The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Tuesday, June 16, 2015 — 1:15 to 4:15 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 Materials are transported within a single-celled organism by the

(1) nucleus
(2) cytoplasm
(3) mitochondrion
(4) ribosome

2 Which row in the chart below correctly pairs a food molecule with its building block?

Row	Food Molecule	Building Block
(1)	starch	amino acid
(2)	sugar	starch
(3)	protein	amino acid
(4)	amino acid	sugar

3 The flow of energy in an ecosystem is best described as energy moving in

(1) one direction from the Sun to the producers and then to the consumers
(2) one direction from a consumer to a producer and then to the Sun as heat and light
(3) two directions between the producers that are present
(4) two directions, back and forth, between the producers and the consumers

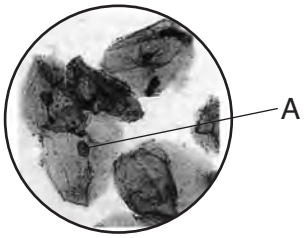
4 Occasionally, during pregnancy, the placenta can separate from the uterus. This causes a disruption in development and sometimes death of the fetus. Harm to the developing fetus might occur because the placenta

(1) transfers oxygen and nutrients to the fetal blood
(2) sends maternal blood into the fetus
(3) supplies milk for the fetus
(4) breaks down wastes of the fetus

5 Which process produces only identical offspring?

(1) meiotic cell division
(2) selective breeding
(3) cloning
(4) fertilization

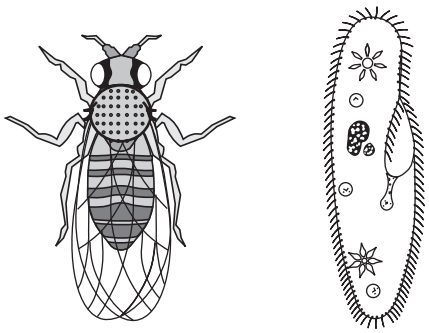
6 A photograph of human cells as seen with a compound light microscope is shown below. A cell structure is labeled *A*.



Structure *A* is most likely a

(1) mitochondrion that synthesizes food for the cell
(2) nucleus that is the site of food storage
(3) mitochondrion that absorbs energy from the Sun
(4) nucleus that is responsible for the storage of information

7 A land-dwelling organism, *A*, and an aquatic single-celled organism, *B*, are represented below.



Which statement best explains how *A* and *B* are able to survive in their environments?

(1) The organelles in *B* perform similar functions to the organ systems in *A*.
(2) The transport system in *B* is more complex than the transport system in *A*.
(3) Both *A* and *B* take in oxygen from the water.
(4) Only *A* can pass on traits to offspring.

8 A man is exposed to large amounts of ultraviolet radiation while sunbathing at the beach. This exposure causes a genetic change in the DNA of a skin cell. In the future, this change can be passed on to

(1) his male and female children
(2) his male children, only
(3) all cells in his body
(4) his skin cells, only

9 Palm oil, produced from palm trees, is not only a biofuel, but is also used in food additives, cosmetics, and lubricants. Palm tree plantations are now cultivated in areas that were formerly natural forests. One ecological concern raised by this expansion is that

(1) the natural forest ecosystem may harm the palm trees
(2) the use of the land for agriculture will increase the biodiversity of the area
(3) humans are changing the basic processes of the palm trees
(4) planting large expanses of one crop reduces the biodiversity of the area

10 Fishermen have harvested certain fish to the point where the population of that fish is decreasing. This level of direct harvesting could cause

(1) ecosystems to be improved for future generations
(2) ecosystems to be severely damaged
(3) the restoration of environmental stability
(4) all other fish species to increase in number

11 Which phrase best describes a gene?

(1) a segment of a DNA molecule found only in the body cells of an organism
(2) a segment of a DNA molecule found only in the gametes of an organism
(3) a segment of a DNA molecule that contains the instructions for producing a trait in an organism
(4) a segment of a DNA molecule that contains the instructions for producing all the characteristics of an organism

12 The molecule DNA contains the four bases listed below.

A – adenine
C – cytosine
G – guanine
T – thymine

Which base pairings normally occur during DNA replication?

(1) Guanine pairs with cytosine. Thymine pairs with thymine.
(2) Adenine pairs with thymine. Cytosine pairs with guanine.
(3) Thymine pairs with guanine. Cytosine pairs with adenine.
(4) Cytosine pairs with cytosine. Thymine pairs with thymine.

13 Evolution of a species could occur as a result of changes in the

(1) DNA in muscle cells
(2) base sequences in liver cells
(3) genes in an egg cell
(4) number of chromosomes in a fetal bone cell

14 One positive impact that industrialization has had is that

(1) industrialization produces waste gases that pollute the air
(2) fossil fuels used by industries help reduce finite resources
(3) industrialization has been a source of many jobs for people
(4) new technologies have increased acid rain

15 When receiving x rays, individuals wear a lead shield over major organs in order to limit the body's exposure to radiation. One reason for this procedure is to

(1) protect the patient against broken bones
(2) prevent mutations in gametes
(3) improve circulation in the patient
(4) increase the chance of a change in DNA

16 When an ant in a colony dies, the live ants will throw the dead ant out of the anthill. If a live ant from the colony, ant *X*, is sprayed with a chemical characteristic of dead ants, the live ants will repeatedly throw this ant out of the anthill until they can no longer detect the chemical on ant *X*. What is the best explanation for this behavior?

(1) The ants are responding to a chromosomal mutation in ant *X*.
(2) The chemical is exhibiting a feedback mechanism.
(3) The live ants must continue this behavior until they have eliminated ant *X*.
(4) The chemical acts as a stimulus for a particular behavior.

17 Rabbits produce large numbers of offspring during each reproductive season, yet the number of rabbits within a given population changes very little from year to year. The stability of the population size is most likely the result of

(1) the development of mutations in young rabbits
(2) environmental factors that keep the population in check
(3) rabbits continuing to reproduce when the population is large
(4) the survival of more female rabbits than male rabbits

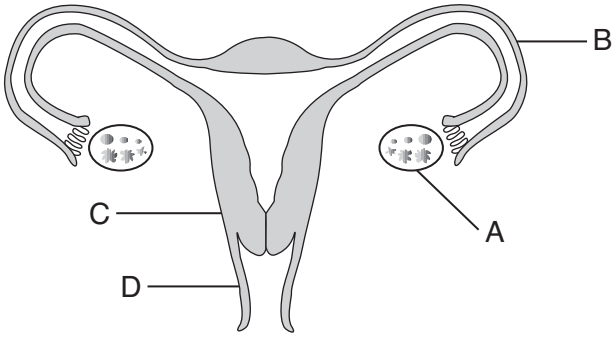
18 Genetic engineering has the potential to correct human genetic disorders. In gene therapy, a defective gene is replaced by using a virus to insert a normal gene into the cells of an individual. This treatment will be most successful if the virus is inserted into cells that

(1) lack a nucleus
(2) are recycled after death, rather than removed from the body
(3) carry out one specific function, rather than multiple functions
(4) continue to divide during the life of the patient

19 In one town, some people support a proposal to build a shopping mall on a large, undeveloped lot, because it would increase business and create new jobs. As a trade-off, the shopping mall would cause a decrease in the

(1) amount of air pollution
(2) volume of garbage and litter
(3) amount of wastewater entering the local sewage system
(4) variety of wildlife populations in the area

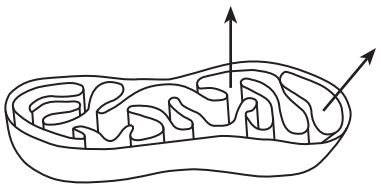
20 The human female reproductive system is represented below.



Which structure produces chemicals that regulate the reproductive cycle?

