The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Tuesday, August 20, 2024 — 12:30 to 3:30 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 The human body maintains a balanced internal environment. In order to accomplish this,

(1) organelles work independently
(2) all cells have the same shape and function
(3) insulin is produced when protein levels are low
(4) stimuli are detected, and actions are taken

2 Wolves are important predators in some ecosystems. If wolves are removed from their environment, the ecosystem is in danger of becoming unstable due to

(1) a reduction of autotrophs when the number of herbivores is not being kept in check by the wolves
(2) a decrease in the number of herbivores because they will not be able to reach carrying capacity
(3) an increase in the biodiversity of the remaining animal and plant species
(4) some species of herbivores taking over the niche the wolves occupied

3 Which statement best explains how deforestation that is the result of forest fires can contribute to global warming?

(1) Burning the trees adds smoke to the atmosphere and blocks sunlight.
(2) Burning the trees adds carbon dioxide to the atmosphere.
(3) Deforestation removes trees that produce carbon dioxide through the process of photosynthesis.
(4) Deforestation immediately increases ecosystem stability needed in the burned area.

4 For centuries, humans have built dams along rivers to redirect water for power, irrigation, and transportation. Dams can prevent migrating fish from swimming upstream to reproduce and can also disrupt the flow of sediments and nutrients. Communities are starting to eliminate some dams, and the health of the river ecosystems is being restored. This best illustrates that

(1) technological advances often involve environmental trade-offs
(2) when humans modify their environment it always has effects that cannot be reversed
(3) industrialization has had a positive effect on the health of river ecosystems
(4) the construction of dams affected abiotic factors in the river but not biotic factors

5 In humans, lactose is broken down into glucose and galactose in the presence of a particular enzyme. It is most likely that the enzyme that breaks down lactose

(1) breaks down several other types of food in the stomach
(2) is involved in other reactions when the temperature and pH are ideal
(3) helps in the synthesis of complex sugars during autotrophic nutrition
(4) is not involved in other types of reactions because enzymes are specific

6 The Tdap vaccine can protect adolescents and adults from the serious bacterial diseases tetanus, diphtheria, and pertussis. Another vaccine, called Td, protects against tetanus and diphtheria, but not pertussis. Td does *not* protect against pertussis because the

(1) Tdap vaccine is given to treat pertussis
(2) Td vaccine does not contain the antibodies from pertussis to fight the bacteria
(3) Tdap vaccine contains a small amount of the bacteria that causes pertussis
(4) Td vaccine does not stimulate the immune system of people to recognize pertussis antigens

7 Pelagic red crabs living on the ocean floor have been found to eat small bits of plastic. When they are consumed, these small creatures are passing the plastics along the food chain to predators, including fish consumed by humans.

This is of concern because it

(1) decreases plastic recycling by primary consumers
(2) increases the risk of harmful substances in our food supply
(3) decreases the producers in the ecosystem
(4) increases the biodiversity of the ocean

8 Duckweed is a small plant that grows on the surface of still bodies of water. Over a nine-week period, scientists monitored the growth of duckweed in three ditches located on the same farm. The number of duckweed plants increased rapidly during weeks one and two. After two weeks, each ditch was completely covered with a layer of duckweed and remained covered for the remaining seven weeks.

A valid conclusion based on the data collected over this nine-week study is that

(1) animals that eat duckweed have the greatest effect on duckweed population size
(2) duckweed populations die off after completing a two-week life cycle in the ditch
(3) only changes in temperature affect duckweed population size
(4) the size of the duckweed population is kept stable by limited resources in the ditch

9 Which statement explains why the organisms in some ecosystems, such as rainforests, deserts, and oceans, are different from each other?

(1) The living organisms in each ecosystem have different needs and produce the physical conditions that they require.
(2) Each ecosystem contains different types of living organisms that change each of the physical conditions present there.
(3) They all have the same physical conditions present, but the living organisms use them in different ways.
(4) Each ecosystem contains different physical conditions that determine the type of living organisms present there.

10 Some green plants secrete acids that dissolve rock, which makes it possible for the plants to absorb phosphorus needed for healthy plant growth. In addition to phosphorus, plants require many other substances. Which substances are required for the production of carbohydrates in green plants?

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

11 Which statement about competition in ecosystems is correct?

(1) Organisms compete most when they occupy different niches and resources are plentiful.
(2) Individuals need not compete, because resources such as water and food are always plentiful in ecosystems.
(3) Organisms that compete successfully will survive, reproduce, and pass their traits on to their offspring.
(4) Competition usually results in the extinction of a species, ensuring the survival of other species.

12 Human body systems interact with each other. The list below illustrates the results of one body system functioning normally.

- Muscle cells receive oxygen.
- Nerve cells receive glucose.
- Lungs get rid of carbon dioxide.
- Some gland cells send chemical signals to organs.

Which body system most directly enables all these functions to occur?

(1) circulatory system
(2) excretory system
(3) digestive system
(4) immune system

13 The Himalayan rabbit lives in the cold Tibetan mountains. It typically has white fur on its body and black fur on its outer extremities, such as the ears, nose, feet, and tail.

A scientist shaved a patch of white fur off the back of a Himalayan rabbit and applied an ice pack to the area for 30 minutes. The fur in the shaved area grew in black. The best explanation for why black fur grew in the shaved area is that

(1) the food the rabbit ate during the experiment influenced fur color
(2) the fur in the newly shaved area was younger than the white fur on the rest of the body
(3) the ice pack caused a mutation in the genes that regulate fur color
(4) warm and cold temperatures activate different genes for fur color

14 Researchers have identified a mutually beneficial relationship between some plant species and specific fungi. The fungi increase the nutrient uptake for these plants, and the plants provide nutrition to the fungi.

In order for this relationship to occur, the plant must produce a particular protein. Scientists hope to enable plants that normally do not interact with these fungi to obtain the benefits that the plant-fungi relationship offers.

In order to make this possible, which process would scientists most likely use?

(1) Treat the plants with chemical fertilizers to stimulate their growth.
(2) Provide the fungi with the same molecular bases that are found in plant protein.
(3) Identify the gene that codes for the protein and introduce it into plant cells by genetic engineering.
(4) Selectively breed a new type of fungus that does not require the nutrients that the plants provide.

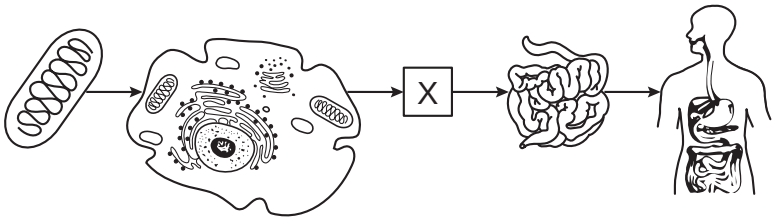
15 Milkweeds are plants that produce toxic, bitter-tasting chemicals. Some insects have developed the ability to safely feed on milkweed. They accumulate some of the toxin in their bodies, causing them to taste bitter to other animals that may try to eat them. As a result, most animals avoid eating these insects. A possible explanation for this relationship is that

(1) eating a toxic plant increases the ability of these insects to survive and reproduce
(2) milkweed populations are controlled by many insects
(3) the milkweed benefits from the insects that can tolerate the toxin they produce
(4) eventually the insects will become immune to the toxin

16 Which type of cell engulfs pathogens and marks them for killing?

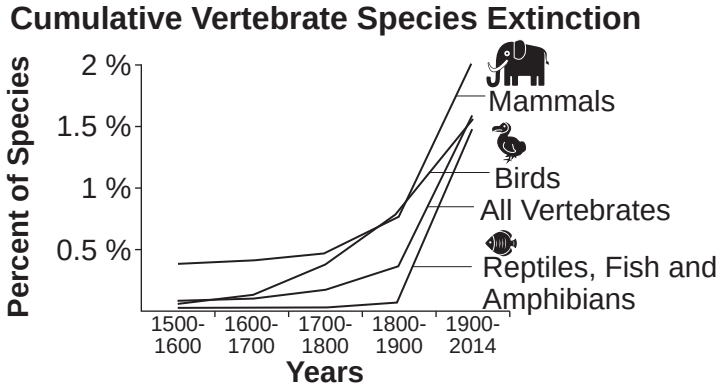
(1) red blood cell
(2) white blood cell
(3) nerve cell
(4) muscle cell

17 Which choice below best completes the diagram with a correct label and definition for the box labeled *X*?



(1) cell: the basic structural, functional, and biological unit
(2) organ: a group of tissues with a common function
(3) tissue: a group of cells with a similar structure and function
(4) organ system: a collection of organs with a common function

18 Concern is rising that mass extinctions of many species may increase. In the graph below, the risk of extinctions is shown to have risen rapidly from 1850 to 2014.



