The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Tuesday, January 25, 2011 — 9:15 a.m. to 12:15 p.m., only

Student Name _____

School Name _____

Print your name and the name of your school on the lines above. Then turn to the last page of this booklet, which is the answer sheet for Part A and Part B–1. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

You are to answer all questions in all parts of this examination. Write your answers to the Part A and Part B–1 multiple-choice questions on the separate answer sheet. Write your answers for the questions in Parts B–2, C, and D directly in this examination booklet. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on the answer sheet and in this examination booklet.

When you have completed the examination, you must sign the statement printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice...

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

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

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

Part A

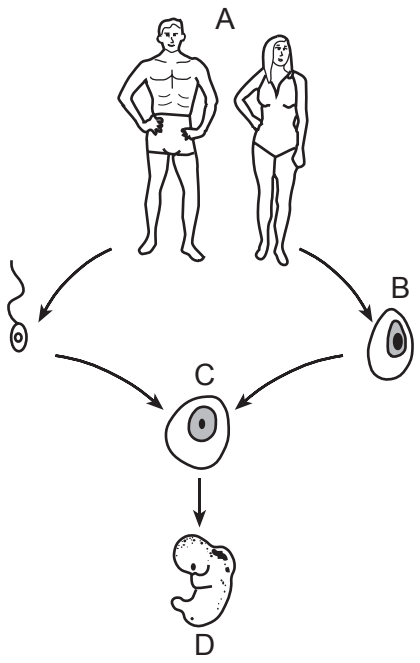
Answer all questions in this part. [30]

Directions (1–30): For *each* statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

1 The greatest number of relationships between the organisms in an ecosystem is best shown in

(1) a food chain
(2) an energy pyramid
(3) a food web
(4) an ecological succession diagram

2 The diagram below shows stages of human reproduction.



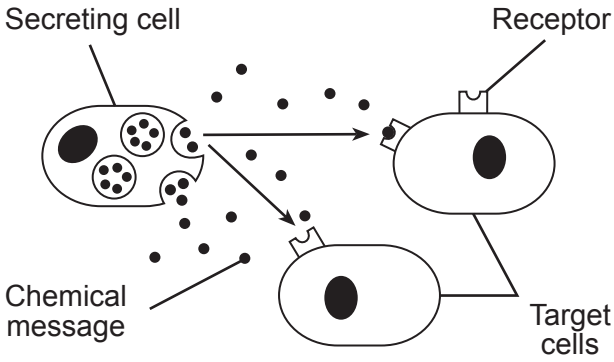
The direct result of fertilization is represented at

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

3 Certain organisms are able to store energy from the Sun in energy-rich compounds. Which event best illustrates this activity?

(1) A fox captures and eats a young rabbit.
(2) A caterpillar is eaten by a blackbird.
(3) Lettuce produces organic substances.
(4) Bacteria change organic material into simple nutrients.

4 The diagram below shows how a chemical message produced by one cell is received by other cells.



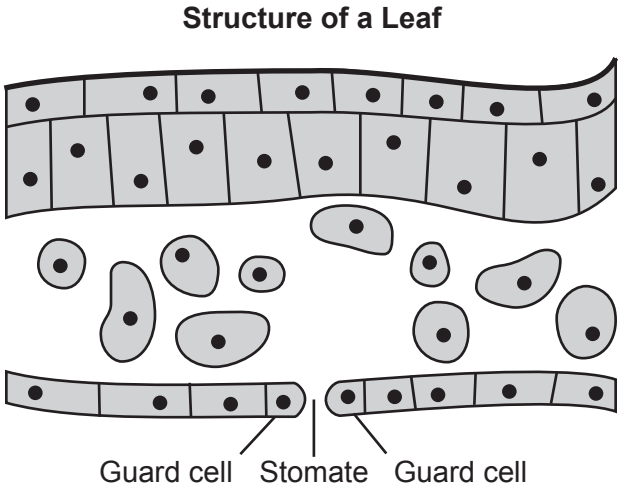
If these chemical messages are destroyed, the target cells will

(1) produce their own chemical messages
(2) not respond with appropriate actions
(3) develop different receptors
(4) no longer be produced in the organism

5 Coded instructions that are passed from one generation to the next can be most directly changed by the processes of

(1) passive transport, natural selection, and synthesis
(2) selective breeding, replication, and absorption
(3) recombination, mutation, and genetic engineering
(4) evolution, reproduction, and digestion

6 The diagram below represents a cross section of a leaf of a green plant, showing an opening (stomate) in the lower surface.



A stomate in the lower surface of the leaf has a function most similar to the function of which cell structure?

(1) cell membrane
(2) vacuole
(3) ribosome
(4) nucleus

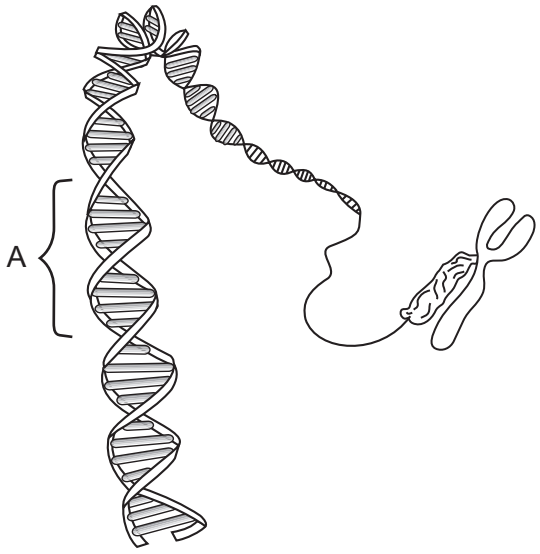
7 When *S. marcescens*, a bacterium, is grown in a refrigerator, it produces red-colored colonies. However, if the bacterium is grown at room temperature, the colonies are white. The best explanation for this situation is that

(1) refrigeration changes the structure of genes
(2) room temperature stimulates the synthesis of a red pigment
(3) temperature has an effect on the expression of genes
(4) only temperature is responsible for the expression of a trait

8 In sexually reproducing organisms, mutations can be inherited if they occur in

(1) the egg, only
(2) the sperm, only
(3) any body cell of either the mother or the father
(4) either the egg or the sperm

9 The diagram below represents a structure found in most cells.



The section labeled *A* in the diagram is most likely a

(1) protein composed of folded chains of base subunits
(2) biological catalyst
(3) part of a gene for a particular trait
(4) chromosome undergoing a mutation

10 Researchers have reported that the number of different species of fish found in certain areas of the ocean has been greatly reduced over the past 50 years. This situation is an example of

(1) a loss of biodiversity
(2) an increase in ecological succession
(3) a lack of differentiation
(4) an increased carrying capacity

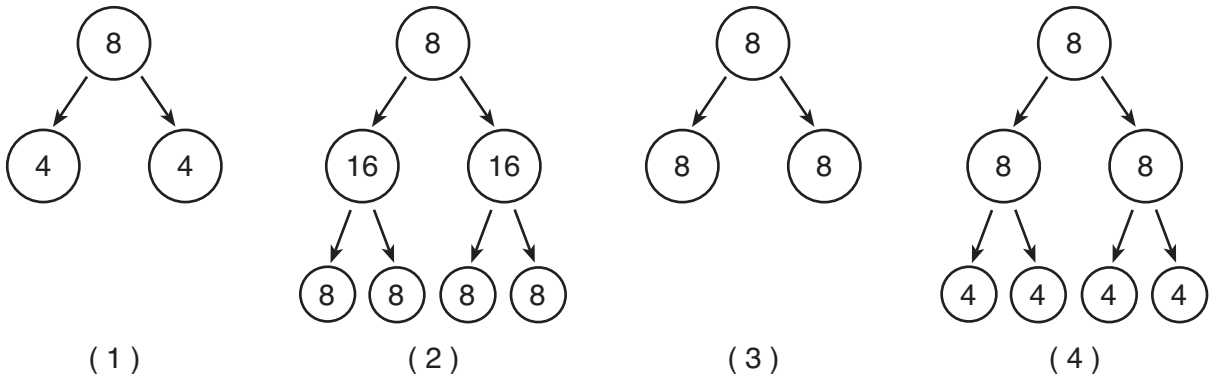
11 Large rebates and low-cost loans have been made available to homeowners to install solar panels to heat their homes. The use of these incentives benefits ecosystems because it