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

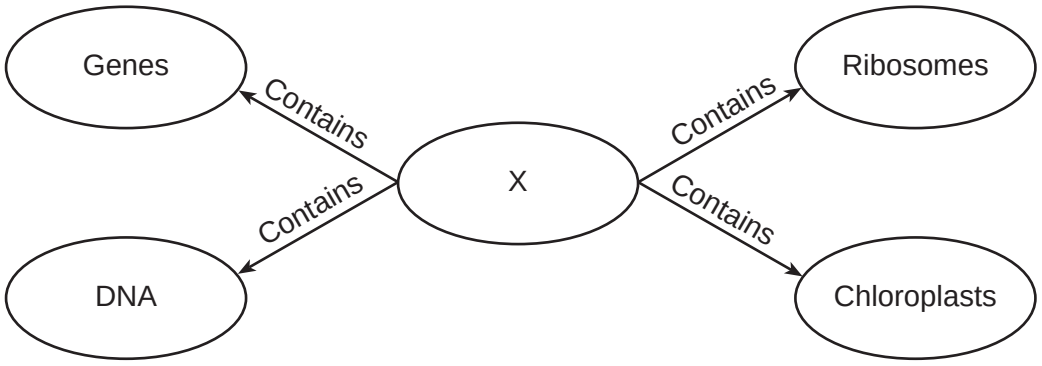
21 The diagram below represents a cell structure involved in converting energy stored in organic molecules into a form used by animal cells.



The arrows represent the movement of which substances?

(1) carbon dioxide and sugar
(2) oxygen and ATP
(3) ATP and carbon dioxide
(4) oxygen and sugar

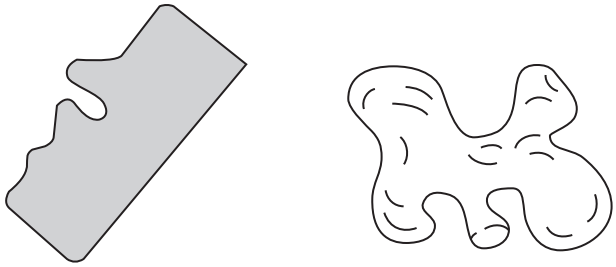
22 The diagram below shows a concept map.



Which label correctly identifies what *X* represents in the concept map?

(1) nucleus
(2) chromosome
(3) autotrophic cell
(4) heterotrophic cell

23 The diagrams below represent two molecules that are involved in metabolic activities in some living cells.



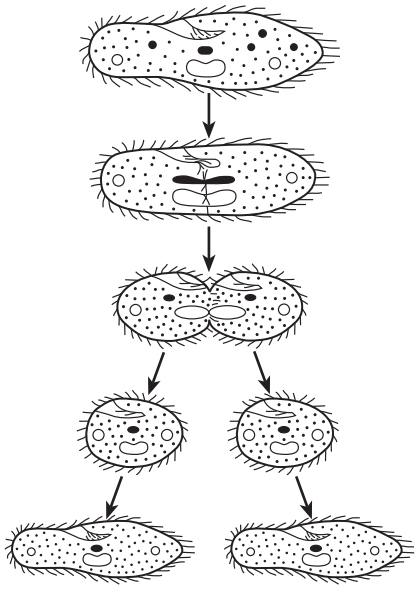
The shape of each of the molecules is important because

(1) molecules having different shapes are always found in different organisms
(2) the shape of a molecule determines how it functions in chemical reactions
(3) the shape of a molecule determines the age of an organism
(4) if the shape of any molecule in an organism changes, the DNA in that organism will also change

24 In the early 1900s, experiments were conducted on two caterpillar species. The members of the two species were each divided into two groups. One group of each species was placed under red light, while the other group of each species was kept in the dark. When the caterpillars developed into butterflies, their wings showed extreme color differences. Exposure to red light resulted in intensely colored wings, while those kept in the dark had paler wing colors. The color differences were most likely due to

(1) mutations in the color-producing genes
(2) the caterpillars in the red light producing more DNA
(3) gene expression being affected by the environment
(4) the caterpillars in the dark evolving less than those in the light

25 A student used a microscope to observe a single-celled organism. As he watched, it looked as if the organism split into two cells. He made drawings, shown below, of the organism over a short period of time.



Which process did the student record in his drawings?

(1) genetic engineering
(2) asexual reproduction
(3) selective breeding
(4) gamete formation

26 Medical professionals are concerned with the increase in the number of bacterial species that are resistant to antibiotics. Once resistance appears in a bacterial population, it spreads rapidly. This is most likely because

(1) populations of resistant bacteria are small
(2) exposure to antibiotics increases the rate of reproduction in bacteria
(3) resistant bacteria are small when compared to non-resistant bacteria.
(4) resistant bacteria survive in greater numbers and pass the trait to their offspring

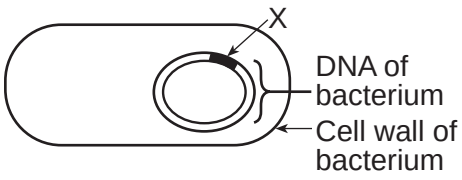
27 When getting a vaccination, which substance is injected into the body?

(1) bacteria to combat a pathogen
(2) white blood cells to engulf a pathogen
(3) a weakened form of a virus
(4) antibiotics to kill a virus

28 Many beverage companies are required to recycle bottles and cans because this activity directly reduces

(1) air pollution and destruction of the ozone shield
(2) overpopulation and soil erosion
(3) solid waste and depletion of resources
(4) thermal pollution and extinction of wildlife

29 The diagram below shows some of the DNA in a bacterium into which a human gene, *X*, has been successfully inserted.



The bacteria that result from reproduction of this cell will most likely have the ability to

(1) replicate all of the genetic instructions found in humans
(2) produce vaccines to be used to immunize humans
(3) produce a human blood cell according to instructions in gene *X*
(4) produce the human protein coded for by gene *X*

30 The Eurasian water milfoil is a nonnative species, which was once commonly sold as an aquarium plant, and is now found growing in many lakes in New York State. It has few natural enemies, and grows rapidly, crowding out many native species. This plant ruins fishing areas and interferes with boating and other water sports. This is an example of

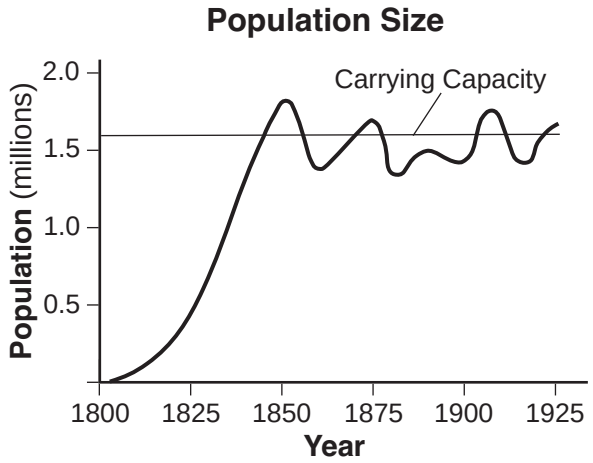
(1) human consumption of finite resources
(2) an unintended consequence of adding an organism to an ecosystem
(3) an abiotic factor having a negative effect on an ecosystem
(4) the introduction of a species that has increased the long-term biodiversity of an ecosystem

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.

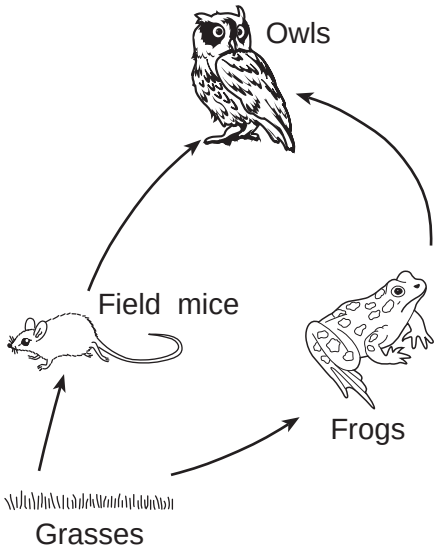
31 The graph below shows the size of a population of foxes over a period of years.



If the line did not stay around the carrying capacity, but continued to rise, which concept would this graph best illustrate?

