosuppressant drugs to prevent the rejection of a transplanted organ. In your answer be sure to:

- state *one* way the immune system is involved in the rejection of transplanted organs [1]
- explain why the best source for a donated kidney would be the identical twin of the recipient [1]
- explain why immunosuppressant drugs might be needed to prevent rejection of a kidney received from a donor other than an identical twin [1]
- state *one* reason a person may get sick more easily when taking an immunosuppressant drug [1]

55

Base your answers to questions 56 through 58 on the information below and on your knowledge of biology.

For Teacher Use Only

A population of gray squirrels lived in the trees surrounding four houses in a city. The houses and trees were removed, and a tall office building was constructed in their place. Some of the squirrels were able to survive by relocating to the trees in a park nearby.

56 State *one* specific way the relocated squirrels would most likely interact with a gray squirrel population that has lived in the park for many years. [1]

_____

_____ 56 ☐

57 State *one* specific way the relocated squirrels will change an abiotic factor in the park ecosystem. [1]

_____

_____ 57 ☐

58 State *one* specific natural factor in the park ecosystem that will limit the growth of the squirrel population and support your answer. [1]

_____

_____ 58 ☐

59 An individual has placed an editorial in the community newspaper stating that the local recycling program should be discontinued. Respond to this editorial by explaining the importance of the local recycling program for the environment. In your explanation be sure to:

- state *one* effect the increasing human population will have on the availability of natural resources [1]
- state *one* reason why recycling is important [1]
- identify *two* natural resources or products made from natural resources that can be recycled [2]

For Teacher Use Only

59 ☐

60 An insect pest known as the medfly significantly reduced the orange crop in California. Pesticides were used to control the medfly. Using the concept of natural selection, explain how the continued use of a certain pesticide may become ineffective in controlling this fly. Your answer must include the concepts of:

- variation [1]
- adaptive value of a variation (adaptation) [1]
- survival [1]
- reproduction [1]

For Teacher Use Only

60 ☐

Base your answers to questions 61 and 62 on the passage below and on your knowledge of biology.

For Teacher Use Only

> Human activities have had a major impact on biodiversity. Scientists cannot solve this problem alone. Concerned individuals need to be involved in restoring and maintaining biodiversity.

61 Explain how a loss of biodiversity today can affect the survival of humans in the future. [1]

_____

_____

_____ 61 ☐

62 State *one* specific action that you as a student can take in your community to help maintain or increase biodiversity. [1]

_____

_____ 62 ☐

_____

Part D

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, 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.

For Teacher Use Only

63 The data in the table below were collected during a reaction-time experiment conducted in five biology classes. Average reaction times for each class were determined first at room temperature and then after cooling each student's hand in cold water for two minutes.

Average Reaction Times to Grab a Falling Ruler

Class	At Room Temperature (seconds)	After Cooling (seconds)
1	.42	.48
2	.36	.41
3	.35	.47
4	.43	.58
5	.44	.47
Averages	.40	.48

Which statement is best supported by the data?

(1) Cooling the hand increases the reaction time.

(2) Cooling the hand does not affect the reaction time.

(3) Cooling the hand affects only some subjects.

(4) Two minutes of cooling is not enough to affect reaction time.

63 ☐

64 A student hypothesized that the pulse rate in humans would increase 1 hour after eating a meal. Pulse rates were obtained from nine classmates 1 hour after eating lunch. The data in beats per minute were recorded as: 60, 64, 56, 68, 72, 76, 72, 80, and 68. State *one* error in this experiment. [1]

