The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Wednesday, January 25, 2017 — 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 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 For a human zygote to become an embryo, it must undergo

(1) fertilization
(2) recombination
(3) meiotic divisions
(4) mitotic divisions

2 Many homeowners and businesses are installing solar electric systems. Greater use of solar electric systems benefits the environment because it

(1) depends on the greater use of fossil fuels
(2) conserves nonrenewable resources
(3) produces gases that cause global warming
(4) reduces the need for the ozone shield

3 A cell in the leaf of a corn plant contains more chloroplasts than a cell in the stem of a corn plant. Based on this observation, it can be inferred that, when compared to the cell in the stem, the cell in the leaf

(1) synthesizes more sugar
(2) has a higher chromosome count
(3) produces fewer proteins
(4) uses less carbon dioxide

4 When the human body is responding to stress, the hormone adrenaline is released. A short time later, the body returns to normal. This is an example of how a human

(1) reacts to an antibody
(2) develops genetic variation in body cells
(3) maintains cellular organization
(4) maintains dynamic equilibrium

5 A direct indication that the white blood cells of the body are functioning would be

(1) an increase in the number of oxygen molecules in the lungs
(2) a decrease in the number of pathogens in the body
(3) a decreased secretion of hormones by certain glands
(4) an increase of carbon dioxide in the cells of the body

6 A fully functioning enzyme molecule is arranged in a complex three-dimensional shape. This shape determines the

(1) specific type of molecule it interacts with during a reaction
(2) rate at which the enzyme breaks down during a reaction it regulates
(3) pH of all body systems
(4) temperature of the products of the reaction it regulates

7 A student received a flu shot in the fall. During the flu season, the student caught a cold. The most likely reason the vaccine he received did not prevent the cold was that

(1) his illness was not caused by a pathogen
(2) he did not get the vaccine at the right time of year
(3) his body produced antibiotics in response to the vaccine
(4) the vaccine he received contained only flu virus antigens

8 In August 2010, the Asian clam was discovered in Lake George. It is not native to that area. A single clam can reproduce and release hundreds of offspring in a day. Fish and crayfish eat the clams but cannot keep pace with the rate at which the clams reproduce. The introduction of the Asian clam into Lake George is

(1) positive, because it adds to the stability of the ecosystem
(2) positive, because the fish and crayfish would otherwise not have food
(3) negative, because it decreases water pollution in the lake
(4) negative, because it competes with native clam species and reduces stability

9 Like humans, animals including dogs and cats get goose bumps. On a cold day, these goose bumps cause their coats to expand creating a layer of insulation. If the animal is scared, the coat will also expand making the animal look larger to predators. These responses serve as examples of

(1) allergic reactions
(2) learned behaviors
(3) detection and response to stimuli
(4) reproductive and feeding success

10 Which factor is a major cause of the changes that occur during puberty, the years when the rate of human physical growth increases and reproductive maturity occurs?

(1) changes in some hormone levels
(2) an increase in meiosis in body cells
(3) a decrease in the rate of metabolism
(4) change in the gene sequences in reproductive cells

11 Which statement best describes how a new human trait develops and can be passed on to future generations?

(1) A mutation in a stomach cell results in the inability of a woman to produce a certain digestive enzyme.
(2) A mother consumes alcohol during pregnancy, causing the fetus to have a low birth weight.
(3) During meiosis, a new combination of DNA subunits is formed.
(4) During mitosis, DNA does not divide correctly and the cells die.

12 Survival of at least a few members of a population after a major environmental change is most dependent on

(1) the population having an individual that is adapted to the original environment
(2) the population having an individual that is adapted to great changes in the temperature in its environment
(3) variations in many different traits in many individuals in the population
(4) no variations in the color of the fur, skin, or feathers of the individuals in the population

13 A characteristic common to both diffusion and active transport is that

(1) enzymes are required
(2) oxygen is moved across a membrane
(3) ATP is needed
(4) the movement of molecules occurs

14 The theory of evolution states that

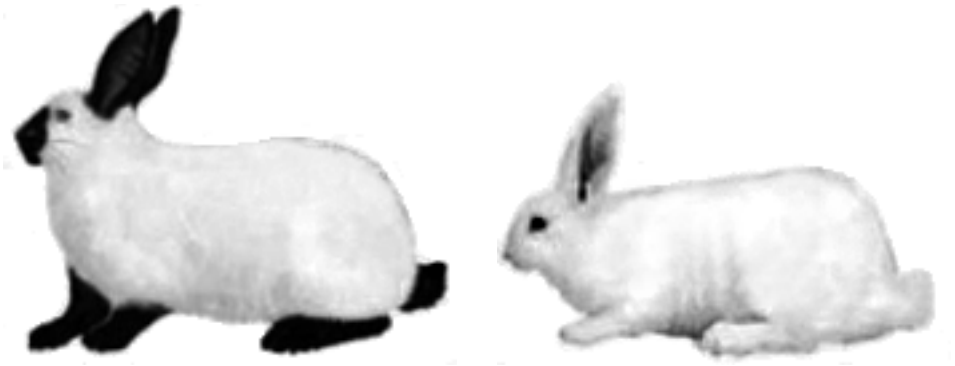
(1) species that are extinct have no biological relationship to living species
(2) different animal species always interbreed to form new and different species
(3) species change over time, sometimes developing into new species
(4) the environment of Earth is constant over time

15 Scientists in Brazil have developed specific fertilizers and special breeds of soybeans and corn so crops can grow on large areas of tropical lands. This is valuable because farmers can help to feed the growing human population and strengthen the economy. However, trade-offs must be considered because farming on tropical lands can also

(1) add helpful microorganisms to the soil
(2) remove oxygen from the atmosphere
(3) reduce populations of native species
(4) reduce mutations and disease in wildlife populations

16 The photograph below shows two color variations of Himalayan rabbits. In the winter, the rabbits resemble the one on the left. In the summer, the rabbits resemble the one on the right.