This loss of different species is a concern because it may

(1) lead to an increase in diversity in the ecosystem
(2) impact the energy flow and food supply within an ecosystem
(3) produce increased nonrenewable resources
(4) provide additional sources of potential medicines

19 The American Museum of Natural History has an exhibit called the Ecosystem Sphere. It is a huge glass globe that was assembled in 1999. Populations of algae, bacteria, and little shrimp were sealed with water and air inside. The Ecosystem Sphere is kept in a well-lit area.

Although the sphere has never been opened, groups of each kind of organism are still alive inside it. The most likely reason for this is because the populations have

(1) remained in separate areas of the sphere and do not interact
(2) adapted so that they do not require food
(3) a constant source of energy because they cannot recycle gases and materials
(4) a constant source of energy and recycle gases and materials

20 Ebola is a deadly viral disease. Victims of Ebola suffer from massive blood loss and organ failure. Researchers are testing a vaccine on people who have not yet been infected by Ebola, but live in high-risk areas. The vaccine must be given to the subjects before exposure to Ebola because

(1) the vaccine will mutate the virus when a person gets infected
(2) if a subject is infected with Ebola, it will destroy the vaccine
(3) vaccines stimulate the subject's immune system to react to future exposure to the virus
(4) vaccines are only effective for a few days, so the patient must get the vaccine before exposure

21 A relatively large number of antibodies in a blood sample would most likely indicate that there is

(1) an infection in the body
(2) a mutation in the lung
(3) a deficiency of carbon dioxide in the circulatory system
(4) an insufficient amount of a specific vitamin in the diet

22 Ultraviolet light can alter the DNA segments of genes in the skin cells of an individual. Which statement best describes a direct result of these alterations?

(1) Any cells produced from the altered skin cells will have the same alterations.
(2) All the offspring of the individual will have the same skin cell alterations.
(3) These alterations will spread to all the other cells in the body.
(4) The sex cells of the individual will have the same alterations.

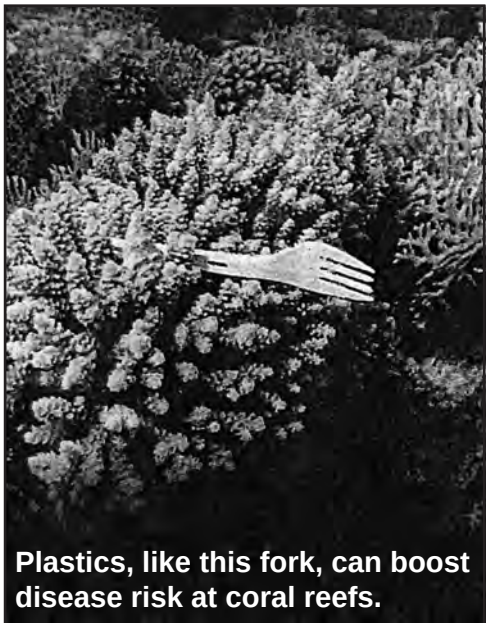
23 The energy required to assemble proteins and fats is directly supplied to body cells from

(1) all the colors of visible light
(2) molecules of ATP contained within the cells
(3) all the DNA found in sex cells
(4) molecules of carbon dioxide produced by chloroplasts

24 There are over 200 different cell types in the human body. Each type of cell is specialized to carry out a particular function, but they all developed from the same single cell. This is because each type of cell

(1) contains different genes than the other types of cells
(2) destroys the genes found in the other types of cells
(3) expresses some genes not expressed in the other cell types
(4) lacks the genes found in the other cell types

25 Coral reefs are vital components of marine ecosystems. They provide shelter and nutrition to many organisms that live on or in them. Some coral reefs in the Pacific Ocean are heavily polluted with plastic objects that provide surfaces where disease-causing microbes are able to grow.



Plastics, like this fork, can boost disease risk at coral reefs.

If the amount of plastic present on coral reefs continues to increase, it is likely that the

(1) coral will adapt to the presence of the plastic and thrive
(2) microbes will adapt to living directly on the coral
(3) algae that live on the reef will begin to decompose the dying coral
(4) species dependent on the coral will be negatively impacted

26 Enzymes, antibodies, and receptor molecules all have different functions. However, they are alike in that they

(1) all are involved in cellular respiration
(2) have a shape that is specific to their function
(3) are classified as carbohydrates
(4) are important in animals but not plants

27 Australian quolls are endangered mammals. One factor causing the death of many quolls is that they occasionally consume cane toads, which are poisonous. Scientists have identified a gene that some quolls possess that makes them avoid eating cane toads. By selectively breeding quolls with the "toad-avoiding gene" with other quolls who lack the gene, scientists found that all of the hybrid offspring inherited the survival gene.

Before the survival gene could be passed on to any offspring, the genetic material present in the parent with the "toad-avoiding gene" would have to be

(1) mutated to become a different gene
(2) accurately replicated
(3) genetically engineered
(4) changed through recombination

28 Scientists have cloned many animals, such as cows, sheep, and chickens, from a single cell. Which natural process is most similar to these cloning techniques?

(1) asexual reproduction
(2) genetic recombination
(3) chromosome mutations
(4) gamete production

29 Within a sexually reproducing species, the correct chromosome number is maintained by

(1) halving the chromosome number in gamete production, followed by fertilization
(2) doubling the chromosome number in gamete production, followed by fertilization
(3) halving the chromosome number during mitosis, followed by differentiation
(4) doubling the chromosome number during mitosis, followed by differentiation

30 The ability of sea otters to find food can be reduced because the environment where they search for food is often dark and murky. It has been recently discovered that the surface of otters' paws are able to quickly detect a difference of one-quarter of a millimeter when comparing the size of objects, including food sources.

The special characteristics of the otters' paws can be described as

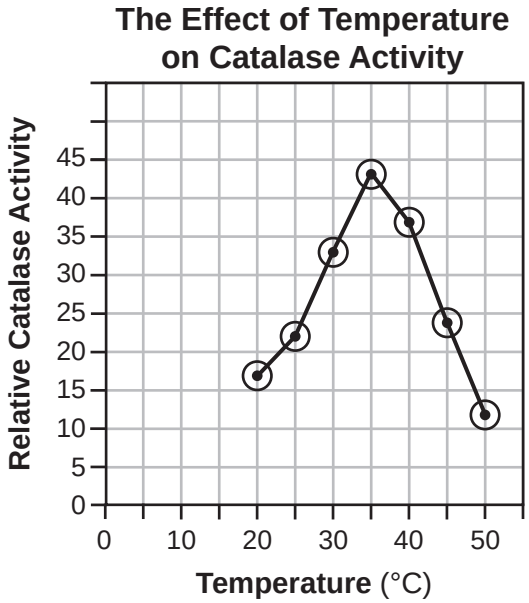
(1) a variation that eliminates the need for other senses otters normally possess
(2) a variation that is unlikely to be passed on to offspring because it is not a genetic trait
(3) an adaptation that could provide an advantage over the other organisms that they compete with for food
(4) an adaptation that is most likely the result of a mutation in body cells of the ancestors of the otter

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 Catalase is an enzyme produced by organisms that breaks down hydrogen peroxide, releasing oxygen and water. The relative enzyme activity, when tested at different temperatures, is shown in the graph below.



Which statement below best explains the *decrease* in activity of catalase after 35ºC shown in the graph?

(1) The structure of the enzyme changes, which slows down the reaction.
(2) There is no hydrogen peroxide left for the activity to continue, so it stops.
(3) The raw materials permanently bind to the catalase, preventing the reaction.
(4) The reaction is no longer needed for survival of the individual.

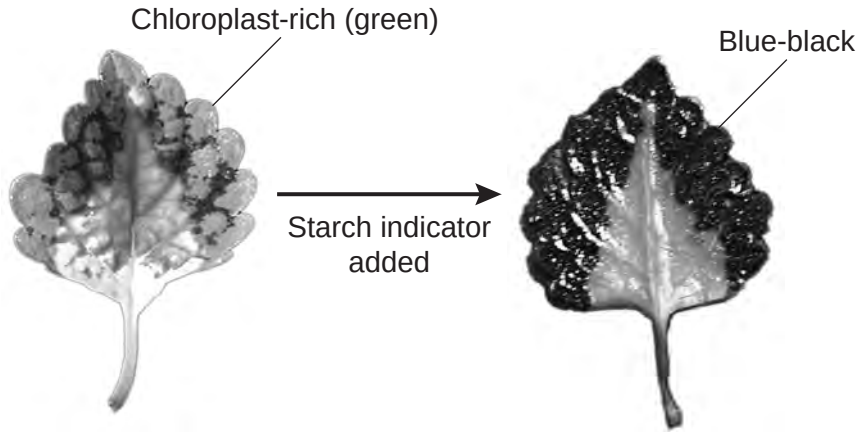
32 Using a microscope, a student observed four different types of cells. For each structure he observed, he placed an *X* in the chart below to indicate the cells where the structure was observed.