_____

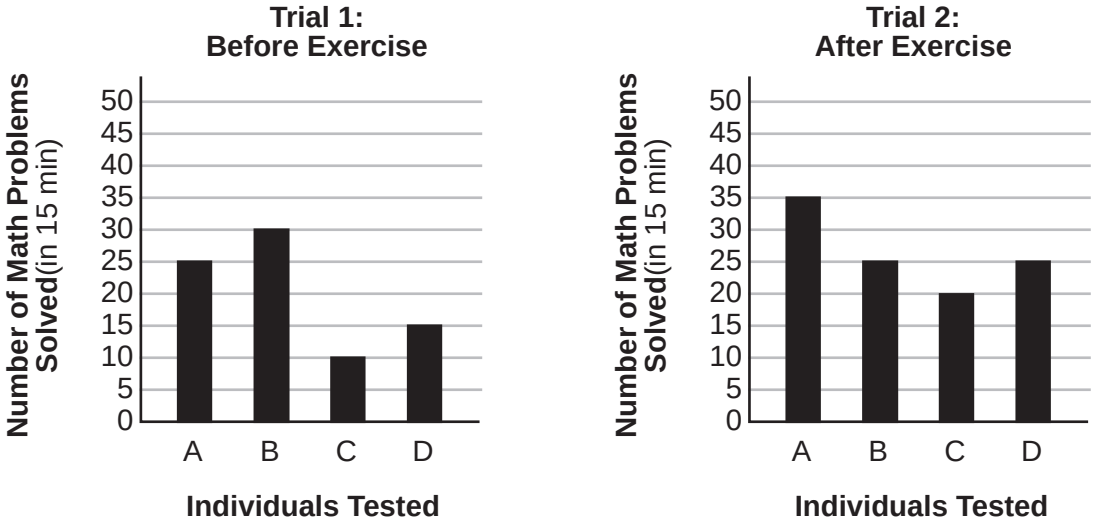
_____

64 ☐

Base your answers to questions 65 and 66 on the information below and on your knowledge of biology.

For Teacher Use Only

A student read a magazine article that claimed people who exercise for 30 minutes are able to solve more math problems than if they had not exercised. The student convinced four of his friends to test this claim. First, he gave them 15 minutes to do 50 math problems. The number each person solved is shown in the trial 1 graph. Next, all four of the students exercised for 30 minutes. At the end of the 30 minutes, they were given another 50 math problems of equal difficulty for the same amount of time. The number of math problems each student solved is shown in the trial 2 graph.



65 Explain why exercise could influence the ability of a student to solve math problems. [1]

_____

_____

65 ☐

66 State whether or not exercising for 30 minutes improved the ability of students to solve math problems. Support your answer using data from the graphs. [1]

_____

_____

66 ☐

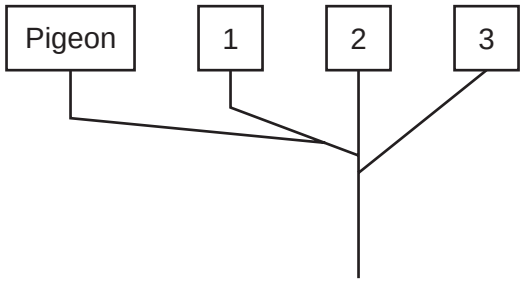
Base your answer to question 67 on the information and data table below and on your knowledge of biology.

For Teacher Use Only

Body Structures and Reproductive Characteristics of Four Organisms

Organism	Body Structures	Reproductive Characteristics
pigeon	feathers, scales 2 wings, 2 legs	lays eggs
A	scales 4 legs	lays eggs
B	fur 2 leathery wings, 2 legs	gives birth to live young provides milk for offspring
C	fur 4 legs	lays eggs provides milk for offspring

67 Explain why it would be difficult to determine which one of the other three organisms from the table should be placed in box 1. [1]



Evolutionary Tree

_____

_____

_____

67 ☐

68 If frog eggs taken from a freshwater pond are placed in a saltwater aquarium, what will most likely happen?

(1) Water will leave the eggs.

(2) Salt will leave the eggs.

(3) Water will neither enter nor leave the eggs.

(4) The eggs will burst.

68 ☐

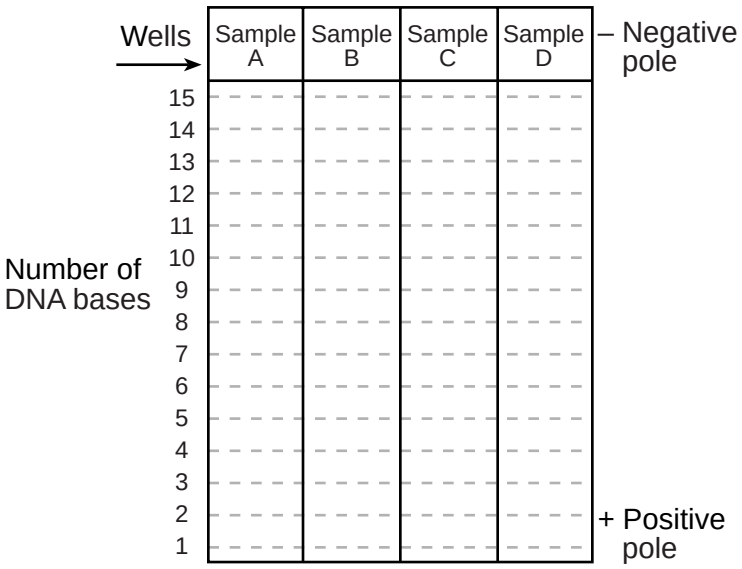
Base your answers to questions 69 through 71 on the information below and on your knowledge of biology.

