The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Monday, January 27, 2014 — 9:15 a.m. to 12:15 p.m., only

Student Name _____

School Name _____

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

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.

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

Part A

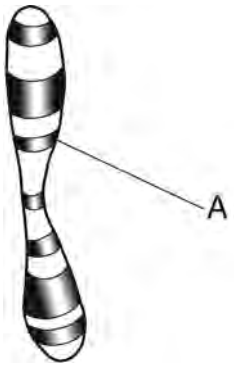
Answer all questions in this part. [30]

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 concentration of potassium is higher in red blood cells than in the surrounding blood plasma. This higher concentration is maintained by the process of

(1) circulation
(2) diffusion
(3) excretion
(4) active transport

2 Human genetic material is represented in the diagram below.



The region labeled *A* is made up of a section of

(1) a protein that becomes an enzyme
(2) DNA that may direct protein synthesis
(3) a carbohydrate made from amino acids
(4) glucose that may be copied to make DNA

3 Brothers and sisters often have similar facial characteristics, such as nose shape or eye color, because they

(1) are raised in similar environments
(2) eat similar types of foods
(3) have similar types of proteins
(4) use similar types of facial care products

4 Compared to a normal body cell, a normal egg cell contains

(1) the same number of chromosomes
(2) half the number of chromosomes
(3) twice the number of chromosomes
(4) four times the number of chromosomes

5 The variations that exist in a population of wild giraffes are usually a result of events that occur during

(1) mitotic division
(2) genetic engineering
(3) asexual reproduction
(4) sexual reproduction

6 Evidence that best supports the theory of biological evolution was obtained from the

(1) investigation of environmental niches
(2) study of fossil records
(3) comparison of the number of cells in organisms
(4) analysis of food chains and food webs

7 The human immune system fights infection by releasing

(1) ATPs
(2) antibiotics
(3) antibodies
(4) antigens

8 The function of a specific enzyme is most directly influenced by its

(1) molecular size
(2) physical shape
(3) carrying capacity
(4) stored energy

9 A vaccine for the viral disease known as chicken pox would contain

(1) a large amount of live virus
(2) a dead or weakened form of the pathogen
(3) several different antibiotics
(4) a small number of white blood cells

10 Which process will result in a gain of energy in an ecosystem?

(1) photosynthesis in algae cells
(2) digestion in hummingbirds
(3) ATP synthesis in fungi
(4) respiration in maple tree cells

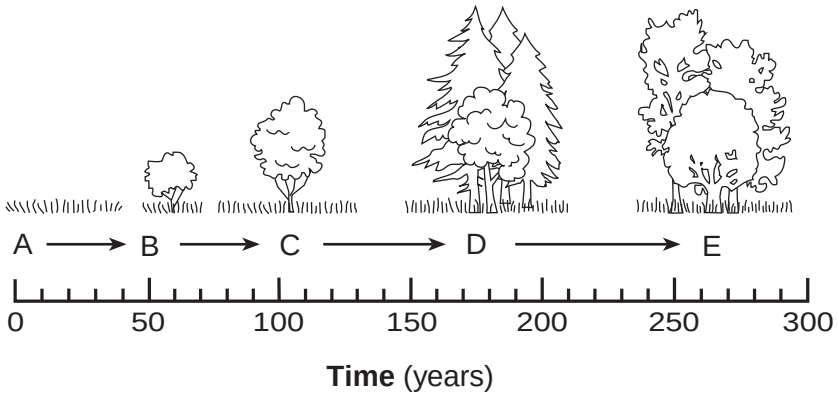
11 A photograph of a polar bear in its environment is shown below.

Source: http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/environment/3_adapt_to_fit1.shtml

One possible reason why polar bears might not be able to survive if the environment they live in changes is because

(1) the species will experience decreased competition for mates
(2) the new environment will cause greater variation in the species
(3) there will be a larger variety of food sources available
(4) they are adapted to the specific environment in which they now live

12 An ecological process is represented below.



Which statement describes an event in this process?

(1) Community *B* modifies the environment, making it suitable for community *C*.
(2) Community *D* modifies the environment, making it suitable for community *C*.
(3) Community *E* will develop into community *A*, if the environment remains stable.
(4) Community *A* organisms will develop directly into community *D* organisms.

13 An infection in the body might result in a sudden
(1) decrease in the activity of antigens produced by the mitochondria
(2) decrease in the amount of DNA present in the nuclei of cells
(3) increase in the activity of white blood cells
(4) increase in the number of red blood cells

14 Which disorder could develop in the human body when the immune system attacks a usually harmless environmental substance?
(1) cancer
(2) AIDS
(3) an allergy
(4) an infection

15 In the human body, carbon monoxide reduces the amount of oxygen that can be transported to cells. Breathing in too much carbon monoxide will most likely result in the production of
(1) less ATP
(2) less glucose
(3) more DNA
(4) more protein

16 Which human activity would interfere most directly with the production of oxygen in the environment?
(1) using fertilizer for agriculture
(2) using nuclear fuels
(3) accelerating deforestation
(4) preserving wetlands

17 Tissues of oleander plants contain chemicals that are poisonous to many mammals. The production of these poisonous chemicals most likely benefits oleanders by preventing leaf loss caused by
(1) lack of rain
(2) scavengers
(3) mineral absorption
(4) herbivores

18 Sugar maples and white pines are two different tree species that often grow side by side in the Adirondack Mountains. Which statement concerning these trees is correct?
(1) Since they are both trees, they can interbreed.
(2) Since they are not closely related, they do not compete with one another.
(3) Even though they are both trees, each plays a different role in the ecosystem.
(4) They utilize totally different abiotic resources.

19 People living in and around the Amazon rain forest have used parts of the gaviola tree to prepare medicines. Research is being conducted to determine if this tree can provide cures for many types of cancer. Continued destruction of rain forests might
(1) reduce biodiversity and remove organisms with the potential to help humans
(2) increase biodiversity and remove damaged and diseased trees
(3) reduce biodiversity and increase the reproductive rates of all organisms
(4) increase biodiversity and ecosystem stability where humans plant crops

20 A fundamental concept of ecology is that living organisms
(1) are independent and do not interact with each other or with the physical environment
(2) do not interact with other living organisms, but do interact with the physical environment
(3) interact with each other, but do not interact with the physical environment
(4) interact with other living organisms and interact with the physical environment

21 Many families now use compost to make the soil in their gardens more fertile. They collect vegetable scraps and yard trimmings, place them in a compost pile or special container, and let them decompose. The organisms primarily responsible for decomposing the vegetable scraps and yard trimmings are
(1) plant parasites
(2) autotrophs
(3) bacteria and fungi
(4) scavengers and viruses

22 In 2003, the city of Rochester, New York, began killing weeds with steam. A machine heats water to 280°F then sprays it on the weeds with great pressure. The extreme heat destroys the cellular structure of the plants. What is a possible *disadvantage* of this method of weed control?
(1) It can be used safely in areas where children play.
(2) It reduces the number of mutations in the ecosystem.
(3) It destroys weeds without chemicals.
(4) It alters the habitats of some beneficial insects.