Structure	Cell A	Cell B	Cell C	Cell D
cell membrane	X	X	X	X
cell wall	X	X		X
chloroplasts	X	X		
DNA	X	X	X	X
nucleus	X		X	X

Which of the cells he viewed were most likely from heterotrophs?

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

33 *Coleus* is a type of plant that has many variations in its leaves. Many coleus plants have chloroplast-rich areas on the edge of the leaf. Other areas in the middle lack chloroplasts. A student exposed the coleus leaf to sunlight. Later, starch indicator was added to the entire leaf. The diagram below shows the result of the experiment.



Which statement is a valid claim, supported by evidence from this experiment?

(1) Chloroplasts are necessary for the production of starch indicator.
(2) Starch indicator causes leaves to produce oxygen.
(3) Chloroplasts are necessary for the production of starch.
(4) Water is necessary for the production of starch.

34 Breathing vapors produced by e-cigarettes has caused respiratory problems, including coughing, shortness of breath, difficulty breathing, and even some deaths. Medical experts are warning the public and discouraging the use of these devices.

The medical issues associated with vaping are an example of

(1) organ malfunctions caused by personal behaviors
(2) feedback response maintaining homeostasis
(3) inherited disorders resulting from inhaling vapors
(4) the effects of infectious parasites carried by the vapors

35 The chart below lists some organisms found in a New York ecosystem and their sources of energy.

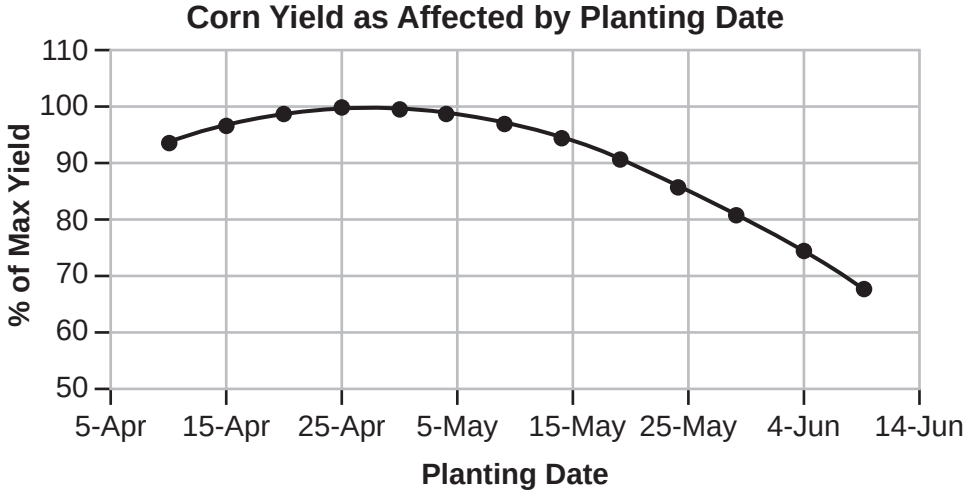
Organism	Source of Energy
grasses	sunlight
leopard frog	insects, algae
carp	plants, insect larvae
heron	carp, frogs, salamanders
turtle	fish, plants, tadpoles, insects

When constructing an energy pyramid of this ecosystem, which of these organisms would be placed at the top of the pyramid?

(1) grasses
(2) carp
(3) heron
(4) leopard frog

Base your answer to question 36 on the information and graph below and on your knowledge of biology.

An unusually cool and wet spring prevented certain farmers from planting corn at the usual time. They normally planted their crop on May 1, but the altered weather patterns delayed planting until June 1.



36 Based on the information given, what is the most likely impact of the delayed planting on the production of corn?

(1) Corn yield will remain at 100% because higher temperatures in June will make plants grow faster.
(2) The corn yield may be reduced by about 20% because of the delay in planting.
(3) Corn yield may be reduced by about 80% because of the delayed planting.
(4) Crops planted on June 1 will have the same yield as those planted on April 1.

---

37 An ecologist is studying the biodiversity of beetle species in four different habitats. She counted the number of individuals of each species she observed in each habitat. The results are shown in the data table below.

Beetle Biodiversity

	Number of Individuals			
Beetle Species	**Habitat W**	**Habitat X**	**Habitat Y**	**Habitat Z**
A	0	2	0	40
B	0	6	0	0
C	32	10	120	40
D	54	22	0	0
E	0	8	0	40

Which of these habitats displays the most biodiversity of beetle species?

(1) Habitat *W*
(2) Habitat *X*
(3) Habitat *Y*
(4) Habitat *Z*

38 Hummingbirds, with their long beaks and tongues, are attracted to long, tubular flowers with a lot of nectar. When a hummingbird consumes the nectar from a flower, pollen sticks to the hummingbird and is transferred when the hummingbird feeds from other flowers.

This relationship between the flowers and hummingbirds is a result of

(1) changes in hummingbirds and flowers in response to their needs
(2) inheritance of characteristics acquired during their lifetime
(3) natural selection of beneficial variations
(4) the environment modifying gene expression

39 The kittens in the photograph below were all born in the same litter.

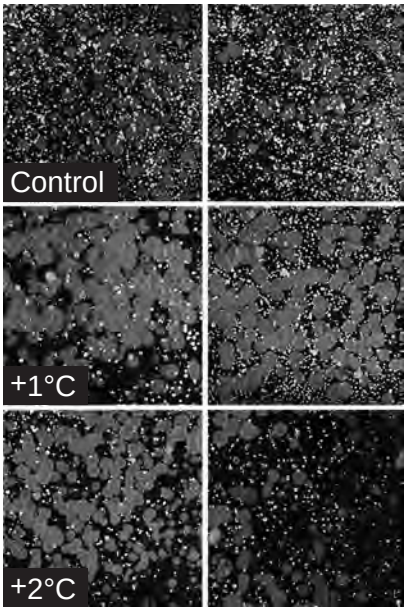
One possible reason that they all have different fur colors and patterns is that

(1) different kittens inherited more chromosomes from one parent than the other
(2) there was a random resorting of genes during gamete formation in each parent
(3) because there were so many, they did not receive the same amount of nutrients from the mother
(4) there were pH differences depending on where in the uterus each kitten developed

Base your answers to questions 40 through 42 on the information below and on your knowledge of biology.

A study was done to determine the effect of a temperature increase on an ocean ecosystem. Panels equipped with heating elements were placed on the ocean floor 50 feet below the surface in the Antarctic Ocean. Some of the panels were heated so that they were 1ºC warmer than the water surrounding them. Others were heated to be 2ºC warmer, and some were not heated. Over a period of nine months, the researchers returned to the site and documented the changes in marine life they observed.

They noted that 1ºC of warming resulted in a substantial change in marine life. One species of invertebrate grew rapidly and became the dominant species. It replaced multiple other species typically present in the area. The results were less consistent on the panels that were 2ºC warmer than the water surrounding them. The photographs on the right show the results observed on the three sets of panels.



40 Based on this experiment, *one* result of the future warming of the Antarctic Ocean could be

(1) an increase in the stability of the Antarctic ecosystem
(2) the disruption of existing Antarctic marine food webs
(3) marine organisms evolving more rapidly in order to compete for resources
(4) the need to import predators to eat the tiny invertebrates

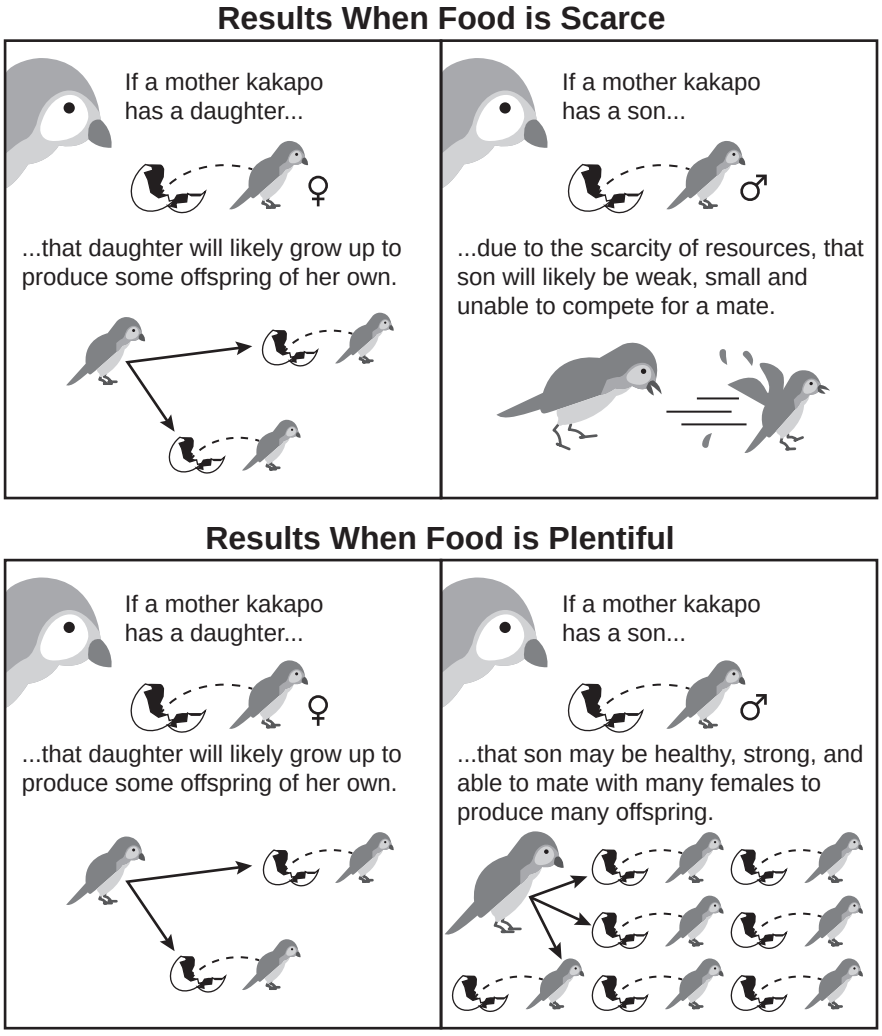
41 A possible explanation for the differences observed on the panels is that