(1) environmental stability
(2) genetic variety
(3) behavioral change
(4) overproduction

32 A food web is represented below.



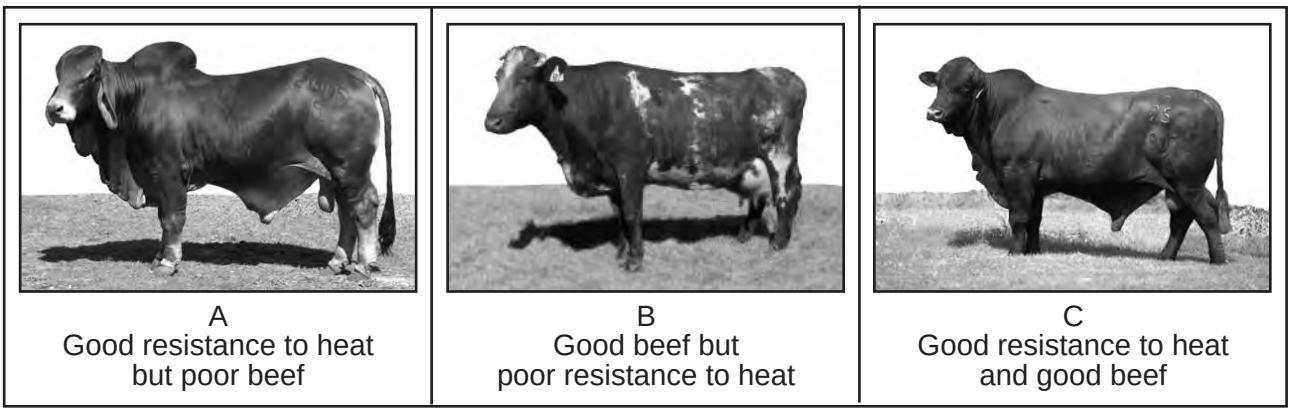
Which organism would receive the *least* amount of transferred solar energy?

(1) grasses
(2) owls
(3) frogs
(4) field mice

33 Birch bolete is a fungus that normally grows on the roots of birch trees in New York State. During the life of the fungus and the birch, each organism receives nutrients from the various biochemical processes of the other. According to this information, it can be inferred that these two species

(1) are both predators
(2) require the same amount of sunlight
(3) require a similar soil pH
(4) recycle the remains of dead organisms

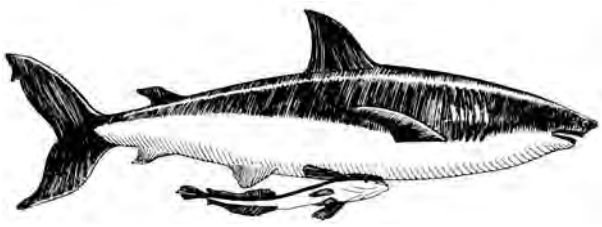
34 The photographs below show different varieties of cattle and characteristics of each variety.



Which statement best explains the development of variety *C*?

(1) Nuclei from body cells taken from variety *A* were inserted into egg cells lacking nuclei taken from variety *B*.
(2) Selective breeding was used to combine desirable traits from both varieties *A* and *B*.
(3) The need to adapt to changes in the environment led to the selection of advantageous characteristics in the offspring of variety *B*.
(4) Mutations that occurred in the body cells of variety *A* were passed on to the offspring generation after generation.

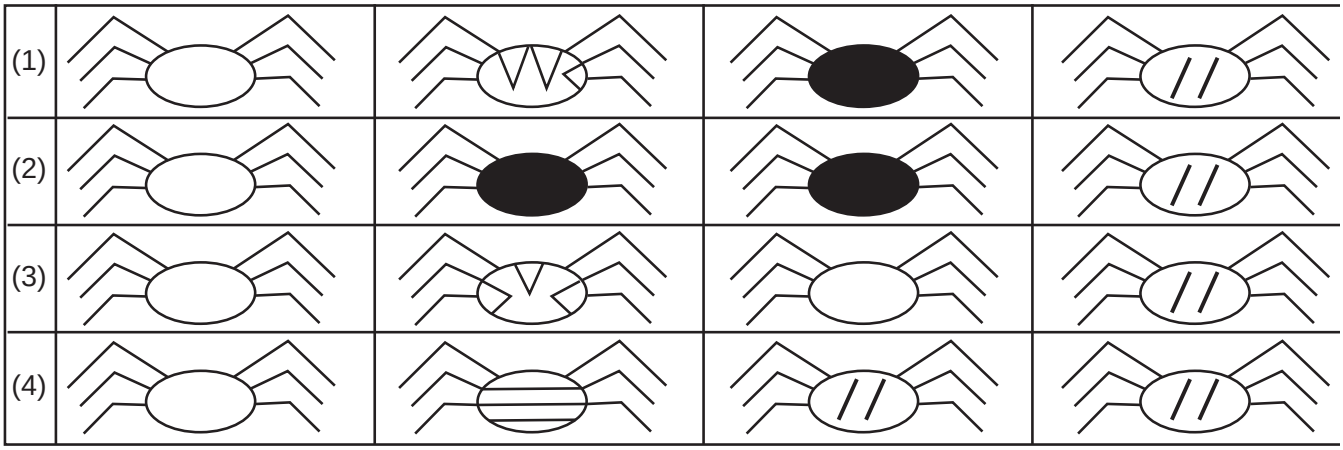
35 The diagram below represents a remora fish attached to a shark.



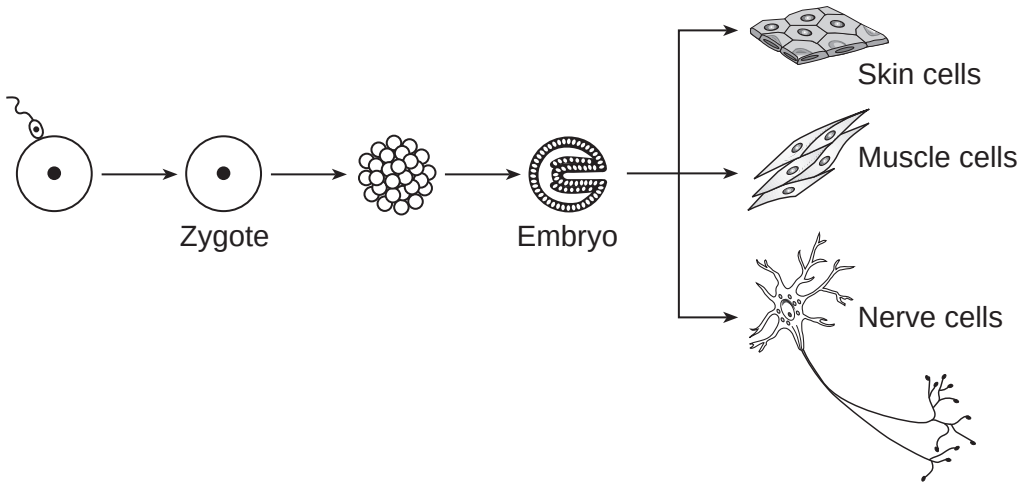
A remora fish has an adhesive disk or sucker on its head, which it uses to attach itself to larger fishes, such as sharks. This attachment causes the shark no harm. The remora fish eat scraps of food that the sharks drop as they feed. This is an example of

(1) an adaptation to a specialized niche
(2) an adaptation of a successful parasite
(3) competition between two fish species for food
(4) competition for abiotic resources

36 Each row in the chart below represents a different population of the same species of insect. Which row shows the population with the greatest chance of survival in a changing environment?



