

LIVING ENVIRONMENT

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

LIVING ENVIRONMENT

Friday, January 25, 2008 — 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 The transfer of genes from parents to their offspring is known as

- (1) differentiation
- (2) heredity
- (3) immunity
- (4) evolution

2 Damage to which structure will most directly disrupt water balance within a single-celled organism?

- (1) ribosome
- (2) cell membrane
- (3) nucleus
- (4) chloroplast

3 Two primary agents of cellular communication are

- (1) chemicals made by blood cells and simple sugars
- (2) hormones and carbohydrates
- (3) enzymes and starches
- (4) hormones and chemicals made by nerve cells

4 The function of most proteins depends primarily on the

- (1) type and order of amino acids
- (2) environment of the organism
- (3) availability of starch molecules
- (4) nutritional habits of the organism

5 Which procedure would most likely provide valid results in a test to determine if drug A would be effective in treating cancer in white mice?

- (1) injecting 1 mL of drug A into 100 white mice with cancer
- (2) injecting 1 mL of drug A into 100 white mice with cancer and 0.5 mL of drug X into 100 white mice without cancer
- (3) injecting 1 mL of drug A into 100 white mice with cancer and 0.5 mL of drug X into another group of 100 white mice with cancer
- (4) injecting 1 mL of drug A into 100 white mice with cancer and 1 mL of distilled water into another group of 100 white mice with cancer

6 The table below provides some information concerning organelles and organs.

Function	Organelle	Organ
gas exchange	cell membrane	lung
nutrition	food vacuole	stomach

Based on this information, which statement accurately compares organelles to organs?

- (1) Functions are carried out more efficiently by organs than by organelles.
- (2) Organs maintain homeostasis while organelles do not.
- (3) Organelles carry out functions similar to those of organs.
- (4) Organelles function in multicellular organisms while organs function in single-celled organisms.

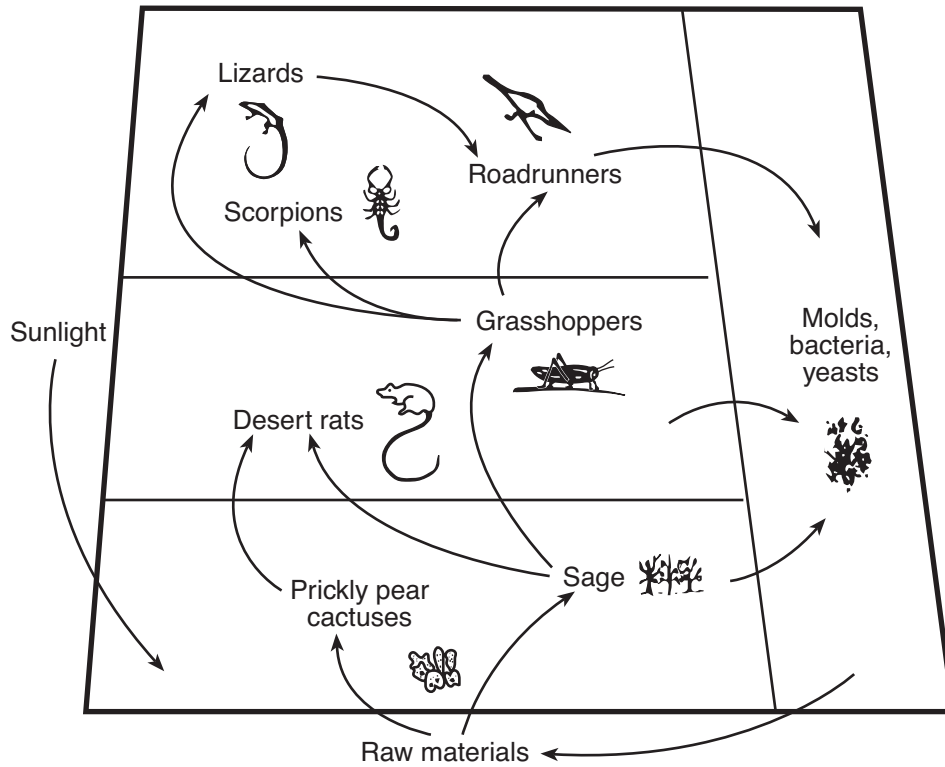
7 In order to produce the first white marigold flower, growers began with the lightest yellow-flowered marigold plants. After crossing them, these plants produced seeds, which were planted, and only the offspring with very light-yellow flowers were used to produce the next generation. Repeating this process over many years, growers finally produced a marigold flower that is considered the first white variety of its species. This procedure is known as

- (1) differentiation
- (2) cloning
- (3) gene insertion
- (4) selective breeding

8 Chromosomes can be described as

- (1) large molecules that have only one function
- (2) folded chains of bonded glucose molecules
- (3) reproductive cells composed of molecular bases
- (4) coiled strands of genetic material

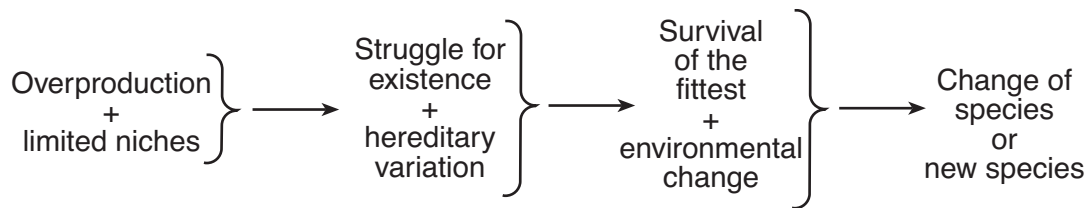
9 Some interactions in a desert community are shown in the diagram below.



