

LIVING ENVIRONMENT

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

LIVING ENVIRONMENT

Thursday, August 18, 2011 — 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.

A separate answer sheet for multiple-choice questions in Parts A, B-1, B-2, and D has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

You are to answer all questions in all parts of this examination. Record your answers for all multiple-choice questions, including those in Parts B-2 and D, on the separate answer sheet. Record your answers for all open-ended questions directly in this examination booklet. All answers in this examination booklet 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 or in this examination booklet as directed.

When you have completed the examination, you must sign the declaration 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.

Notice...

A four-function or scientific calculator must be made available for you to use while taking this examination.

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

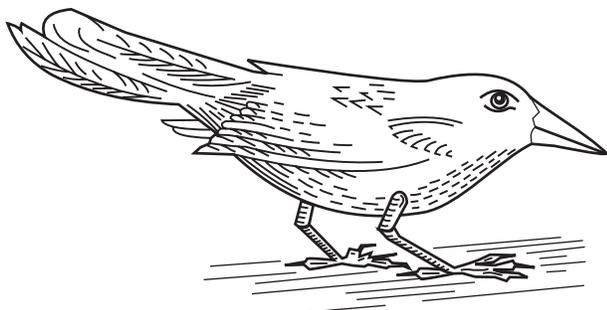
Answer all questions in this part. [30]

Directions (1–30): For *each* statement or question, record 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 ability to grow in size is a characteristic of living organisms. Although an icicle may grow in size over time, it is considered nonliving because there is

- (1) an increase in matter, but no increase in the number of icicles
- (2) an interaction between the icicle and the environment
- (3) no way for the icicle to move away from heat
- (4) no metabolic activity present

2 The diagram below represents a woodpecker finch.



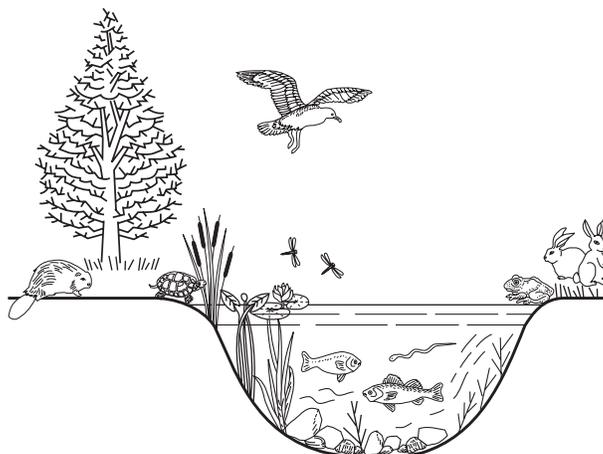
This bird may best be described as

- (1) a decomposer that most likely feeds on nectar (a sugary liquid) from flowers
- (2) a heterotroph that may eat insects and is more closely related to a robin than to an earthworm
- (3) a scavenger that feeds on animals and reproduces asexually
- (4) an autotroph that probes tree bark for insects and is pathogenic

3 Which cell structure is correctly paired with its primary function?

- (1) ribosome—protein synthesis
- (2) mitochondrion—movement
- (3) vacuole—cell division
- (4) nucleus—storage of nutrients

4 The diagram below represents many species of plants and animals and their surroundings.



The diagram best represents

- (1) a population
- (2) a community
- (3) an ecosystem
- (4) the biosphere

5 The cytoplasm in a cell carries out a function similar to a function of which human system?

- (1) respiratory system
- (2) reproductive system
- (3) circulatory system
- (4) nervous system

6 Which statement best describes a human chromosome?

- (1) It is made of amino acid subunits that form genes.
- (2) It contains genes that may code for the production of enzymes.
- (3) It is normally passed to the next generation through a placenta.
- (4) It varies in function from one generation to the next.

7 Four different segments of a DNA molecule are represented below.

Segment 1	Segment 2	Segment 3	Segment 4
T-A-G-G-C	G-G-T-G-A	G-A-T-T-A	C-A-A-T-G
A-T-C-C-G	C-C-A-C-T	C-C-A-A-T	G-T-T-A-C

There is an error in the DNA molecule in

- (1) segment 1, only
- (2) segment 3, only
- (3) segments 2 and 3
- (4) segments 2 and 4

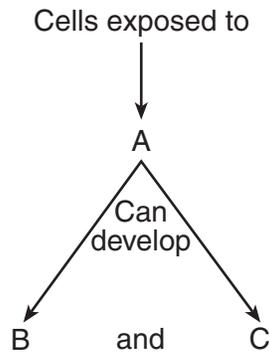
8 Some human structures and their functions are listed below.

Human Structures	Functions
alveoli	absorption of oxygen, excretion of carbon dioxide
kidney	excretion of salts and nitrogenous wastes
large intestine	absorption of water

In a single-celled organism such as an ameba, all these functions can be performed by the

- (1) nucleus
- (2) ribosomes
- (3) mitochondria
- (4) cell membrane

9 The diagram below can be used to illustrate cellular changes.



Which row of terms in the chart below best completes the diagram?