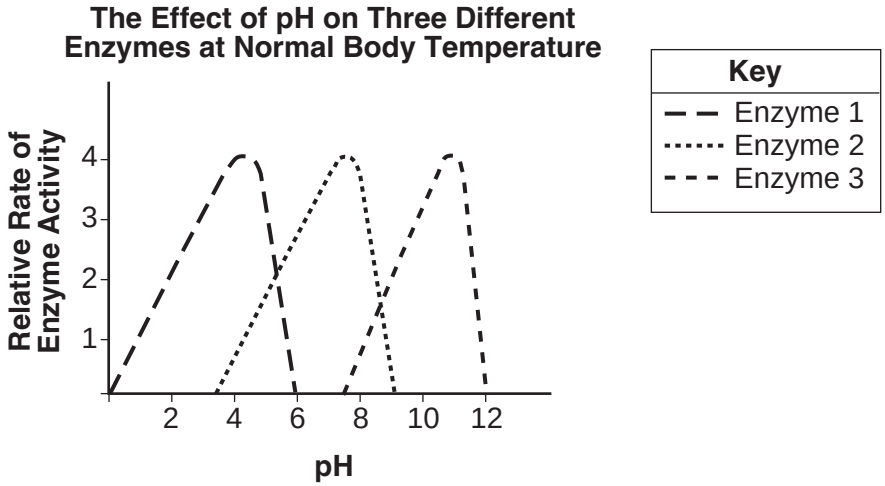
37 The development of nerve, muscle, and skin cells is represented in the diagram below.



Which statement best explains how each of the different cell types can develop from the same embryo?

(1) The cells have identical genetic instructions, but different parts of these instructions are being expressed in each cell.
(2) The cells have identical genetic instructions, and all parts of these instructions are being expressed in each cell.
(3) The cells are produced by asexual reproduction and contain identical genetic instructions.
(4) The cells contain genetic instructions from two different parents and will express the instructions from one parent, only.

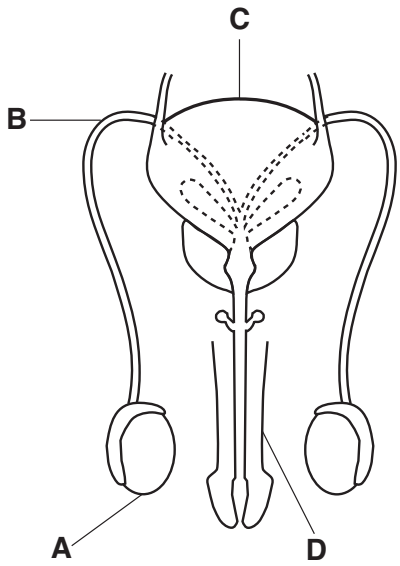
38 The graph below represents the effect of pH on three different enzymes at normal body temperature.



The graph illustrates that enzymes 1, 2, and 3

(1) are not affected by pH
(2) work best at different pH levels
(3) work best in an acidic environment
(4) work best in a basic environment

39 The human male reproductive system is represented below.



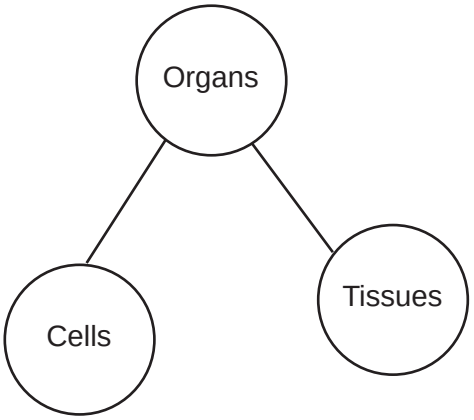
Which structure produces cells that have the potential to become gametes?

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

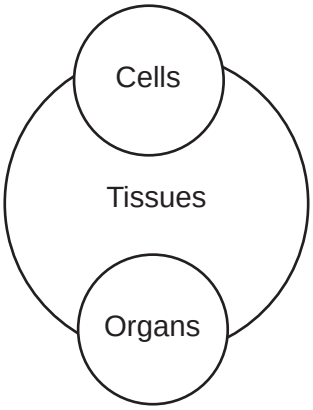
40 Some scientists have collected and stored seeds for many types of food-producing plants. The purpose of this is to

(1) increase the destruction of environments
(2) continue the deforestation of world ecosystems
(3) decrease the dependence on plants for food
(4) preserve the diversity of plant species

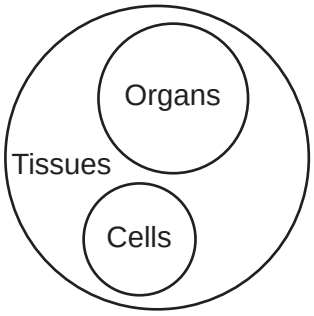
41 Which diagram best illustrates the relationship between the number of cells, tissues, and organs in a complex multicellular organism?



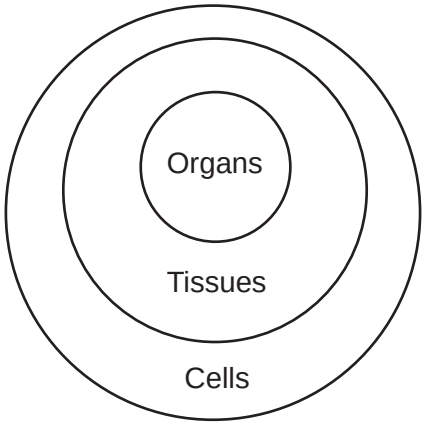
(1)



(3)

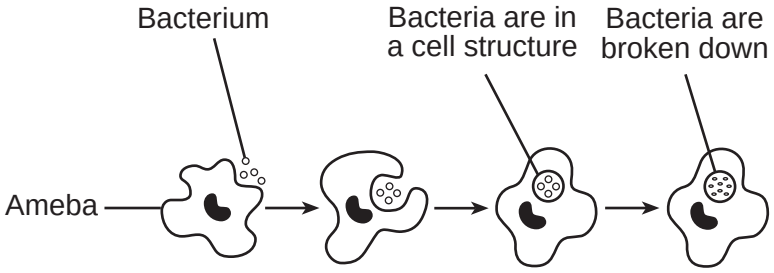


(2)



(4)

Base your answers to questions 42 and 43 on the diagram below, which represents an ameba engulfing bacteria, and on your knowledge of biology.



42 This ameba would most likely be classified as a

(1) decomposer
(2) producer
(3) consumer
(4) pathogen

43 The activity taking place is

(1) photosynthesis
(2) differentiation
(3) autotrophic nutrition
(4) heterotrophic nutrition

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 information and data table below and on your knowledge of biology.

The Enzyme Catalase

Catalase is an enzyme found in nearly all living organisms that breathe or are exposed to oxygen. According to recent scientific studies, low levels of catalase may play a role in the graying process of human hair. The body naturally produces hydrogen peroxide, and catalase breaks it down into water and oxygen. If there is a dip in catalase levels, hydrogen peroxide cannot be broken down. This causes hydrogen peroxide to bleach hair from the inside out. Scientists believe this finding may someday be used in anti-graying treatments for hair.

A pharmaceutical company, investigating ways to prevent hair from turning gray, took tissue samples from two different individuals. Both individuals were the same age. Each of the samples was placed in a solution of hydrogen peroxide. The volume of oxygen gas produced was measured every 5 minutes for 25 minutes. The data the company collected are shown below.