(1) the growth of organisms is dependent on the abiotic factors present in the environment
(2) on the warmer panels, organisms reached carrying capacity more rapidly and completely died out
(3) on the control panels, wastes built up, poisoning some of the organisms growing there
(4) on the warmer panels, there were fewer decomposers present to recycle available energy

42 These test panels provided scientists with information about

(1) how ecological niches influence the rate of mutation
(2) the effect of environmental change on the biodiversity of the Antarctic Ocean
(3) the variety of producer/consumer relationships in the Antarctic Ocean
(4) how the stability of an ecosystem is affected by competition and disease

43 The kakapo is a small, flightless parrot. Currently there is a small population of kakapos living on four islands off the coast of New Zealand. Scientists are concerned that the kakapo may become extinct due to the introduction of predators and recent infections that have drastically reduced the already small population. During their conservation attempts, scientists made an interesting observation: When food is plentiful, more male offspring survive. Scientists provided the illustration below to explain this observation.



If scientists were going to test this hypothesis, the best way would be to select a test group and develop a research plan that includes collecting data when

(1) all of the kakapos are fed a reduced amount of food
(2) all of the kakapos are fed an unlimited amount of food
(3) the kakapo test group is divided in half, and one-half is fed unlimited food and the other a reduced amount of food
(4) the entire test group of kakapos is fed one type of food for one month and a different type of food for the second month

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 below and on your knowledge of biology.

West Nile virus can cause a disease that attacks the nervous system. The virus is transmitted to humans when they are bitten by an infected mosquito. Researchers studying West Nile virus collected data on how a mosquito's level of dehydration during a drought affects the mosquito's biting behavior.

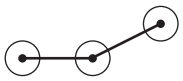
Mosquito Feeding Depending on Dehydration Level

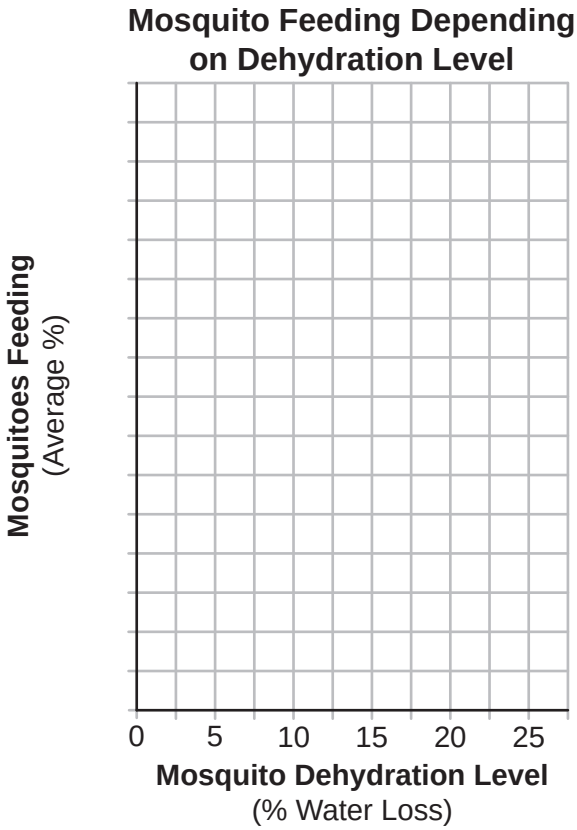
Mosquito Dehydration Level (% Water Loss)	**Mosquitoes Feeding** (Average %)
0	6
5	8
10	12
15	18
20	31
25	27

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

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

45 Plot the data for the mosquitoes feeding on the grid. Connect the points and surround each point with a small circle. [1]

Example: 



46 Prior to this investigation, researchers studying West Nile virus transmission claimed that wetter conditions lead to more mosquito-borne illness. Does the data provided support this claim? Support your answer with specific data. [1]

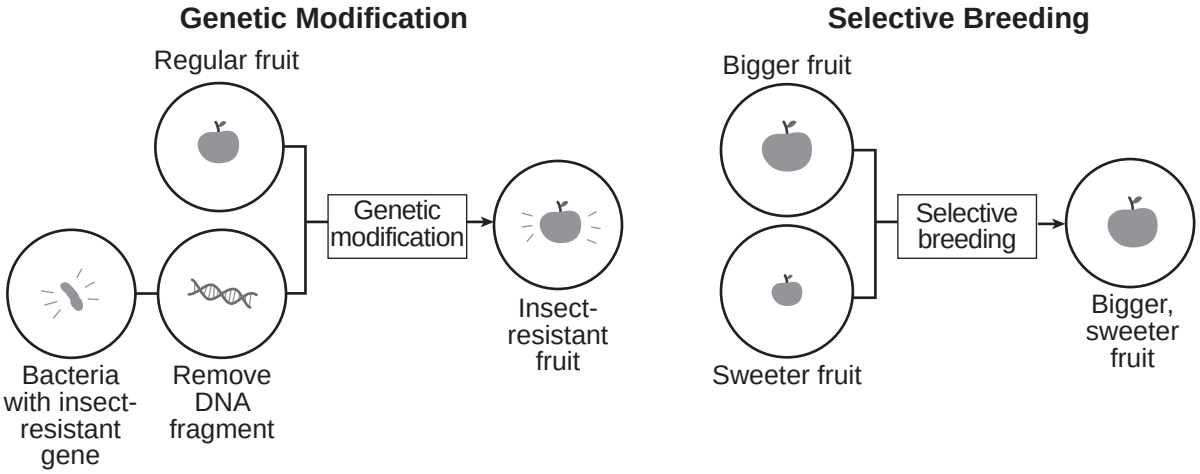
Note: The answer to question 47 should be recorded on your separate answer sheet.

47 The effect of this feeding relationship between the mosquito and the human can best be described as

Row	Mosquito	Human
(1)	negative	positive
(2)	positive	positive
(3)	positive	negative
(4)	negative	negative

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

The models below illustrate two methods that can be used to modify the characteristics of plants.



48 Does the production of many "bigger and sweeter" apples require the selective breeding of two different apple varieties each time? Support your answer. [1]

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

49 In both methods of reproduction, scientists are trying to produce desired traits by manipulating the

(1) growth proteins
(2) variation in genes inherited
(3) number of genes inherited
(4) DNA codes for ribosomes

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

The Albany Pine Bush

The Pine Bush is an inland pine barrens ecosystem in the Albany-Schenectady area of New York State. This ecosystem normally consists of pitch pine trees, a tall shrub layer with scrub oak trees, and a low shrub layer with blueberries, blackberries, grasses, and other low-growing plants.

Today it is protected as a preserve because it is one of the largest examples of the 20 inland pine barrens ecosystems remaining in the world. A number of rare or endangered species of animals live there.

Only about 42% of the Pine Bush is still a true pine bush ecosystem, while the rest are areas which have had other species, such as cherry and maple trees, and various shrubs, slowly move in over the years. The area has been maintained as a pine bush ecosystem as a result of periodic fires that kill off outside species.