Row	A	B	C
(1)	atmospheric oxygen	mutations	increased mitochondria
(2)	radiation	cancer	mutations
(3)	salt water	more cytoplasm	two nuclei
(4)	less sunlight	extra genes	decreased mutations

10 A scientist wants to change the DNA of a sexually reproducing organism and have the new DNA present in every cell of the organism. In order to do this after fertilization, she would change the DNA in the

- (1) zygote
- (2) placenta
- (3) testes of the father
- (4) ovaries of the mother

11 If the same antibiotic is used too many times, it can become less effective against a certain type of bacteria. This observation is best explained by the

- (1) presence of pathogens in antibiotics
- (2) production of antibiotics by white blood cells
- (3) replication of viruses that attack bacteria
- (4) survival and reproduction of unaffected bacteria

12 Which group would most likely have the greatest survival success during a long period of environmental changes?

- (1) a small population of rabbits living in a field of grass
- (2) a large population of red ants living in a forest
- (3) an endangered population of polar bears living near an iceberg
- (4) one species of bird that nests only in sugar maple trees

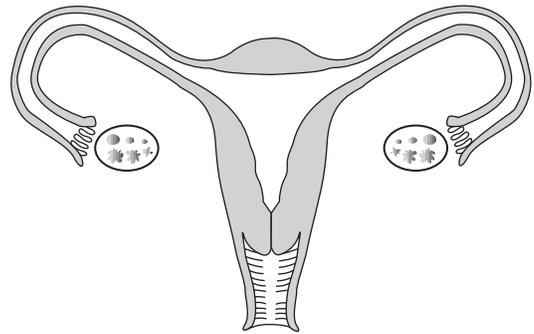
13 When changes occur in the genes of sex cells, these changes

- (1) lead to mutations in the parent organism
- (2) are always harmful to the offspring
- (3) can be the basis for evolutionary change
- (4) only affect asexually reproducing organisms

14 Asexual reproduction produces offspring that each contain

- (1) genetic information from one parent
- (2) genetic information from two parents
- (3) less genetic information than either parent
- (4) a unique combination of genetic information

15 The diagram below represents part of a human reproductive system.



One of the functions of this part of the system is to

- (1) supply essential nutrients to the offspring in the form of milk
- (2) provide nutritional support for the embryo
- (3) provide a structure that allows the mixing of maternal and fetal blood
- (4) produce specialized proteins used in the production and release of sperm

16 Which row in the chart below indicates the correct process for each event indicated?

Row	Formation of Egg	Formation of Sperm	Growth of Embryo
(1)	mitosis	mitosis	meiosis
(2)	mitosis	meiosis	mitosis
(3)	meiosis	mitosis	meiosis
(4)	meiosis	meiosis	mitosis

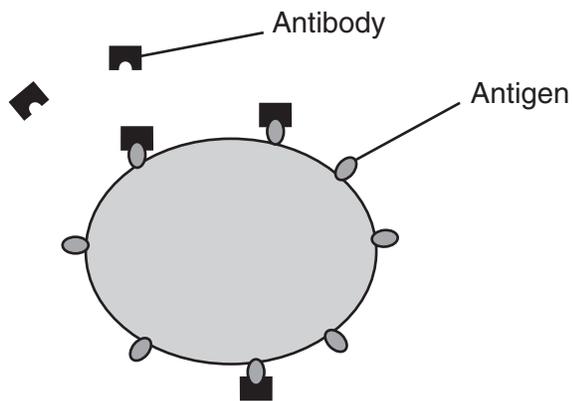
17 The drinking of alcoholic beverages by a pregnant woman is harmful to the development of her fetus. This is most damaging early in a pregnancy because during this time

- (1) the lungs of the fetus become functional
- (2) alcohol can easily enter the mouth of the fetus
- (3) many of the essential organs of the fetus are forming
- (4) the fetus cannot excrete wastes

18 Which substance is an inorganic molecule?

- (1) starch
- (2) DNA
- (3) water
- (4) fat

- 19 The enzyme amylase will affect the breakdown of carbohydrates, but it will not affect the breakdown of proteins. The ability of an enzyme molecule to interact with specific molecules is most directly determined by the
- (1) shapes of the molecules involved
 - (2) number of molecules involved
 - (3) sequence of bases present in ATP
 - (4) amount of glucose present in the cell
- 20 The disease known as malaria may result in a fever, a decrease in red blood cells, and an enlarged liver and spleen. These symptoms are evidence of
- (1) a disruption of homeostasis
 - (2) a decrease in allergic reactions
 - (3) an increased number of cell organelles
 - (4) hormone destruction
- 21 An activity that occurs in the human body is shown below.



This activity helps to

- (1) provide protection against pathogens
 - (2) produce antibiotics to control disease
 - (3) eliminate harmful gene alterations
 - (4) regulate production of ATP by the cell
- 22 Sweating is a process that helps cool the body during strenuous exercise. This is an example of
- (1) recycling of gases
 - (2) cellular respiration
 - (3) gene malfunction
 - (4) a feedback mechanism

- 23 A population of animals is permanently split by a natural barrier into two separate populations in different environments. What will likely result after a long period of time?
- (1) The evolution of the two populations will be identical.
 - (2) The production of variations will stop in the two populations.
 - (3) The two populations will evolve into separate species.
 - (4) Autotrophic nutrition will replace heterotrophic nutrition in the two populations.
- 24 Which consequence could most likely be associated with a decrease in biodiversity in an area?
- (1) More species would be better able to survive a major environmental change.
 - (2) The ecosystems in the area would become more stable.
 - (3) The amount of genetic information in the species of the area would increase.
 - (4) Some sources of future foods or medications would be lost.
- 25 The release of products of combustion into the air often causes the formation of ozone near the surface of Earth. This ground-level ozone damages plants and affects their ability to absorb carbon dioxide. The doubling of ground-level ozone since 1850 is most likely due to
- (1) the chemical composition of the upper atmosphere
 - (2) emissions from vehicles and industrial processes
 - (3) the extinction of certain animal species
 - (4) a greater use of nuclear fuel
- 26 After a fire destroys a forest, the area will most likely
- (1) remain bare land indefinitely
 - (2) develop into a desert area
 - (3) develop into an entirely different type of forest after hundreds of years
 - (4) recover through gradual changes back to a point of long-term stability