23 A food chain is represented below.

grass → rabbit → hawk

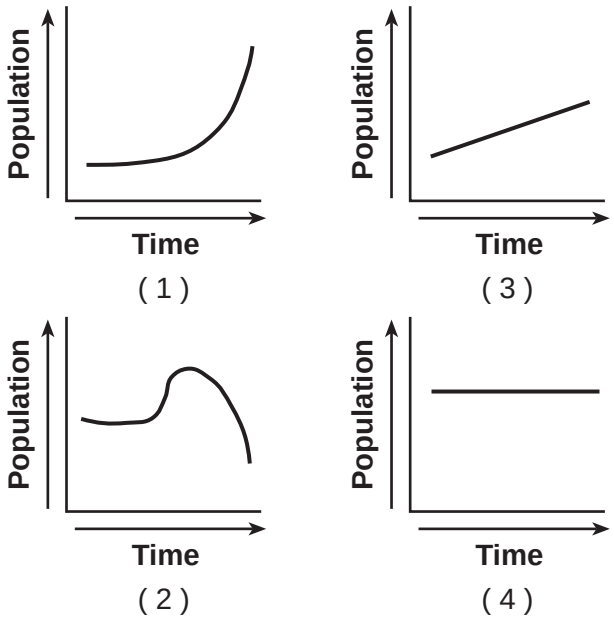
Structures within the rabbit are formed using

(1) solar energy from the grass
(2) heat energy lost to the environment
(3) chemical energy from the hawk
(4) chemical energy from the grass

24 The graduating class of a high school would like to give the school a gift that would have a positive impact on the environment. Which plan would be the best choice?

(1) making wooden benches by harvesting trees from school property
(2) planting native trees along the border of the school property
(3) introducing a new population of foxes, the school mascot, to school grounds
(4) clearing an area to make room for additional student parking

25 Which graph best illustrates the change in the human population over the past 2000 years?



26 Which processes lead to the greatest variety of genetic combinations?

(1) asexual reproduction and cloning
(2) meiosis and fertilization
(3) meiosis and mitosis
(4) cloning and mitosis

27 One possible explanation for the fact that some simple, one-celled organisms did *not* evolve into complex, multicellular organisms is that

(1) energy flow in an ecosystem requires simple autotrophic organisms
(2) the reproductive rate of single-celled organisms is too fast for change to occur
(3) these organisms possessed traits that enabled them to survive in a changing environment
(4) stability within an ecosystem requires the presence of a variety of different species

28 In New York State, cars are inspected to be sure they are not releasing excessive amounts of several gases into the atmosphere. This is done in an effort to

(1) recycle more nutrients
(2) reduce biodiversity
(3) reduce global warming
(4) increase the growth rates of forests

29 Damage to the ozone shield over the United States is likely to cause

(1) increased warming of local ecosystems
(2) increased exposure to ultraviolet light
(3) reduction in the pH of acid precipitation
(4) reduction in the frequency of floods and droughts

30 Researchers recently discovered that when hammerhead sharks were moved to shallower water, resulting in exposure to increased light intensity, their backs turned a deep brownish black. Which statement best supports this observation?

(1) Genes are inherited, but their expression can be modified by interactions with the environment.
(2) The cells of hammerhead sharks contain many thousands of different genes in their nuclei.
(3) An inherited trait of an individual can be determined by one or by many genes.
(4) Asexually produced offspring are normally genetically identical to the parent.

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.

Base your answers to questions 31 through 33 on the information below and on your knowledge of biology.

An experiment was carried out to answer the question "Does the pH of water affect the growth of radish plants?" Two groups of ten radish plants were set up. One group was watered with water having a pH of 3.0, and the other group was watered with water having a pH of 7.0. Both groups of plants received the same amount and intensity of light, the same amount of water, and they were grown in the same type of soil. The heights of the radish plants were measured every 2 days for a period of 2 weeks.

31 Which sentence is a possible hypothesis that was tested in this experiment?

(1) Does the pH of water affect the growth of radish plants?
(2) Will the amount of water alter the heights of the radish plants?
(3) The temperature of the water will affect the heights of the radish plants.
(4) The pH of the water will affect the heights of the radish plants.

32 What was the dependent variable in this experiment?

(1) heights of the plants
(2) pH of the water
(3) temperature of the water
(4) type of soil

33 Which activity might help to increase the validity of this experiment?

(1) repeating the experiment several times
(2) using two different types of radish seeds in each group
(3) using the same pH for both groups of plants
(4) placing one set of plants in sunlight and one in darkness

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

Female mosquitoes spread diseases when they bite humans to obtain blood. It is only the females that do the biting. Research is being conducted to alter the DNA of male mosquitoes. These altered males could then mate with normal female mosquitoes. All of the resulting female offspring would have wing defects that prevent them from flying.

34 One assumption from this research is that the

(1) altered males would begin to bite humans and spread the diseases
(2) female offspring would be unable to bite humans, since they cannot fly
(3) altered males would not be able to reproduce
(4) female offspring would become larger in size

35 The method used to alter the male mosquitoes is an example of an application of

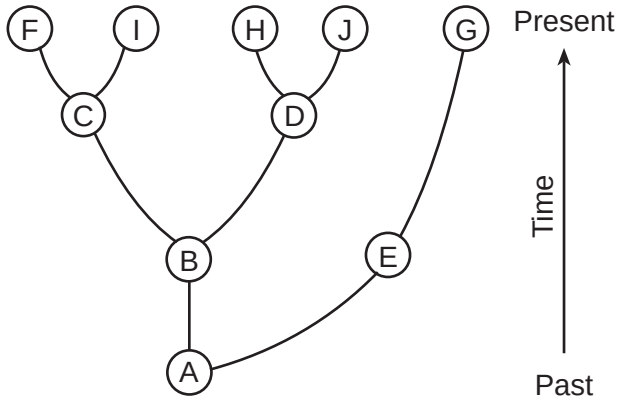
(1) a feedback mechanism
(2) selective breeding
(3) biotechnology
(4) physiology

---

36 Scientists have successfully cloned animals, including large mammals such as sheep. Which statement provides the most likely reason that a human has *not* yet been cloned?