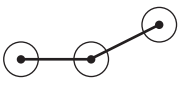
Oxygen Production in the Breakdown of Hydrogen Peroxide by Catalase

Time (min)	Sample from Person A (mL oxygen)	Sample from Person B (mL oxygen)
5	2.0	4.5
10	3.5	8.5
15	5.0	12.0
20	7.5	15.5
25	9.5	20.0

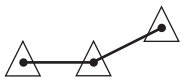
Directions (44–46): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

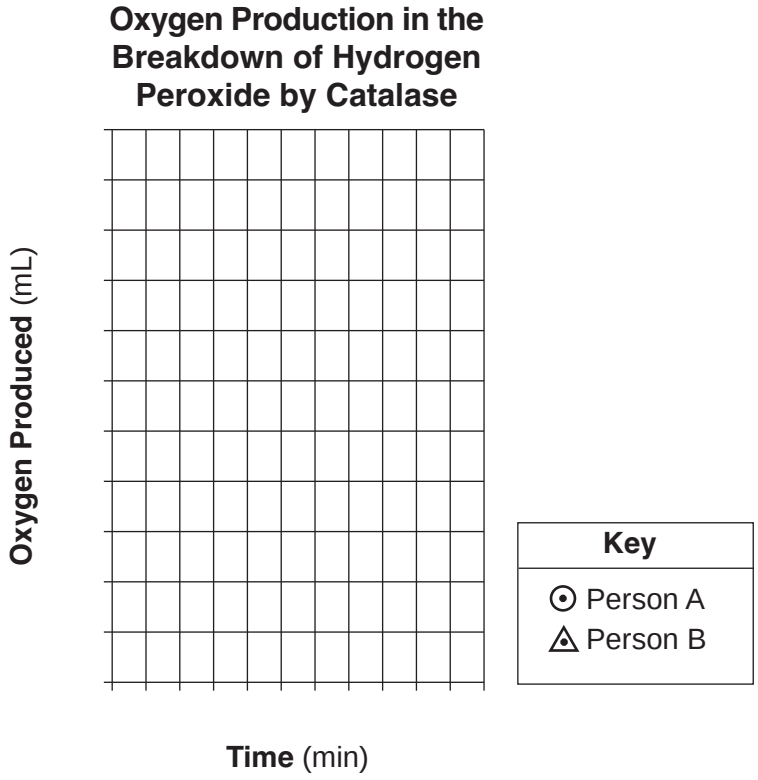
44 Mark an appropriate scale, without any breaks in the data, on each labeled axis. [1]

45 Plot the data from the data table for the sample from person *A* on the grid. Connect the points and surround each point with a small circle. [1]

Example: 

46 Plot the data from the data table for the sample from person *B* on the grid. Connect the points and surround each point with a small triangle. [1]

Example: 



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

47 If the temperature of the tissue samples used in the experiment had been raised from 37°C (body temperature) to 50°C, the results would have been different because

(1) more enzymes are produced at higher temperatures, increasing the amount of hydrogen peroxide
(2) more hydrogen peroxide is released at higher temperatures, increasing the activity of catalase
(3) increasing temperatures altered the structure of catalase, decreasing oxygen production
(4) increasing temperatures decreased the synthesis of amino acids, increasing levels of hydrogen peroxide

48 According to the data provided, which person, *A* or *B*, is more likely to be the first to have gray hair? Support your answer. [1]

Person: _____

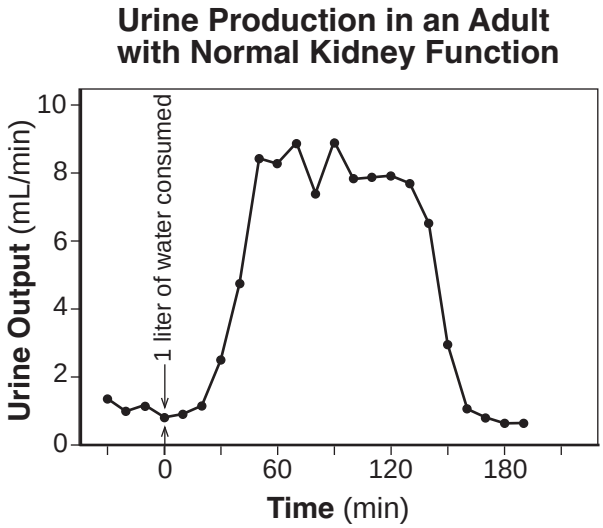
_____

_____

_____

Base your answers to questions 49 through 52 on the information and graph below and on your knowledge of biology.

An investigation was carried out to determine the effect of drinking an excessive amount of water on urine flow. A subject drank 1 liter of water in 5 minutes, and then urine output was measured. The graph shows how the human adult kidneys responded to regulate water balance in the body. Urine output was measured every 10 minutes for a little over 3 hours. Normal output for an average adult is approximately 0.5–1 mL/min.



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

49 One half-hour after the liter of water was consumed, the urine produced by the kidneys was

(1) between 2 and 3 mL/min
(2) between 4 and 5 mL/min
(3) eight times greater than normal
(4) below the normal range

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

50 The change in urine production during this 3-hour period was most likely the result of

(1) antibody production
(2) homeostatic feedback
(3) enzymatic breakdown of the water consumed
(4) nerve cell malfunctions of the kidneys

51 Identify a structure, in organisms that do *not* have kidneys, that is adapted to regulate water balance. [1]

_____

52 Approximately how long did it take, in minutes, for the body to return to normal after the intake of water? [1]

_____ minutes

Base your answers to questions 53 through 55 on the information and data table below and on your knowledge of biology.

The data table summarizes the changes that occurred to farmland in the years immediately following its abandonment. The land is located in a very stable ecosystem. It was abandoned after years of overuse and weathering, which resulted in the depletion of soil nutrients.

Common Types of Vegetation Present

Years Since Abandoned	Grasses and Weeds	Shrubs	Pine Forest	Hardwood Forest
1	X			
18	X	X	X	
30			X	
70			X	X
100				X
118 (present)				X

53 Which type of vegetation appears to have the lowest soil nutrient requirements? Support your answer with information from the data table. [1]

Lowest soil nutrient requirement vegetation: _____

_____

_____

54 Assuming the ecosystem remains undisturbed, which type of vegetation would you expect to be most common in this area 200 years after it was first abandoned? Support your answer. [1]

Most common vegetation: _____

_____

_____

55 Describe how the types of vegetation present on this farmland would change if a fire burned down all the trees 120 years after the land was abandoned. [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 56–58 on the information and photograph below and on your knowledge of biology.

The photograph below is part of an advertisement used by a company selling solar panels. The company claims that their panels, like plants, provide clean, renewable energy. They also claim that using solar panels will have a positive effect on the biosphere by reducing global warming.

Source:http://www.stockwatch.in/files/Energy.jpg

56–58 Explain why these claims are valid. In your answer, be sure to:

- explain why both plants and solar panels provide renewable energy, rather than nonrenewable energy [1]
- state how the widespread use of solar panels to generate electricity can help to reduce global warming [1]
- state how the energy-capturing process used by plants worldwide can help to reduce global warming [1]

Base your answers to questions 59 and 60 on the information below and on your knowledge of biology

Fungi are interesting organisms that interact with humans in many ways. Yeasts are fungi used in the food industry to produce products such as bread and certain beverages. Some fungi are valuable in medicine. For example, the drug cyclosporine, which is capable of suppressing the response of the immune system to foreign antigens, and the antibiotic penicillin are both products from fungi. Other fungi are less welcomed by humans. The irritation of athlete's foot is caused by a fungus, and a number of allergies are caused by reproductive spores released by fungi.

59 Describe the role of a drug like cyclosporine when transplanting organs from one person to another person. [1]

60 Explain the difference between an infection caused by a fungus and an allergy caused by a fungus. [1]

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

Female mosquitoes need a meal of blood from a person or other animal in order to produce eggs. It has been discovered that mosquitoes have cells on their antennae that can detect the insect repellent known as DEET. The repellent is not harmful to mosquitoes, but when mosquitoes detect DEET, they will not land on the surface where the DEET has been applied. This protects people from being bitten by mosquitoes.

Recently, scientists found some mosquitoes that are resistant to DEET because they do not detect its presence. They bred these mosquitoes and eventually produced a population consisting of about 50% DEET-resistant insects.

61 Identify the process most likely responsible for a mosquito initially becoming resistant to DEET. [1]

62 Mosquitoes with DEET resistance have been found in natural environments. Explain how the continued use of this repellent may cause the percentage of these resistant mosquitoes to increase in the future. [1]

Base your answers to questions 63 through 67 on the passage below and on your knowledge of biology.

Ocean-dwelling (marine) iguanas and land iguanas inhabit the Galapagos Islands. Some scientists believe that both types of iguanas diverged from a common ancestor. Marine iguanas eat algae. Land iguanas feed on cacti. Algae are more abundant in the ocean than cacti are on the islands. Both species lay their eggs in the sand.

Rats, cats, and goats have been introduced to the islands by humans. Rats feed on iguana eggs, cats eat baby iguanas, and goats eat cacti.