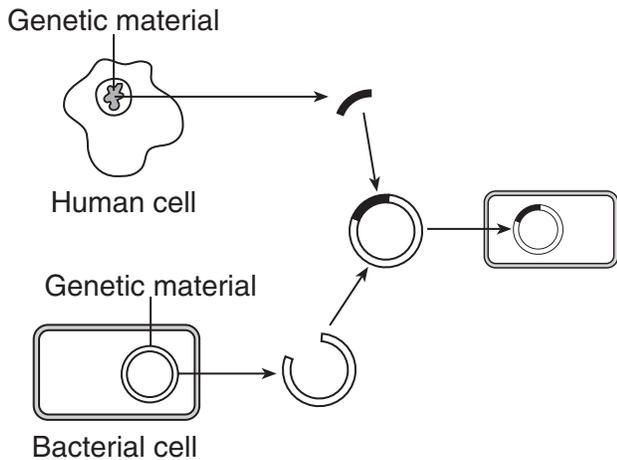
- 27 New fuels are being produced by converting corn and grasses into compounds containing alcohols that can be broken down for energy in various engines. The purpose of this research is to
- (1) reduce the use of finite resources
 - (2) increase the rate of air pollution
 - (3) reduce the rate of homeostasis in organisms
 - (4) cause a loss of biodiversity in the rain forests
- 28 The presence of wastes, such as plastic bags and motor oil, in lakes and streams miles away from developed areas suggests that
- (1) ecosystems are interconnected and human action can alter ecosystem equilibrium
 - (2) recycling programs have failed to conserve biotic resources
 - (3) natural processes can alter ecosystem stability
 - (4) direct harvesting practices have led to irreversible destruction of ecosystems
- 29 A new bird species is introduced to control an insect pest. A *negative* consequence of this action is that the new bird species may
- (1) limit the population of the pest insect
 - (2) consume beneficial insects
 - (3) disrupt mineral availability in the ecosystem
 - (4) cause an increase of pesticide-resistant insects
- 30 Most scientists recommend reducing carbon dioxide emissions. Less carbon dioxide in the atmosphere would be expected to
- (1) reduce the rate of global warming
 - (2) increase damage caused by acid rain
 - (3) decrease the number of biotic factors in ecosystems
 - (4) reduce destruction of the ozone layer
-

Part B-1

Answer all questions in this part. [13]

Directions (31–43): For each statement or question, record 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 laboratory technique is represented in the diagram below.



Which knowledge was needed to develop this technique?

- (1) knowledge of sexual reproduction in plants
 - (2) knowledge of the structure of starch molecules
 - (3) knowledge of the development of embryos
 - (4) knowledge of the structure of a DNA molecule
- 32 Male stickleback fish with red undersides attack other male sticklebacks with red undersides and also attack models of fish with red undersides. Sticklebacks and fish models without red undersides are not attacked. Which is the best inference that can be drawn regarding this behavior?
- (1) A male stickleback will defend its territory against all other fish.
 - (2) The stimulus for an attack is a model with red fins or a male stickleback.
 - (3) The stimulus for an attack is a red underside.
 - (4) Male sticklebacks turn red to attract females.
- 33 Specialized cells and organs are necessary in multicellular organisms because in these organisms
- (1) fewer cells are in direct contact with the external environment
 - (2) all cells are in direct contact with the external environment
 - (3) a body type evolved that relied on fewer body cells
 - (4) a body type evolved that required larger sized cells
- 34 *Bacillus thuringiensis*, a bacterium commonly known as *Bt*, produces a protein that can kill certain insects that feed on corn crops. Scientists have been successful in transferring the gene that codes for this protein from the bacterium to the corn, so the corn can now make the *Bt* protein. Corn borers, insects that eat corn, die when they feed on corn containing the *Bt* protein. A potential problem associated with increased production of *Bt* corn is
- (1) corn borers may stop feeding on corn plants
 - (2) corn borers may develop resistance to the *Bt* protein
 - (3) farmers may need to use less pesticide to control corn borers
 - (4) corn borers may compete with other insects that feed on corn plants
- 35 Throughout the history of life on Earth, many processes have resulted in new traits in organisms. Which list shows some of these processes in order from the oldest to the most recently used?
- (1) gene manipulation, natural selection, selective breeding
 - (2) natural selection, selective breeding, gene manipulation
 - (3) natural selection, gene manipulation, selective breeding
 - (4) selective breeding, gene manipulation, natural selection

36 DDT and other pesticides used over 50 years ago are still affecting the environment today. Scientists have found these substances in recent glacier runoff. Glacier runoff occurs during the summer, when precipitation that has fallen on glaciers during the winter is released. Ice layers from existing glaciers have been analyzed. The results of this analysis show that the concentrations of DDT and other pesticides were highest about 10 years after the use of these substances was banned.