(1) Humans have DNA that is structurally very different from other mammals.
(2) Cloning can only be performed on animals that normally reproduce asexually.
(3) Human genes are made of too many different types of simple sugars.
(4) Some people consider human genetic experiments unethical.

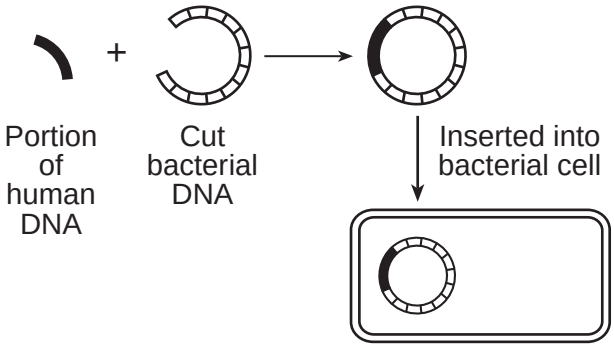
37 Some evolutionary pathways are represented in the diagram below.



An inference that can be made from information in the diagram is that

(1) species *E* evolved from species *G*
(2) species *A* was probably much larger than all the other species
(3) species *C* is a direct descendant of species *I*
(4) species *J* is adapted to the existing environment

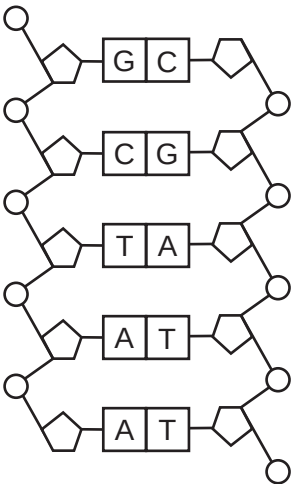
38 The diagram below represents a technique used in some molecular biology laboratories.



Which phrase best describes a possible result of this process?

(1) the production of gametes having both human and bacterial DNA
(2) the production of a human hormone by the bacterial cell
(3) the introduction of a pathogen into a human cell
(4) the separation of DNA fingerprints in the bacterial cell

39 The diagram below represents a portion of a molecule found in cells of the human body.



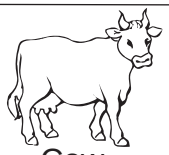
Sequences represented by the letters in this molecule enable human cells to

(1) alter the method of absorption of material
(2) carry out asexual reproduction by meiosis
(3) synthesize enzymes from organic molecules
(4) modify genetic recombination during mitosis

40 Potatoes were the main crop in Ireland in the 1800s. Almost the entire population of Ireland was dependent on a single variety of potato, the "lumper." These potatoes were reproduced by a method of asexual reproduction known as vegetative propagation. In the middle of the 1800s, a disease caused by a fungus killed almost the entire lumper crop within two years. As a result, millions of people in Ireland died of starvation. The most likely reason the potato disease was able to destroy the potato crop in such a short time is that the

(1) potato population lacked variations
(2) lumper variety had a long reproductive cycle
(3) lumper had several variations caused by vegetative propagation
(4) potato population in Ireland utilized all of the finite resources

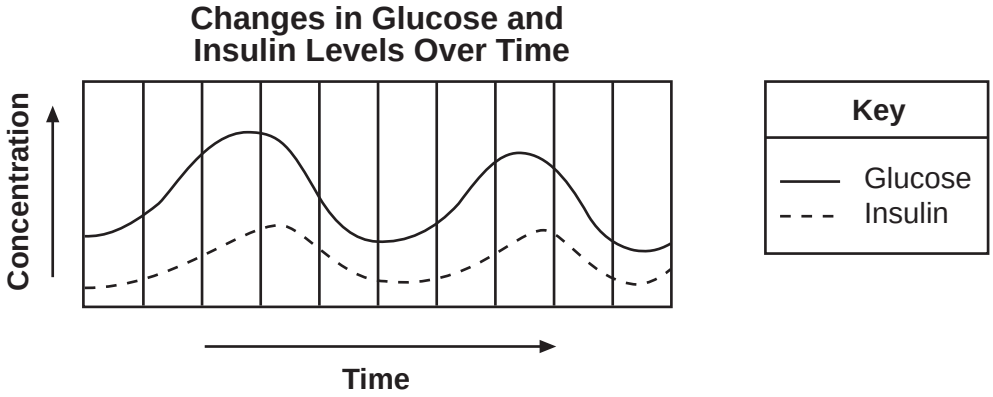
41 The chart below shows examples from two groups of organisms, multicellular and one-celled.

Group A – Multicellular Organisms		Group B – One-celled Organisms	
 Cow	 Cat	 *Paramecium*	 *Vorticella*

The tissues and organs in group *A* perform functions that are

(1) similar to those performed by the tissues and organs in group *B*
(2) similar to those performed by the cell organelles in group *B*
(3) different from those performed by the tissues and organs in group *B*
(4) identical to those performed by the cell organelles in group *B*

42 The graph below shows changes in the concentrations of glucose and insulin in the blood of a human over a period of time.



Which statement correctly explains these changes?

(1) High glucose levels cause more insulin to be released.
(2) High insulin levels cause more glucose to be released.
(3) Low glucose levels cause more insulin to be released.
(4) Low insulin levels cause more glucose to be released.

43 The diagram below represents an incomplete sequence of levels of organization.

organelles → tissues → organs → organ systems → organism

This sequence can be completed correctly by inserting

(1) "cells →" between organelles and tissues
(2) "proteins →" between tissues and organs
(3) "populations →" between organs and organ systems
(4) "molecules →" between organ systems and organisms

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 48 on the data table below, which shows the estimated population of wolves in Minnesota from 1995 through 2002.

Minnesota Wolf Population

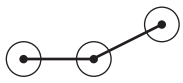
Year	Estimated Population
1995	2000
1996	2200
1997	2300
1998	2450
1999	2500
2000	2600
2001	2600
2002	2600

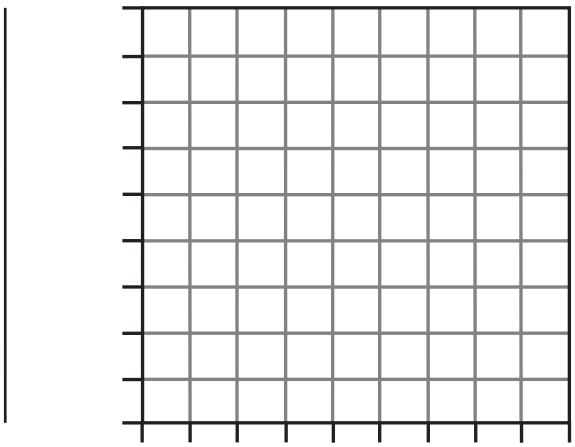
Directions (44–46): Using the information in the data table, construct a line graph on the grid, following the directions below.