(1) encourages conservation of resources
(2) reduces the need for recycling
(3) promotes the use of nonrenewable resources
(4) discourages the use of alternative energy

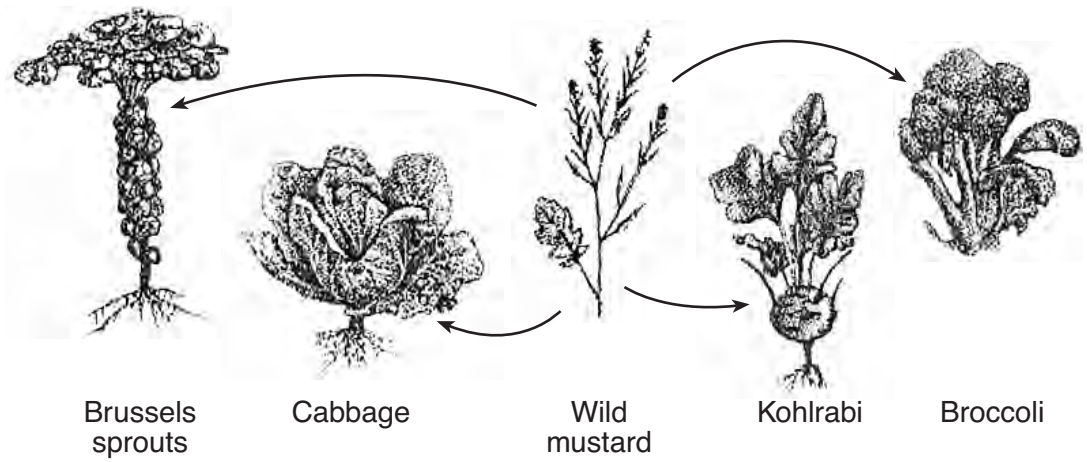
12 Which sequence represents the correct order of events for the production of necessary complex molecules after food is taken in by a multicellular animal?

(1) diffusion → synthesis → absorption → digestion → circulation
(2) circulation → diffusion → synthesis → absorption → digestion
(3) digestion → absorption → circulation → diffusion → synthesis
(4) synthesis → digestion → absorption → diffusion → circulation

13 The number in each circle below represents the chromosome number of the cell. Which diagram represents the production of offspring by an asexually reproducing organism?



14 The arrows in the diagram below indicate the development of four different varieties of vegetable plants from wild mustard.



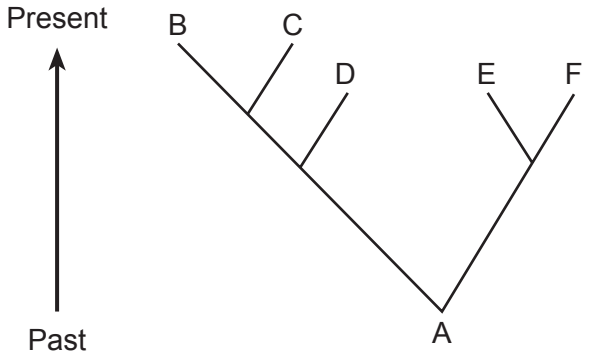
Each of these varieties was most likely produced as a result of

(1) asexual reproduction in the wild for many years
(2) changes in light availability
(3) competition between plants
(4) selective breeding over many generations

15 The sorting and recombination of genes during reproduction is important to evolution because these processes

(1) decrease variation and help maintain a stable population
(2) increase variation that enables species to adapt to change
(3) decrease the chances of producing offspring that are adapted to the environment
(4) increase the ability of all the offspring to adapt to the environment

16 A diagram of evolutionary pathways of various animal species is shown below.



The pattern of these evolutionary pathways is most likely the result of alterations within which structure?

(1) vacuole
(2) cell membrane
(3) nucleus
(4) ribosome

17 Which situation is *least* likely to result in new inherited characteristics?

(1) altering genetic information
(2) changes in the structure of genes
(3) producing new individuals by means of cloning
(4) changes in the structure of individual chromosomes

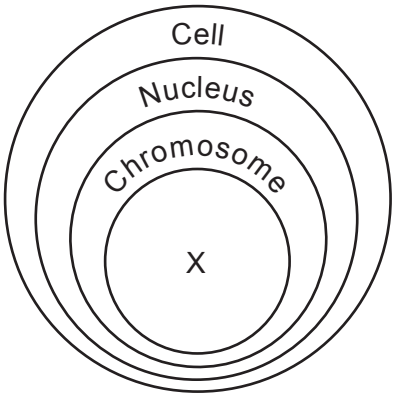
18 In most mammals, the placenta is essential to the embryo for the processes of

(1) meiosis and excretion
(2) nutrition and excretion
(3) milk production and digestion
(4) blood exchange and digestion

19 Ancestors of the giant panda had rounded paws with five very short toes. Today, the giant panda has a sixth toe, often referred to as a thumb, even though it develops from a wrist bone. This unique thumb is an adaptation that allows the panda to easily hold and eat bamboo shoots. The presence of the giant panda's thumb is most likely the result of

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

20 The diagram below represents levels of organization within a cell of a multicellular organism.



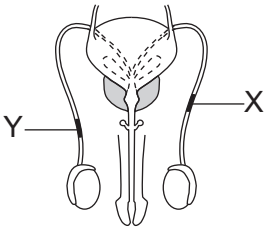
Which statement is correct regarding the structure represented by *X*?

(1) Structure *X* is composed of many different amino acids that determine the type of cell it will become in the organism.
(2) Structure *X* has the same base sequence in all the body cells of the organism.
(3) Structure *X* is a folded chain arrangement of carbohydrate found in all the body cells of the organism.
(4) Structure *X* contains 20 different kinds of subunits that are present in all the cells of the organism.

21 A pathogen passing from a mother to her fetus could cause

(1) a decrease in the chromosome number of the fetus
(2) an increase in milk production in the mother
(3) gamete production to increase
(4) an infection in the fetus

22 The diagram below represents the human male reproductive system.



Which activity would be prevented by blockages at *X* and *Y*?

(1) transport of urine out of the body
(2) passage of testosterone to the female to stimulate egg production
(3) movement of sperm out of the body
(4) movement of testosterone to the testes to stimulate sperm production

23 One environmental problem caused by the use of nuclear power as an energy source is the

(1) destruction of the ozone shield
(2) disposal of wastes
(3) production of acid rain
(4) accumulation of CO_2 in the atmosphere

24 Which method of protecting members of an endangered species is most ecologically sound?

(1) protecting the habitats where these animals live from human development
(2) capturing these animals and putting them in wildlife parks
(3) feeding and constructing shelters for these organisms
(4) passing laws that encourage hunting of the predators of these species

25 The interaction of which two systems provides the molecules needed for the metabolic activity that takes place at ribosomes?

(1) digestive and circulatory
(2) reproductive and excretory
(3) immune and nervous
(4) respiratory and muscular

26 The swordfish contains a heat generating organ that warms its brain and eyes up to 14°C above the surrounding ocean water temperature. Which structures are most likely to be found at relatively high concentrations within the cells of this heat generating organ?

(1) nuclei
(2) chloroplasts
(3) chromosomes
(4) mitochondria

27 Two species of animals with a similar appearance live in the same habitat but do *not* compete for food. This is because they most likely

(1) reproduce at different times of the year
(2) are the same size
(3) occupy different ecological niches
(4) are active at night

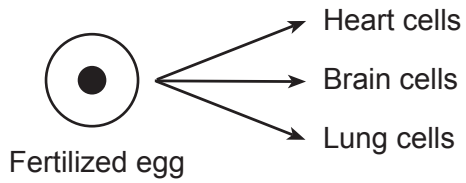
28 During its annual migration, the red knot, a medium-size shorebird, flies the entire length of North and South America. During one critical stop to feed on the eggs of horseshoe crabs, the birds nearly double their body mass. The relationship between the red knot and the horseshoe crab is that of

(1) parasite–host
(2) consumer–producer
(3) scavenger–producer
(4) predator–prey

29 It is recommended that people at risk for serious flu complications be vaccinated so that their bodies will produce

(1) antigens to fight the flu virus
(2) antibodies against the flu virus
(3) toxins to fight the infection caused by the flu virus
(4) antibiotics to reduce symptoms caused by the flu virus

30 The diagram below represents a process that occurs during normal human development.



Which statement is correct regarding the cells and DNA?