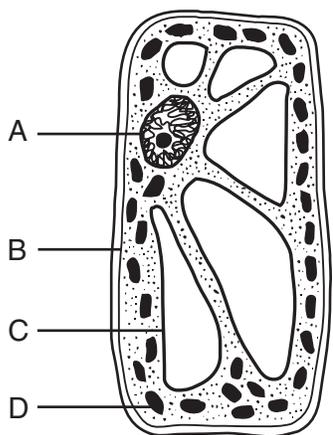
This information shows that

- (1) DDT and other pesticides cause glacier runoff during the summer
- (2) it takes humans over 50 years to analyze a glacier
- (3) precipitation helps to break down pesticides
- (4) the decision of one human generation may have an impact on future generations

37 Abnormalities present in the cells that line the uterus may prevent the production of offspring by directly interfering with the

- (1) development of the embryo
- (2) differentiation of gametes into zygotes
- (3) secretion of estrogen by the ovary
- (4) production and release of egg cells

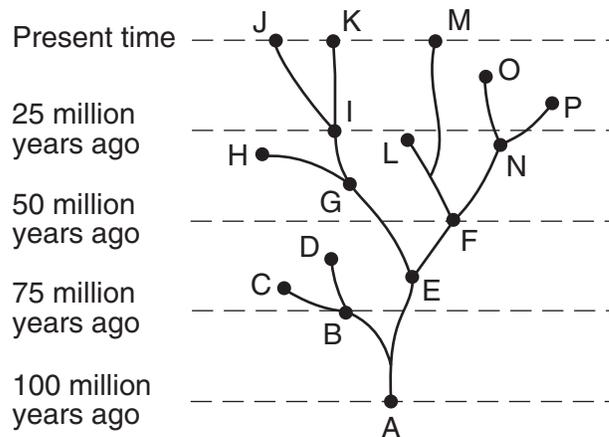
38 The diagram below represents a cell of a green plant.



Solar energy is used to produce energy-rich compounds in structure

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

Base your answers to questions 39 and 40 on the diagram below and on your knowledge of biology. The diagram represents possible evolutionary pathways of certain organisms.



39 Which species is most closely related to species L?

- (1) E
- (2) F
- (3) G
- (4) I

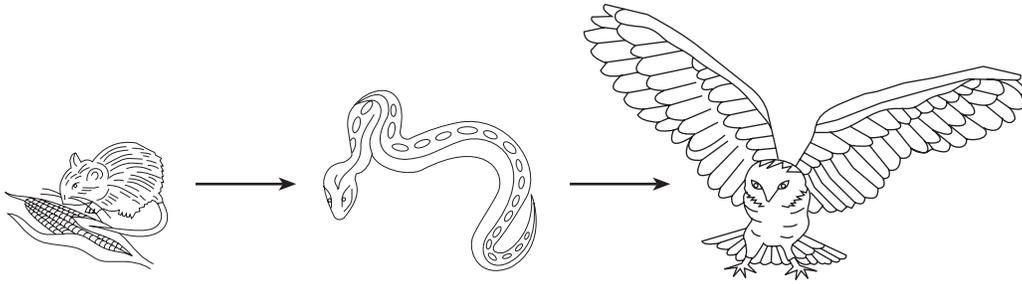
40 Which statement can best be inferred based on the information in the diagram?

- (1) Natural selection occurs only as a result of mutations.
- (2) Natural selection requires a minimum of 5 million years to occur.
- (3) Each new species that develops continues to exist through present time.
- (4) Some species that are no longer successful in their environment may become extinct.

41 Reasons for conducting peer review include all of the following *except*

- (1) analyzing the experimental design
- (2) pointing out possible bias
- (3) identifying an illogical conclusion
- (4) changing data to support the hypothesis

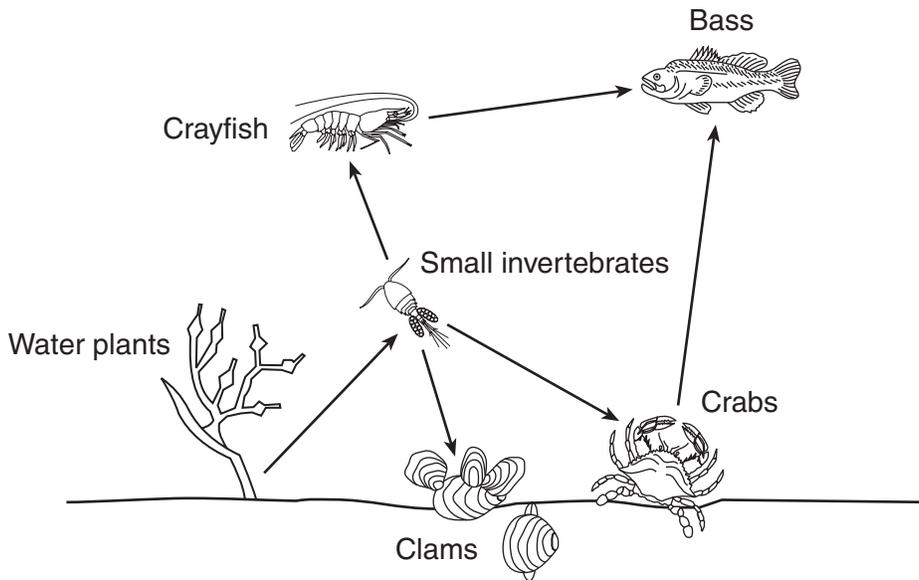
42 The diagram below represents a food chain made up of organisms found in a field.