63 Identify the process by which ancestral iguanas developed into the present-day marine iguanas and land iguanas of the Galapagos Islands. [1]

Process: _____

64 Identify *one* organism in the Galapagos Islands that directly limits the population of both the marine iguanas and land iguanas. [1]

Organism: _____

65 Which population of iguanas, marine or land, would you expect to be larger? Support your answer. [1]

Population of iguana: _____

_____

_____

66 Would the introduction of goats have a greater effect on the population of the marine iguanas or the land iguanas? Support your answer. [1]

Population of iguana: _____

_____

_____

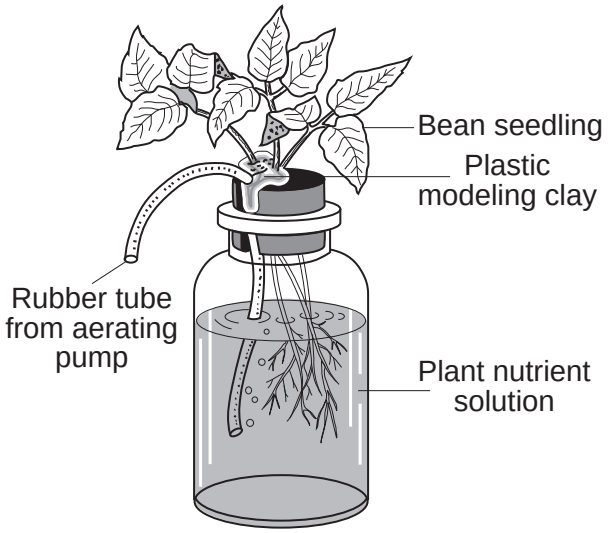
67 Identify *one* technique that can be used to support the conclusion that these two species of iguana developed from a common ancestor. [1]

Technique: _____

_____

Base your answer to question 68–72 on the information and diagram below and on your knowledge of biology.

The presence of air is believed to be important for root growth in bean plants. The apparatus available to conduct an investigation is shown below. There are enough bottles and other materials to have multiple setups. Air (for aeration) can be bubbled into the bottle through the rubber tube.



Source: Biology Handbook, SED 1960

68–72 Design an experiment to test the effect of aeration on the growth of roots of bean seedlings. In your answer, be sure to:

- state *one* hypothesis the experiment would test [1]
- describe how the control group will be treated differently from the experimental group [1]
- identify the dependent variable in the experiment [1]
- state *one* reason why many setups should be used in both the experimental and control groups [1]
- state *one* reason why several different kinds of seedlings were *not* tested in this experiment [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.

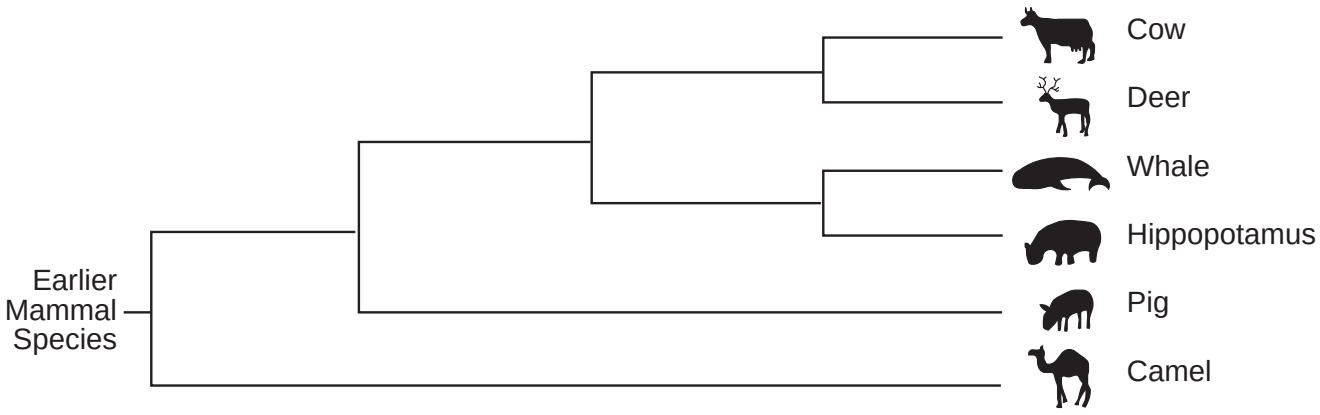
Note: The answer to question 73 should be recorded on your separate answer sheet.

73 The buildup of waste products in muscle cells that are active might cause

(1) digestion
(2) cellular respiration
(3) increased fatigue
(4) decreased heart rate

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

74 The diagram below shows the evolutionary relationships among several types of mammals.



Which mammal would be most closely related to a hippopotamus?

(1) deer
(2) whale
(3) pig
(4) cow

Base your answers to questions 75 and 76 on the information and data table below and on your knowledge of biology.

A group of students obtained the following data while trying to determine the effect of exercise on pulse rate.

Effect of Exercise on Pulse Rate

Student	**Resting Pulse Rate** (beats per minute)	**Pulse Rate After Exercising** (beats per minute)
A	66	92
B	82	107
C	65	97
D	74	124
E	79	118
F	68	98
G	89	122

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

75 Which statement is an example of an observation the students could have made?

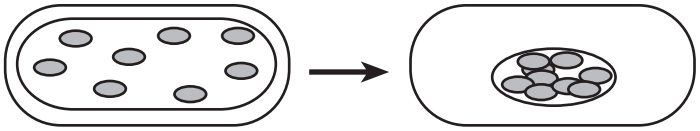
(1) Pulse rates in beats per minute decrease for all people after exercise.
(2) Student *A* most likely exercises regularly.
(3) The pulse rate of student *C* was dangerously low.
(4) The pulse rate of student *F* increased by 30 beats per minute.

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

76 Which two body systems were most actively involved in this experiment?

(1) respiratory and immune
(2) digestive and endocrine
(3) respiratory and circulatory
(4) immune and circulatory

77 The diagram below represents a green plant cell viewed with the high power of a compound light microscope before and after a particular substance was added.



Identify a substance that could have been added to the slide to bring about the change shown. [1]

_____

78 Using the DNA base sequences below, identify which *two* species are more closely related. Support your answer. [1]

Species A: CAC GTG GAC AGA GGA CAC CTC

Species B: CAT GTG GAC AGA GGA CAC CTC

Species C: CAC GTA GAC TGA GGA CTT CTC

Species: _____ and _____

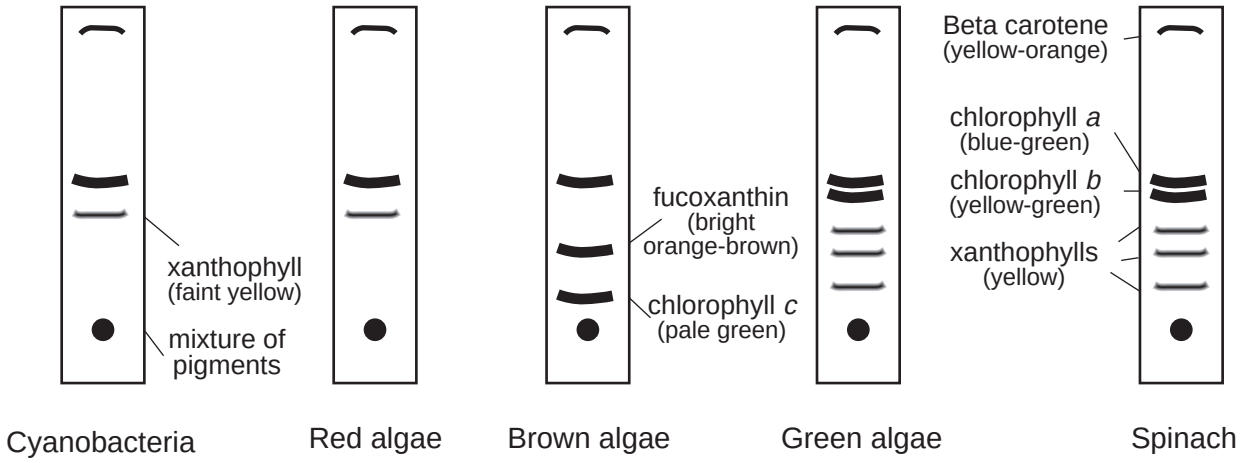
_____

_____

79 A student observing onion cells using a microscope was having difficulty seeing any detail in the cells. State *one* action the student could take to improve the detail. [1]

_____

Base your answers to questions 80 and 81 on the diagram below and on your knowledge of biology. The diagram represents the results of paper chromatography performed on extracts from five organisms.