In an investigation, DNA samples from four organisms, *A*, *B*, *C*, and *D*, were cut into fragments. The number of bases in the resulting DNA fragments for each sample is shown below.

Data Table

Sample	Number of Bases in DNA Fragments
A	3, 9, 5, 14
B	8, 4, 12, 10
C	11, 7, 6, 8
D	4, 12, 8, 11

69 The diagram below represents the gel-like material through which the DNA fragments moved during gel electrophoresis. Draw lines to represent the position of the fragments from each DNA sample when electrophoresis is completed. [1]



69 ☐

70 Which *two* DNA samples are the most similar? Support your answer using data from this investigation. [1]

Samples _____ and _____

_____

_____

70 ☐

For Teacher Use Only

71 State *one* specific use for the information obtained from the results of gel electrophoresis. [1]

For Teacher Use Only

_____

_____ 71 ☐

Base your answers to questions 72 through 74 on the information below and on your knowledge of biology.

> In the *Beaks of Finches* laboratory activity, students were each assigned a tool to use to pick up seeds. In round one, students acting as birds used their assigned tools to pick up small seeds from their own large dishes (the environment) and place them in smaller dishes (their stomachs). The seeds collected by each student were counted. Some students were able to collect many seeds, while others collected just a few.
>
> In round two, students again used their assigned tools to collect seeds. This time several students were picking up seeds from the same dish of seeds.

72 Explain how this laboratory activity illustrates the process of natural selection. [1]

_____

_____ 72 ☐

73 One factor that influences the evolution of a species that was *not* part of this laboratory activity is

(1) struggle for survival

(2) variation

(3) competition

(4) overproduction 73 ☐

74 Identify *one* trait, other than beak characteristics, that could contribute to the ability of a finch to feed successfully. [1]

_____ 74 ☐

75 A student fills a dialysis membrane bag with a mixture of red dye, yellow dye, and water. He soaks the bag in pure water for 24 hours and then observes that the water outside the bag turns yellow. Which statement best explains the results of this experiment?

(1) Water diffused into the membrane bag.

(2) The dialysis membrane actively transported yellow dye molecules.

(3) Only red dye diffused through the membrane.

(4) The yellow dye molecules are smaller than the red dye molecules.

For Teacher Use Only

75 ☐

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, August 16, 2007 — 12:30 to 3:30 p.m., only

ANSWER SHEET

Student ..... Sex: ☐ Female ☐ Male

Teacher .....

School ..... Grade .....

Part	Maximum Score	Student's Score
A	30	
B–1	10	
B–2	15	
C	17	
D	13	

Total Raw Score (maximum Raw Score: 85) ☐

Final Score (from conversion chart) ☐

Raters' Initials

Rater 1 ..... Rater 2 .....

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

Part A

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

Part A Score ☐

Part B–1

31	36 .....
32	37 .....
33	38 .....
34	39 .....
35	40 .....

Part B–1 Score ☐

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

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

Signature

Tear Here

FOR TEACHERS ONLY

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

LE

LIVING ENVIRONMENT

Thursday, August 16, 2007 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site http://www.emsc.nysed.gov/osa/ and select the link "Examination Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents examination period.

Part A and Part B–1
Allow 1 credit for each correct response.

Part A

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

Part B–1

31 . . . . . **4**	36 . . . . . **2**
32 . . . . . **1**	37 . . . . . **4**
33 . . . . . **3**	38 . . . . . **3**
34 . . . . . **3**	39 . . . . . **2**
35 . . . . . **1**	40 . . . . . **2**

Follow the procedures below for scoring student answer papers for the Regents Examination in Living Environment. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the student's work by making insertions or changes of any kind.