Which row in the chart correctly identifies characteristics that can be associated with the members of this food chain?

Row	Producer	Consumer	Autotroph	Heterotroph
(1)	corn	snake	mouse	owl
(2)	mouse	owl	snake	mouse
(3)	corn	owl	corn	snake
(4)	owl	corn	snake	corn

43 A food web is represented below.



When water used to cool machinery is returned to a river, it raises the river water temperature. This causes a sharp decline in small invertebrate populations. Based on the food web, a likely consequence of this change would be

- (1) an increase in the number of clams
- (2) a decrease in the number of water plants
- (3) an increase in the number of crabs
- (4) a decrease in the number of crayfish

Part B–2

Answer all questions in this part. [12]

Directions (44–55): For those questions that are multiple choice, record on the separate answer sheet the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided in this examination booklet.

Base your answers to questions 44 through 47 on the data table below and on your knowledge of biology. The data table shows the number of fish species found at various ocean depths.

Fish Species Found at Various Ocean Depths

Water Depth (m)	Number of Fish Species Found
50	35
75	31
100	22
150	13
200	6

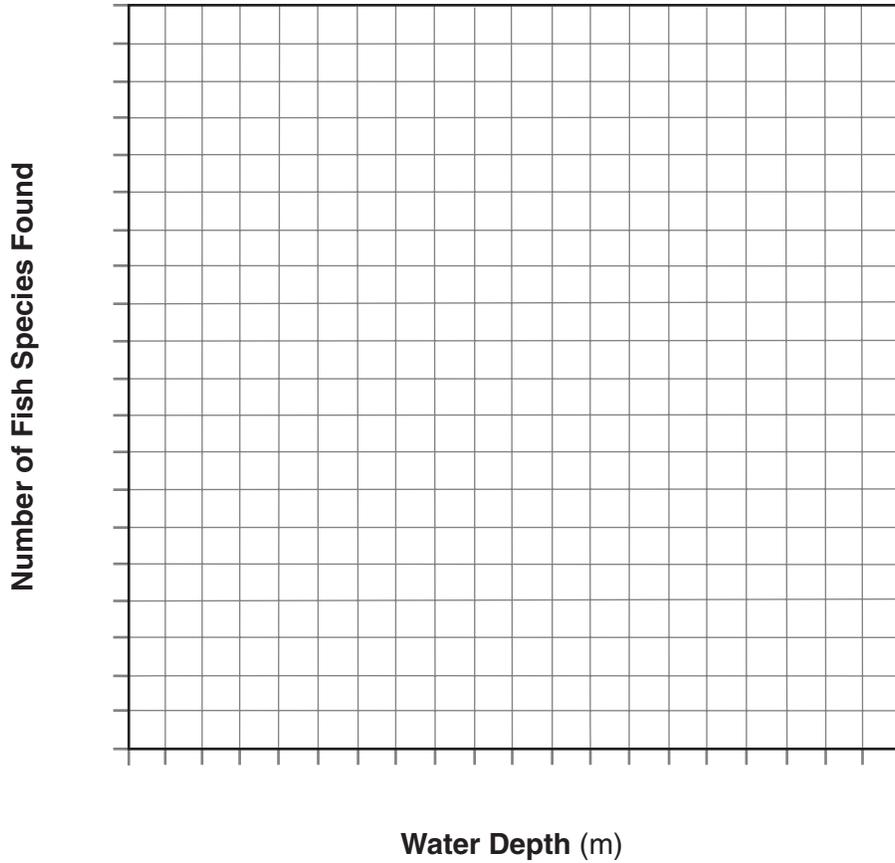
Directions (44–45): Using the information in the data table, construct a line graph on the grid, following the directions below.

44 Mark an appropriate scale, without any breaks, on each labeled axis. [1]

45 Plot the data from the data table. Surround each point with a small circle and connect the points. [1]



Fish Species Found at Various Ocean Depths



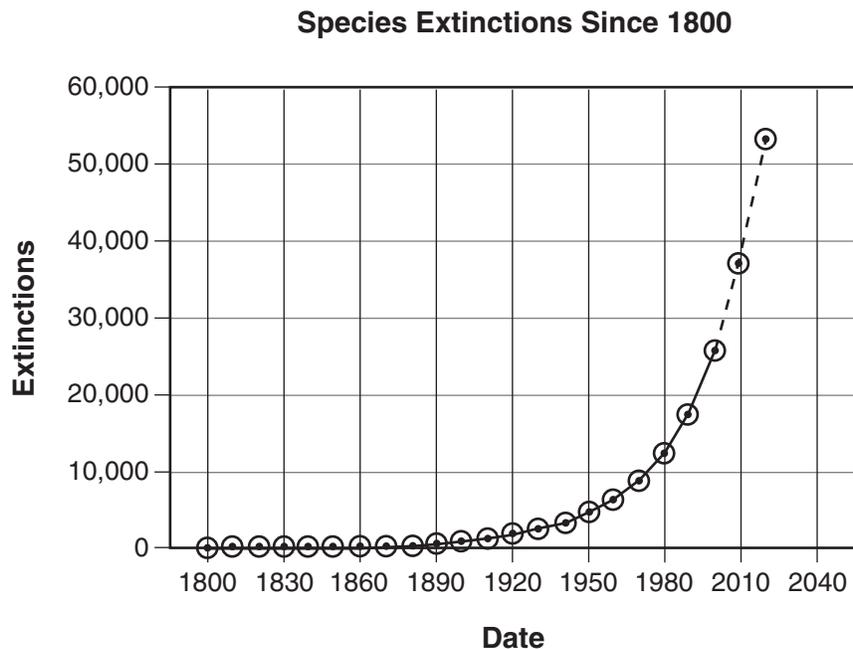
46 State the general relationship between water depth and the number of fish species found. [1]

Note: The answer to question 47 should be recorded on your separate answer sheet.