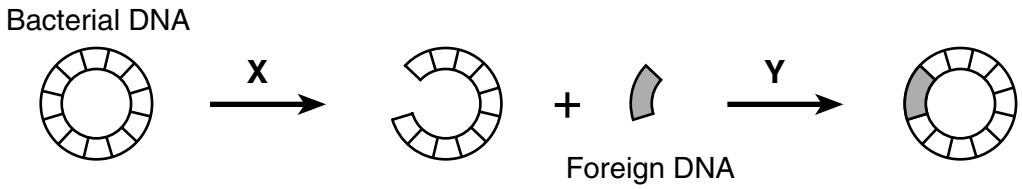
Himalayan Rabbits



The changes in fur color are most likely due to

(1) a virus that affected genes in specific areas of the body
(2) the sorting and recombination of genes
(3) gene expression due to the differences in abiotic conditions
(4) the molecular arrangement of sugars

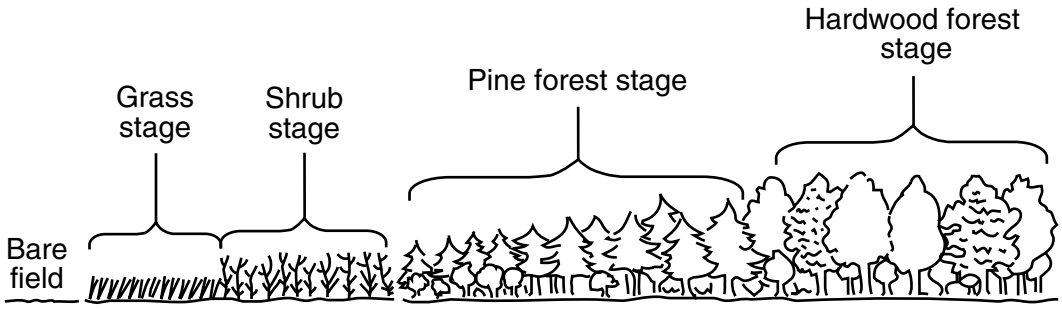
17 The diagram represents a process used to modify bacterial cells.



In the diagram, arrows labeled *X* and *Y* represent the use of

(1) clones
(2) receptors
(3) genes
(4) enzymes

18 The diagram below represents the changes over time in an area.



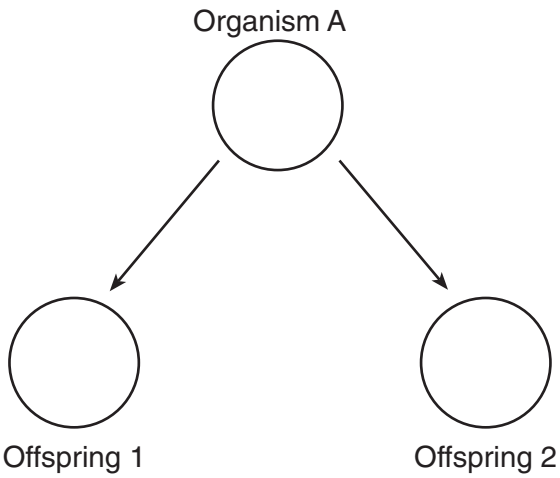
Which example is *not* a natural process that could return a hardwood forest to the grass stage once again?

(1) a forest fire caused by a lightning strike
(2) the aging and falling of trees
(3) clearing the land for agriculture
(4) a hurricane or tornado

19 The Mississippi River Delta wetlands ecosystem is home to a large number of fish, birds, and other aquatic organisms. During the last century, this ecosystem has seen a decrease in wetland areas and species diversity due to land development, agriculture, and flooding. Conservation groups have been working to reconnect the Mississippi River with its flood plain and restore lost wetlands. One result of restoring wetland areas in this ecosystem would be

(1) an increase in abiotic factors that would cause organisms to develop new adaptations
(2) the development of an ecosystem that will prevent invasive species from settling there
(3) an increase in the carrying capacity of the ecosystem for wetland organisms
(4) to prevent the organisms that live in this ecosystem from competing for food and shelter

20 The diagram below represents a form of cellular reproduction.



As a result of this process, offspring 1 and offspring 2 will have

(1) the same number of genes but different traits
(2) a different number of genes but the same traits
(3) the same number of genes and the same traits
(4) a different number of genes and different traits

21 The instructions for the genetic traits of an organism are directly determined by the

(1) numbers of A, T, C, and G units in a sugar molecule
(2) sequence of bases in DNA molecules
(3) length of a DNA molecule
(4) way the bases are paired in the two strands of a DNA molecule

22 Which statement best describes some protein molecules in a cell?

(1) Proteins are long, folded chains that can form various cell parts.
(2) Proteins are composed of four different starches that direct cell activity.
(3) Proteins are long, twisted strands of glucose that regulate cells.
(4) Proteins are genetically diverse substances that are synthesized in the nucleus.

23 *Rafflesia arnoldii* is a bright red and yellow flowering plant that has no leaves, roots, or stems. Rafflesia do not carry out photosynthesis. They take nutrients from the cells of grapevines. *Rafflesia arnoldii* is an example of a

(1) producer
(2) omnivore
(3) carnivore
(4) parasite

24 Female hammerhead sharks sometimes produce offspring by a type of asexual reproduction. These offspring

(1) are a result of the uniting of a male and a female gamete
(2) have cells that contain DNA found only in the female shark
(3) are considered to be a different species from the male parent
(4) have cells that contain genetic information from both parents

25 A tomato gene, known as the SIKLUH gene, has recently been discovered. The gene leads to the production of larger tomatoes. The gene affects fruit size by increasing cell layers and promoting extra cell divisions. In order to produce large fruit in other commercial plant species, scientists might

(1) clone the genes of other types of plants until they develop larger fruits
(2) breed the tomatoes with other fruits such as apples
(3) insert the gene into other types of plants
(4) stimulate the process of meiosis in the other plants

26 During the last century, human impacts on our planet have led to an increasing and alarming loss of biodiversity in rainforest ecosystems. Scientists estimate that current extinction rates exceed those of some prehistoric mass extinctions. This loss of biodiversity also means loss of genetic diversity and loss of ecosystems. What could be done to minimize this loss of biodiversity?