80 Identify *one* pigment molecule common to all five organisms. [1]

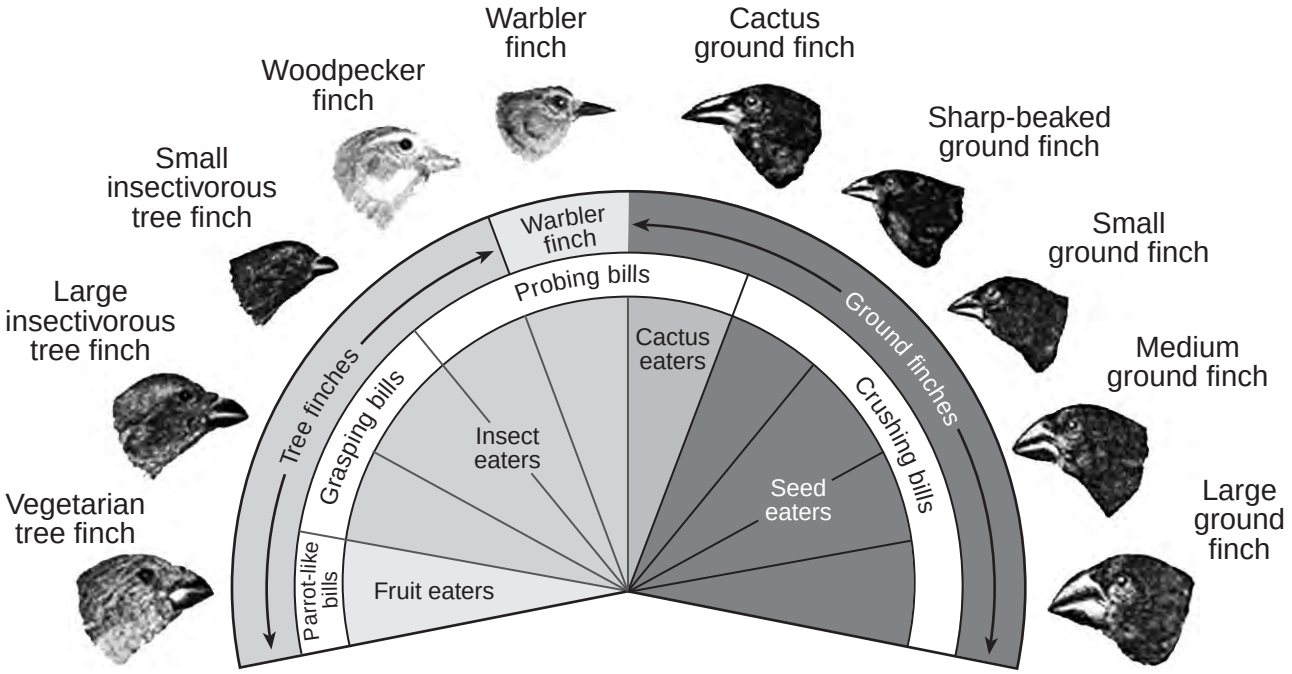
_____

Note: The answer to question 81 should be recorded on your separate answer sheet.

81 Which two organisms are most closely related?

(1) cyanobacteria and green algae
(2) red algae and spinach
(3) brown algae and red algae
(4) red algae and cyanobacteria

Base your answers to questions 82 through 84 on the diagram below and on your knowledge of biology. The diagram shows variations in the beaks of finches in the Galapagos Islands.



Source: www.pbs.org

Note: The answer to question 82 should be recorded on your separate answer sheet.

82 In this diagram, the variety of beak sizes and shapes are adaptations directly related to successful

(1) feeding
(2) camouflage
(3) defense
(4) singing

83 State *one* reason why the large ground finch and the woodpecker finch can live successfully on the same island. [1]

_____

_____

84 Identify *one* finch in the diagram that is *least* likely to compete with any of the other finches. Support your answer. [1]

_____

_____

_____

85 State *one* reason why a molecule may *not* be able to pass into or out of a cell. [1]

_____

_____

_____

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LIVING ENVIRONMENT

FOR TEACHERS ONLY

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

LE

LIVING ENVIRONMENT

Tuesday, June 16, 2015 — 1:15 to 4:15 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 ..... **2**	9 ..... **4**	17 ..... **2**	25 ..... **2** .....
2 ..... **3**	10 ..... **2**	18 ..... **4**	26 ..... **4** .....
3 ..... **1**	11 ..... **3**	19 ..... **4**	27 ..... **3** .....
4 ..... **1**	12 ..... **2**	20 ..... **1**	28 ..... **3** .....
5 ..... **3**	13 ..... **3**	21 ..... **3**	29 ..... **4** .....
6 ..... **4**	14 ..... **3**	22 ..... **3**	30 ..... **2** .....
7 ..... **1**	15 ..... **2**	23 ..... **2**	
8 ..... **4**	16 ..... **4**	24 ..... **3**	

Part B–1

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

Part B–2

47 ..... **3**	49 ..... **1**	50 ..... **2** .....

Part D

73 ..... **3**	75 ..... **4**	81 ..... **4** .....
74 ..... **2**	76 ..... **3**	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 score their own students' 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 Tuesday, June 16, 2015. 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.

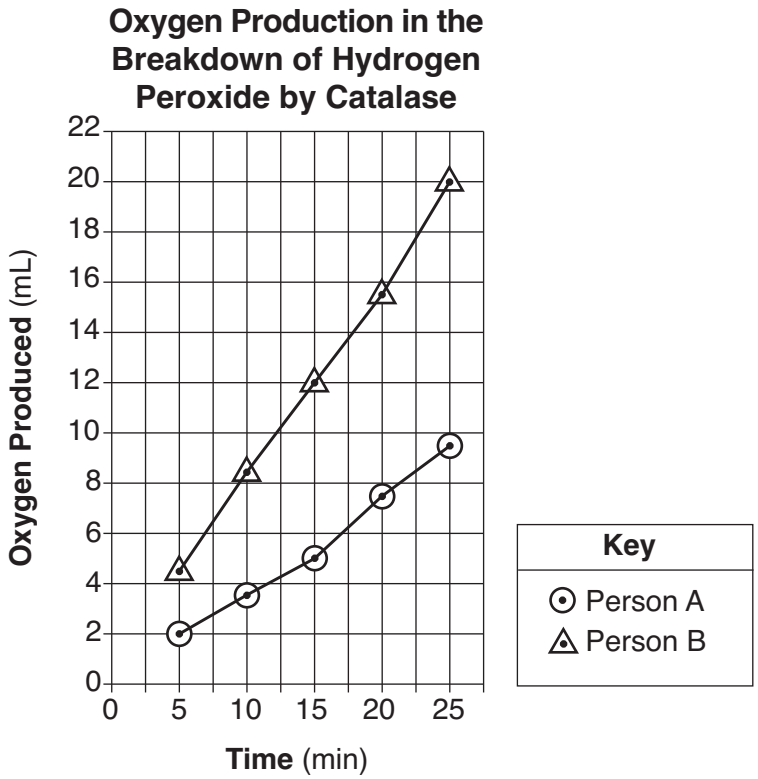
Part B–2

44 [1] Allow 1 credit for marking an appropriate scale, without any breaks in the data, on each labeled axis.

45 [1] Allow 1 credit for correctly plotting the data for person *A*, connecting the points and surrounding each point with a small circle.

46 [1] Allow 1 credit for correctly plotting the data for person *B*, connecting the points, and surrounding each point with a small triangle.

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



Note: Allow credit only if circles and triangles are used.