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

50 The primary reason the occurence of periodic fires helps to maintain the Pine Bush ecosystem is because the fires

(1) allow other types of plants and animals to move into the Pine Bush ecosystem
(2) discourage developers from building houses or bringing industry to the Pine Bush
(3) maintain the diversity of plants that are well adapted to the Pine Bush ecosystem
(4) kill most of the plants and animals adapted to live in the Pine Bush

51 Explain what the ecosystem present in this area would most likely look like in 100 or more years if it was decided to prevent all fires in the Albany Pine Bush. [1]

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

	Raccoon	Wolf	Bison	Lion	Polar Bear	Baboon	Fin Whale	Elephant	Walrus
Generation Time (years)	1.7	2.2	3.3	3.7	5.1	6.5	9.0	11.8	12.3
Generations in 6,000 years	3,587	2,765	1,829	1,614	1,170	923	670	507	488

*Generation time - Average span of years between birth of parents and the birth of offspring

52 Based on the data in the table, identify the species that would most likely have the greatest chance of surviving if their environment changed slowly over the course of 10,000 years. [1]

53 Describe *one* important role of mitosis in the formation of an embryo. [1]

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

How Fish Fins Evolved Just Before the Transition to Land

Scientists from the University of Chicago used CT scanners to examine the fins of fossilized fish still inside of rock. CT imaging allowed them to construct digital 3D models of the 375 million-year-old fishapod, *Tiktaalik*. A fishapod is a member of one of several extinct species having features of both tetrapods, which are four-legged animals, and fish.

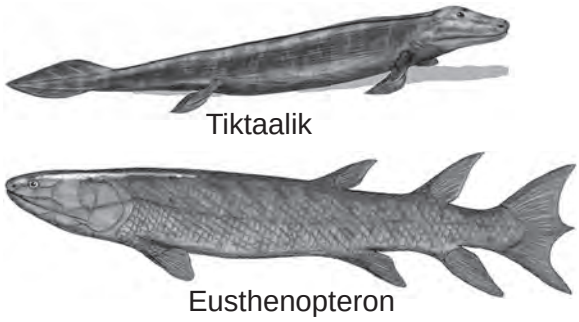
Scientists could then use these models to infer how the fins worked and changed over time. One researcher involved in the study wrote, "Animals went from swimming freely and using their fins to control the flow of water around them, to becoming adapted to pushing off against the surface at the bottom of the water."

By comparing living fish to fishapods such as *Tiktaalik*, they could detect patterns in the changes that had occurred. Examine the chart below that lists some characteristics used to distinguish fish from tetrapods.

Comparison of Fish and Early Tetrapod Traits

Fish	Early Tetrapods
gills	lungs
fins	four limbs (such as arms and legs)
scales	no scales
no neck	neck
eyes on side of head	flat head with eyes on top

The illustrations below represent what scientists think *Tiktaalik* and a related genus, *Eusthenopteron*, looked like.



54 Explain why early scientists might classify *Eusthenopteron* as a species of fish that is *not* closely related to *Tiktaalik*. Use information from the chart to support your answer. [1]

Using CT imaging, scientists discovered that *Tiktaalik* had fin bones similar to those in tetrapod limbs. It also had lungs.

55 Identify what additional evidence, other than fin bones and lungs, scientists could use to determine if *Eusthenopteron* is related to *Tiktaalik*. [1]

Part C

Answer all questions in this part. [17]

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

Base your answers to questions 56 and 57 on the information below, on the next page, and on your knowledge of biology.

Wilding Pines

Before humans arrived in New Zealand, forests covered over 80% of the land. When the Mãori people arrived around 1250 A.D., they burned off large numbers of trees to clear areas of land for other uses. European traders later logged large areas for exporting the timber, and by the time European settlements began to appear, forests covered only 50% of the country. The cutting of native forests continued for many years, and by 2005 only about 25% was covered by native forests.

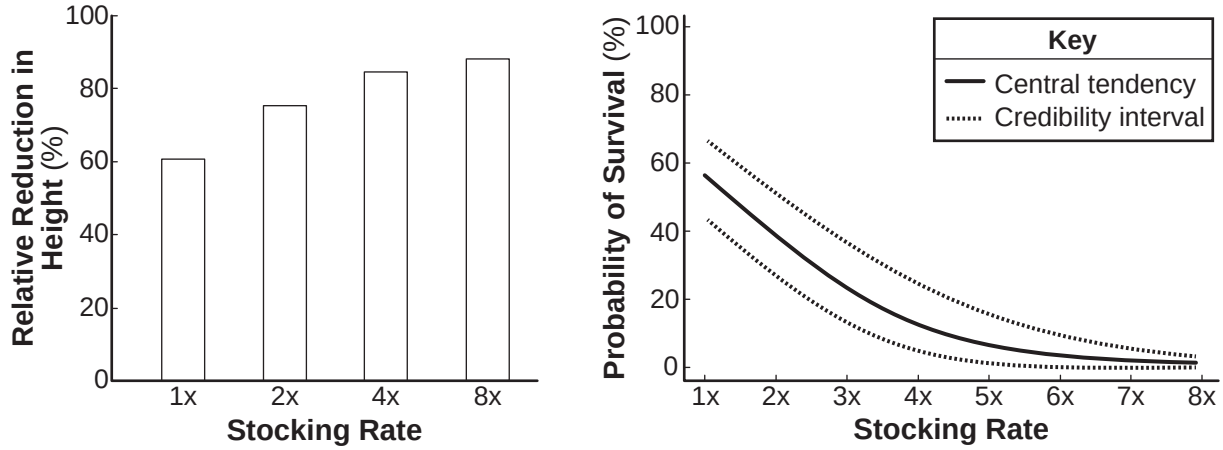
Today, the cutting of native forest has nearly stopped, and the timber industry now uses several imported species of pine and other conifers from North America. These non-native "wilding pines" have provided the lumber industry with trees to grow for export to sustain this important industry.

Some of the wilding pines were also planted in other areas to help solve erosion problems on hilly slopes. However, because each tree can produce as many as 15,000 small light seeds, these introduced-trees soon spread into many new areas. They competed successfully with many native plants for light and water, often crowding native plants out completely. Their uncontrolled spread continues, and it is predicted they will cover about 20% of the entire country in about 20 years. The photo below shows the pines invading both lowland and higher elevation areas.

Many efforts to control the spreading wilding pines have been tried with varying degrees of success. These include the use of poisonous herbicides, cutting individual scattered trees or large areas of the trees.

Recently, a study was conducted to determine if grazing animals could be used to destroy wilding pine seedlings. Sheep, a common farm animal in New Zealand, were placed in several enclosures containing newly planted wilding pine seedlings. The numbers of sheep in each enclosure varied from normal herd size (1x), up to eight times (8x) that number of sheep. This was the "stocking rate" for each enclosure. Conditions such as number of seedlings and enclosure size were proportionally adjusted to prevent overcrowding. The results of the study are summarized in the graphs below.

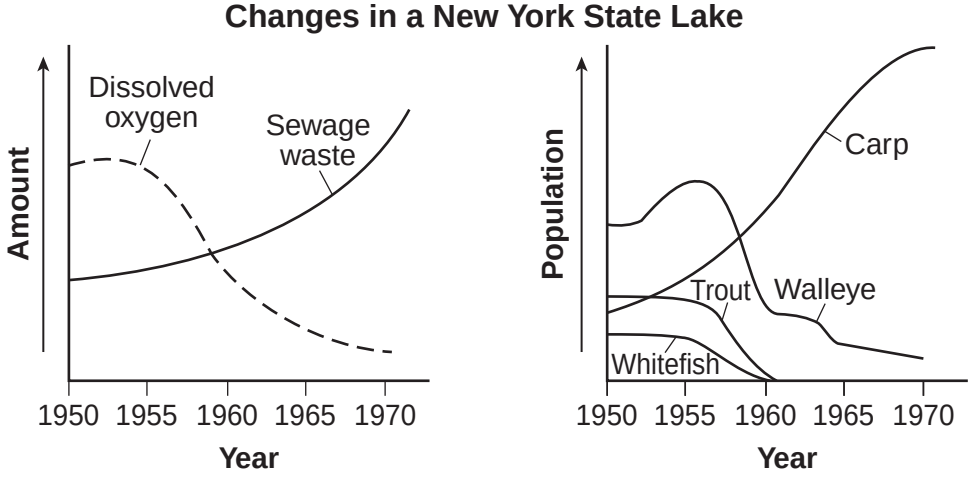
Effects of Sheep-Stocking Rate on Wilding Pine Seedling Height and Survival



56 Use data from one or both graphs to describe the effect of the stocking rate of sheep on seedlings of these wilding pines. [1]

57 Explain how the introduction of the wilding pine trees has had both positive and negative effects in New Zealand. [1]

Base your answer to question 58 on the information below and on your knowledge of biology. The graphs below show changes in some biotic and abiotic factors in a lake in New York State.



58 Using information from the graphs, state a likely reason why the population of trout and whitefish disappeared around 1960. [1]

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

After fertilization, the development of a human embryo involves many interacting factors. As a result, an embryo gradually develops a variety of multicellular structures.

59 Other than avoiding drugs or toxic substances, identify *one* action a pregnant woman can take, and explain how that action would have a positive effect on the development of her fetus. [1]

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

Some research indicates that there is a 75% increase in the risk for developing skin cancer if an individual starts using tanning devices such as tanning beds before the age of 30. Since these devices use UV radiation, a federal government agency has issued a proposal to reclassify UV radiation emitting tanning devices into a category that has stricter regulations.