44 Label the *y*-axis on the line provided. [1]

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

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

Example: 



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

47 The most likely explanation for the size of the wolf population for the 2000–2002 period is that the population

(1) reached the carrying capacity of the environment
(2) stabilized due to global warming
(3) began reproducing at a faster rate
(4) was affected by a new pathogen

48 Wolves prey on animals such as deer. Identify *one* adaptation of deer that would help them to survive in an area populated by wolves. [1]

Base your answers to questions 49 through 51 on the passage below and on your knowledge of biology.

Tracking the Big Horn

Bighorn sheep, *Ovis canadensis*, are a majestic symbol of the mountainous West. They browse at high altitudes and in steep, rocky areas from Texas to British Columbia. Rams' horns curl around their eyes and grow up to 45 inches long. Males butt horns to establish dominance during the fall rut [mating season]. Ewes [females] sport shorter, spiked horns similar to a mountain goat's. From their first days of life, bighorns are surefooted enough to scale cliffs too steep for most predators to follow.…

Two centuries ago, an estimated 1.5 million to 2 million bighorn sheep lived in North America; today, a mere 28,000 remain. Diseases caught from domestic sheep, competition from livestock for forage, and trophy hunting for their horns caused populations to plummet [drop rapidly]. Bighorns graze in mountain meadows, habitat that is being lost to expanding forests, which are growing beyond their historic boundaries in part because the wildfires that are used to hold them in check have been suppressed. Glacier National Park, home to 400 to 600 bighorn sheep, lists the animals as a "species of concern," that is, at risk of becoming endangered.…

Source: Becky Lomax, *Smithsonian Magazine,* March, 2008
"Tracking the Big Horn"

Note: The answers to questions 49 and 50 should be recorded on your separate answer sheet.

49 The feeding activity of the bighorn sheep is best described as

(1) consumers feeding on autotrophs
(2) decomposers feeding on consumers
(3) autotrophs feeding on decomposers
(4) autotrophs feeding on heterotrophs

50 Which statement best accounts for the decline in bighorn sheep populations?

(1) Predators of the sheep decreased in number.
(2) Sheep ewes that have shorter, spiked horns increased in number.
(3) Human activities directly and indirectly affected the sheep.
(4) The sheep were listed as a "species of concern" by Glacier National Park.

51 State *one* way that young bighorn sheep are able to avoid predators. [1]

Base your answer to question 52 on the information below and on your knowledge of biology.

For many years, scientists hypothesized the existence of a single tomato gene that increases the sweetness and production of tomatoes. After years of research, a team of scientists identified the gene and observed greater sweetness and tomato production in plants that contain this gene.

52 Identify a process that could be used to insert this gene into other plant species to increase fruit production. [1]

Base your answer to question 53 on the information below and on your knowledge of biology.

Bisphenol-A (BPA), is an industrial chemical commonly added to disposable, plastic water bottles to make them sturdier. BPA has been shown to inhibit the development of tadpoles into frogs. Some tadpoles exposed to high levels of BPA develop into frogs without legs. Others, when exposed to the chemical as tadpoles, fail to reabsorb their tails and thus grow into frogs with significantly long tails.

53 State *one* specific way humans can help decrease the exposure of animals to bisphenol-A. [1]

54 Organ systems of the human body interact to maintain a balanced internal environment. As blood flows through certain organs of the body, the composition of the blood changes because of interactions with those organs. State *one* change in the composition of the blood as it flows through the respiratory system. [1]

55 State *one* possible *negative* impact of importing a natural predator to control a pest. [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 answer to question 56–60 on the information below and on your knowledge of biology.

A student has a sandwich for lunch. The bread contains starch molecules and various other molecules. After chewing and swallowing some of the sandwich, the starch moves along the digestive system and is digested. The sequence below represents what takes place next.

digested starch → bloodstream → cell → cell structure → ATP

56–60 Explain what occurs, beginning with the digestion of starch and ending with ATP production. In your answer, be sure to:

- identify the molecules that are used to digest the starch [1]
- identify the molecules produced when starch is digested [1]
- explain why starch must be digested before its building block molecules can enter the bloodstream [1]
- identify the structure in the cell that will produce ATP from the starch building blocks [1]
- state why ATP is important to cells [1]

Base your answers to questions 61 through 63 on the information below and on your knowledge of biology.

A Study of Antibacterial Cleansers

An experiment was designed to test the effectiveness of three antibacterial hand-cleansing solutions against bacteria present on hands. Swabs were used to take one sample each from the unwashed hands of ten test subjects. Each swab was then rubbed across the surface of bacterial growth medium in a separate petri dish. The dishes were placed in an incubator to allow bacterial colonies to develop.

Ten other test subjects treated their hands with an antibacterial hand-cleansing solution, then had their hands swabbed, and ten more petri dishes were set up and incubated in the same way as the first set of dishes.

The process was repeated again with ten more test subjects for a second hand cleanser, and again for a third group with a third hand cleanser.

The results from the incubated petri dishes were averaged. The averages are shown in the data table below.

Effectiveness of Antibacterial Cleansers

Treatment Before Swabbing	Average Number of Bacterial Colonies
none	30
antibacterial hand-cleansing solution 1	12
antibacterial hand-cleansing solution 2	13
antibacterial hand-cleansing solution 3	11

61 What was the purpose of testing unwashed hands? [1]

62 Explain why the researchers used data from ten trials and averaged them, rather than data from a single trial. [1]

63 Based on the data provided, what could the researchers conclude regarding the effectiveness of the antibacterial hand-cleansing solutions tested? [1]

Base your answer to question 64–66 on the information below and on your knowledge of biology.

The Critical Role of the Placenta

The proper functioning of the placenta is critical to the growth and development of a healthy fetus. For example, the placenta appears to act as a nutrient sensor. It regulates the amounts and types of nutrients that are transported from the mother to the fetus.

Improper functioning of the placenta can alter the structure and function of specific cells and organ systems in the developing fetus, putting it at risk for health problems as an adult. For example, in some pregnancies, the placenta develops a resistance to blood flow. This resistance appears to force the heart of the fetus to work harder. This could result in an increased chance of the individual developing heart disease as an adult. A group of hormones known as glucocorticoids affects the development of all the tissues and organ systems. One of the things this group of hormones does is to alter cell function by changing the structure of cell membrane receptors.