(1) Introduce new species to rainforest ecosystems.
(2) Write and pass new environmental protection laws specific to rainforest ecosystems.
(3) Build barriers around rainforest ecosystems to keep animals and plants contained.
(4) Move all rainforest animals to new ecosystems where they will be safe.

27 Molecules in a certain medication attach to receptors on nerve cells. This prevents the normal chemical signal from binding to the receptor. One immediate result of taking this medication might be a disruption in the ability of

(1) the body to produce reproductive cells
(2) cells to communicate with each other
(3) cells to synthesize proteins
(4) the body to convert inorganic material into organic nutrients

28 The chart below contains information about some structures found in single-celled organisms

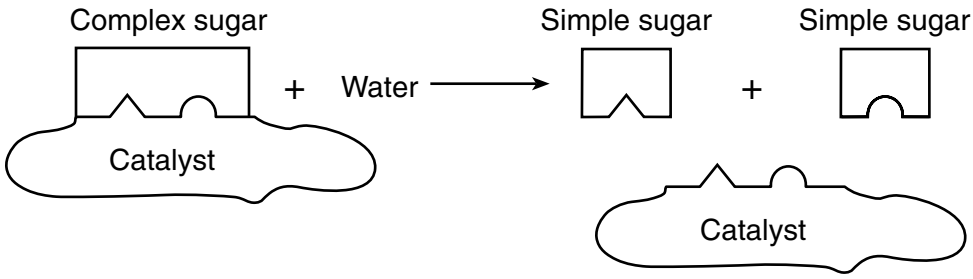
Cell Structures

Structure	Function
contractile vacuole	maintains water balance
flagellum	movement
chloroplast	food production

The information in this chart best illustrates the biological concept that

(1) all single-celled organisms contain contractile vacuoles, a flagellum, and chloroplasts
(2) single-celled organisms contain structures that function in maintaining homeostasis
(3) the organs found in complex organisms evolved from these three structures
(4) multicellular organisms do not contain any cell structures

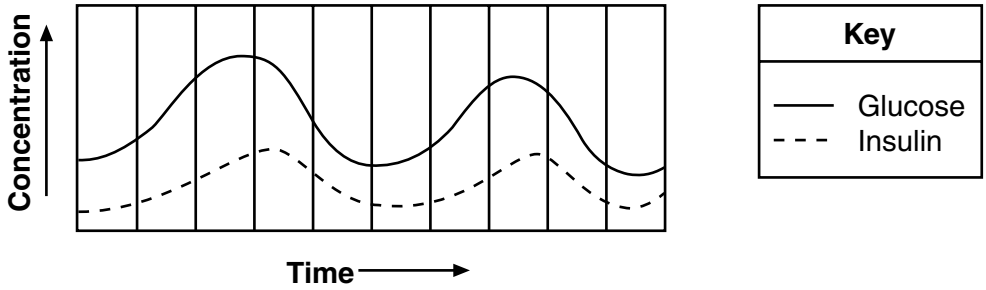
29 The diagram below represents a process that occurs in human systems.



This process is known as

(1) excretion
(2) respiration
(3) circulation
(4) digestion

30 The diagram below represents levels of glucose and insulin found within the bloodstream of a healthy person throughout the course of the day.



The increase in insulin levels following an increase in glucose levels in the blood can best be explained by

(1) insulin being released into the blood to digest glucose
(2) a feedback mechanism that regulates blood glucose levels
(3) an excess of glucose-stimulating guard cells
(4) a response of the immune system to lower excess blood glucose levels

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 number of white-tailed deer in certain areas of Long Island, NY has increased significantly. Homeowners and farmers have put up tall fencing to protect their gardens and crops from the deer. One reason why the white tailed-deer might have increased significantly in certain areas of Long Island is

(1) the lack of natural predators
(2) an increase in deer pathogens
(3) a shortage of biotic resources needed by the deer
(4) that carrying capacity has no effect on deer populations

32 Researchers have discovered a chemical that sterilizes soil by killing all of the bacteria that are normally present. If this chemical were released in a forest ecosystem, the most likely result would be that

(1) the food web would be disrupted because there would be little recycling of nutrients
(2) fewer animals would suffer from disease such as cancer
(3) there would be more energy available for insects and worms that live in the soil
(4) the diversity of plants and animals present would increase

33 In order to be accepted, a scientific theory must be

(1) widely tested and supported by extensive data
(2) based on the results of a single experiment
(3) controversial and cause debate
(4) in line with all previous historical ideas

34 Anoles are a group of lizards consisting of approximately 400 species. A scientist studying them on an island observed two species that live in different habitats and display different behaviors. His observations are listed in the table below.

Observations of Two Species of Anoles

Characteristics	Species A	Species B
length	130 – 191 mm	55 – 79 mm
toepad size	large	intermediate
color	usually green	brown
tail length	long	long

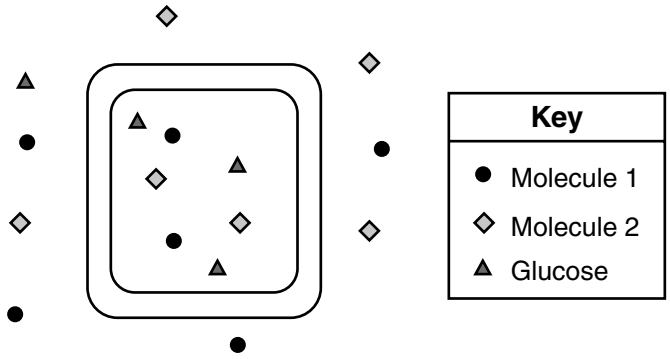
Based on the scientist's observations, which statement best describes these two species of anoles?