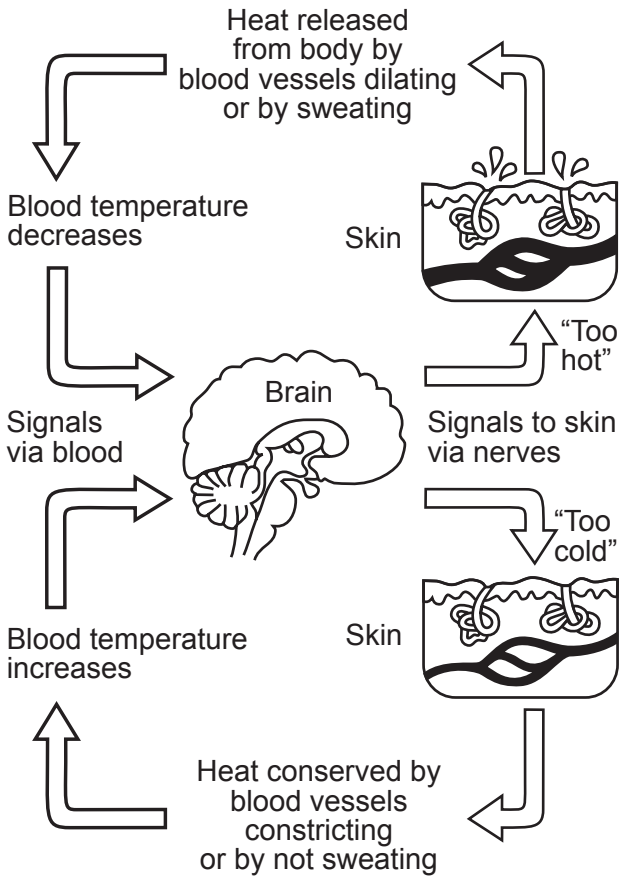
(1) All the cells have identical DNA.
(2) The DNA of the fertilized egg differs from the DNA of all the other cells.
(3) The DNA of the fertilized egg differs from some, but not all, of the other cells.
(4) Only the fertilized egg contains DNA.

Part B–1

Answer all questions in this part. [15]

Directions (31–45): For *each* statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

31 Activities in the human body are represented in the diagram below.



(Not drawn to scale)

Source: Campbell and Reece, *Biology*, 6th edition (adapted)

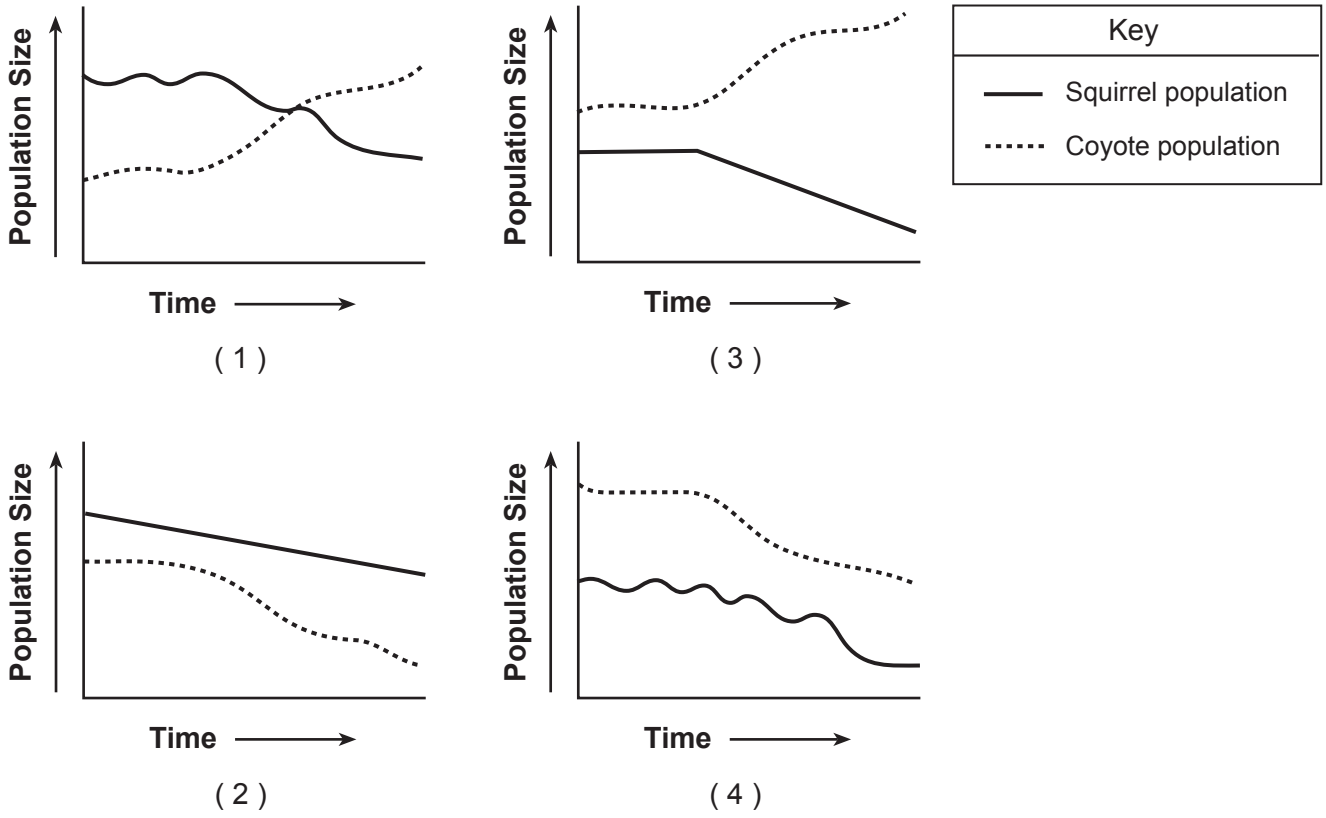
Which title would be appropriate for the diagram?

(1) Rate of Excretion Varies in Response to Amount of Water Taken In
(2) Feedback Mechanisms Help to Maintain Homeostasis
(3) Respiratory Rate Responds to an Increase in Muscle Activity
(4) The Nervous System Responds to Changes in Blood Sugar Levels

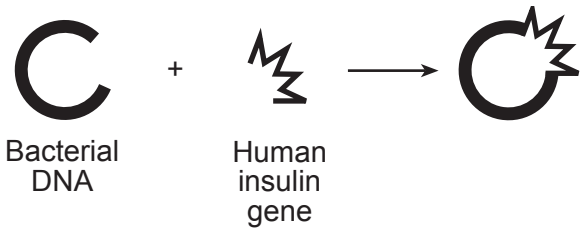
32 A company that manufactures a popular multivitamin wanted to determine whether their multivitamin had any side effects. For its initial study, the company chose 2000 individuals to take one of their multivitamin tablets per day for one year. Scientists from the company surveyed the participants to determine whether they had experienced any side effects. The greatest problem with this procedure is that

(1) only one brand of vitamin was tested
(2) the study lasted only one year
(3) the sample size was not large enough
(4) no control group was used

33 In a particular ecosystem, squirrels make up a large portion of the diet of coyotes. A fatal disease in the squirrel population begins to reduce their population over a period of months. Which graph best represents the expected changes in population size of the coyotes and the squirrels?

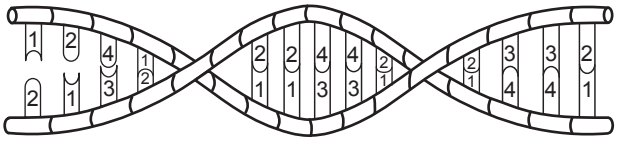


34 Which statement would most likely be used to describe the procedure represented in the diagram below?



(1) Enzymes are used to assemble an insulin gene, which is then attached to bacterial DNA.
(2) Bacterial DNA is cut from a human DNA strand and inserted into a human cell to form an insulin gene.
(3) The insulin gene is cut out of a human DNA strand using an enzyme and inserted into bacterial DNA, resulting in a combination of different DNA segments.
(4) A gene is deleted from bacterial DNA to produce an insulin gene, which is then inserted into human DNA.