Which statement is a valid inference based on the diagram?

- (1) Certain organisms may compete for vital resources.
- (2) All these organisms rely on energy from decomposers.
- (3) Organisms synthesize energy.
- (4) All organisms occupy the same niche.

10 Which concept is best illustrated in the flowchart below?



- (1) natural selection
- (2) genetic manipulation
- (3) dynamic equilibrium
- (4) material cycles

11 The headline “Improved Soybeans Produce Healthier Vegetable Oils” accompanies an article describing how a biotechnology company controls the types of lipids (fats) present in soybeans. The improved soybeans are most likely being developed by the process of

- (1) natural selection
- (2) asexual reproduction
- (3) genetic engineering
- (4) habitat modification

12 Which statement indicates one difference between the gene that codes for insulin and the gene that codes for testosterone in humans?

- (1) The gene for insulin is replicated in vacuoles, while the gene for testosterone is replicated in mitochondria.
- (2) The gene for insulin has a different sequence of molecular bases than the gene for testosterone.
- (3) The gene for insulin is turned on in liver cells, but the gene for testosterone is not.
- (4) The gene for insulin is a sequence of five different molecular bases while the gene for testosterone is a sequence of only four different molecular bases.

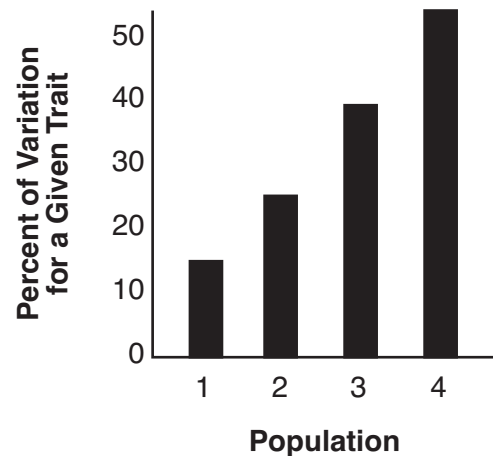
13 Cells that develop from a single zygote all contain identical DNA molecules. However, some of these cells will develop differently because

- (1) different groups of cells containing the DNA may be exposed to different environmental conditions
- (2) only the DNA in certain cells will replicate
- (3) some of the DNA in some of the cells will be removed by chemical reactions
- (4) DNA is functional in only 10% of the cells of the body

14 Which sequence represents the correct order of processes that result in the formation and development of an embryo?

- (1) meiosis → fertilization → mitosis
- (2) mitosis → fertilization → meiosis
- (3) fertilization → meiosis → mitosis
- (4) fertilization → mitosis → meiosis

15 The graph below shows the percent of variation for a given trait in four different populations of the same species. The populations inhabit similar environments.



In which population will the greatest number of individuals most likely survive if a significant environmental change related to this trait occurs?

- (1) 1
- (2) 2
- (3) 3
- (4) 4

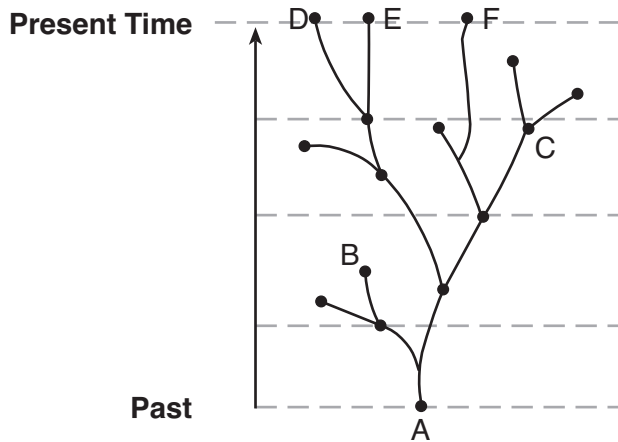
16 The sequence of events occurring in the life cycle of a bacterium is listed below.

- (A) The bacterium copies its single chromosome.
- (B) The copies of the chromosome attach to the cell membrane of the bacterium.
- (C) As the cell grows, the two copies of the chromosome separate.
- (D) The cell is separated by a wall into equal halves.
- (E) Each new cell has one copy of the chromosome.

This sequence most closely resembles the process of

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

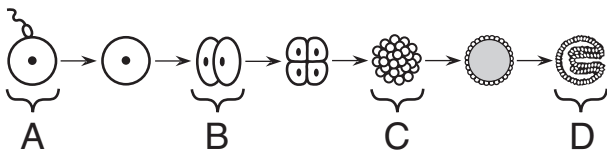
17 The diagram below illustrates possible evolutionary pathways of some species.



Which statement is a valid inference based on the information in the diagram?

- (1) Species *A* is the common ancestor of all life on Earth.
- (2) Species *D* is more closely related to species *E* than to species *F*.
- (3) Species *B* is the ancestor of species *F*.
- (4) Species *C* is the ancestor of species that exist at the present time.