60 State *one* reason why the use of these devices could increase the risk of developing skin cancer. [1]

Base your answers to questions 61 through 63 on the information and photograph below and on your knowledge of biology. The photograph shows a naked mole rat.

Naked Mole Rats

The unique traits of naked mole rats have made it a focus of research. Found in the hot, dry grasslands of East Africa, they live in underground tunnel systems in social colonies of 20 to 300. They are well-adapted for life underground with protruding teeth for digging, small eyes, and the ability to survive without oxygen for up to 18 minutes. They feed primarily on very large tubers (underground plant stems) and rely on bacteria in their intestine to break down the indigestible plant fibers.

Although most small rodents live only a few years, naked mole rats can live up to 30 years. Unlike most mammals that maintain a constant body temperature despite external conditions, mole rats cannot regulate their body temperature.

Researchers have found that they are resistant to the pain caused by venom injected by aggressive ants that share their burrow systems. Analysis has shown that naked mole rats have variations in the membranes of nerve cells that block the pain signals from the venom.

61 Based on information from the reading, describe *one* advantage the mole rats have by living in underground tunnels. [1]

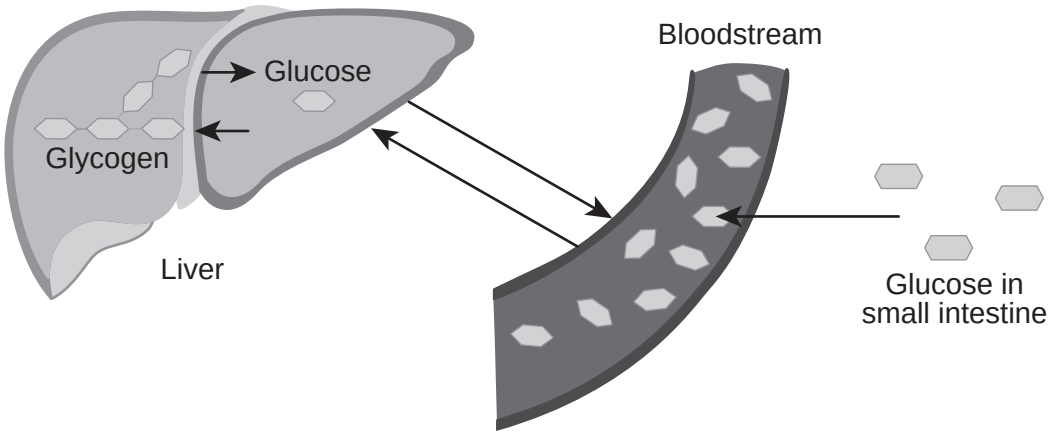
62 Describe how the relationship between the mole rat and intestinal bacteria is positive for both. [1]

63 Mole rats more effectively repair DNA errors than mice. Explain why scientists claim this contributes to the longer lifespan of mole rats compared to mice. [1]

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

Glycogen Storage Disease

An increase in the glucose level in the blood causes a release of insulin. Insulin signals the liver to absorb excess glucose. In order to store it, the liver then synthesizes glycogen from glucose. When blood sugar is low, the liver breaks the large glycogen molecules back down into glucose and releases it back into the bloodstream for use by the cells. The diagram below illustrates how a person normally metabolizes glucose.



People with glycogen storage disease (GSD) cannot break the glycogen down, so they can't access their stored glucose. It is essentially "locked" in the liver. Symptoms of this disease include low blood sugar, poor growth, and weakness. Currently, one of the treatments for children with GSD is to drink a starch solution several times a day.

64 Explain how drinking a starch solution several times a day can help maintain homeostasis for a person with glycogen storage disease. [1]

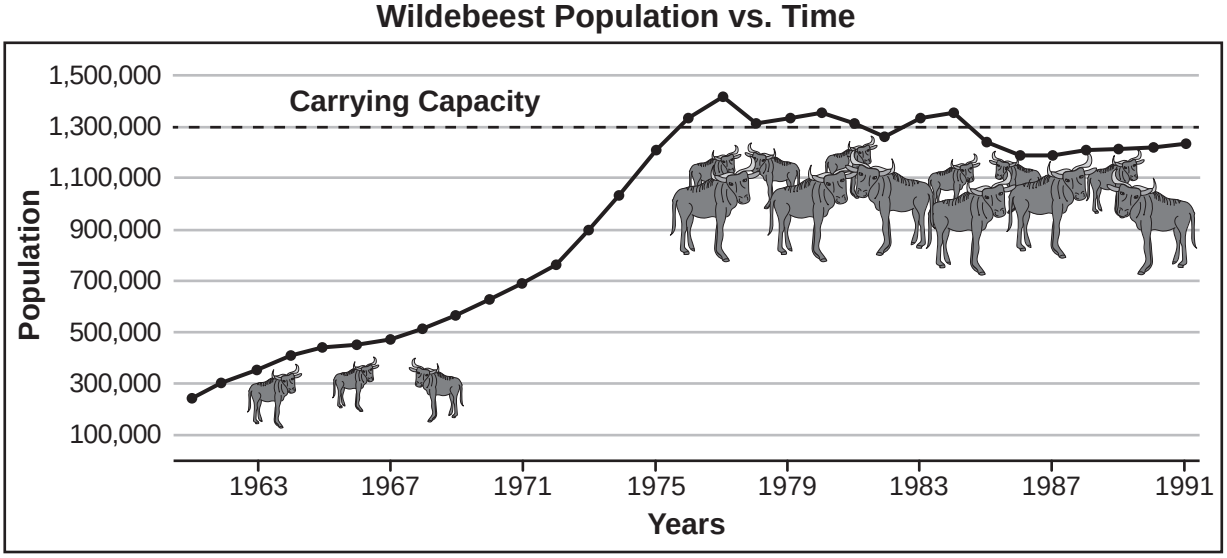
65 Explain why glucose is able to be absorbed across cell membranes but glycogen is unable to be absorbed unless it is broken down. [1]

Base your answers to questions 66 through 68 on the information below and on your knowledge of biology.

Wildebeest

Located in southern Africa, wildebeest are the largest members of the antelope family, weighing from 260-595 pounds. In some parts of southern Africa, their population is decreasing. Their natural predators include lions, hyenas, cheetahs, and African wild dogs. Humans are disrupting the wildebeest habitat by putting up fences. However, in Serengeti National Park, where the population has been studied and monitored since the 1960s, the herd has experienced a rapid increase. A successful vaccination program had been developed to protect cattle that had passed the deadly disease called rinderpest to wildebeest. This vaccine is one of the contributing factors for this population increase.

The trend in the graph below indicates that the carrying capacity for wildebeest was reached around 1975.



66 Describe *two* different factors that limited the size of the wildebeest population, one before and one after the rinderpest vaccination program. [1]

67 Seeing the rate of population increase between 1971 and 1975, some scientists became concerned and started to think they might have to do something to slow down this trend. Explain why these scientists might have thought that the rapid population increase could have negative environmental effects. [1]

68 Some biologists claimed that the rapid population growth rate would not negatively affect the wildebeest population and decided not to interfere and let the herd grow. Describe evidence from the graph that supports their claim. [1]

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

Sand Tiger Shark Adult

Sand Tiger Shark Embryo

Embryonic Cannibalism

The sand tiger shark gives birth to two offspring at a time every two years. The female reproductive tract consists of a uterus with two separate chambers that may each contain 16 to 23 eggs. After the eggs are fertilized, each developing embryo receives nourishment from its own yolk sac. There is never a placental connection between the mother and the embryos. Approximately five months into the year-long gestation, the food from the yolk sacs is used up. The embryos then have to find a new source of nutrition. By this point, the embryos have developed teeth. The strongest embryo will then begin to cannibalize (eat) the other embryos in the same uterine chamber until all but one of the embryos remains in each uterine section. At the completion of prenatal development, the female shark will give birth to only two offspring, one from each part of the uterus.