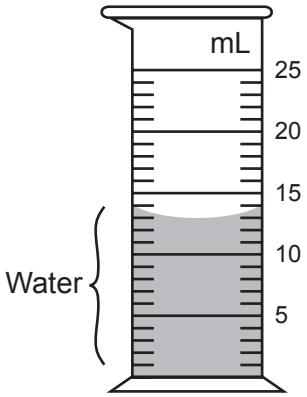
35 Part of a molecule found in cells is represented below.



Which process is most directly affected by the arrangement of components 1 through 4?

(1) diffusion through cell membranes
(2) fertilization of a sex cell
(3) sequencing of amino acids in cells
(4) increasing the number of cells in an organism

36 What is the volume of water represented in the graduated cylinder shown below?



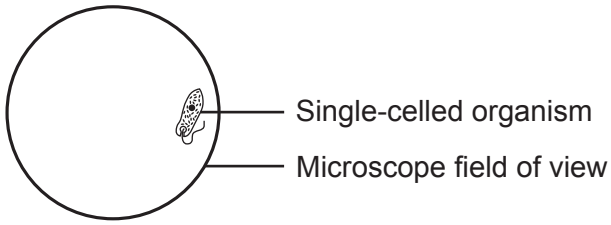
(1) 10.3 mL
(2) 13.0 mL
(3) 14.0 mL
(4) 15.0 mL

37 A student prepared a test tube containing yeast, glucose, and water. After 24 hours, the test tube was analyzed for the presence of several substances.

What substance would the student expect to find if respiration occurred in the test tube?

(1) a hormone
(2) starch
(3) nitrogen
(4) carbon dioxide

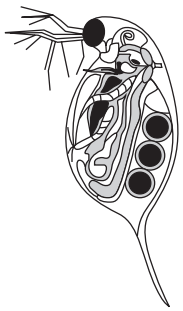
38 A student used the low-power objective of a compound light microscope and observed a single-celled organism as shown in the diagram below.



When he switched to high power, the organism was no longer visible. This most likely happened because switching to high power made the

(1) field too bright to see the organism
(2) image too small to be seen
(3) area of the slide being viewed smaller
(4) fine-adjustment knob no longer functional

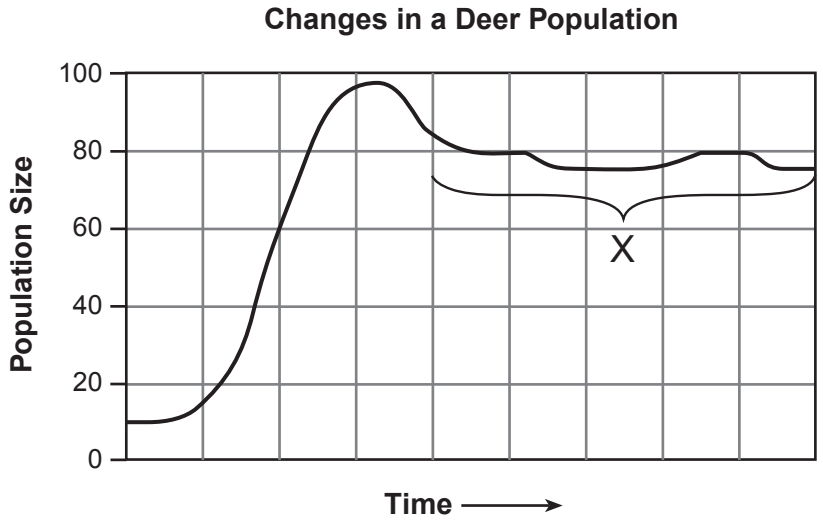
39 The daphnia shown below has produced three egg cells, eats live single-celled organisms, lives in freshwater, and is caught and eaten by animals known as hydra.



Which terms would most likely be used in a description of this organism?

(1) asexual reproduction, herbivore, prey, aquatic, heterotrophic
(2) sexual reproduction, predator, aquatic, heterotrophic, prey
(3) asexual reproduction, autotrophic, predator, terrestrial, scavenger
(4) sexual reproduction, carnivore, aquatic, autotrophic, prey

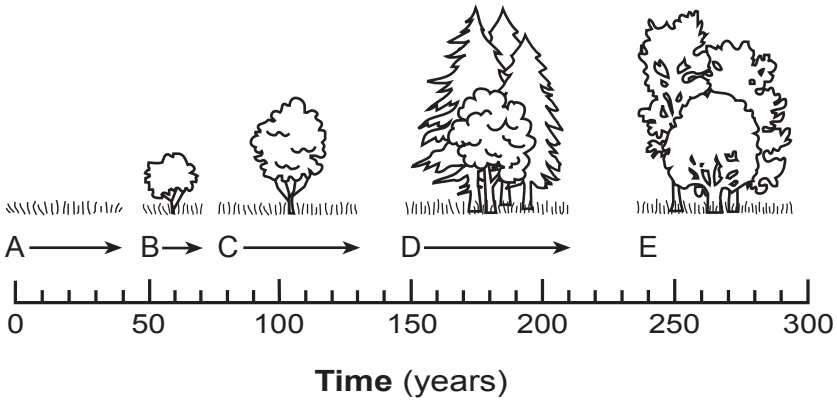
40 Changes in a deer population are shown in the graph below.



Which statement best explains section *X*?

(1) The population has reached the carrying capacity of its environment.
(2) Energy is used for interbreeding between members of different species.
(3) A predator recycles the remains of dead organisms.
(4) Competition does not occur between members of different species in the same habitat.

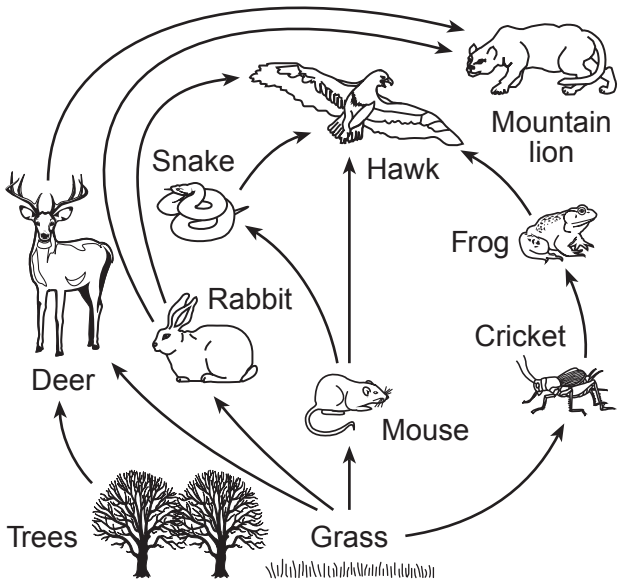
41 The diagram below shows various ecological communities that occupied an area over a period of 300 years.



Which statement best describes the diagram?

(1) Community *A* is the most stable community.
(2) Community *B* replaced community *C* after a period of 100 years.
(3) Community *C* developed into community *A* after a period of 75 years.
(4) Community *D* modified the environment, making it more suitable for community *E*.

Base your answers to questions 42 and 43 on the food web below and on your knowledge of biology.



42 Which organisms are carnivores?

(1) grass and trees
(2) mouse, rabbit, and cricket
(3) deer and mountain lion
(4) frog, snake, and hawk

43 A *decrease* in the grass population will most immediately *decrease* the available energy for the

(1) mouse
(2) hawk
(3) snake
(4) frog

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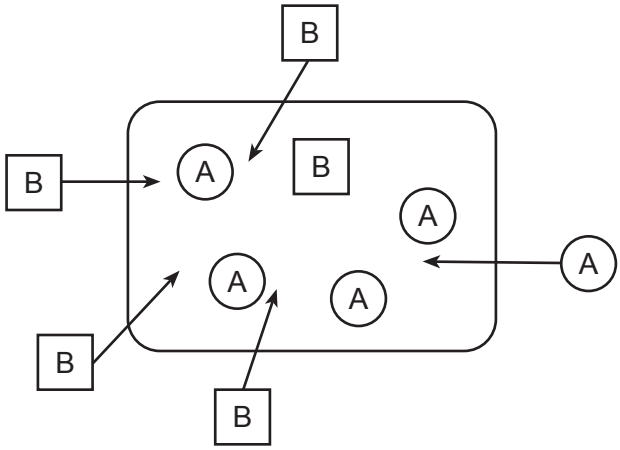
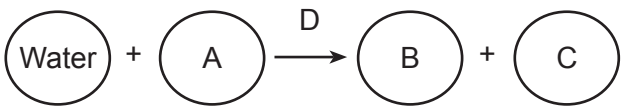
44 The diagram below shows two different kinds of substances, *A* and *B*, entering a cell.