Allow 1 credit for each correct response for multiple-choice questions.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a checkmark each incorrect or omitted answer to multiple-choice questions. In the box provided in the upper right corner of the answer sheet, record the number of questions the student answered correctly for each of these parts.

At least two science teachers must participate in the scoring of the Part B–2, Part C, and Part D open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score all the open-ended questions on a student's answer paper.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. In the student's examination booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, Part C, and Part D on the appropriate lines in the box printed on the answer sheet and should add these five scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, August 16, 2007. The student's scaled score should be entered in the box labeled "Final Score" on the student's answer sheet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Part B–2

41 3

42 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Many other organisms are caught in the slug traps.
— Traps kill off natural predators of slugs.
— may disrupt food web

43 [1] Allow 1 credit for centipedes *or* ground beetles.

44 [1] Allow 1 credit for indicating that the increasing order of complexity is:

organelle
cell
tissue
organ
organism

45 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— interfere with development
— cause low birth weight
— cause death of the fetus
— cause Fetal Alcohol Syndrome

Note: Responses that simply state that the fetus could be hurt or harmed are *not* acceptable.

46 2

47 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The reactions in rat cells could be different from those in other organisms.
— to increase validity
— The results of the experiment indicate only what happens in cells outside the organism.

48 [2] Allow a maximum of 2 credits, 1 for naming a specific hormone and 1 for explaining how disruption of the activity of that hormone might upset a feedback mechanism in the body. Acceptable responses include, but are not limited to:

— insulin—prevent regulation of glucose levels in blood
— estrogen (or testosterone)—interfere with messages for development of sex characteristics

49 4

50 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

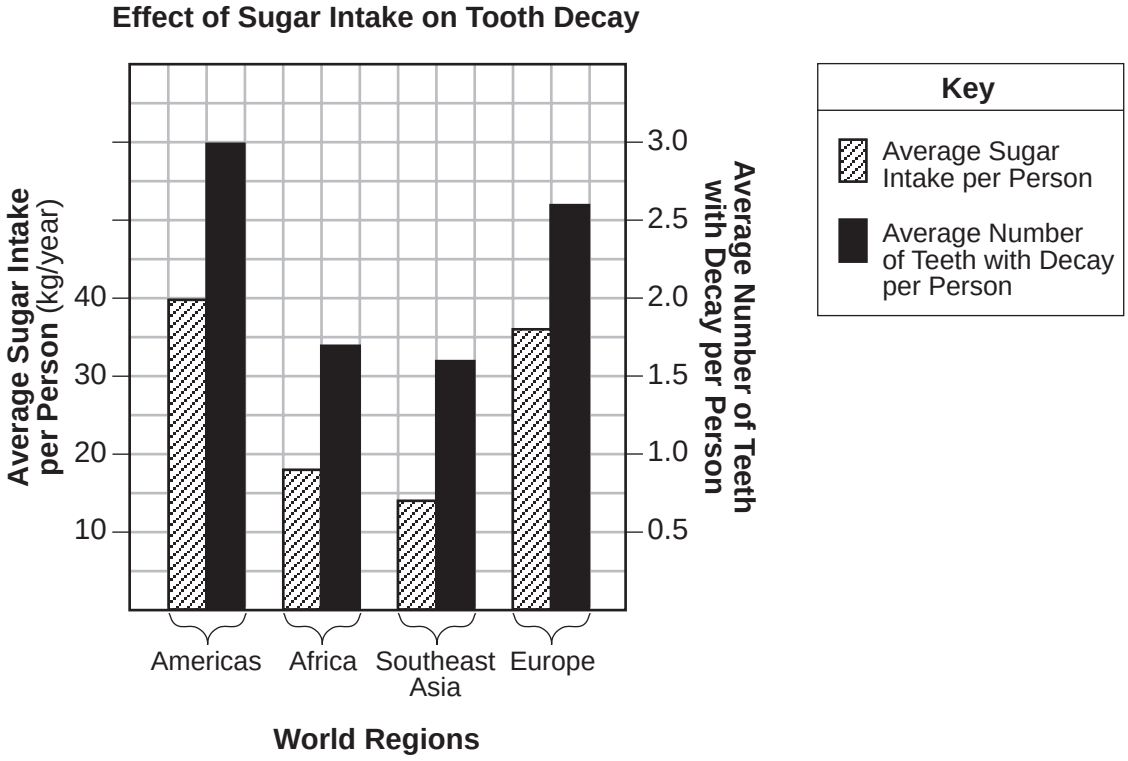
— Enzymes are used to cut the DNA.
— to cut the genetic material

51 [1] Allow 1 credit for marking an appropriate scale.