(1) Both species evolved through the process of ecological succession.
(2) Each species is adapted to a different niche.
(3) The two species can interbreed.
(4) Species *A* is an herbivore and species *B* is a decomposer.

35 In an appropriately designed experiment, a scientist is able to test the effect of

(1) a single variable
(2) multiple variables
(3) the hypothesis
(4) scientific observations

Base your answers to questions 36 through 38 on the information and diagram below and on your knowledge of biology. The diagram represents a plant leaf cell and two different molecules used in the process of glucose synthesis.



36 Molecules 1 and 2 are most likely

(1) carbon dioxide and oxygen
(2) carbon dioxide and water
(3) nitrogen and oxygen
(4) nitrogen and water

37 Molecules 1 and 2 enter the cell and glucose leaves the cell through the process of

(1) respiration
(2) digestion
(3) active transport
(4) diffusion

38 Which statement best describes a function of glucose in plant cells?

(1) It is converted into solar energy in the chloroplasts.
(2) It can be used directly as a building block in protein synthesis.
(3) It can be used during the digestion of fats.
(4) It is used during cellular respiration in the mitochondria.

---

39 Students collected data about the capacities of their lungs by inflating balloons with a single breath. They measured the circumference of the balloons in centimeters. Each student completed three trials and calculated the average.

Balloon Circumference (cm)

Student	Trial 1	Trial 2	Trial 3	Average
1	66.0	66.5	68.5	67.0
2	67.5	64.0	70.5	67.3
3	60.3	60.5	60.5	61.0
4	55.0	58.0	59.0	57.3

Which student miscalculated her average?

(1) student 1
(2) student 2
(3) student 3
(4) student 4

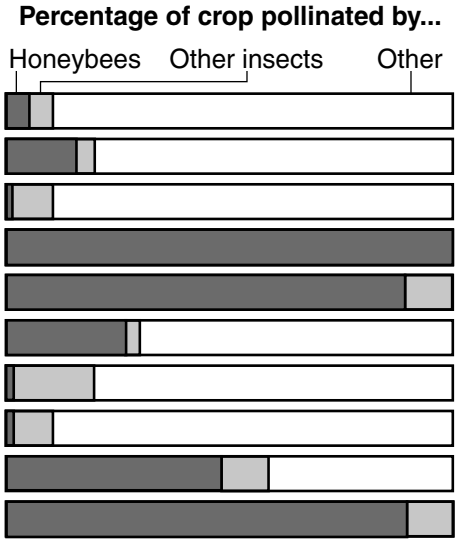
Base your answers to questions 40 and 41 on the information and chart below and on your knowledge of biology.

In recent years, biologists have noticed that honeybees responsible for pollinating food crops across the United States are dying at an alarming rate. Farmers, economists, and biologists are very worried about the impact that the loss of honeybees might have on the food supply.

Relying on Bees

Some of the most valuable fruits, vegetables, nuts and field crops depend on insect pollinators, particularly honeybees. Besides insects, other means of pollination include birds, wind and rainwater.

	Crop value in billions 2006	**Percentage pollinated by honeybees**
Soybeans	$19.70	5%
Cotton	5.20	16
Grapes	3.20	1
Almonds	2.20	100
Apples	2.10	90
Oranges	1.80	27
Strawberries	1.52	2
Peanuts	.06	2
Peaches	.05	48
Blueberries *cultivated*	.05	90



Adapted from: United States Department of Agriculture:
Roger A. Morse and Nicholas W. Calderone, Cornell University

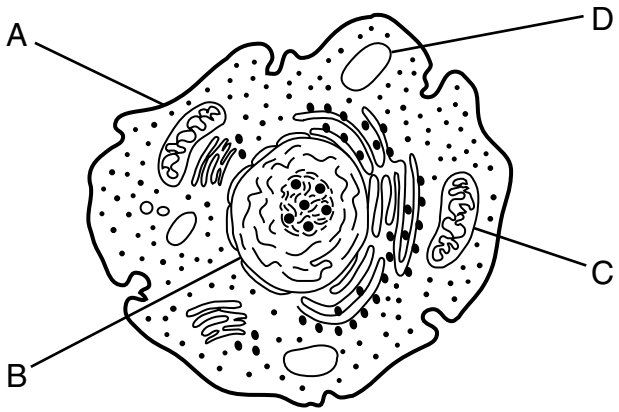
40 Based on this information and the graph provided, which crops are most at risk if honeybees continue to decline?

(1) strawberries, peanuts, and grapes
(2) almonds, apples, and blueberries
(3) almonds, oranges, and soybeans
(4) peaches, cotton, and grapes

41 Peach blossom pollinations could be at risk if there is a total loss of honeybee populations in areas where peaches are grown. Which action would be most likely to help peach growers stay in business and be able to produce good-sized crops of peaches?

(1) Hire scientists to find a way to kill other pollinating insects in the area so there are more peach blossoms for the honeybees to pollinate.
(2) Hire researchers to identify which other native insects are able to pollinate peach blossoms and find a way to increase their populations.
(3) Encourage the peach growers to plant other kinds of fruit instead of peaches.
(4) Genetically engineer peach trees to be able to reproduce without producing any fruit (peaches) or seeds.

Base your answers to questions 42 and 43 on the information and diagram below and on your knowledge of biology. The diagram represents a cell.