ATP is most likely being used for

(1) substance *A* to enter the cell
(2) substance *B* to enter the cell
(3) both substances to enter the cell
(4) neither substance to enter the cell

45 A biological process that occurs in plants is represented below.



Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
(1)	enzymes	oxygen	carbon dioxide	glucose
(2)	carbon dioxide	glucose	oxygen	enzymes
(3)	glucose	enzymes	oxygen	carbon dioxide
(4)	oxygen	glucose	carbon dioxide	enzymes

Part B–2

Answer all questions in this part. [10]

Directions (46–55): For those questions that are followed by four choices, circle the *number* preceding the choice that, of those given, best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answers in the spaces provided.

For Teacher Use Only

Base your answers to questions 46 through 50 on the data table below and on your knowledge of biology. The data table shows the concentrations of oxygen in parts per million (ppm) present in freshwater and seawater at various temperatures.

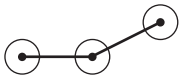
Concentration of Oxygen in Water

Temperature (°C)	Oxygen Concentration in Freshwater (ppm)	Oxygen Concentration in Seawater (ppm)
1	14.0	11.0
10	11.5	9.0
15	10.0	8.0
20	9.0	7.5
25	8.0	7.0
30	7.5	6.0

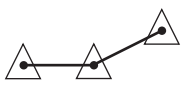
Directions (46–48): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

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

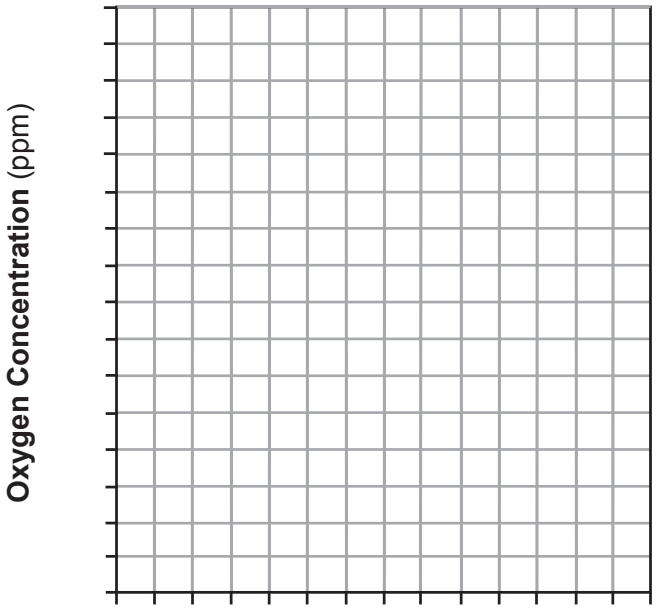
47 Plot the data for freshwater oxygen concentration on the grid. Surround each point with a small circle and connect the points. [1]

Example: 

48 Plot the data for seawater oxygen concentration on the grid. Surround each point with a small triangle and connect the points. [1]

Example: 

Concentration of Oxygen in Water



For Teacher Use Only

46 ☐

47 ☐

48 ☐

49 Predict the oxygen concentration in freshwater at 35°C. [1]

_____ **ppm**

49 ☐

50 State *one* relationship between temperature and dissolved oxygen concentration in water. [1]

_____

_____

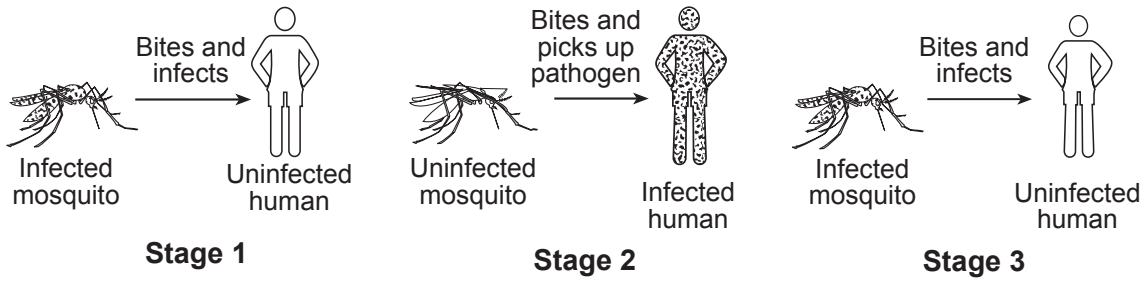
50 ☐

Base your answers to questions 51 through 53 on the passage below and on your knowledge of biology.

For Teacher Use Only

A New Theory on Malaria Transmission

Plasmodium falciparum, one parasite that causes malaria, spreads rapidly, infecting up to 500 million people every year. Malaria spreads when an infected mosquito bites an uninfected human, who then becomes infected. This infected human is bitten by an uninfected mosquito, which then becomes infected. This infected mosquito then bites and infects an uninfected human. Malaria transmission is illustrated below.



(Not drawn to scale)

Scientists have a new idea about how this disease spreads. When the malaria parasite is passed to humans through the bite of an infected mosquito, there is a great possibility that this action alters the chemical scent of the human. The altered human body scent then attracts more uninfected mosquitoes, which bite the infected person, thus spreading the disease.

To test this hypothesis, an experiment was conducted on humans infected with malaria. The results indicate that malaria gametocytes (a stage of the parasite) may trigger the production of chemicals that change the scent of the human. The change in human scent makes humans more appealing to mosquitoes.

Scientists are now studying ways to copy this chemical scent for use in traps that would attract mosquitoes.

51 Which statement best describes the role of gametocytes in the spread of malaria?

(1) They give off a scent that attracts infected mosquitoes.

(2) They absorb human body scents that attract mosquitoes.

(3) They release a scent into the human body.

(4) They cause a chemical reaction that alters human scent.

51 ☐

52 Malaria is easily spread because uninfected mosquitoes are attracted to

(1) humans without malaria

(2) humans infected with gametocytes

(3) gametocytes in other mosquitoes

(4) mosquitoes that are uninfected

For Teacher Use Only

52 ☐

53 State *one* reason why the use of synthetic scents in traps is a better way to lower mosquito populations than spraying with pesticides. [1]

_____

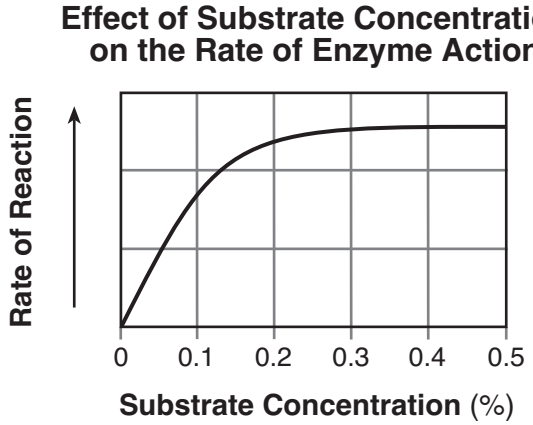
_____

53 ☐

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

For Teacher Use Only

The graph below shows the effect of substrate concentration on the action of enzyme *X*. This enzyme is functioning at its optimal temperature, 36°C, and at its optimal pH, 5.5.