18 The diagram below represents stages in the processes of reproduction and development in an animal.



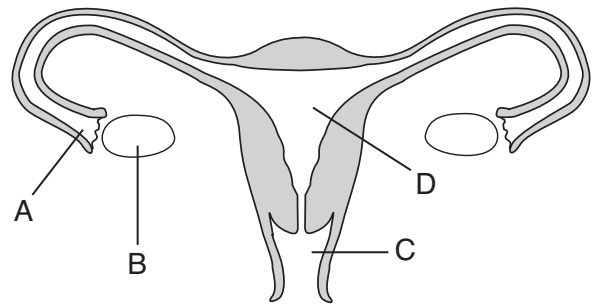
Cells containing only half of the genetic information characteristic of this species are found at

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

19 Which hormones most directly influence the uterus during pregnancy?

- (1) testosterone and insulin
- (2) progesterone and testosterone
- (3) estrogen and insulin
- (4) progesterone and estrogen

20 The diagram below represents the human female reproductive system.



Exposure to radiation or certain chemicals could alter the genetic information in the gametes that form in structure

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

21 All life depends on the availability of usable energy. This energy is released when

- (1) organisms convert solar energy into the chemical energy found in food molecules
- (2) respiration occurs in the cells of producers and high-energy molecules enter the atmosphere
- (3) cells carry out the process of respiration
- (4) animal cells synthesize starch and carbon dioxide

22 The sweet taste of freshly picked corn is due to the high sugar content in the kernels. Enzyme action converts about 50% of the sugar to starch within one day after picking. To preserve its sweetness, the freshly picked corn is immersed in boiling water for a few minutes, and then cooled.

Which statement most likely explains why the boiled corn kernels remain sweet?

- (1) Boiling destroys sugar molecules so they cannot be converted to starch.
- (2) Boiling kills a fungus on the corn that is needed to convert sugar to starch.
- (3) Boiling activates the enzyme that converts amino acids to sugar.
- (4) Boiling deactivates the enzyme responsible for converting sugar to starch.

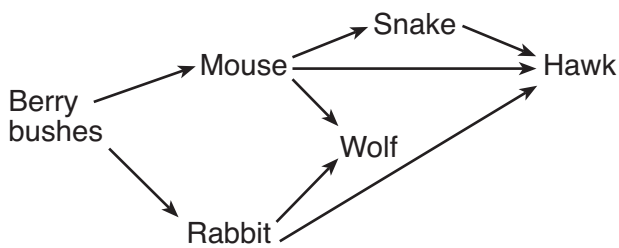
23 One biotic factor that affects consumers in an ocean ecosystem is

- (1) number of autotrophs
- (2) temperature variation
- (3) salt content
- (4) pH of water

24 Which component of a stable ecosystem can *not* be recycled?

- (1) oxygen
- (2) water
- (3) energy
- (4) nitrogen

25 A food web is represented in the diagram below.



Which population in this food web would most likely be *negatively* affected by an increase in the mouse population?

- (1) snake
- (2) rabbit
- (3) wolf
- (4) hawk

26 Years after the lava from an erupting volcano destroyed an area, grasses started to grow in that area. The grasses were gradually replaced by shrubs, evergreen trees, and finally, by a forest that remained for several hundred years. This entire process is an example of

- (1) feedback
- (2) ecological succession
- (3) plant preservation
- (4) deforestation

27 Increased industrialization will most likely

- (1) decrease available habitats
- (2) increase environmental carrying capacity for native species
- (3) increase the stability of ecosystems
- (4) decrease global warming

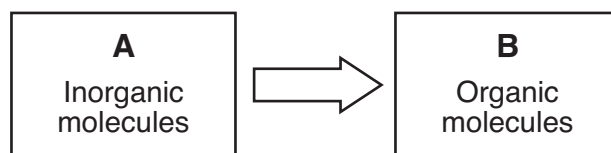
28 A five-year study was carried out on a population of algae in a lake. The study found that the algae population was steadily decreasing in size. Over the five-year period this decrease most likely led to

- (1) a decrease in the amount of nitrogen released into the atmosphere
- (2) an increase in the amount of oxygen present in the lake
- (3) an increase in the amount of water vapor present in the atmosphere
- (4) a decrease in the amount of oxygen released into the lake

29 Which result of technological advancement has a positive effect on the environment?

- (1) development of new models of computers each year, with disposal of the old computers in landfills
- (2) development of new models of cars that travel fewer miles per gallon of gasoline
- (3) development of equipment that uses solar energy to charge batteries
- (4) development of equipment to speed up the process of cutting down trees

30 The diagram below represents a biological process.



Which set of molecules is best represented by letters A and B?

- (1) A: oxygen and water
B: glucose
- (2) A: glucose
B: carbon dioxide and water
- (3) A: carbon dioxide and water
B: glucose
- (4) A: glucose
B: oxygen and water

Part B-1

Answer all questions in this part. [12]

Directions (31–42): For *each* statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

31 A biologist used the Internet to contact scientists around the world to obtain information about declining amphibian populations. He was able to gather data on 936 populations of amphibians, consisting of 157 species from 37 countries. Results showed that the overall numbers of amphibians dropped 15% a year from 1960 to 1966 and continued to decline about 2% a year through 1997.