47 The approximate number of fish species that can be found at 120 meters is

- | | |
|--------|--------|
| (1) 5 | (3) 18 |
| (2) 13 | (4) 31 |
-

Base your answers to questions 48 and 49 on the graph below and on your knowledge of biology. The graph shows the number of species that became extinct from 1800 to 2000. It also shows estimates of the number of species that will become extinct between 2000 and 2020.



48 State *one* possible reason for the change in the number of species extinctions between 1890 and 1990. [1]

Note: The answer to question 49 should be recorded on your separate answer sheet.

49 The number of species that became extinct between the years 1950 and 2000 is approximately

(1) 5,000	(3) 22,000
(2) 12,000	(4) 37,000

Base your answers to questions 50 through 52 on the passage below and on your knowledge of biology.

Mayflies

Mayflies belong to a group of insects known as Ephemeroptera, which means “short-lived wings.” They have been given this name because the adult, the only stage that has wings, lives for only a few days.

The aquatic juvenile form of most mayfly species lives for several years under rocks in streams that have high levels of dissolved oxygen. The juveniles feed on microscopic photosynthetic organisms. Juveniles supply food for trout and other stream fish.

Millions of adult mayflies emerge from stream water in early summer. The adults have wings for flight, but lack functional mouth parts. Their energy supply comes from food stored in their bodies. Birds and bats eat adult mayflies. Adult mayflies mate, lay eggs, and die within a few days.

Note: The answer to question 50 should be recorded on your separate answer sheet.

50 Adult mayflies are unable to

(1) take in food

(2) move from place to place

(3) form ATP

(4) form gametes

51 Identify the nutritional role of the juveniles in a stream food chain. [1]

52 A student was asked to construct a food chain based on the information given in the passage. The student's answer is shown below.

microscopic plants → mayfly eggs ← bats

State *one* of the errors the student made when constructing this food chain. [1]

53 State *one* way white blood cells protect the body from foreign microbes. [1]

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

When Whales Walked the Earth

A newly unearthed fossil is the missing link between land and marine mammals

Standing two to three feet tall on legs adapted to wade through shallow water, the 48-million-year-old *Indohyus* is the missing link between modern day whales and their land-lubbing ancestors. Hans Thewissen of the Northeastern Ohio Universities Colleges of Medicine and Pharmacy recovered the skeleton in rocks from Kashmir, a disputed region between India and Pakistan, where the deer-like herbivore lived during the Eocene epoch, 56 to 34 million years ago.

The extreme thickness of its bones is a trait seen often in animals that are aquatic waders (thick, heavy bones counteract buoyancy and allow the animal to stay underwater more easily), and chemical traces in its teeth indicate that the animal ate plants in a freshwater environment. Scientists know that *Indohyus* belongs in the evolutionary path with whales because it has skeletal similarities to both modern whales and known primordial whale ancestors.

Source: Day Greenberg, "When Whales Walked the Earth," *Popular Science*, May 2008

54 Identify *one* structure present in *Indohyus* mentioned in the passage. State how that structure made *Indohyus* successful in its environment during the Eocene Epoch. [1]

Structure: _____

55 Identify *one* characteristic of *Indohyus* that led some scientists to conclude that it was an ancestor of modern whales. [1]

Part C

Answer all questions in this part. [17]

Directions (56–72): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 56 and 57–59 on the passage below and on your knowledge of biology.

**Blown Away
Head Lice Meet Hair Dryer of Death**

Head lice are becoming indestructible. A study found that as many as 80 percent of the bugs are [resistant] to insecticides in over-the-counter shampoos, and resistance will only increase. Evolutionary biologist Dale Clayton may have a new line of attack.

Clayton, who usually studies lice on bird feathers, stumbled onto his solution after a major research setback. When he moved his laboratory from England to the University of Utah a decade ago, his entire louse collection perished in the dry desert air. Soon after, his 8-year-old came home from school with head lice. He wondered if human head lice could also be killed by drying them out. “It was sort of a forehead slapper,” Clayton says. After conventional hair dryers failed, Clayton came up with the LouseBuster, a 10-pound device resembling a vacuum cleaner that desiccates [dries out] the bugs with a jet of 140-degree air [140°F]. “It’s a pretty brutal assault,” he says. Tests show the invention is both safe and effective, eradicating 80 percent of live lice and 98 percent of eggs, leaving survivors unable to breed. And, Clayton says, “it will be awfully hard for lice to develop resistance.”

Source: Emily Saarman, “Blown Away—Head Lice Meet Hair Dryer of Death,”
Discover Magazine, February 2007

56 State how Clayton first learned that desiccating lice kills them. [1]

57–59 Design a controlled experiment to determine the effect of hot, dry air on head lice. In your experimental design, be sure to:

- state the hypothesis to be tested in the experiment [1]
- state *one* way the control group will be treated differently from the experimental group [1]
- state *one* result of the experiment that would support the hypothesis [1]

60 In the past, diabetics used horse or cow insulin to control their glucose levels. Today, as a result of genetic engineering, human insulin can be synthesized by bacteria. State *one* advantage for a person with diabetes to receive genetically engineered insulin rather than insulin taken from a horse or cow. [1]

Base your answer to question 61–63 on the information below and on your knowledge of biology.