54 When the substrate concentration increases from 0.4% to 0.5%, the rate of the reaction

(1) decreases

(2) increases

(3) remains the same

(4) increases, then decreases

54 ☐

55 State what would most likely happen to the rate of enzyme action if the temperature were reduced by 10 degrees. Support your answer. [1]

_____

_____

55 ☐

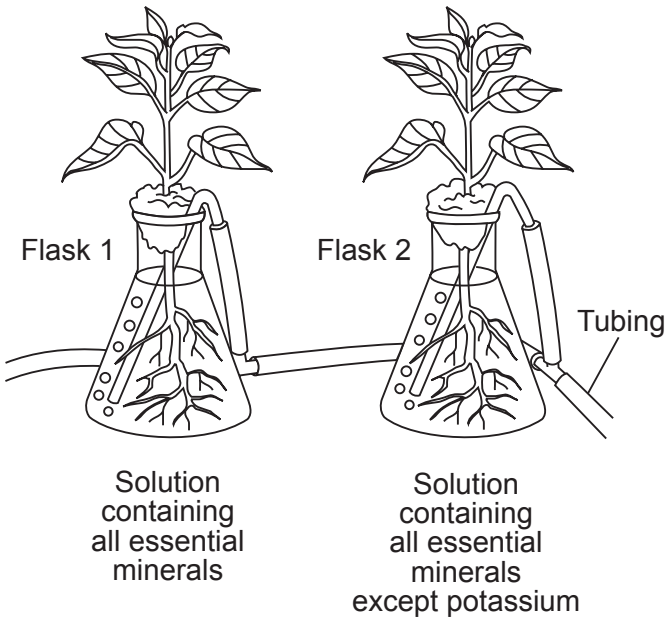
Part C

Answer all questions in this part. [17]

Directions (56–67): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 56 and 57 on the experimental setup shown below. The tubing connected to both flask setups used in the experiment provides oxygen to the solution.

For Teacher Use Only



Source: Campbell and Reece, *Biology*, 6th edition (adapted)

56 State *one* possible hypothesis for the experiment. [1]

_____

_____ 56 ☐

57 State what type of data would most likely be collected during the experiment to support or refute your hypothesis. [1]

_____

_____ 57 ☐

Base your answer to question 58 on the information below and on your knowledge of biology.

For Teacher Use Only

> Stem cells present in an embryo are responsible for the formation of various tissues and organs. Recent research suggests that it may be possible to replicate stem cells from sections of skin taken from adult mice, rather than having to use stem cells from the embryos of mice. In the future, human stem cells may be used to replace human tissue damaged by diseases such as Parkinson's disease and multiple sclerosis.

58 Discuss why the use of stem cells taken from a patient to replace damaged tissues and organs may decrease the potential risk to a patient. In your answer, be sure to:

- identify the major problem that may occur when tissues and organs donated by another individual are used [1]
- explain why this problem may occur [1]
- explain why this problem will *not* occur if tissues and organs produced by stem cells from the patient are used [1]

_____

_____

_____

_____

_____

_____

58 ☐

59 *Staphylococcus aureus* is a type of bacterium that lives on the skin and in the nostrils of most people. Generally, it is controlled by the immune system of the body. Occasionally, the antibiotic penicillin is needed to control the bacterium. However, some strains of *S. aureus* have a resistance to penicillin, which makes them hard to kill and infections difficult to cure.

Explain how the resistance to penicillin affects the *S. aureus* population. In your answer, be sure to include an explanation of:

- how the exposure to penicillin affects the survival of some bacteria in the population [1]
- why the frequency of penicillin-resistant bacteria can change over time within the population [1]
- how it is still possible to cure patients who are infected with penicillin-resistant bacteria [1]

For Teacher Use Only

59 ☐

Base your answers to questions 60 through 63 on the information below and on your knowledge of biology.

For Teacher Use Only

An ecology class is trying to help reduce the problem of global warming by asking their school district to change all of their old lightbulbs to compact fluorescent lightbulbs that use less electricity.

60 Identify *one* specific gas that contributes to the problem of global warming. [1]

_____

60 ☐

61 State *one* activity of humans that increases the concentration of this gas. [1]

_____

61 ☐

62 Describe *one negative* effect of global warming on humans or ecosystems. [1]

_____

_____

62 ☐

63 Explain why switching to more efficient lightbulbs will help reduce the school's contribution to global warming. [1]

_____

_____

63 ☐

Base your answers to questions 64 and 65 on the information below and on your knowledge of biology.

For Teacher Use Only

There's No Place Like Home!

Some pets need expensive food, or grow to large sizes, or have nasty, dangerous behavior. Because of this, some people realize that they can no longer care for their pets. A pet twist-neck turtle in a state of near starvation was found by rescuers at the Brooklyn Botanic Garden. The food that this species eats is not commonly found in New York State. In Florida and other warm states, people have released pet snakes such as pythons and anacondas into local lakes and swamps, where they have become a threat to other animals and even to humans. Those released pets that survive in their new environment can eventually breed and multiply, causing even more problems!

64 Identify *one* abiotic factor that might affect the survival of a released pet and explain why that factor would affect survival. [1]

_____

_____

64 ☐

65 State *one* reason released pets that survive in a new environment may be able to form a large population. [1]

_____

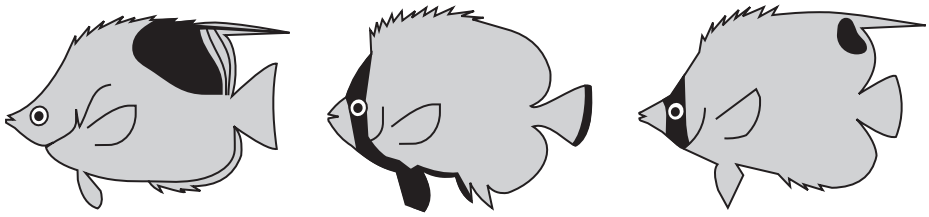
_____

65 ☐

Base your answers to questions 66 and 67 on the information and diagrams below and on your knowledge of biology.

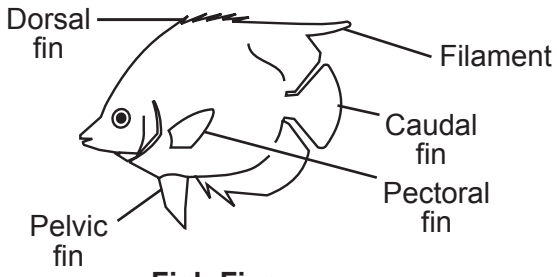
For Teacher Use Only

There are over 40 different species of butterfly fish found in tropical reefs throughout the world. Three different species of butterfly fish are shown below.



Fish A Fish B Fish C

The fish fin diagram and dichotomous key shown below can be used to determine the species of each of these fish.



Fish Fins

Dichotomous Key to Butterfly Fish	
1. a. Pelvic fin dark	2
b. Pelvin fin light	4
2. a. Two large white spots below dorsal fin	*C. quadrimacul*
b. Lacks two large white spots below dorsal fin	3
3. a. Caudal fin with two dark bars at tip	*C. reticulatus*
b. Caudal fin with one dark bar at tip	*C. kleinii*
4. a. Dorsal fin has long filament extension	5
b. Filament extension lacking from dorsal fin	6
5. a. Large dark spot on body near filament	*C. ephippium*
b. Small dark spot on body near filament	*C. auriga*
6. a …	

Directions (66–67): Using the information and dichotomous key, complete the table following the directions below.

For Teacher Use Only

66 Use the dichotomous key and fish fin diagram to identify fish *A*, *B*, and *C* and write the name of *each* fish in the column labeled "Scientific Name" in the table below. [1]

67 Select *two* characteristics from the dichotomous key that are useful for determining the identity of fish *A*, *B*, and *C*. Using these characteristics, label the headings for the last two columns in the table and complete the last two columns in the table. [2]

Fish	Scientific Name	Subgroup		
A		Rabdophorus		
B		Lepidochaetodon		
C		Rabdophorus		

66 ☐

67 ☐

Part D

Answer all questions in this part. [13]

Directions (68–78): For those questions that are followed by four choices, circle the *number* of the choice that, of those given, best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answers in the spaces provided.

For Teacher Use Only

Base your answer to question 68 on the chart below and on your knowledge of biology.