69 Other than cannibalism, identify *one* way the development of sand tiger shark embryos is different from development in the human species. [1]

_____

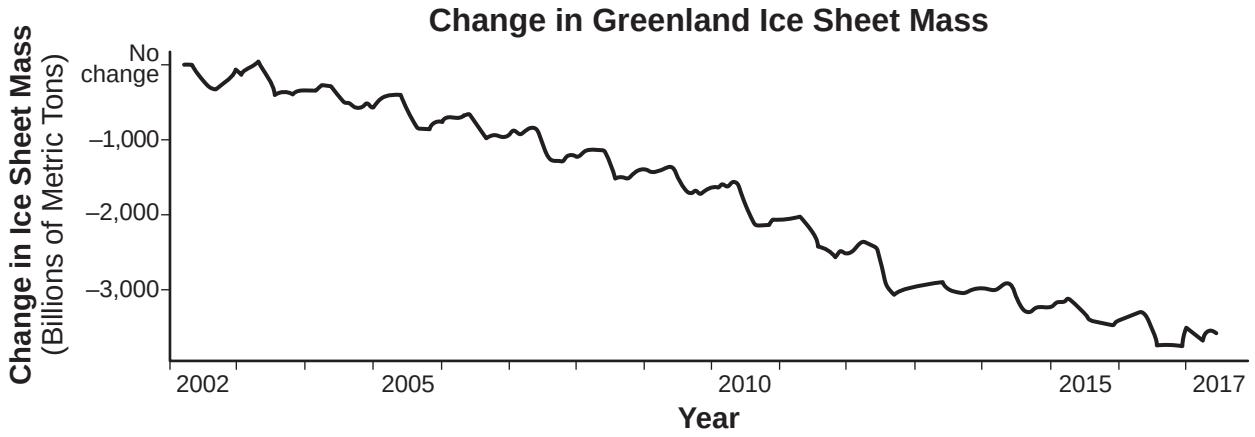
_____

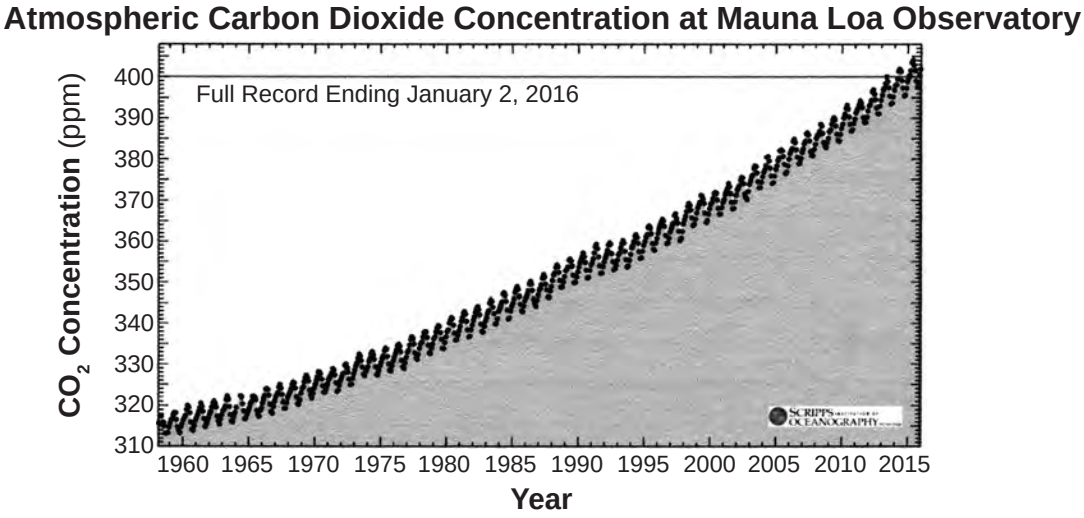
70 Identify *one* reproductive adaptation of the female sand tiger shark anatomy and discuss how this provides an advantage to the species. [1]

_____

_____

Base your answers to questions 71 and 72 on the graphs below and on your knowledge of biology. The graphs show some of the atmospheric and ice sheet changes that have been observed on Earth.





71 State the trend indicated by the data regarding the Greenland ice sheet and identify *one* likely human activity that has directly contributed to that trend. [1]

72 Explain why increasing our use of solar energy worldwide could result in a *decrease* in global temperatures. [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.

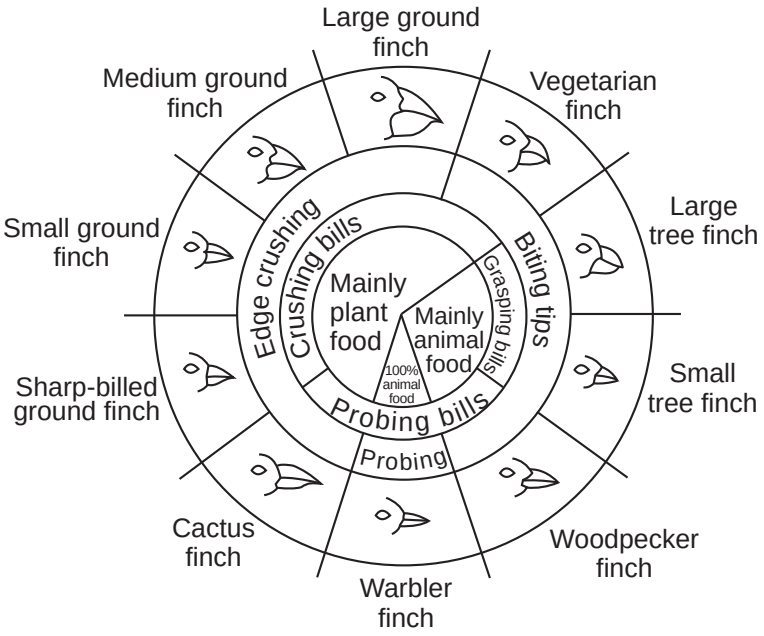
73 In the *Relationships and Biodiversity* lab, the enzyme used for the gel electrophoresis cut the DNA into fragments by recognizing the sequence CCGG and cutting in between C and G. Using the same enzyme on the DNA sequence below, how many fragments would be generated?

ATGCCGGAATATAAGGCCGGCGGTGTGGGC

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

Base your answers to questions 74 and 75 on the information in the diagram below and on your knowledge of biology.

Variation in Beaks of Galapagos Islands Finches



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

74 How many bird species represented in the diagram are strictly carnivores?

(1) 1
(2) 6
(3) 3
(4) 4

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

75 Different species of the Galapagos finches have beaks of unique shapes and sizes. These differences are most likely due to finches

(1) adapting to different environments over many generations
(2) flying to the Galapagos Islands from South America
(3) mating with other bird species living on the Galapagos Islands
(4) feeding on small and large seeds

Base your answer to question 76 on the information below, on the next page, and on your knowledge of biology.

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

FIRST BASE	SECOND BASE: U	SECOND BASE: C	SECOND BASE: A	SECOND BASE: G	THIRD BASE
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

The DNA sequences below are from species *X*, *Y*, and *Z*, and *Botana curus*.

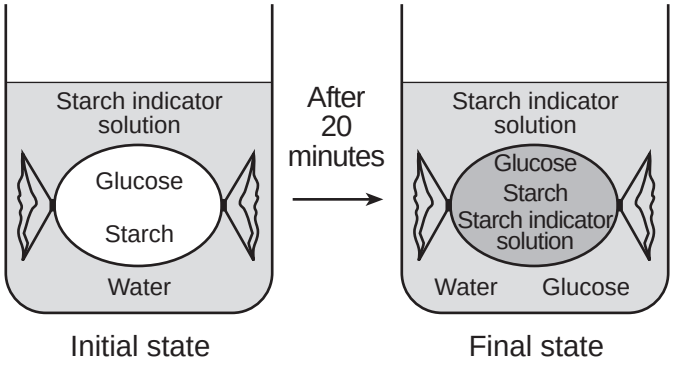
Species	DNA Sequence
Botana curus	CAC GTA GAC TGA GGA CTC CTC
X	CAC GTG GAC AGA GGA CAC CTC
Y	CAC GTG GAC AGA GGA CAC CTC
Z	CAC GTA GAC TGA GGA CTT CTC

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

76 Based on these sequences, which species, *X*, *Y*, or *Z*, is most closely related to *Botana curus*?

(1) species *Z*, because there are no DNA sequence differences
(2) species *X*, because there are no amino acid differences
(3) species *Y*, because there are only two DNA sequence differences
(4) species *Z*, because there are no amino acid differences

Base your answer to question 77 on the information below and on your knowledge of biology. The diagram represents a model cell with a semi-permeable membrane. The contents of the model cell and beaker are labeled.



77 State *one* reason for the color change in the model cell represented in the final state diagram. [1]

78 Predict how the appearance of human blood cells would change if they were placed in a concentrated salt solution. [1]

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

Genetic evidence indicates that land and marine iguana species on the Galapagos Islands have a common ancestor that came from South America millions of years ago. There are three species of land iguanas and one species of marine iguana. The marine iguana is an excellent swimmer and is the world's only sea-going lizard. It feeds on algae (seaweed) attached to underwater rocks and is widely distributed on all Galapagos rocky shorelines.

The photos and information below compare the pink land iguana and the Galapagos land iguanas.

Pink Land Iguana

Color: Pink with black bands
Found only on Wolf Volcano in northern Isabela Island (endangered)
Feeds on cacti, shrubs, and grasses.

Galapagos Land Iguana

Color: Yellow to brownish body
Found on 6 islands (widely distributed)
Feeds on cacti, seeds, grasses, and some animal sources.

79 State *one* reason why the Galapagos and pink land iguanas can coexist on Wolf Volcano on northern Isabela Island. [1]

Base your answers to questions 80 through 82 on the information below and on your knowledge of biology.