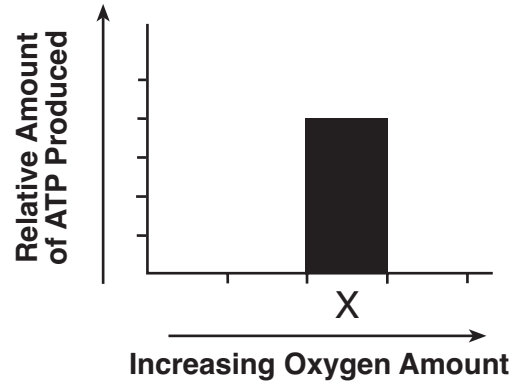
What is the importance of collecting an extensive amount of data such as this?

- (1) Researchers will now be certain that the decline in the amphibian populations is due to pesticides.
- (2) The data collected will prove that all animal populations around the world are threatened.
- (3) Results from all parts of the world will be found to be identical.
- (4) The quantity of data will lead to a better understanding of the extent of the problem.

32 The first trial of a controlled experiment allows a scientist to isolate and test

- (1) a logical conclusion
- (2) a variety of information
- (3) a single variable
- (4) several variables

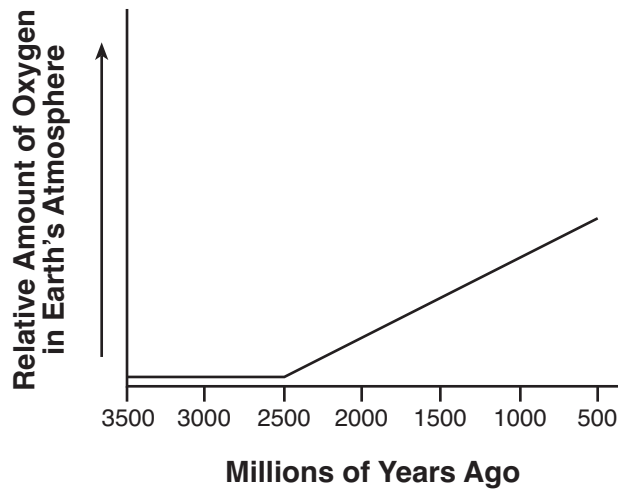
33 A student studied how the amount of oxygen affects ATP production in muscle cells. The data for amount X are shown in the graph below.



If the student supplies the muscle cells with *less* oxygen in a second trial of the investigation, a bar placed on the graph to represent the results of this trial would most likely be

- (1) shorter than bar X and placed to the left of bar X
- (2) shorter than bar X and placed to the right of bar X
- (3) taller than bar X and placed to the left of bar X
- (4) taller than bar X and placed to the right of bar X

37 The relative amount of oxygen in the atmosphere of Earth over millions of years is shown in the graph below.



At what point in the history of Earth did autotrophs most likely first appear?

- (1) 3500 million years ago
- (2) 2500 million years ago
- (3) 1500 million years ago
- (4) 500 million years ago

38 A biologist collected the data shown in the table below.

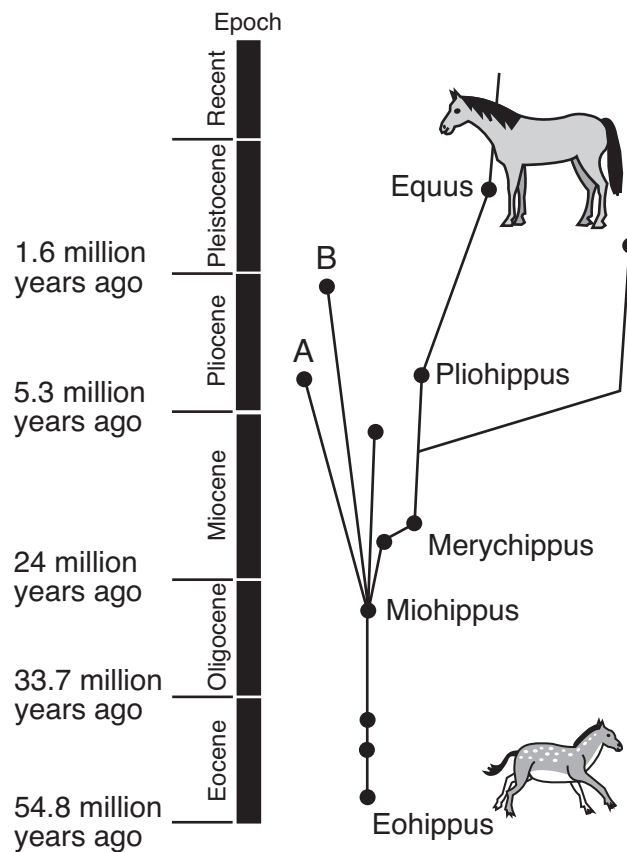
Data Table

Type of Organism	Number of Organisms in a Field		
	May	July	September
grasshoppers	100	500	150
birds	25	100	10
spiders	75	200	50

Which statement is supported by the data in the table?