Universal Genetic Code Chart
Messenger RNA and the Amino Acids for Which They Code

	U	C	A	G	
U	UUU, UUC: PHE UUA, UUG: LEU	UCU, UCC, UCA, UCG: SER	UAU, UAC: TYR UAA, UAG: STOP	UGU, UGC: CYS UGA: STOP UGG: TRP	**U C A G**
C	CUU, CUC, CUA, CUG: LEU	CCU, CCC, CCA, CCG: PRO	CAU, CAC: HIS CAA, CAG: GLN	CGU, CGC, CGA, CGG: ARG	**U C A G**
A	AUU, AUC, AUA: ILE AUG: MET or START	ACU, ACC, ACA, ACG: THR	AAU, AAC: ASN AAA, AAG: LYS	AGU, AGC: SER AGA, AGG: ARG	**U C A G**
G	GUU, GUC, GUA, GUG: VAL	GCU, GCC, GCA, GCG: ALA	GAU, GAC: ASP GAA, GAG: GLU	GGU, GGC, GGA, GGG: GLY	**U C A G**

68 Fill in the missing mRNA bases and the amino acid sequence that corresponds to the DNA base sequence below. [2]

DNA CAC GTG GAC TGA

mRNA _____ _____ _____ _____

Amino acids _____ _____ _____ _____

68 ☐

Base your answers to questions 69 and 70 on the information below and on your knowledge of biology.

For Teacher Use Only

An investigation is carried out to determine the effect of exercise on the rate at which a person can squeeze a clothespin.

69 In this investigation, the independent variable is the

(1) control

(2) exercise

(3) rate of squeezing

(4) number of participants

69 ☐

70 Muscle fatigue occurs during this activity when

(1) carbon dioxide is used up in the muscle cells

(2) simple sugar is converted to starch in the muscle cells

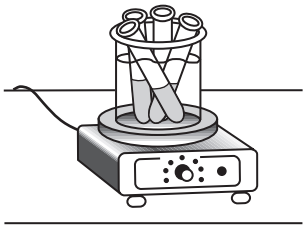
(3) proteins accumulate in mitochondria in the muscle cells

(4) certain waste products collect in the muscle cells

70 ☐

---

71 Part of a laboratory procedure is shown in the diagram below.



This setup would most likely be involved in a procedure to

(1) stain specimens while making a wet mount

(2) test for the presence of glucose using an indicator

(3) separate pigments in a mixture

(4) determine the pH of solutions

71 ☐

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

For Teacher Use Only

A valuable medicine is obtained from a certain rare species of plant. Scientists are anxious to find another more abundant species of plant that is closely related to the rare one, and also produces the medicine.

Two newly discovered plant species, *A* and *B*, were studied and compared to the rare one. The results of the study are shown in the table below.

Species of Plant	Characteristics of Flowers	Shape of Leaves	Species Number of Chromosomes	Enzyme A Present	Enzyme B Present	Enzyme C Present
rare species	pink 5 petals	round	36	yes	yes	yes
species A	pink 5 petals	oval	34	no	no	yes
species B	white 5 petals	round	36	yes	yes	yes

72 Which newly discovered species is more closely related to the rare species? Support your answer. [1]

Species:_____

_____

_____ 72 ☐

73 Which procedure could also be carried out to help determine which newly discovered species is most closely related to the rare species?

(1) measurement of respiration rate in the plants

(2) chromatography of pigment extracts from the plants

(3) determination of the type of gas released by photosynthesis in the plants

(4) analysis of chemical bonds present in glucose in the plants 73 ☐

74 The characteristics of four finches that inhabit the same island are represented in the chart below.

For Teacher Use Only

Characteristics Chart

Large Ground Finch  Beak: crushing Food: mainly plant	Warbler Finch  Beak: probing Food: 100% animal
Small Ground Finch  Beak: crushing Food: mainly plant	Large Tree Finch  Beak: grasping Food: mainly animal

Complete the table below using information in the characteristics chart and your knowledge of biology. [2]

Competes With the Large Tree Finch	**Type of Finch**	**State *one* reason why it competes *or* does *not* compete with the large tree finch.**
no		
yes		

74 ☐

75 Studies of the finches of the Galapagos Islands have shown that

(1) DNA will change to produce structures needed by birds to survive intense competition

(2) a bird's beak changes annually in response to the type of food that is most abundant each year

(3) natural selection occurs when there are scarce resources and intense competition

(4) the beak of a finch will change if the environment of the bird remains stable

75 ☐

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

For Teacher Use Only

A student prepared four different red blood cell suspensions, as shown in the chart below.

Suspension	Contents
A	red blood cells in normal blood serum (0.7% salt solution)
B	red blood cells in 10% salt solution
C	red blood cells in distilled water
D	red blood cells in tap water

76 Which suspension would contain red blood cells that would appear wrinkled and reduced in volume?

(1) *A*

(2) *B*

(3) *C*

(4) *D*

76 ☐

77 The change in red blood cell volume is principally due to the movement of

(1) serum

(2) oxygen

(3) water

(4) salt

77 ☐

78 Which process is most likely involved in the change in red blood cell volume?

(1) active transport

(2) evaporation

(3) replication

(4) diffusion

78 ☐

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Tuesday, January 25, 2011 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student ..... Sex: ☐ Female ☐ Male

Teacher .....

School ..... Grade .....

Part	Maximum Score	Student's Score
A	30	
B–1	15	
B–2	10	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		
Final Score (from conversion chart)		

Raters' Initials

Rater 1 ..... Rater 2 .....

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

Part A

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

Part A Score

Part B–1

31	39 .....
32	40 .....
33	41 .....
34	42 .....
35	43 .....
36	44 .....
37	45 .....
38	

Part B–1 Score

Tear Here

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

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

Signature

LIVING ENVIRONMENT

Tear Here

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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, January 25, 2011 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site http://www.p12.nysed.gov/osa/ and select the link "Examination 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.

Part A and Part B–1
Allow 1 credit for each correct response.

Part A

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

Part B–1

31 . . . . . **2**	39 . . . . . **2**
32 . . . . . **4**	40 . . . . . **1**
33 . . . . . **2**	41 . . . . . **4**
34 . . . . . **3**	42 . . . . . **4**
35 . . . . . **3**	43 . . . . . **1**
36 . . . . . **2**	44 . . . . . **1**
37 . . . . . **4**	45 . . . . . **2**
38 . . . . . **3**	

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*.

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* attempt to *correct* the student's work by making insertions or changes of any kind.

Allow 1 credit for each correct response for multiple-choice questions.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a check mark each incorrect or omitted answer to multiple-choice questions. In the box provided in the upper right corner of the answer sheet, record the number of questions the student answered correctly for each of these parts.

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 all the open-ended questions on a student's answer paper.

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. In the student's examination booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

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.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, Part C, and Part D on the appropriate lines in the box printed on the answer sheet and should add these five scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site http://www.p12.nysed.gov/osa/ on Tuesday, January 25, 2011. The student's scaled score should be entered in the box labeled "Final Score" on the student's answer sheet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination 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.

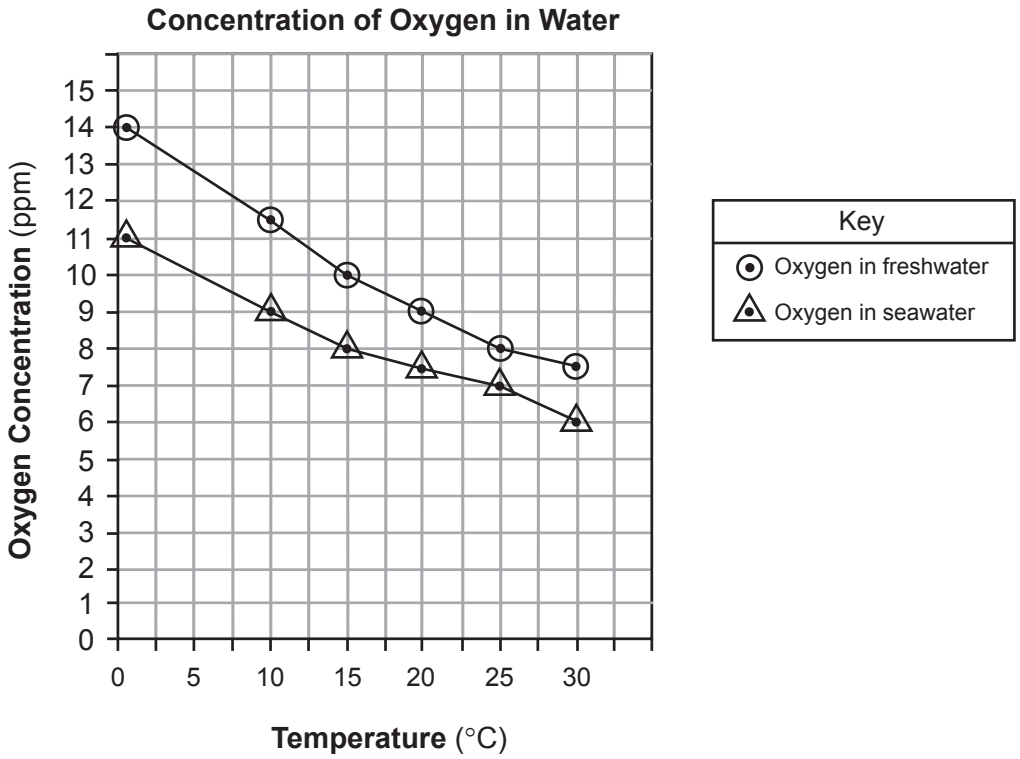
Part B–2

46 [1] Allow 1 credit for marking an appropriate scale on each axis.