52 [1] Allow 1 credit for constructing vertical bars to represent the "Average Sugar Intake per Person" and shading the bars according to the key.

53 [1] Allow 1 credit for constructing vertical bars to represent the "Average Number of Teeth With Decay per Person" and shading the bars according to the key.

Example of a 3-credit response for questions 51 through 53:



Note: Do *not* penalize the student more than once for shading the bars incorrectly.

54 3

Part C

55 [4] Allow a maximum of 4 credits, allocated as follows:

- Allow 1 credit for stating *one* way the immune system is involved in the rejection of transplanted organs. Acceptable responses include, but are not limited to:

  — The immune system will reject the organ by producing antibodies.
  — Antibodies will cause the organ to be rejected by the recipient.
  — The immune system recognizes the organ as foreign and attacks it.

- Allow 1 credit for explaining why the best source for a donated kidney would be the identical twin of the recipient. Acceptable responses include, but are not limited to:

  — The identical twin of the recipient has the same genetic makeup as the recipient.
  — Identical twins have the same DNA.
  — The recipient will not reject the donated kidney.
  — Twins have the same proteins.
  — The immune system doesn't recognize the kidney as foreign tissue and will not respond by producing antibodies.

- Allow 1 credit for explaining why immunosuppressant drugs might be needed to prevent rejection of a kidney received from a donor other than an identical twin. Acceptable responses include, but are not limited to:

  — to stop the immune system from attacking the donated organ
  — The drugs will block the production of antibodies.
  — The donated kidney has different proteins.

- Allow 1 credit for stating *one* reason a person may get sick more easily when taking an immunosuppressant drug. Acceptable responses include, but are not limited to:

  — Immunosuppressant drugs may depress the immune system and make the recipient more susceptible to disease.
  — weakens the immune system

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Relocated squirrels compete with park squirrels for food *or* space *or* mates.
— Relocated squirrels can mate with park squirrels.

57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The soil will be enriched by added wastes.
— Relocated squirrels will use water.
— Relocated squirrels will take up space.

58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Predators will eat the squirrels.
— Competition with other gray squirrels will keep the population from increasing.
— spread of disease because of denser population

59 [4] Allow a maximum of 4 credits, allocated as follows:

- Allow 1 credit for stating *one* effect the increasing human population will have on the availability of natural resources. Acceptable responses include, but are not limited to:

  — More people use more natural resources and they begin to run out.

- Allow 1 credit for stating *one* reason why recycling is important. Acceptable responses include, but are not limited to:

  — Fewer wastes will accumulate in landfills.
  — Recycling keeps certain natural resources available for use by organisms.
  — Resources will last longer.

- Allow a maximum of 2 credits, 1 credit for each of *two* natural resources or products made from natural resources that can be recycled. Acceptable responses include, but are not limited to:

  — water
  — wood/paper
  — soil
  — glass
  — cans
  — plastic

60 [4] Allow a maximum of 4 credits. Acceptable responses include, but are not limited to:

Example of a 4-credit response:

Some medflies have a variation that provides resistance to pesticide. When the pesticide is present, those flies with the favorable variation will survive to reproduce and pass the variation to offspring. A variety of medfly resistant to the pesticide will result.

61 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— A loss of biodiversity can result in a shortage of food.
— lack of materials for building *or* medicine *or* research

62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— plant trees
— preserve habitats
— recycle
— do not import foreign species
— work to reduce pollution

Part D

63 1

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— did not obtain pulse rates before lunch
— sample size too small
— no control group

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The blood will bring more oxygen to the brain.
— Increased blood flow will remove wastes from the brain.
— Increased blood flow brings more glucose (food molecules) to the brain.

66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Yes, because three of the four students solved more problems after exercise.
— No, because one student did fewer problems.
— cannot tell because there are only results from four students
— cannot tell because there are no data for a separate control group

Note: Answers must include a reference to data.