64–66 Discuss the importance of the placenta in the development of a healthy fetus. In your answer, be sure to:

- identify *two* factors that could influence the nutrients that can pass from the mother to the fetus [1]
- identify the group of hormones that alter cell membrane receptors and explain how this alteration can affect cell function [1]
- state the role of the uterus in the development of the fetus and the placenta [1]

67 A farmer planted two corn varieties, one of which was very tasty but had small ears, and the other one had large ears but did not taste nearly as good. The pollen from one variety was used to fertilize the other variety of corn. State *one* biological advantage this method of reproduction has over cloning. [1]

Base your answer to question 68–70 on the information below and on your knowledge of biology.

68–70 Feedback mechanisms have evolved that maintain homeostasis. Describe how homeostasis is maintained through feedback. In your answer, be sure to:

- identify *one* feedback mechanism in the human body [1]
- identify, other than death, *one* specific result if homeostasis fails in the human body [1]
- describe how a plant regulates water loss through a feedback mechanism that involves guard cells [1]

Base your answers to questions 71 and 72 on the information below and on your knowledge of biology.

New York State relies on natural gas for 24% of its energy supply. It is estimated that large deposits of natural gas are located in New York State. It is possible to extract the gas via high-volume hydraulic fracturing (hydrofracking). Hydrofracking involves freeing the natural gas by using a large amount of water treated with chemicals, which produces large quantities of waste products. Some people are in favor of hydrofracking, while others are against it. One side is concerned about the negative effect it will have on the environment. The other side points out the potential benefits it might provide.

71 Describe a trade-off that must be considered in the decision whether to move forward with hydrofracking. [1]

72 Identify *one* renewable alternative to natural gas as an energy source that New York State could use and describe the advantage of using this source, other than it is renewable. [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, of those given, 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.

Note: The answer to question 73 should be recorded on your separate answer sheet.

73 A class is recording pulse rates of the students in a data table like the one shown below.

Class Pulse Rates

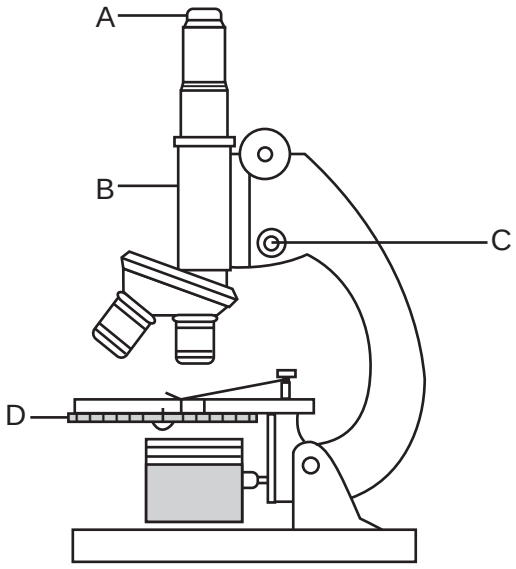
Row	Pulse Rate (beats per minute)	Number of Students
A	< 51	
B	51–70	
C	71–90	
D	>90	

One student checks his pulse and counts 23 beats over a time interval of 20 seconds. In which row in the data table should the pulse rate of this student be recorded?

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

Note: The answer to question 74 should be recorded on your separate answer sheet.

74 The diagram below represents a compound light microscope. Several parts have been labeled.



In order to make an image brighter, which labeled part of the microscope would most likely be adjusted?

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

Note: The answer to question 75 should be recorded on your separate answer sheet.

75 Cell membranes are said to be selectively permeable. Which statement best explains what selectively permeable means?

(1) The cell membrane prevents any harmful substance from entering the cell.
(2) The cell membrane lets certain substances enter the cell and keeps certain substances out of the cell.
(3) The cell membrane allows only large molecules to diffuse into the cell.
(4) The cell membrane has pores that let only water and glucose into the cell and carbon dioxide out.

Base your answers to questions 76 and 77 on the information below and on your knowledge of biology.

One of the effects of Hurricane Katrina, which devastated New Orleans in 2005, was the death of almost all of the plants in flooded areas. Initially, toxic chemicals and bacteria were suspected as a possible cause. Scientists later determined that the salt concentration in the floodwater caused the plants to die.

Note: The answer to question 76 should be recorded on your separate answer sheet.

76 The death of the plants was most likely due to

(1) water moving into plant cells from the surrounding environment
(2) water moving out of plant cells into the surrounding environment
(3) both water and salt moving from plant cells into the surrounding environment
(4) both water and salt moving into plant cells from the surrounding environment

77 Identify the process responsible for the effect that the salt water had on the plants. [1]

Base your answers to questions 78 and 79 on the information and data table below and on your knowledge of biology.

An investigation was carried out on four different plant species to determine which of three species was most closely related to an unknown plant species. The results of the investigation are shown in the data table below.

Comparison of Four Plant Species

Plant Species	Test for Enzyme M	Differences in Amino Acid Sequences	Gel Electrophoresis Banding Pattern
unknown	+		11, 8, 6, 2
1	–	4	24, 8, 5
2	+	1	11, 8, 6, 2
3	+	3	13, 7, 5, 2

78 Which plant species appears to be most closely related to the unknown species? Support your answer. [1]

Species: _____

_____

_____

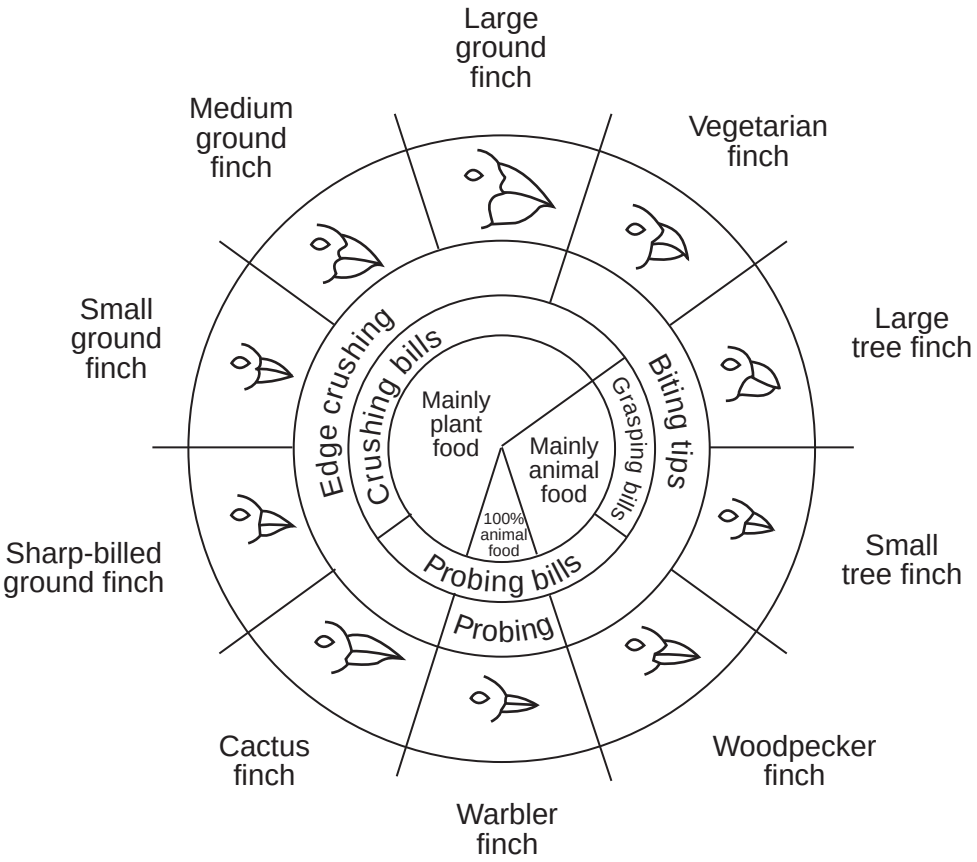
79 Identify *two* pieces of evidence, other than those shown in the chart, that can be used to determine if two plant species are related. [1]