42 Which structure is responsible for the passage of materials into and out of the cell?

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

43 Which structure is responsible for the synthesis of ATP?

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

Part B–2

Answer all questions in this part. [12]

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

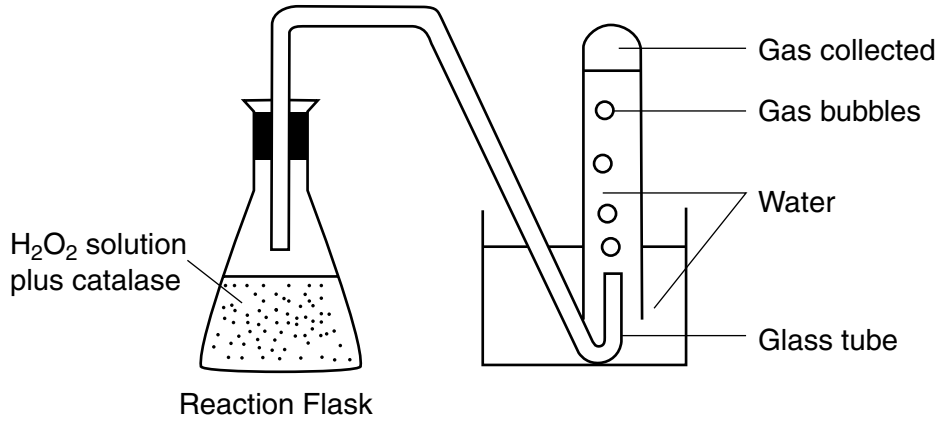
Base your answers to questions 44 through 47 on the information and data table below and on your knowledge of biology.

Hydrogen peroxide (H_2O_2), a byproduct of cellular metabolism, is broken down by the enzyme catalase which is produced by nearly all organisms. When catalase is added to hydrogen peroxide, a reaction occurs that produces bubbles of oxygen gas (O_2) and water (H_2O).

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

The laboratory setup represented below was used to investigate the effect of pH on the breakdown of H_2O_2. Five setups were made with H_2O_2 solutions, each at a different pH level.

Catalase was added to the solution in the first setup and the reaction proceeded for one minute and the amount of gas produced by the reaction was recorded on the data table. This exact procedure was repeated with the other four setups containing different H_2O_2 solutions.

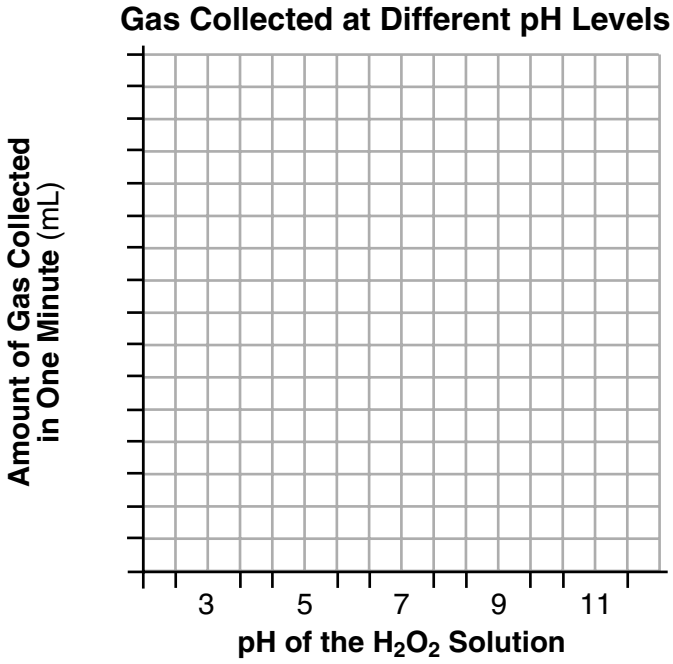


Gas Collected in Reactions at Different pH Levels	
pH	**Gas Collected in One Minute** (mL)
3	2
5	5
7	11
9	9
11	6

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

44 Mark an appropriate scale, without any breaks in the data, on the axis labeled "Amount of Gas Collected in One Minute (mL)." [1]

45 Construct vertical bars to represent the data. Shade in each bar. [1]



46 This investigation was performed again with identical conditions except with a hydrogen peroxide solution at pH 8. Predict the number of mL of gas that was collected in one minute. [1]

_____ **mL**

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

47 Based on the investigation, the student should conclude that enzymes

(1) function best within a specific range of conditions
(2) function best when observed in living cells
(3) are not affected by changes in environmental factors
(4) are easily broken down by hydrogen peroxide

Base your answers to questions 48 and 49 on the information below and on your knowledge of biology.

Mutations cause many disorders in humans. Cystic fibrosis (CF) is a disorder that can be passed on from generation to generation. Skin cancer is a disorder that sometimes originates in skin cells as a result of overexposure to the Sun.

48 Explain why some disorders, such as CF, can be passed on from generation to generation, whereas some other disorders, such as skin cancer, cannot. [1]

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

49 Which statement best explains the formation of the mutations that cause both cystic fibrosis and skin cancer?

(1) These mutations are a direct result of a change in the amino acid molecule that controls the formation of genetic codes in gametes.
(2) These mutations are caused by a change in the sugars that make up the genetic codes in all cells.
(3) Both of these mutations involve a change in the makeup of genes.
(4) Both of these mutations are a result of the incorrect synthesis of the proteins that make up DNA.

Base your answers to questions 50 and 51 on the information and table below and on your knowledge of biology.

Prey selection in a species of California garter snake depends upon where the snake lives. Snakes living inland feed on frogs, leeches, and fish while coastal snakes have added banana slugs to their diet. Banana slugs are found only in coastal areas. Researchers performed an experiment to determine what prey newly born snakes preferred. The table below summarizes the findings.

Prey Preference in Newborn Garter Snakes

	Newborn Coastal Snakes	**Newborn Inland Snakes**
Percentage of Snakes Eating Banana Slugs	60%	20%

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

50 Which inference best explains these differences?

(1) The coastal snakes have been selectively bred for slug-eating behavior.
(2) Genetic manipulation has enabled the coastal snakes to recognize slugs as prey.
(3) The coastal snakes evolved a new organ so that they could recognize and feed on slugs.
(4) An adaptation enabled coastal snakes to use slugs as food source.

51 State how the feeding habits of this population of inland snakes would most likely change over many generations if they were relocated to a coastal region where frogs, leeches, and fish were rare. [1]

_____

_____

52 Estrogen is one of the hormones produced by human females. Identify *one* organ that produces estrogen and state *one* specific function of estrogen in a human female. [1]

Organ: _____

Function: _____

Base your answer to question 53–54 on the information below and on your knowledge of biology.