Smokers are passing down problems to future generations. Men who smoke and drink alcohol could be endangering the health of their future children and grandchildren. Toxic chemicals in cigarettes and alcohol are thought to cause changes in the DNA, which are passed down via the sperm to future generations.

Source: *Associate Newspapers Ltd., Mail Online Health*, Fiona Macrae, February 9, 2008

61–63 Explain how smoking and drinking alcohol by males can affect the development of an embryo. In your answer, be sure to:

- identify the term used to describe a change in DNA [1]
- state why changes that take place in a sperm cell can affect an embryo [1]
- identify *one* factor, other than smoking and drinking alcohol, that may *negatively* affect a developing embryo [1]

Base your answer to question 64 on the information below and on your knowledge of biology.

The California condor is the largest bird species in North America, with a wingspan of about 3.5 meters. They live in parts of California and in the Grand Canyon, and nest on rock ledges. Condors are scavengers. The condor population in the Grand Canyon is very small, with only about 70 adult birds.

64 Identify *one* human activity that could *negatively* affect this bird and state why it would have a negative effect. [1]

Base your answers to questions 65 through 67 on the information below and on your knowledge of biology.

Every population is linked, directly or indirectly, with many others in an ecosystem. The table below shows the size of the moose and wolf populations that live on an island in Lake Superior.

Moose and Wolf Populations

Year	Population Size	
	Moose	Wolves
1960	610	22
1965	733	28
1970	1295	18
1975	1355	41
1980	910	50
1985	1115	22
1990	1216	15
1995	2422	16
2000	850	29

65 State how the information in the table can be used to determine that the wolves are the predators. [1]

66 State *one* possible ecological reason, other than human activity, for the change in the moose population between 1975 and 1980. [1]

67 Identify *two* limiting factors that keep the wolf population size from growing any larger. [1]

_____ and _____

68–70 Describe how a flu vaccine protects the human body. In your answer, be sure to:

- identify what substance is in a flu vaccine that stimulates immunity [1]
- state how the human immune system reacts to the vaccine [1]
- state *one* reason the flu vaccine does *not* protect a person from other viral diseases, such as measles [1]

Base your answer to question 71 on the information below and on your knowledge of biology.

Two methods for controlling mosquitoes are listed below.

Control Methods

A: Draining a swamp where mosquitoes lay eggs

B: Releasing more mosquito predators that are native to the ecosystem

71 Identify the letter of the control method in the list that would most likely have the *least* damaging effect on the ecosystem. Support your answer. [1]

Method: _____

72 Scientists have recently discovered that two toxic chemicals in most antibacterial soap products do *not* break down when treated at wastewater facilities. These chemicals are in the nutrient-rich sludge that remains after wastewater treatment. Farmers can buy this sludge to fertilize their fields. State *one* possible ecological problem that may result from the use of sludge for fertilizer. [1]

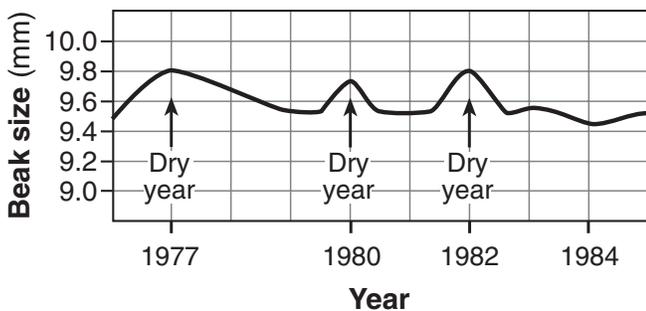
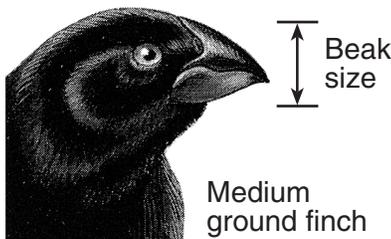
Part D

Answer all questions in this part. [13]

Directions (73–85): For those questions that are multiple choice, record on the separate answer sheet 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 and record your answers in the spaces provided in this examination booklet.

Base your answers to questions 73 through 76 on the information and diagram below and on your knowledge of biology.

Average beak sizes of the seed-eating medium ground finch on one of the Galapagos Islands are shown in the diagram below. During wet years, all types of seeds are abundant. The medium ground finch prefers to eat small seeds that are easy to crush. However, during droughts (dry years), when small seeds are not as abundant, they eat the larger seeds on the island.

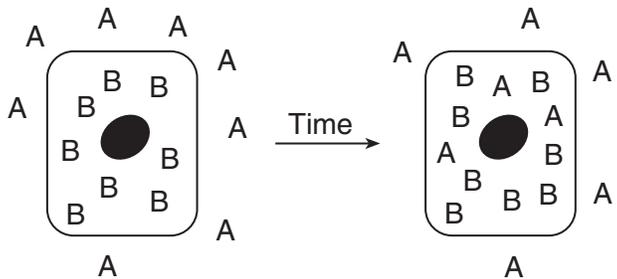


Note: The answers to questions 73 through 76 should be recorded on your separate answer sheet.