(1) _____

(2) _____

Base your answer to question 80 on the diagram below and on your knowledge of biology.

Variations in Beaks of Galapagos Islands Finches



From: *Galapagos: A Natural History Guide*

80 There are a number of islands in the Galapagos that these finches could possibly inhabit. Explain why each island would *not* be expected to have all of the species shown. [1]

Base your answers to questions 81 through 83 on the information and chart below and on your knowledge of biology.

The Galapagos Islands are home to many different species of finches. Three finch species, their relative beak sizes, and their food preferences are represented below. All three species live on the same island.

Three Galapagos Finches and Their Sources of Nutrition

Name	Foods
Vegetarian finch *Platyspiza crassirostris* 	Buds, leaves, fruit of trees 
Warbler finch *Certhidea olivacea* 	Flying and ground-dwelling insects 
Cactus finch *Geospiza scandens* 	Cactus flowers and nectar 

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

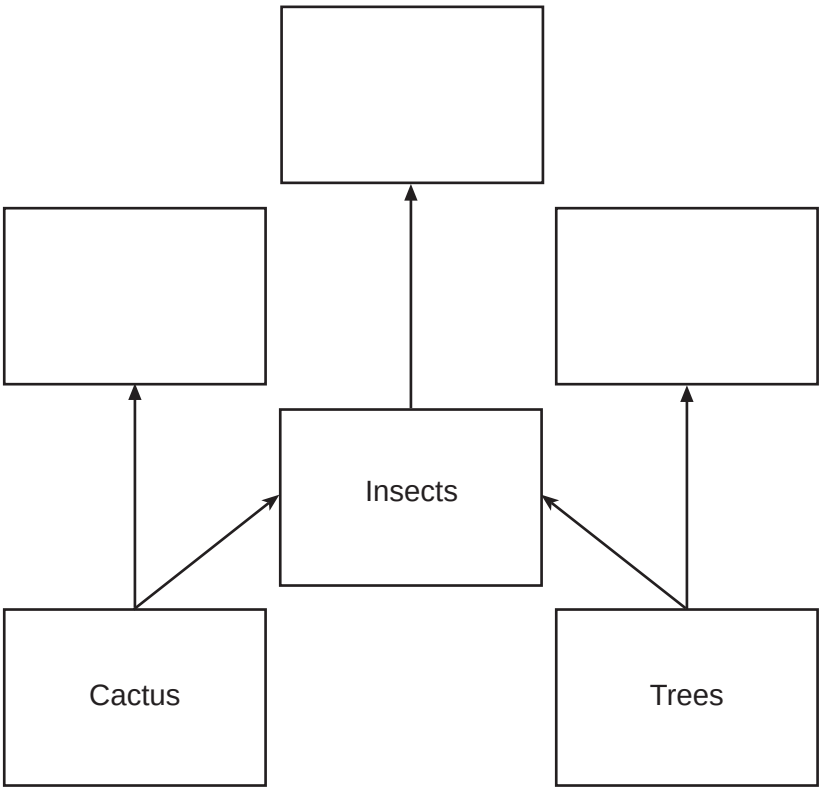
81 Which statement is correct concerning the nutritional preferences of these finches?

(1) The three species do not compete for food because they eat different types of foods.
(2) The vegetarian and cactus finches compete for food because they both feed on producers.
(3) The vegetarian and warbler finches compete for food because they both live in trees.
(4) The three species of finches compete for food because their beaks are similar in shape and size.

82 Which process allows for the evolution of finches over time?

(1) natural selection
(2) selective breeding
(3) asexual reproduction
(4) ecological succession

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



84 Identify *one* trait, other than a beak characteristic, that could affect the survival of a finch. Support your answer. [1]

85 Identify *one* specific substance necessary for muscle activity that is delivered to muscles more effectively as a result of increased heart rate. [1]

Printed on Recycled Paper

LIVING ENVIRONMENT

FOR TEACHERS ONLY

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

LE

LIVING ENVIRONMENT

Monday, January 27, 2014 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 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 at: http://www.p12.nysed.gov/assessment/ and select the link "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.

Multiple Choice for Parts A, B–1, B–2, and D
Allow 1 credit for each correct response.

Part A

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

Part B–1

31 ..... **4**	35 ..... **3**	39 ..... **3**	43 ..... **1** .....
32 ..... **1**	36 ..... **4**	40 ..... **1**	
33 ..... **1**	37 ..... **4**	41 ..... **2**	
34 ..... **2**	38 ..... **2**	42 ..... **1**	

Part B–2

47 ..... **1**	49 ..... **1**	50 ..... **3** .....

Part D

73 ..... **2**	75 ..... **2**	81 ..... **1** .....
74 ..... **4**	76 ..... **2**	82 ..... **1** .....

Directions to the Teacher

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.*

Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Allow 1 credit for each correct response.

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 more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not to score their own student's answer papers.