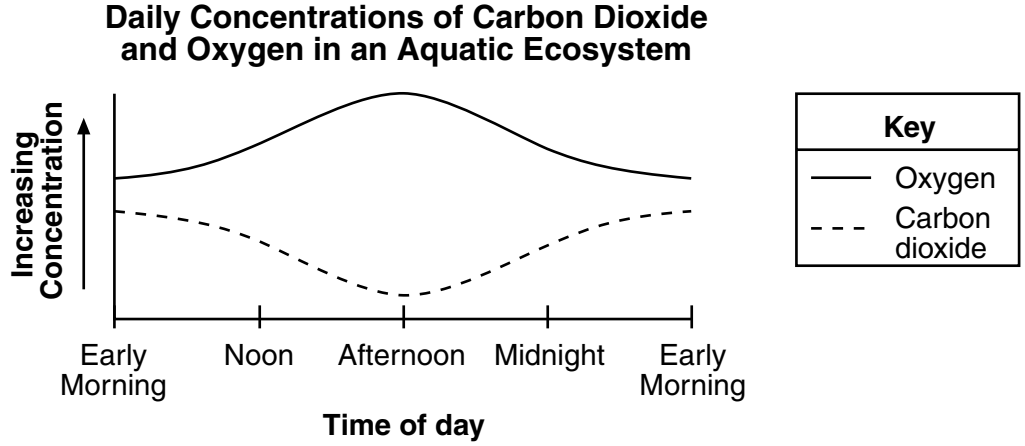
Both food chains and food webs can be used to illustrate relationships between organisms in an ecosystem.

53–54 Discuss these methods of representing relationships. In your answer, be sure to:

- state *one* similarity in the way relationships between organisms are shown in food chains and food webs [1]
- explain why using a food chain is more limiting than using a food web to show relationships between organisms in an ecosystem [1]

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

A student measured oxygen and carbon dioxide concentration levels in an aquatic ecosystem during a 24 hour period. The data are represented in the graph below.



55 Identify *two* biological processes that are responsible for the production of varying amounts of carbon dioxide and oxygen within the aquatic ecosystem. [1]

Processes: _____ and _____

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 below and on your knowledge of biology.

Super-Size It?

The American Academy of Pediatrics has noted an increase in the population of children with disorders that are usually associated with older adults, such as diabetes. Observers of American culture point to the trend to "super-size" food servings as a possible cause. Larger servings might encourage children of today to eat more fats and sugars than children ate a generation ago.

In an attempt to determine if there is a relationship between diet and the development of diabetes in children, a study was done which surveyed a group of children regarding their eating habits and whether or not they were diabetic. When the survey results were collected, the data were used to organize the children into two groups based on their responses, and then the data were analyzed.

56–58 Discuss this investigation. In your answer, be sure to:

- state the hypothesis being tested in this investigation [1]
- identify *one* survey response that was most likely used for organizing the children into two groups [1]
- state what survey results would support the hypothesis stated above [1]

Base your answer to question 59 on the expression below and on your knowledge of biology.

Think globally, act locally!

59 This expression has been applied to many ecological problems, such as global warming [global climate change], and air pollution. Choose *one* of these ecological problems and write the name of the problem on your answer sheet. For the problem chosen, state *one* specific "local action" that could be taken. [1]

Problem: _____

Local action: _____

Base your answer to question 60 on the information below and on your knowledge of biology.

Increased food production is essential to feed the growing human population. Some experts suggest that technology will be the answer. One application of technology is to clone a single plant to produce large numbers of it to grow as a single crop.

60 Explain how using cloning to produce a single crop could actually lead to a loss of the entire crop. [1]

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

Green Algae Could Help Clean up Radioactive Nuclear Waste

Recent studies have shown that the uses of green algae are boundless. First, scientists at R.I.T. used algae to synthesize biofuel, and recently scientists at Northwestern University and Argonne National have found that freshwater algae can remove strontium 90 from radioactive wastewater. These developments can significantly aid the future effort to clean up radioactive waste at the Fukushima Daichi Plant [a nuclear power plant in Japan]. Scientists discovered that the process begins when the green algae first absorb strontium, calcium and barium from water. The strontium and barium form crystals inside each algae cell. The crystals remain inside the cells, but the algae filters out and excretes calcium and other minerals that may be present. The strontium is then isolated, and thus able to be treated.

Researchers are still figuring the best way to harness the algae's capabilities. Since algae doesn't differentiate between radioactive and inactive strontium (they are chemically identical), it is not known how the algae would hold up in a highly radioactive environment. But the good news is that they have been able to manipulate the algae's process to be more strontium-selective, thus removing as much as possible.…

Source: http://inhabitat.com/green-algae-could-help-clean-up-radioactive-nuclear-waste/algae-ed01/

61 Biofuels are produced from resources that can be grown, such as algae. Explain *one* specific benefit of using biofuels in place of the fossil fuels in wide use today. [1]

62 State *one* specific way that radioactive wastes from nuclear fuels can be harmful to humans. [1]

63 State *one* way the scientists may "have been able to manipulate the algae's process to be more strontium-selective." [1]

64 These algae are adapted to live in fresh water. State *one* way their cells would likely be affected if the scientists tried to use them in a saltwater environment. [1]

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

Gray Wolves in the Rocky Mountains

Reintroduction of gray wolves in the northern Rocky Mountains has increased the ecological health of Yellowstone National Park in Wyoming. When all wolves in Yellowstone National Park were killed in 1920, elk soon ate trees and shrubs down to short stubs. Now that wolves are reducing elk numbers, many aspens and willow trees are taller and fuller and birds are returning to the trees to nest. The beaver population has grown from one colony to 12 colonies in 13 years. Spreading these benefits across the Rocky Mountain region would require increasing the present wolf population of 1,770 to 17,000.