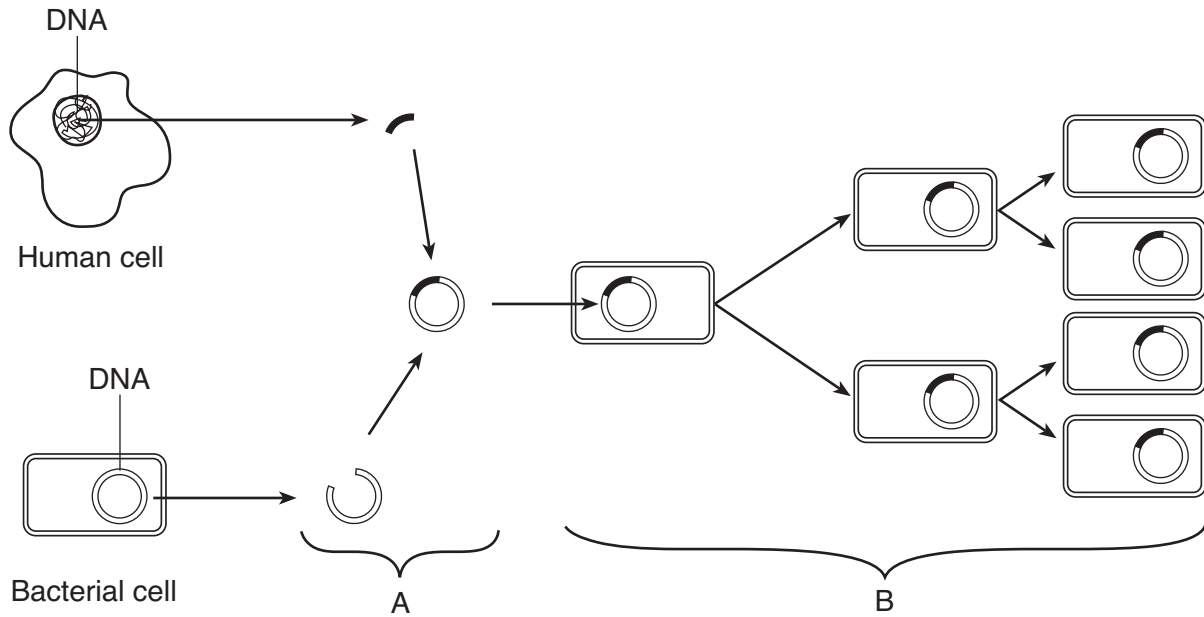
- (1) Populations do not vary from month to month.
- (2) The populations are highest in September.
- (3) The grasshoppers increased in length in July.
- (4) Seasonal variations may affect populations.

Base your answers to questions 39 and 40 on the diagram below, which represents possible relationships between animals in the family tree of the modern horse, and on your knowledge of biology.



- 39 One possible conclusion that can be drawn regarding ancestral horses *A* and *B* is that
- (1) *A* was better adapted to changes that occurred during the Pliocene Epoch than was *B*
 - (2) the areas that *B* migrated to contained fewer varieties of producers than did the areas that *A* migrated to
 - (3) competition between *A* and *B* led to the extinction of *Pliohippus*
 - (4) the adaptive characteristics present in both *A* and *B* were insufficient for survival
- 40 *Miohippus* has been classified as a browser (an animal that feeds on shrubs and trees) while *Merychippus* has been classified as a grazer (an animal that feeds on grasses). One valid inference that can be made regarding the evolution of modern horses based on this information is that
- (1) *Eohippus* inhabited grassland areas throughout the world
 - (2) *Pliohippus* had teeth adapted for grazing
 - (3) *Equus* evolved as a result of the migration of *Pliohippus* into forested areas due to increased competition
 - (4) ecological succession led to changes in tooth structure during the Eocene Epoch

Base your answers to questions 41 and 42 on the diagram below and on your knowledge of biology.



41 In the procedure indicated by letter *A*, DNA segments from humans and bacteria are joined by the action of

- (1) starch molecules
- (2) simple sugars
- (3) enzymes
- (4) hormones

42 Which process is indicated by letter *B*?

- (1) natural selection
 - (2) asexual reproduction
 - (3) sexual reproduction
 - (4) gene deletion
-

Part B-2

Answer all questions in this part. [13]

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

43 Select *one* of the paired items below and describe how the first item in the pair regulates the second item for the maintenance of homeostasis. [1]

- insulin—blood sugar level
- CO₂ in blood—breathing rate
- activity of guard cells—water loss from a leaf

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43

44 Explain how harmful substances in the blood of a pregnant female can enter a fetus even though the blood vessels of the mother and fetus are *not* directly connected. [1]

44

45 Identify *one* farming practice that could be a source of environmental pollution. [1]

45

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

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When humans perspire, water, urea, and salts containing sodium are removed from the blood. Drinking water during extended periods of physical exercise replenishes the water but not the sodium. This increase in water dilutes the blood and may result in the concentration of sodium dropping low enough to cause a condition known as hyponatremia.

Symptoms of hyponatremia include headache, nausea, and lack of coordination. Left untreated, it can lead to coma and even death. The body has a variety of feedback mechanisms that assist in regulating water and sodium concentrations in the blood. The kidneys play a major role in these mechanisms, as they filter the blood and produce urine.