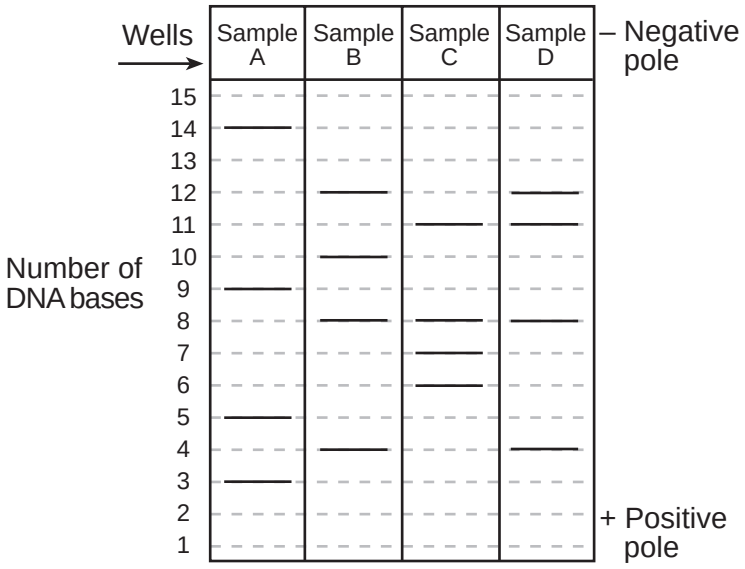
67 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The pigeon shares characteristics with all of the other organisms.
— Organisms *A* and *C* also lay eggs.

68 1

69 [1] Allow 1 credit for drawing lines to represent the final positions.

Example of a 1-credit response:



70 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— *B* and *D* because they have the most fragments in common

Note: Allow credit for a response that is consistent with the student's response to question 69.

71 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— determine identity of criminal
— determine parents of a child
— determine identity of a crime victim
— determine evolutionary relationships

72 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The tools represent types of beaks, some of which are more successful for gathering seeds and so are more favorable for survival.
— Students with favorable "beaks" survived.

73 4

74 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— strength
— vision
— coordination

75 4

The *Chart for Determining the Final Examination Score for the August 2007 Regents Examination in Living Environment* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, August 16, 2007. Conversion charts provided for previous administrations of the Regents Examination in Living Environment must NOT be used to determine students' final scores for this administration.

On-line Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an on-line evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to www.emsc.nysed.gov/osa/exameval/.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

August 2007 Living Environment

Standards	Question Numbers			
	Part A 1–30	**Part B–1 31–40**	**Part B–2 41–54**	**Part C 55–62**
Standard 1 — Analysis, Inquiry and Design				
Key Idea 1	2		54	
Key Idea 2		35		
Key Idea 3		40	51,52,53	
Appendix A (Laboratory Checklist)		36		
Standard 4				
Key Idea 1	1,3,5,7		43,44,46,47	56,57,58
Key Idea 2	8,9,10,11,12	37,38	49,50	
Key Idea 3	13,14,15,18			60
Key Idea 4	6,17,19,20	39	45	
Key Idea 5	4,16,21,22,26	33,34	48	55
Key Idea 6	24,25,28,30	31,32	41	61
Key Idea 7	23,27,29		42	59,62

Part D 63–75	
Lab 1	67,69,70,71
Lab 2	63,64,65,66
Lab 3	72,73,74
Lab 5	68,75

University of the State of New York
State Education Department

Regents Examination in Living Environment
August 2007

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scaled Scores)

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	56	77	27	51
84	98	55	76	26	49
83	97	54	75	25	48
82	96	53	75	24	47
81	95	52	74	23	46
80	94	51	73	22	44
79	93	50	73	21	43
78	93	49	72	20	41
77	92	48	71	19	40
76	91	47	70	18	38
75	90	46	70	17	37
74	89	45	69	16	35
73	89	44	68	15	33
72	88	43	67	14	32
71	87	42	66	13	30
70	86	41	65	12	28
69	86	40	64	11	26
68	85	39	64	10	24
67	84	38	63	9	22
66	84	37	62	8	20
65	83	36	61	7	18
64	82	35	60	6	15
63	81	34	59	5	13
62	81	33	58	4	11
61	80	32	56	3	8
60	80	31	55	2	6
59	79	30	54	1	3
58	78	29	53	0	0
57	77	28	52		

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scaled score that corresponds to that raw score. The scaled score is the student's final examination score. Enter this score in the space labeled "Final Score" on the student's answer sheet.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart change from one examination to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Living Environment Examination.