In September 2012, wolves lost federal protection in Wyoming. In 2014, Wyoming closed its hunting season after meeting its quota of 26 wolves around Yellowstone and Grand Teton parks. The sizes of traps to catch wolves have been regulated to reduce the chance of trapping endangered species such as lynx and wolverines and the hunting season was shortened. Some ecologists wonder if removing the wolves from federal protection and allowing them to be hunted is a good ecological decision.

65 Explain how increasing the wolf population caused an increase in birds and beavers. [1]

66 Explain why some ecologists are concerned about removing wolves from federal protection. [1]

67 In the space below, construct a food chain using *three* organisms identified in the above passage. [1]

Base your answers to questions 68 and 69 on the information below and on your knowledge of biology.

Some viruses can enter cells by first attaching to the cell membrane. The flu virus targets and attaches to the cells of the nose and mouth. The hepatitis virus targets only specific cells of the liver.

68 State *one* way the immune system reacts when one of these viruses enters the body. [1]

69 Most people who get vaccinated develop immunity to the disease. Explain why the contents of the vaccine usually do *not* cause people to get sick. [1]

Base your answers to questions 70 through 72 on the information below and on your knowledge of biology.

Mitochondrial Replacement Therapy

Mutations in mitochondrial DNA (mtDNA) are associated with some severe human diseases and are inherited through the cytoplasm in the egg cell. These diseases vary, but often affect organs and tissues with the highest energy requirements, including the brain, heart, muscle, pancreas, and kidney.

Scientists have successfully used mitochondrial replacement therapy with monkeys. Scientists are considering using this technique to reduce the incidence of mitochondrial disease in children. The proposed treatment would involve removing the nucleus from an egg donated by a healthy woman and replacing it with an egg nucleus from a patient (mother) with mitochondrial disease. This would place the patient's egg nucleus into the cytoplasm of the donor's egg containing healthy mitochondria. The egg is then fertilized with the father's sperm externally using *in vitro* fertilization (IVF) to produce a zygote. The zygote is cultured for a few days to produce an embryo.

70 Explain what must be done with the embryo after *in vitro* fertilization (IVF) has been completed so the embryo can complete development. [1]

71 Explain why the scientists used the cytoplasm from the donor's egg. [1]

72 State *one* reason why muscle tissues are likely to be affected by mitochondrial diseases. [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 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.

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

73 A student collected data from an experiment on muscle fatigue. In order to interpret these data, the student should

(1) ignore the data because they do not support their hypothesis
(2) recalculate the data so that the numbers are easier to work with
(3) share the data with a student who has none
(4) organize the data into a table or graph

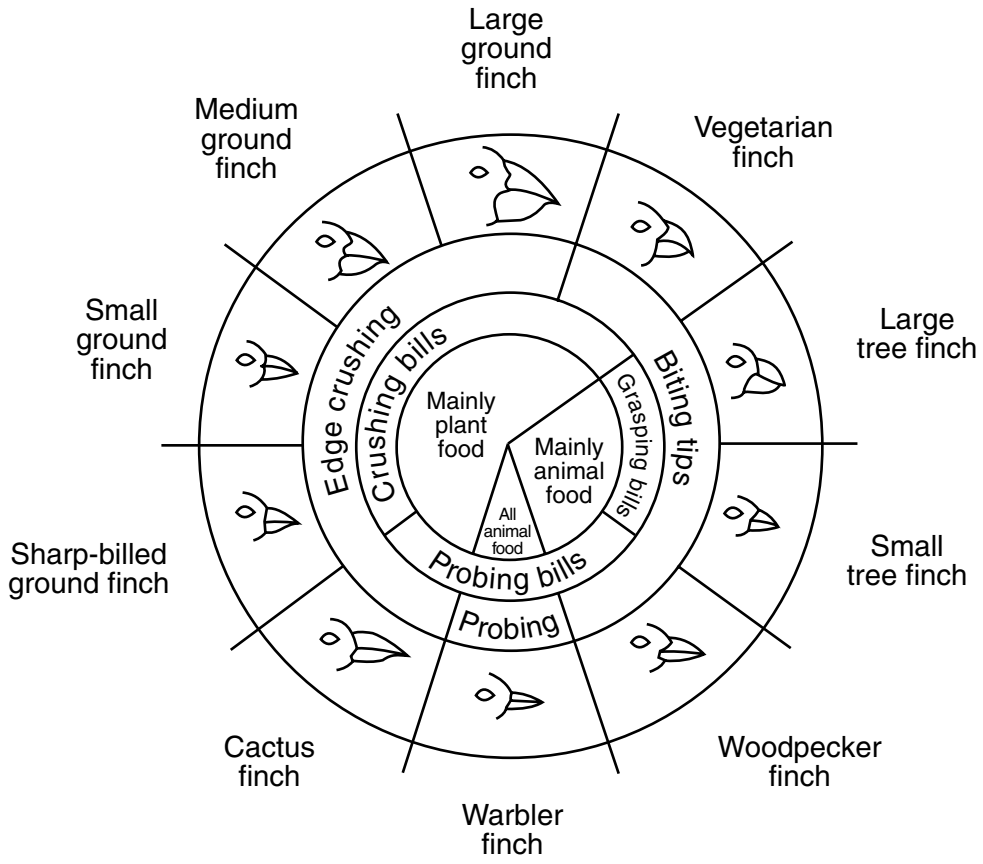
Note: The answer to question 74 should be recorded on your separate answer sheet.

74 Paper chromatography is a method used in

(1) comparing the shapes of plant leaves
(2) separating mixtures of plant pigments
(3) comparing habitats of different plants
(4) separating individual DNA fragments of plants

75 The diagram below represents the relationship between beak structure and food in several species of finches found on the Galapagos Islands.

Variations in Beaks of Galapagos Islands Finches



From: *Galapagos: A Natural History Guide*

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

The different beak structures observed in the diagram are evidence of

(1) different species of finches adapting to different environments over many generations
(2) finches changing their beak characteristics so that they could feed efficiently
(3) finch species with different beak structures coming to the Galapagos Islands from the mainland
(4) finches mating with birds of other species and acquiring some of their traits

Base your answers to questions 76 through 78 on the information below and on your knowledge of biology.