Make no assumptions about the origin unless it is labeled.

Do *not* allow credit for plotting points that are not in the data table, e.g., (0,0), or for extending lines beyond the data points.

Do *not* deduct more than 1 credit for plotting points that are not in the data table or for extending lines beyond the data points.

47 MC on scoring key

48 [1] Allow 1 credit for person *A* and supporting your answer. Acceptable responses include, but are not limited to:

— because their tissue sample produced a lower amount of oxygen, indicating a lower amount of catalase

— They have less catalase than person *B* because less oxygen is being released.

— They have less catalase so more peroxide is present.

49 MC on scoring key

50 MC on scoring key

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

— cell membrane

— guard cells/stomate

— vacuole/contractile vacuoles

52 [1] Allow 1 credit for an answer between 150 minutes and 190 minutes.

Note: Do *not* accept 3 hours.

53 [1] Allow 1 credit for grasses *or* weeds *or* grasses and weeds and supporting the answer. Acceptable responses include, but are not limited to:

— They are the first plants/vegetation to grow on the abandoned farmland.

— They grow in soil depleted of nutrients.

54 [1] Allow 1 credit for hardwood forest and supporting the answer. Acceptable responses include, but are not limited to:

— They make up the climax community and will remain the most common plant until the environment changes.

— The hardwood forest will remain because it is the most stable.

— They were the climax species because they replaced all the others and existed from year 70 on.

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

— Grasses and weeds would become the most common plants once again.

— Ecological succession would start again with grasses and weeds growing.

— The trees would be gone and replaced by grasses and weeds.

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 explaining why both plants and solar panels provide renewable energy, rather than nonrenewable energy. Acceptable responses include, but are not limited to:

— The Sun provides energy for both solar panels and plants that is continually being released.

— The Sun is the energy source for both solar panels and plants and the energy is renewable.

57 [1] Allow 1 credit for stating how the widespread use of solar panels to generate electricity can help to reduce global warming. Acceptable responses include, but are not limited to:

— Fewer fossil fuels would be used, resulting in a decrease of global warming.

— Using solar panels would decrease the amount of greenhouse gasses/carbon dioxide.

58 [1] Allow 1 credit for stating how the energy-capturing process used by plants worldwide can help to reduce global warming. Acceptable responses include, but are not limited to:

— Carbon dioxide increases global warming and photosynthesis takes carbon dioxide out of the air.

— Plants remove carbon dioxide from the air.

— Photosynthesis removes carbon dioxide from the air.

59 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The transplanted organ contains foreign antigens. Cyclosporine suppresses the immune response to these antigens.

— It stops rejection of the organ.

— It suppresses the response of the immune system.

60 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— An infection involves an actual pathogen that attacks the human organism. An allergy is an immune response to a harmless substance in the environment.

— An infection is caused by a microbe and an allergy is an immune response.

— An infection is usually caused by a harmful organism and an allergy is a response to a substance that is not usually harmful.

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

— mutation

— recombination during fertilization

— sexual reproduction

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

— Mosquitoes resistant to DEET will land on people and bite them and be able to reproduce successfully, while some of those not resistant will not be able to get blood and reproduce.

— Mosquitoes that do not detect the presence of DEET will land on people and bite them and then be able to reproduce.

Note: Do *not* accept answers indicating that "DEET kills the mosquitoes, so DEET-resistant mosquitoes survive and reproduce."

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

— evolution/natural selection

— adaptive radiation

— speciation

64 [1] Allow 1 credit for rats *or* cats.

Note: Do *not* allow credit for goats since they do not compete with marine iguana for food.

65 [1] Allow 1 credit for marine and for supporting the answer. Acceptable responses include, but are not limited to:

— The population is larger because their food supply is greater than that of the land iguanas.

66 [1] Allow 1 credit for land and for supporting the answer. Acceptable responses include, but are not limited to:

— These iguanas would be affected more because the goats are land animals and would compete for the cacti.

— Goats will also eat cacti.

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

— gel electrophoresis

— chromatography

— electrophoresis

— DNA fingerprinting

Note: The student's response to the bulleted items in question 68–72 need *not* appear in the following order.

68 [1] Allow 1 credit for stating *one* hypothesis the experiment would test. Acceptable responses include, but are not limited to:

— Roots of bean plant seedlings grown in aerated nutrient solution will grow faster than roots of seedlings grown without aeration of the nutrient solution.

— Bubbling air into the nutrient solution will lead to more root growth.

— If air is bubbled into the nutrient solution, then the roots will grow more rapidly.

— Air is important for root growth in bean plants.

Note: Do *not* allow credit for a hypothesis written in the form of a question.

69 [1] Allow 1 credit for describing how the control group will be treated differently from the experimental group. Acceptable responses include, but are not limited to:

— The control group will have no aeration.

— No air will be pumped through the rubber tube.

70 [1] Allow 1 credit for identifying the dependent variable in the experiment. Acceptable responses include, but are not limited to:

— number of roots

— length of roots

— rate of root growth

Note: Allow credit for an answer consistent with the student's hypothesis in question 68.

71 [1] Allow 1 credit for stating *one* reason why many setups should be used in both the experimental and control groups. Acceptable responses include, but are not limited to:

— Many setups provide more data for drawing a valid conclusion.

— so your conclusion will be valid

72 [1] Allow 1 credit for stating *one* reason why several different kinds of seedlings were not tested in this experiment. Acceptable responses include, but are not limited to:

— This experiment was done to test the presence of air on root growth in bean seedlings only.

— There should be only one variable.

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:

— salt

— salt solution

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

— They have more bases in common.

— Their DNA sequences are more similar.

— They have only one difference.

79 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— add stain

— adjust the diaphragm

— use a higher magnification

— adjust fine/coarse adjustment knob

— add water to the slide

— clean the lens

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

— beta carotene

— chlorophyll *a*

— the pigment molecule that causes the yellow-orange band

81 MC on scoring key

82 MC on scoring key

83 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The two finches eat different kinds of food.

— The woodpecker finch eats insects and the large ground finch eats seeds.

— They do not compete for the same resources.

84 [1] Allow 1 credit for the cactus finch or vegetarian tree finch and supporting the answer. Acceptable responses include, but are not limited to:

— The cactus finch, because it is the only one that eats cactus.

— The vegetarian tree finch is the only one that is a fruit eater.

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

— too large to pass through the cell membrane

— no receptor site

— faulty receptor site

— molecule is charged

The *Chart for Determining the Final Examination Score for the June 2015 Regents Examination in Living Environment* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Tuesday, June 16, 2015. 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

June 2015 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				
Key Idea 3			44, 45, 46, 48	
Appendix A (Laboratory Checklist)				67, 68, 69, 70, 71, 72
Standard 4				
Key Idea 1	1, 2, 3, 6, 7, 21, 22	41, 42, 43	47	
Key Idea 2	11, 12, 18, 24, 25, 29	34, 37		
Key Idea 3	8, 13, 15, 26	31, 36		61, 62, 63
Key Idea 4	4, 5, 17, 20	39		
Key Idea 5	16, 23, 27	38	49, 50, 51, 52	58, 59, 60
Key Idea 6	30	32, 33, 35	53, 54, 55	64, 65
Key Idea 7	9, 10, 14, 19, 28	40		56, 57, 66

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

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

Regents Examination in Living Environment – June 2015

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

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

Raw Score	Scale Score
56	**77**
55	**77**
54	**76**
53	**75**
52	**74**
51	**73**
50	**73**
49	**72**
48	**71**
47	**70**
46	**69**
45	**68**
44	**67**
43	**66**
42	**66**
41	**65**
40	**64**
39	**62**
38	**61**
37	**60**
36	**59**
35	**58**
34	**57**
33	**56**
32	**55**
31	**53**
30	**52**
29	**51**
28	**49**

Raw Score	Scale Score
27	**48**
26	**47**
25	**45**
24	**44**
23	**43**
22	**41**
21	**40**
20	**38**
19	**36**
18	**35**
17	**33**
16	**32**
15	**30**
14	**28**
13	**27**
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.