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. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

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.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Monday, January 27, 2014. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

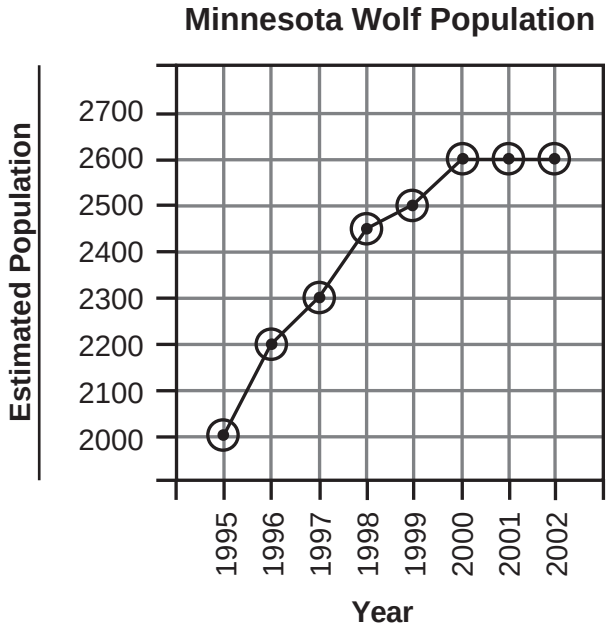
Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

44 [1] Allow 1 credit for correctly labeling the *y*-axis.

45 [1] Allow 1 credit for marking an appropriate scale, without any breaks, on each axis.

46 [1] Allow 1 credit for correctly plotting the data and connecting the points.

Example of a 3-credit graph for questions 44–46:



Note: Allow credit if points are correctly plotted, but not circled.
Do *not* assume that the intersection of the *x*- and *y*-axes is the origin (0,0), unless it is labeled. An appropriate scale only needs to include the data range in the data table.
Do *not* allow credit if points are plotted that are not in the data table, e.g., (0,0), or for extending lines beyond the data points.

47 MC on scoring key

48 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— speed

— antlers

— hooves for protection/defense

— fur color similar to surroundings

— well-developed senses

49 MC on scoring key

50 MC on scoring key

51 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Young bighorn sheep are able to climb mountains too steep for predators to follow.

— They can scale cliffs.

— They are surefooted.

52 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— genetic engineering

— gene splicing

— gene manipulation

Note: Do *not* allow credit for biotechnology; it is a field of science, not a process.

53 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— use reusable water bottles not made with BPA

— pass legislation that outlaws the manufacturing of products with BPA

— ensure that water bottles are not littered in the environment

— recycle disposable water bottles

— use metal/glass containers

— control the disposal of industrial waste

54 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The blood takes in oxygen as it flows through the respiratory system.

— The oxygen level goes up/increases.

— It releases water.

— It releases carbon dioxide.

55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The predator might feed on beneficial organisms.

— might outcompete other species of predators

— might become a pest

— They might overpopulate and wipe out prey species.

— might bring in a disease

— could alter the existing ecosystem

Part C

Note: The student's response to the bulleted items in question 56–60 need *not* appear in the following order.

56 [1] Allow 1 credit for identifying the molecules that are used to digest the starch. Acceptable responses include, but are not limited to:

— enzymes

— biological catalysts

— amylase molecules

57 [1] Allow 1 credit for identifying the molecules produced when starch is digested. Acceptable responses include, but are not limited to:

— glucose molecules

— simple sugars

— monosaccharides

— sugars

58 [1] Allow 1 credit for explaining why starch must be digested before its building block molecules can enter the bloodstream. Acceptable responses include, but are not limited to:

— Starch molecules are too large.

— They are too big to get from the digestive tract into the blood.

— Large molecules cannot diffuse through cell membranes.

59 [1] Allow 1 credit for identifying the structure in the cell that will produce ATP from the starch building blocks as the mitochondrion (mitochondria).

60 [1] Allow 1 credit for stating why ATP is important to cells. Acceptable responses include, but are not limited to:

— ATP is the molecule that supplies usable energy for all the activities of a cell.

— ATP molecules provide energy for cells.

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

— to have a group for comparison

— to use the unwashed group as a control

— to see what would happen without the treatment

— the control

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

— Data from single trials are more likely to include error.

— to make the experiment/conclusion more valid

— Averaging data makes the conclusion more valid.

— to make the experiment/conclusion more reliable

63 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Solution 3 is the most effective antibacterial hand-cleansing solution of those tested.

— Solution 2 is the least effective antibacterial hand-cleansing solution of those tested.

— Solutions 1, 2, and 3 are all more effective at killing bacteria than no treatment.

— All of them are equally effective.

— None of them were 100% effective.

Note: The student's response to the bulleted items in question 64–66 need *not* appear in the following order.

64 [1] Allow 1 credit for identifying *two* factors that could influence the nutrients that can pass from the mother to the fetus. Acceptable responses include, but are not limited to:

— diet of the mother

— hormones

— blood supply to the placenta

— the ability of the placenta to sense nutrients

— concentration of nutrients in the blood/blood vessels

— permeability of the placenta

— improper functioning of the placenta

— illness/disease

— size of molecules

65 [1] Allow 1 credit for identifying the group of hormones that alter cell membrane receptors and for explaining how this alteration can affect cell function. Acceptable responses include, but are not limited to:

— Glucocorticoids–Receptors have a specific shape that determines their function. If the shape of a receptor is altered, it might not be able to perform its job appropriately.

— Glucocorticoids–They alter cell function by changing the structure of the cell membrane receptors.

— Glucocorticoids–They alter receptors to help them function.

66 [1] Allow 1 credit for stating the role of the uterus in the development of the fetus and the placenta. Acceptable responses include, but are not limited to:

— The uterus is where the placenta forms and the fetus develops.

— provides protection

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

— This method gives the offspring characteristics of each variety, and does not make a copy of just one.

— This method can create new varieties.

— increases biodiversity

Note: The student's response to the bulleted items in question 68–70 need *not* appear in the following order.

68 [1] Allow 1 credit for identifying *one* feedback mechanism in the human body. Acceptable responses include, but are not limited to:

— the change in heart rate in response to exercise

— the change in respiratory rate in response to exercise

— sweating or shivering in response to changes in body temperature

— the maintenance of blood sugar levels

— regulation of body temperature on a hot day

— increase in white blood cells in response to an infection

69 [1] Allow 1 credit for identifying, other than death, *one* specific result if homeostasis fails in the human body. Acceptable responses include, but are not limited to:

— disease/gets sick

— disruption in the body's ability to carry out respiration/digestion/excretion, etc.

— The body is unable to respond to external/internal stimuli correctly.

— diabetes

— heat stroke/hypothermia

Note: Do *not* allow credit for death.

70 [1] Allow 1 credit for describing how a plant regulates water loss through a feedback mechanism that involves guard cells. Acceptable responses include, but are not limited to:

— Guard cells close openings in the leaves, slowing/stopping water loss.

— When guard cells close the stomata, less water evaporates out of the leaves.

— Guard cells regulate the rate of transpiration when they change shape.

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

— The decision involves balancing the economic gains and the possible environmental damage.