46 The best way to reduce the symptoms of hyponatremia would be to

- (1) drink more water
- (2) eat chocolate
- (3) eat salty foods
- (4) drink cranberry juice

46

47 Many runners pour water on their bodies during a race. Explain how this action helps to maintain homeostasis. [1]

47

48 How would running in a marathon on a warm day most likely affect urine production? Support your answer. [1]

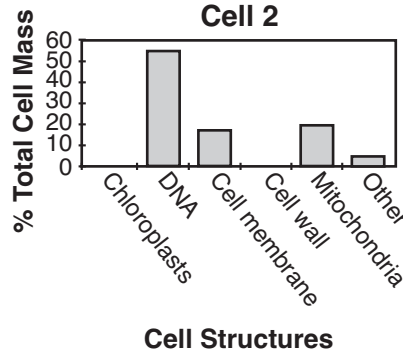
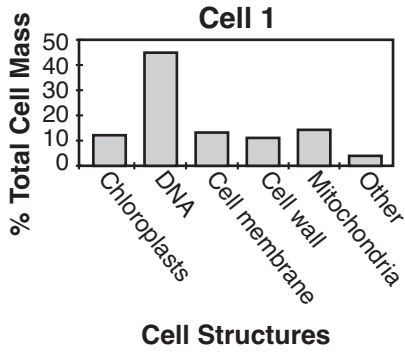
48

49 Many people today drink sport drinks containing large amounts of sodium. Describe *one* possible effect this might have on a person who is *not* very active. [1]

49

50 Data from two different cells are shown in the graphs below.

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Which cell is most likely a plant cell? Support your answer. [1]

50

Base your answers to questions 51 through 55 on the information below and on your knowledge of biology. The average level of carbon dioxide in the atmosphere has been measured for the past several decades. The data collected are shown in the table below.

Average CO₂ Levels in the Atmosphere

Year	CO ₂ (in parts per million)
1960	320
1970	332
1980	350
1990	361
2000	370

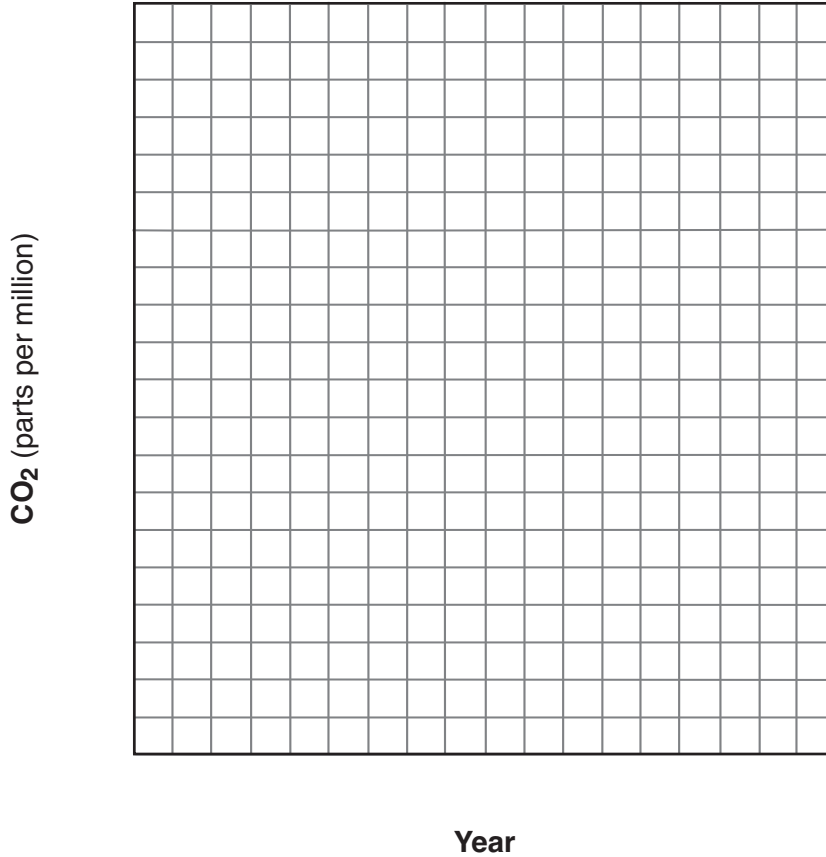
Directions (51 and 52): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

51 Mark an appropriate scale on each labeled axis. [1]

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



Average CO₂ Levels in the Atmosphere



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51

52

53 Identify *one* specific human activity that could be responsible for the change in carbon dioxide levels from 1960 to 2000. [1]

53

54 State *one* possible *negative* effect this change in CO₂ level has had on the environment of Earth. [1]

54

55 Calculate the net change in CO₂ level in parts per million (ppm) during the years 1960 through 2000. [1]

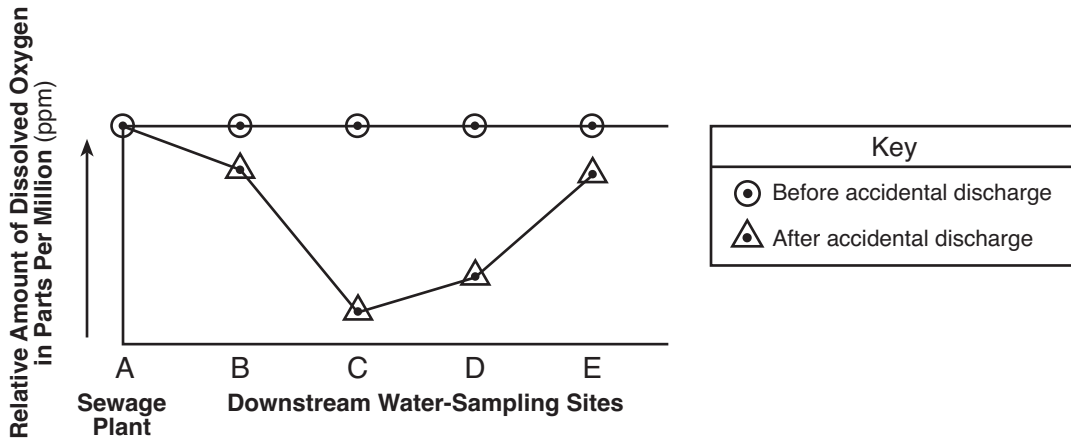
_____ ppm

55

Base your answers to questions 57 through 59 on the information below and on your knowledge of biology.