- 73 How might an extended period of drought influence the ground finch population?
- (1) The birds with smaller beaks would be more numerous.
 - (2) The birds with larger beaks would be more numerous.
 - (3) Drought decreases seed availability, but has no influence on the ground finch.
 - (4) Drought increases seed availability, and all ground finches would be more numerous.

- 74 How would the introduction of another species of seed-eating ground finch to the island most likely influence the medium ground finch?
- (1) The finches would not compete, since they both eat seeds.
 - (2) The finches would interbreed and produce a new species of finch.
 - (3) The medium ground finch would face increased competition for seeds.
 - (4) The medium ground finch would become a parasite of the introduced species.
- 75 Which factors most likely had a role in the development of beak characteristics in the medium ground finch?
- (1) mutation and cloning
 - (2) genetic engineering and selective breeding
 - (3) unchanging environment and the need to reproduce
 - (4) variation and recombination
- 76 The most likely explanation for this variation in the beak size of the medium ground finch is that
- (1) the birds acquired larger beaks so they could take advantage of the supply of small seeds
 - (2) the birds with smaller beaks mutated due to the drought so they produced more offspring
 - (3) different adaptations gave some birds a better chance for survival
 - (4) the environment caused the birds to exercise their beaks and the beaks became longer and stronger
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77 Two molecules, *A* and *B*, and their distribution inside and outside of a cell are represented in the diagram below.



State *one* possible reason why molecule *A* could diffuse across the membrane of the cell but molecule *B* could *not*. [1]

78 Some of the pain from a sore throat is caused by swelling of moist throat tissue. A common remedy for a sore throat is to gargle (rinse the throat tissue) with salt water. Explain why gargling with salt water would be expected to relieve the pain of a sore throat. [1]

Base your answer to question 79 on the information below and on your knowledge of biology.

The segments of DNA below were extracted from two different species of plants. The segments represent the same region of DNA that codes for a particular pigment (color) in these species.

Plant Species A: A C C G C A G G G A T T C G C

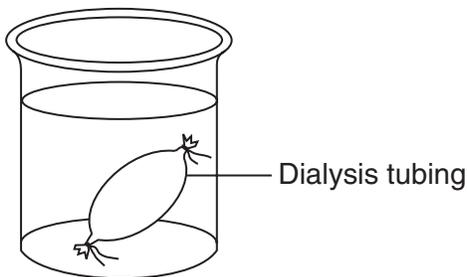
Plant Species B: A C C G G A G C G A T T C G C

79 A restriction enzyme is used to cut the DNA from species *A* and *B*. The enzyme binds to the sequence G G G A T T and cuts between G and A. State how many cuts will be made in the DNA sequences of each species when this enzyme is used. [1]

Plant species *A* cuts: _____

Plant species *B* cuts: _____

80 An experimental setup using a model cell is shown in the diagram below.



State what cell structure the dialysis tubing represents. [1]

Base your answers to questions 81 and 82 on the information below and on your knowledge of biology.

An experiment was designed to test whether students could squeeze a clothespin more times in one minute after resting or after exercise.

Note: The answers to questions 81 and 82 should be recorded on your separate answer sheet.

81 The dependent variable for this experiment is the

- (1) time the student was squeezing the clothespin
- (2) number of times the student was able to squeeze the clothespin
- (3) strength of the student
- (4) length of the clothespin

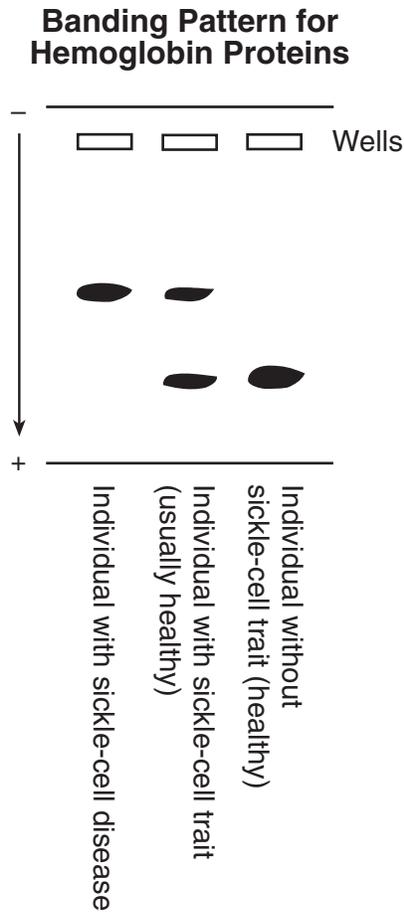
82 The experimental results could be made more valid by

- (1) increasing the number of students
- (2) using a plastic clothespin
- (3) using safety precautions
- (4) making a bar graph of the data

83 The technique of paper chromatography was performed on plant extracts from four different plant species. The results showed the same pattern for two of the plant species. State an evolutionary relationship between these two plants that is supported by this observation. [1]

Base your answers to questions 84 and 85 on the information and diagram below and on your knowledge of biology.

A change in hemoglobin, a protein found in red blood cells, causes sickle-cell disease. Hemoglobin samples from different individuals can be compared by using a specific technique. The protein banding patterns of three samples are shown below.



84 Identify the technique that was used to produce these results. [1]

85 Identify another substance that can be analyzed using this technique. [1]

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