— Fracking will provide people with more natural gas but might damage the environment.

— There might be more jobs, but there is a possibility for increased water pollution.

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

— solar energy – Energy from the Sun is free.

— wind energy – no air pollution

— geothermal – no carbon dioxide released

— hydroelectricity – Energy is generated locally.

Part D

73 **MC on scoring key**

74 **MC on scoring key**

75 **MC on scoring key**

76 **MC on scoring key**

77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— diffusion

— osmosis

— dehydration

78 [1] Allow 1 credit for 2 and supporting the answer. Acceptable responses include, but are not limited to:

— It has the most characteristics in common with the unknown species.

— It has the same gel electrophoresis banding pattern.

— It has only one amino acid sequence different from the unknown species.

79 [1] Allow 1 credit for *two* additional pieces of evidence that can be used to determine if two plant species are related. Acceptable responses include, but are not limited to:

— shapes of the leaves

— structures of the stems/flower

— characteristics of the seeds

— types of chlorophyll present

— comparison of DNA sequences

— fossil records

80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Each island has its own set of environmental conditions which might not provide food or shelter for some of these species.

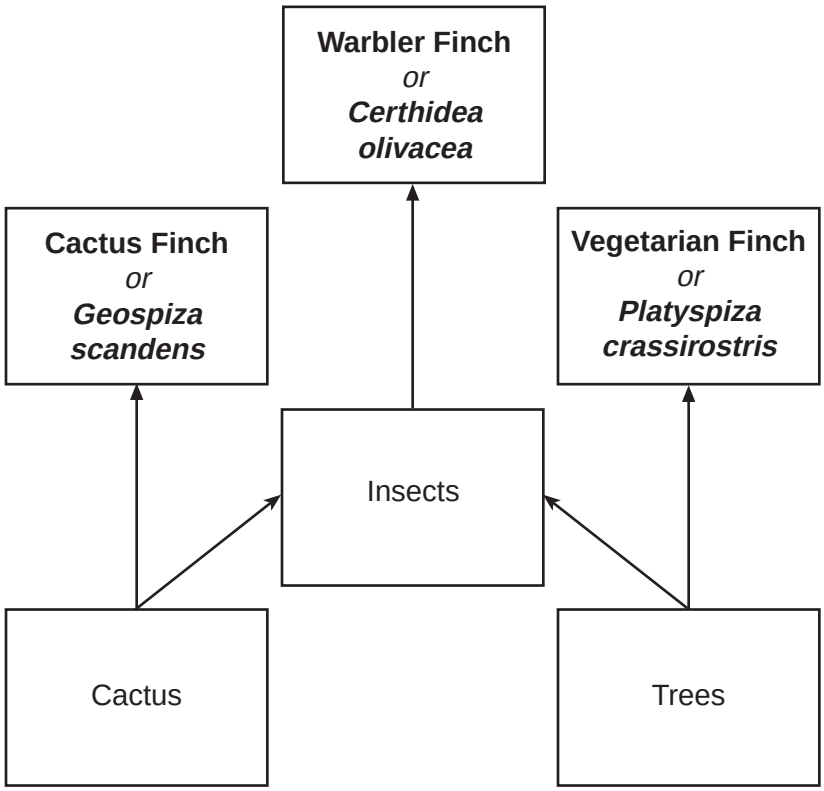
— Different islands might have different kinds of food available.

— too much competition

81 MC on scoring key

82 MC on scoring key

83 [1] Allow 1 credit for completing the three boxes with the correct finch species, as shown below.



84 [1] Allow 1 credit for identifyng *one* trait, other than beak characteristic, that could affect the survival of a finch and supporting the answer. Acceptable responses include, but are not limited to:

Coloration:

— Camouflage would help survival.

— attract a mate for successful reproduction

Strength:

— helps in competition for food

Aggressiveness:

— helps in competition for mate/food

85 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— oxygen

— glucose

The *Chart for Determining the Final Examination Score for the January 2014 Regents Examination in Living Environment* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Monday, January 27, 2014. 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.

Online 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 online 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 http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.
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

January 2014 Living Environment

Standards	Question Numbers			
	Part A 1–30	Part B–1 31–43	Part B–2 44–55	Part C 56–72
Standard 1 — Analysis, Inquiry and Design				
Key Idea 1				
Key Idea 2		31, 33		62
Key Idea 3		32	44, 45, 46	
Appendix A (Laboratory Checklist)				61, 63
Standard 4				
Key Idea 1	1	41, 43	49, 50, 51, 54	56, 57, 58, 59, 60
Key Idea 2	2, 3, 4, 30	34, 35, 38, 39	52	
Key Idea 3	5, 6, 11, 26, 27	37, 40		
Key Idea 4		36		64, 65, 66, 67
Key Idea 5	7, 8, 9, 10, 13, 14, 15	42		68, 69, 70
Key Idea 6	12, 16, 17, 18, 19, 20, 21, 23		47, 48	
Key Idea 7	22, 24, 25, 28, 29		53, 55	71, 72

Part D 73–85	
Lab 1	78, 79
Lab 2	73, 85
Lab 3	80, 81, 82, 83, 84
Lab 5	74, 75, 76, 77

The State Education Department / The University of the State of New York

Regents Examination in Living Environment – January 2014

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

Raw Score	Scale Score
85	**100**
84	**98**
83	**97**
82	**97**
81	**96**
80	**95**
79	**94**
78	**94**
77	**93**
76	**92**
75	**91**
74	**91**
73	**90**
72	**89**
71	**89**
70	**88**
69	**87**
68	**86**
67	**86**
66	**85**
65	**84**
64	**84**
63	**83**
62	**82**
61	**81**
60	**81**
59	**80**
58	**79**
57	**79**

Raw Score	Scale Score
56	**78**
55	**77**
54	**77**
53	**76**
52	**75**
51	**74**
50	**73**
49	**73**
48	**72**
47	**71**
46	**70**
45	**69**
44	**68**
43	**67**
42	**66**
41	**65**
40	**64**
39	**63**
38	**62**
37	**61**
36	**60**
35	**59**
34	**58**
33	**56**
32	**55**
31	**54**
30	**53**
29	**51**
28	**50**

Raw Score	Scale Score
27	**49**
26	**47**
25	**46**
24	**44**
23	**43**
22	**41**
21	**40**
20	**38**
19	**37**
18	**35**
17	**33**
16	**32**
15	**30**
14	**28**
13	**26**
12	**25**
11	**23**
10	**21**
9	**19**
8	**17**
7	**15**
6	**13**
5	**11**
4	**9**
3	**7**
2	**5**
1	**2**
0	**0**

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 scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration 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 Regents Examination in Living Environment.