47 [1] Allow 1 credit for correctly plotting freshwater data, surrounding each point with a small circle, and connecting the points.

48 [1] Allow 1 credit for correctly plotting seawater data, surrounding each point with a small triangle, and connecting the points.

Example of a 3-credit response to questions 46–48:



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.

49 [1] Allow 1 credit for response between 6 ppm and 7.5 ppm.

50 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— As temperature increases, oxygen concentration decreases.

— As temperature decreases, oxygen concentration increases.

51 4

52 2

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

— The scents are very specific for the insect they attract.

— Pesticides disrupt food webs.

— Pesticides affect organisms other than mosquitoes.

— Over time, more insects that are resistant to the pesticide would appear in the population.

54 3

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

— The reaction will slow down because it is below the optimal temperature.

Part C

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Potassium helps plants grow.

— Potassium is not needed by plants for proper growth.

— Plants missing potassium will not grow tall.

— Plants lacking potassium will not be green.

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

57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— plant height

— number/size of leaves/roots

— amount/percent of leaf discoloration

— daily growth

Note: The type of data must be measurable. Allow credit for an answer consistent with the student's hypothesis.

58 [3] Allow a maximum of 3 credits, allocated as follows:

- Allow 1 credit for identifying the major problem that may occur when tissues and organs donated by another individual are used. Acceptable responses include, but are not limited to:

  — rejection of tissues or organs

- Allow 1 credit for explaining why this problem may occur. Acceptable responses include, but are not limited to:

  — foreign proteins from donated/tissues/organs trigger immune response

  — immune system attacks foreign tissues/organs

- Allow 1 credit for explaining why this problem will *not* occur if tissues and organs produced by stem cells from the patient are used. Acceptable responses include, but are not limited to:

  — Proteins in tissues/organs will be the same as those of the patient, so the immune system will not attack.

59 [3] Allow a maximum of 3 credits, allocated as follows:

- Allow 1 credit for explaining how the exposure to penicillin affects the survival of some bacteria in the population. Acceptable responses include, but are not limited to:
  - — Bacteria may vary in their susceptibility to penicillin, and resistant ones survive.
  - — In the bacteria that survive, there are naturally occurring variations that provide resistance to penicillin.
  - — When exposed to penicillin, more of the resistant ones survive.
  - — Nonresistant bacteria die off.
- Allow 1 credit for explaining why the frequency of penicillin-resistant bacteria can change over time within the population. Acceptable responses include, but are not limited to:
  - — When exposed to penicillin, the frequency of resistant bacteria will increase as those that are resistant survive and reproduce.
  - — The resistant bacteria will survive and they will produce offspring that are resistant.
- Allow 1 credit for explaining how it is still possible to cure patients who are infected with penicillin-resistant bacteria. Acceptable responses include, but are not limited to:
  - — Patients can be treated with antibiotics other than penicillin.

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

- — carbon dioxide (CO_2)
- — methane
- — nitrous oxide
- — CFCs

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

Carbon dioxide:

— burning fossil fuels

— deforestation

— driving cars

Methane:

— establishing landfills

— raising cattle

Nitrous oxide:

— treating raw sewage

— producing synthetic fertilizers

CFCs:

— air conditioner leaks

— use of certain aerosols

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

— higher sea levels

— habitat loss

— climate change

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

— They would use less electricity, resulting in less fossil fuels being burned.

— Reduced energy use would decrease the amount of fossil fuels burned.

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Lack of water could result in dehydration, which interferes with cell functions.

— temperature, because different species are adapted to live in different climates

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— lack of natural predators

— Food/prey may be extremely abundant in the new environment.

— breed and multiply in the new environment

66 [1] Allow 1 credit for identifying fish *A*, *B*, and *C* and writing the name of each fish in the column labeled "Scientific Name" in the table.

Note: Allow this credit even if the genus (*C.*) is *not* included.

67 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for selecting *two* characteristics from the dichotomous key that are useful for determining the identity of fish *A*, *B*, and *C* and labeling the headings for the last two columns in the table.

- Allow 1 credit for correctly completing the last two columns in the table.

Example of a 3-credit response for questions 66 and 67:

Fish	Scientific Name	Subgroup	Pelvic Fin Color	Spot Near Dorsal Fin Filament
A	***C. ephippium***	Rabdophorus	**light**	**large**
B	***C. kleinii***	Lepidochaetodon	**dark**	**none**
C	***C. auriga***	Rabdophorus	**light**	**small**

Part D

68 [2] Allow a maximum of 2 credits, 1 credit for correctly filling in the missing mRNA bases and 1 credit for correctly filling in the amino acid sequence that corresponds to the DNA base sequence.

Example of a 2-credit response:

DNA	CAC	GTG	GAC	TGA
mRNA	GUG	CAC	CUG	ACU
Amino acids	VAL	HIS	LEU	THR

Note: Allow credit for an amino acid sequence that is consistent with the student's response for the mRNA sequence.

69 2

70 4

71 2

72 [1] Allow 1 credit for species *B* and supporting the answer. Acceptable responses include, but are not limited to:

— because it has more characteristics in common with the rare species

73 2

74 [2] Allow a maximum of 2 credits, 1 credit for completing *both* columns for each of the finches.

Example of a 2-credit response:

Competes With the Large Tree Finch	Type of Finch	State *one* reason why it competes *or* does *not* compete with the large tree finch.
no	**large/small ground finch** *or* **warbler finch**	**The large tree finch eats mainly animal food, while the large/small ground finch eats mainly plant food.** *or* **The warbler finch may eat different animals.**
yes	**warbler finch**	**They both eat animal food.**

75 3

76 2

77 3

78 4

The *Chart for Determining the Final Examination Score for the January 2011 Regents Examination in Living Environment* will be posted on the Department's web site http://www.p12.nysed.gov/osa/ on Tuesday, January 25, 2011. 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 www.p12.nysed.gov/osa/teacher/evaluation.html.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

January 2011 Living Environment

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

Part D 68–78	
Lab 1	68, 72, 73
Lab 2	69, 70
Lab 3	74, 75
Lab 5	71, 76, 77, 78

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

Regents Examination in Living Environment – January 2011

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

Raw Score	Scale Score
56	77
55	77
54	76
53	75
52	75
51	74
50	73
49	73
48	72
47	71
46	70
45	70
44	69
43	68
42	67
41	66
40	66
39	65
38	64
37	63
36	62
35	61
34	60
33	59
32	57
31	56
30	55
29	54
28	53

Raw Score	Scale Score
27	52
26	50
25	49
24	48
23	46
22	45
21	43
20	42
19	40
18	39
17	37
16	35
15	34
14	32
13	30
12	28
11	26
10	24
9	22
8	20
7	18
6	16
5	13
4	11
3	8
2	6
1	3
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 "Final Score" on the student's answer sheet.

All student answer papers that receive a scale score of 60 through 64 **must** be scored a second time to ensure the accuracy of the score. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate and reliable scoring of the student's answer paper.

Because scale scores corresponding to raw scores in the conversion chart change from one examination 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.