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Untreated organic wastes were accidentally discharged into a river from a sewage treatment plant. The graph below shows the dissolved oxygen content of water samples taken from the river at specific distances downstream from the plant, both before, and then three days after the discharge occurred.



57 State why this accident would be expected to benefit the decomposers in the river below the sewage plant. [1]

57

58 Explain why an energy-releasing process occurring in the mitochondria of the decomposer organisms is most likely responsible for the change indicated by the data shown at sampling site C in the graph. [1]

58

59 State *one* reason why the statement below is correct.

“The effects of the accidental discharge are not expected to last for a long time.” [1]

59

Base your answers to questions 61 through 64 on the information below and on your knowledge of biology.

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In recent years, the striped bass population in Chesapeake Bay has been decreasing. This is due, in part, to events known as “fish kills,” a large die-off of fish. Fish kills occur when oxygen-consuming processes in the aquatic ecosystem require more oxygen than the plants in the ecosystem produce, thereby reducing the amount of dissolved oxygen available to the fish.

One proposed explanation for the increased fish kills in recent years is that human activities have increased the amount of sediment suspended in the water of Chesapeake Bay, largely due to increased erosion into its tributary streams. The sediment acts as a filter for sunlight, which causes a decrease in the intensity of the sunlight that reaches the aquatic plants in the Chesapeake Bay ecosystem.

61 Identify *one* abiotic factor in the Chesapeake Bay ecosystem involved in the fish kills. [1]

61

62 Identify the process carried out by organisms that uses oxygen and contributes to the fish kills. [1]

62

63 State *one* way humans have contributed to the *decrease* of the striped bass population in Chesapeake Bay. [1]

63

64 State how a *decrease* in the amount of light may be responsible for fish kills in the Chesapeake Bay area. [1]

64

65 Over the past few decades, many oil companies have discovered oil below the seafloor near the coasts of many states. Some states, however, refuse to permit offshore oil drilling, fearing it might damage the environment.

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Discuss both sides of this issue. In your answer, be sure to:

- state *one* way in which offshore oil drilling might have a long-term *negative* effect on the environment [1]
- state *one* way in which offshore oil drilling could benefit society [1]

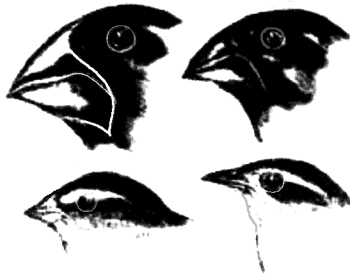
65

Part D

Answer all questions in this part. [13]

Directions (66–75): 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.

- 66 Researchers discovered four different species of finches on one of the Galapagos Islands. DNA analysis showed that these four species, shown in the illustration below, are closely related even though they vary in beak shape and size. It is thought that they share a common ancestor.



Which factor most likely influenced these differences in beak size and shape?

- (1) Birds with poorly adapted beaks changed their beaks to get food.
- (2) Birds with yellow beaks were able to hide from predators.
- (3) Birds with successful beak adaptations obtained food and survived to have offspring.
- (4) Birds with large, sharp beaks become dominant.

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66

- 67 Relationships between plant species may most accurately be determined by comparing the

- (1) habitats in which they live
- (2) structure of guard cells
- (3) base sequences of DNA
- (4) shape of their leaves

67

Base your answers to questions 68 through 70 on the information below and on your knowledge of biology.

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Cytochrome c is an enzyme located in the mitochondria of many types of cells. The number of differences in the amino acid sequences of Cytochrome c from different species are compared to human Cytochrome c in the data table below.

Differences in Amino Acid Sequences

Organism	Number of Differences in Cytochrome c Compared to Humans
tuna	21
mold	48
moth	31
dog	11
horse	12
chicken	13
monkey	1

68 Of the organisms listed below, which one has a DNA code for Cytochrome c that is most similar to that of a human?

- (1) tuna
- (2) chicken
- (3) moth
- (4) dog

68

69 The fact that all of these organisms contain Cytochrome c could lead to the inference that

- (1) Cytochrome c is essential for the reproduction of all organisms
- (2) these organisms have all evolved from an ancestor that produced Cytochrome c
- (3) mutations in genes that code for Cytochrome c always occur during DNA replication
- (4) only heterotrophs make Cytochrome c

69

70 Cytochrome c is most likely a

- (1) protein molecule
 - (2) material containing genes
 - (3) carbohydrate that is absorbed by cells
 - (4) component of the membrane around the cell
-

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70

71 The data table below compares blood flow in various human body structures, both at rest and during strenuous exercise.