Seriously, We're Poisonous: Coloration Is An Honest Signal Of Toxicity In Poison Frogs

The conspicuous [noticeable] colors of poisonous frogs serve as a warning to predators: Don't eat me; I'm toxic. And a new study shows that in the case of at least one frog species, they aren't bluffing–the more conspicuous the color, the more poisonous the frog. Researchers Martine Maan (University of Groningen, the Netherlands) and Molly Cummings (University of Texas) studied strawberry poison dart frogs, which are native to Panama and come in more than a dozen different color patterns that vary from region to region.…

…Maan and Cummings tested the toxicity levels of 10 differently colored frog populations. Then using known properties of birds' visual systems, the researchers estimated how each color pattern would look to a bird, an important frog predator. The results show that frogs with more conspicuous color patterns–as seen by birds–tended to be more toxic. The findings suggest that "birds can predict the toxicity of frogs by looking at their colors, possibly better than the frogs can themselves," Maan said.…

Source: http://www.ineffableisland.com/2012/01/seriously-were-poisonous-coloration-is.html

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

76 If a sudden genetic mutation in the birds that feed on these frogs made them able to consume any amount of the poison with no harm to them, it is most likely that

(1) the frogs that are least poisonous and less conspicuous now would survive better than those that have more poison

(2) the frogs that are most poisonous would continue to survive and be protected by the poison they contain

(3) without the protection of the poison, all of the frogs would need to change color to become less conspicuous

(4) the birds would find another source of food that does not contain any poison

77 Researcher Austin Penner of the University of Alberta has noted that climate change and deforestation in the habitat of the strawberry poison dart frog could have "drastic effects" as the habitat required for the development of the tadpoles [young] of these frogs is extremely specific. Explain why it is important to protect these poisonous frog species and the habitat that supports them. [1]

78 Frogs come in "more than a dozen different color patterns." State *one* method the scientists could have used to determine that they are all the same species. [1]

79 Pulse rate is measured in beats per minute (bpm). Individual *A* has a resting pulse rate of 64 bpm. Individual *B* has a resting pulse rate of 82 bpm. Identify *two* reasons why the pulse rates of both of these individuals could be considered "normal." [1]

Reason 1: _____

Reason 2: _____

Base your answers to questions 80 and 81 on the information below and on your knowledge of biology.

An athlete bought a sport gel food and wanted to test it to see if it contained fats, starches, and glucose. The tests that the student used are shown in the table below.

	Test for Fat	**Test for Starch**	**Test for Glucose**
Positive Result	paper that is greasy	blue black color	brick red/orange color
Negative Result	paper that is not greasy	amber color	blue color

80 The athlete received the following results from the tests.

	Test for Fat	**Test for Starch**	**Test for Glucose**
Student's Result	paper not greasy	blue black color	brick red/orange color

Identify the contents of the sports gel. [1]

_____

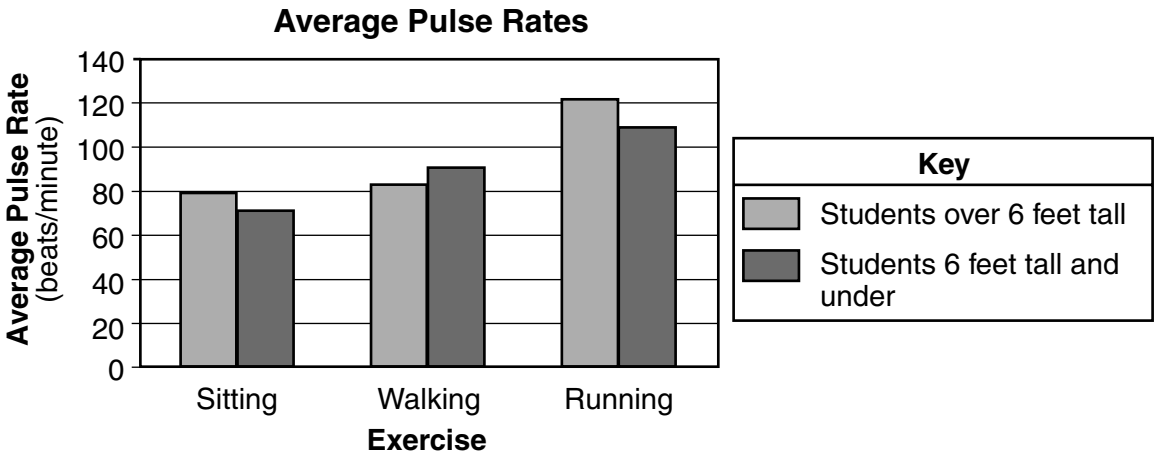
Note: The answer to question 81 should be recorded on your separate answer sheet.

81 If a starch-digesting enzyme were added to a sports gel that lists starch as an ingredient, which substance would increase in concentration?

(1) fat
(2) glucose
(3) amino acids
(4) water

Base your answers to questions 82 through 84 on the information below and on your knowledge of biology.

Students in a high school biology class conducted an investigation on pulse rates. The thirty students performed three different activities and determined their pulse rates. Each activity was done three times. The average is shown in the graph below.



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

82 The students want to improve the validity of their conclusion. The best way to accomplish this is to

(1) change the hypothesis
(2) repeat the investigation several times
(3) increase the number of variables
(4) increase the height of participants in each group

83 Some biology students concluded that classmates over 6 feet tall always have higher pulse rates than shorter classmates. Does the information from the investigation support this conclusion? Support your answer. [1]

84 State the relationship between intensity of physical activity and pulse rate. [1]

85 Identify *one* adaptation, other than beak size and shape, a finch species might possess and state how that would aid in its survival. [1]

Printed on Recycled Paper

LIVING ENVIRONMENT