Structure	Blood Flow at Rest (mL/min)	Blood Flow During Strenuous Exercise (mL/min)
heart	250	750
skeletal muscle	1200	12,500
digestive organs	1400	600

Select *one* structure from the data table and write its name in the space below. Explain *one* way that the change in the rate of blood flow in this structure helps maintain homeostasis during exercise. [1]

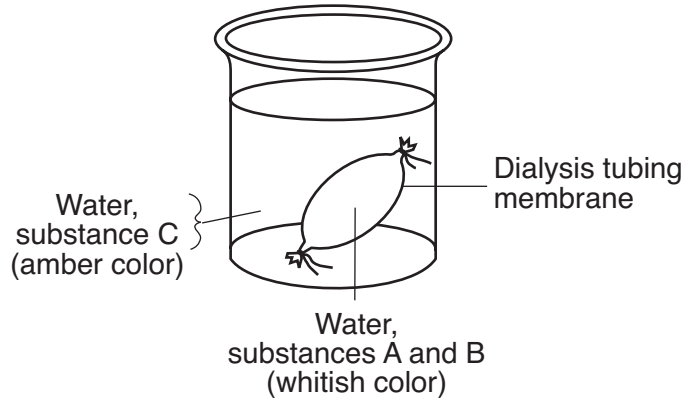
Structure: _____

71

Base your answers to questions 72 and 73 on the information and table below and on your knowledge of biology.

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A model of a cell is prepared and placed in a beaker of fluid as shown in the diagram below. The letters *A*, *B*, and *C* represent substances in the initial experimental setup.



The table below summarizes the content and appearance of the cell model and beaker after 20 minutes.

Results After 20 Minutes

	Outside of Cell Model	Inside of Cell Model
Substances	water, A, C	water, A, B, C
Color	amber	blue black

72 Complete the table below to summarize a change in location of substance *C* in the experimental setup. [3]

Name of Substance C	Direction of Movement of Substance C	Reason for the Movement of Substance C

72

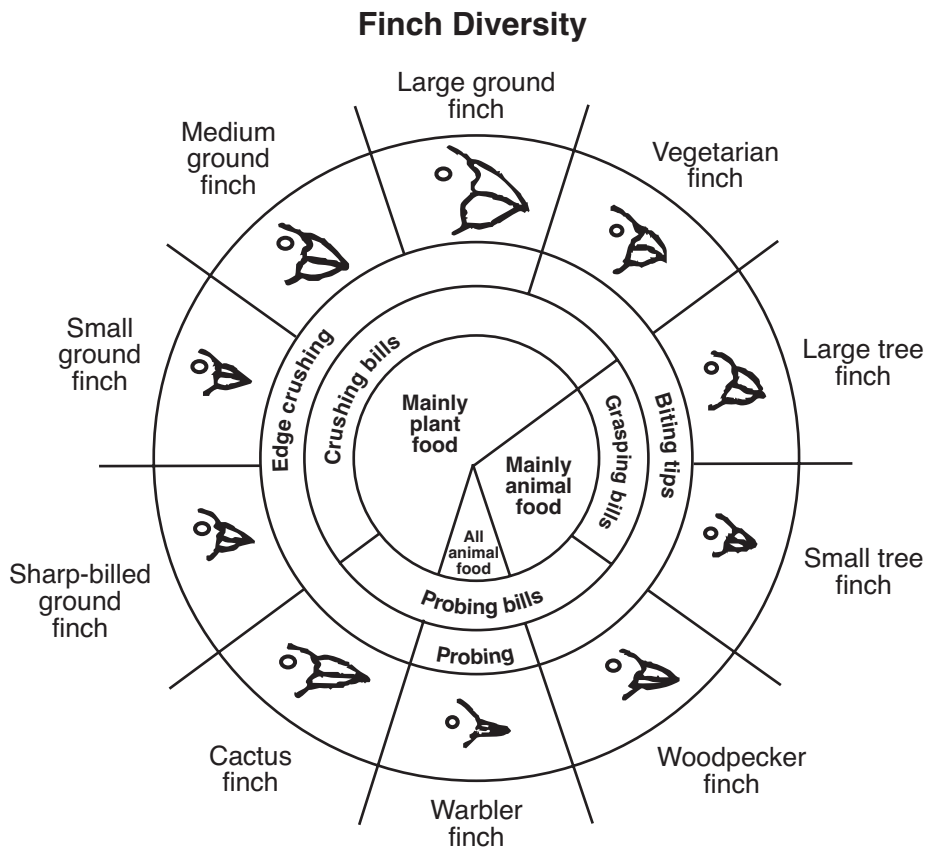
73 Identify substance *B* and explain why it did *not* move out of the model cell. [2]

Substance: _____

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73

74 Species of finches are represented in the diagram below.



State the name of *one* species of finch from the diagram that is most likely to compete with the small tree finch if they lived on the same island. Support your answer with an explanation. [1]

Species: _____

74

75 Electrophoresis is a method of

- (1) separating DNA fragments
 - (2) changing the genetic code of an organism
 - (3) indicating the presence of starch
 - (4) separating colored compounds on a strip of paper
-

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75

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, January 25, 2008 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student Sex: Female
 Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	
B-1	12	
B-2	13	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
Raters' Initials		
Rater 1		Rater 2

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

Part A

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

Part A Score

Part B-1

- | | |
|----------|----------|
| 31 | 37 |
| 32 | 38 |
| 33 | 39 |
| 34 | 40 |
| 35 | 41 |
| 36 | 42 |

Part B-1 Score

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

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

Signature

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