Students hypothesized that eating a candy bar a few minutes prior to exercising would increase the number of jumping jacks they could do in a given amount of time. Each participant ate one candy bar, waited 10 minutes, then did jumping jacks for one minute.

80 After conducting the experiment, the students reported their data in the data table below.

Student	Number of Jumping Jacks Done in One Minute
(1)	35
(2)	52
(3)	48
Average	45

Can the data in the table be used to support the hypothesis the students proposed? Support your answer. [1]

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

81 Four students were asked to explain the reason that the hypothesis was most likely correct. Their responses are shown in the table below. Which row contains a correct explanation of how the body would use the candy bar?

Row	Student	Explanation
(1)	A	The candy bar would provide protein for increasing the muscle mass to do the jumping jacks.
(2)	B	The candy bar would provide the raw materials required for cellular respiration in the muscles to do the jumping jacks.
(3)	C	The candy bar would increase the red blood cells' ability to carry more oxygen during the exercise.
(4)	D	The candy bar would help the digestive system to digest sugar faster during the exercise.

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

82 Which three human body systems are most directly involved in converting the energy in food to energy needed to do an activity such as jumping jacks?

(1) circulatory, respiratory, and immune
(2) respiratory, reproductive, and digestive
(3) circulatory, digestive, and immune
(4) digestive, respiratory, and circulatory

83 Students compared four varieties of plants using different tests. They looked at the plant's leaves and flowers, used the microscope to observe additional plant structures, paper chromatography to analyze plant pigments, and gel electrophoresis to compare DNA fragments.

Explain what the students were most likely trying to figure out by performing all these tests on the plants. [1]

Base your answer to question 84 on the reading passage below and on your knowledge of biology.

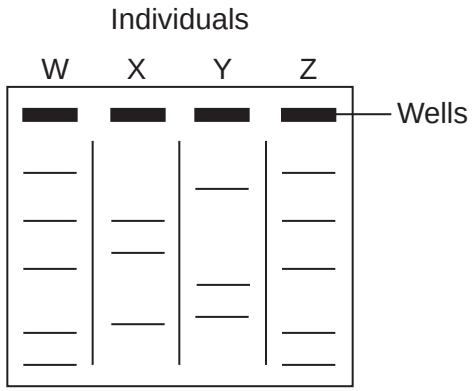
Predicting Changes in Pulse Rate due to Physical Activity

Three students had different plans for after school. Student *A* took several young children to the playground. Student *B* read science fiction at the library. Student *C* worked at the cash register of a fast-food restaurant.

Each of the students was healthy. Their heights and weights were similar. However, their pulse rates were quite different during their afternoon activities.

84 Predict which student will show the *lowest* average pulse rate throughout the afternoon. Support your answer. [1]

85 The diagram below represents a DNA gel.



Which individuals are most likely the result of asexual reproduction from the same parent? Support your answer. [1]

Printed on Recycled Paper

LIVING ENVIRONMENT

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

Regents Examination in Living Environment – August 2024

Scoring Key: Parts A, B-1, B-2 and D (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Living Environment	August '24	**1**	**4**	MC	1	1
Living Environment	August '24	**2**	**1**	MC	1	1
Living Environment	August '24	**3**	**2**	MC	1	1
Living Environment	August '24	**4**	**1**	MC	1	1
Living Environment	August '24	**5**	**4**	MC	1	1
Living Environment	August '24	**6**	**4**	MC	1	1
Living Environment	August '24	**7**	**2**	MC	1	1
Living Environment	August '24	**8**	**4**	MC	1	1
Living Environment	August '24	**9**	**4**	MC	1	1
Living Environment	August '24	**10**	**3**	MC	1	1
Living Environment	August '24	**11**	**3**	MC	1	1
Living Environment	August '24	**12**	**1**	MC	1	1
Living Environment	August '24	**13**	**4**	MC	1	1
Living Environment	August '24	**14**	**3**	MC	1	1
Living Environment	August '24	**15**	**1**	MC	1	1
Living Environment	August '24	**16**	**2**	MC	1	1
Living Environment	August '24	**17**	**3**	MC	1	1
Living Environment	August '24	**18**	**2**	MC	1	1
Living Environment	August '24	**19**	**4**	MC	1	1
Living Environment	August '24	**20**	**3**	MC	1	1
Living Environment	August '24	**21**	**1**	MC	1	1
Living Environment	August '24	**22**	**1**	MC	1	1
Living Environment	August '24	**23**	**2**	MC	1	1
Living Environment	August '24	**24**	**3**	MC	1	1
Living Environment	August '24	**25**	**4**	MC	1	1
Living Environment	August '24	**26**	**2**	MC	1	1
Living Environment	August '24	**27**	**2**	MC	1	1
Living Environment	August '24	**28**	**1**	MC	1	1
Living Environment	August '24	**29**	**1**	MC	1	1
Living Environment	August '24	**30**	**3**	MC	1	1
Living Environment	August '24	**31**	**1**	MC	1	1
Living Environment	August '24	**32**	**4**	MC	1	1
Living Environment	August '24	**33**	**3**	MC	1	1
Living Environment	August '24	**34**	**1**	MC	1	1
Living Environment	August '24	**35**	**3**	MC	1	1
Living Environment	August '24	**36**	**2**	MC	1	1
Living Environment	August '24	**37**	**2**	MC	1	1
Living Environment	August '24	**38**	**3**	MC	1	1
Living Environment	August '24	**39**	**2**	MC	1	1
Living Environment	August '24	**40**	**2**	MC	1	1
Living Environment	August '24	**41**	**1**	MC	1	1
Living Environment	August '24	**42**	**2**	MC	1	1
Living Environment	August '24	**43**	**3**	MC	1	1
Living Environment	August '24	**47**	**3**	MC	1	1
Living Environment	August '24	**49**	**2**	MC	1	1
Living Environment	August '24	**50**	**3**	MC	1	1
Living Environment	August '24	**73**	**3**	MC	1	1
Living Environment	August '24	**74**	**1**	MC	1	1
Living Environment	August '24	**75**	**1**	MC	1	1
Living Environment	August '24	**76**	**4**	MC	1	1
Living Environment	August '24	**81**	**2**	MC	1	1
Living Environment	August '24	**82**	**4**	MC	1	1

Regents Examination in Living Environment – August 2024

Scoring Key: Parts B-2, C, and D (Constructed Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Living Environment	August '24	**44**	–	CR	1	1
Living Environment	August '24	**45**	–	CR	1	1
Living Environment	August '24	**46**	–	CR	1	1
Living Environment	August '24	**48**	–	CR	1	1
Living Environment	August '24	**51**	–	CR	1	1
Living Environment	August '24	**52**	–	CR	1	1
Living Environment	August '24	**53**	–	CR	1	1
Living Environment	August '24	**54**	–	CR	1	1
Living Environment	August '24	**55**	–	CR	1	1
Living Environment	August '24	**56**	–	CR	1	1
Living Environment	August '24	**57**	–	CR	1	1
Living Environment	August '24	**58**	–	CR	1	1
Living Environment	August '24	**59**	–	CR	1	1
Living Environment	August '24	**60**	–	CR	1	1
Living Environment	August '24	**61**	–	CR	1	1
Living Environment	August '24	**62**	–	CR	1	1
Living Environment	August '24	**63**	–	CR	1	1
Living Environment	August '24	**64**	–	CR	1	1
Living Environment	August '24	**65**	–	CR	1	1
Living Environment	August '24	**66**	–	CR	1	1
Living Environment	August '24	**67**	–	CR	1	1
Living Environment	August '24	**68**	–	CR	1	1
Living Environment	August '24	**69**	–	CR	1	1
Living Environment	August '24	**70**	–	CR	1	1
Living Environment	August '24	**71**	–	CR	1	1
Living Environment	August '24	**72**	–	CR	1	1
Living Environment	August '24	**77**	–	CR	1	1
Living Environment	August '24	**78**	–	CR	1	1
Living Environment	August '24	**79**	–	CR	1	1
Living Environment	August '24	**80**	–	CR	1	1
Living Environment	August '24	**83**	–	CR	1	1
Living Environment	August '24	**84**	–	CR	1	1
Living Environment	August '24	**85**	–	CR	1	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **August 2024 Regents Examination in Living Environment** will be posted on the Department's web site at https://www.nysedregents.org/LivingEnvironment/ on the day of the examination. Conversion charts provided for the previous administrations of the Living Environment examination must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

LIVING ENVIRONMENT

Tuesday, August 20, 2024 — 12:30 to 3:30 p.m., only

RATING GUIDE

Directions to the Teacher:

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

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Regents Examination in Living Environment. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

Allow 1 credit for a correct response to each item.

At least two science teachers must participate in the scoring of the Part B–2, Part C, and Part D open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

Students' responses must be scored strictly according to the 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. Do not attempt to correct the student's work by making insertions or changes of any kind. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Tuesday, August 20, 2024. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

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

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

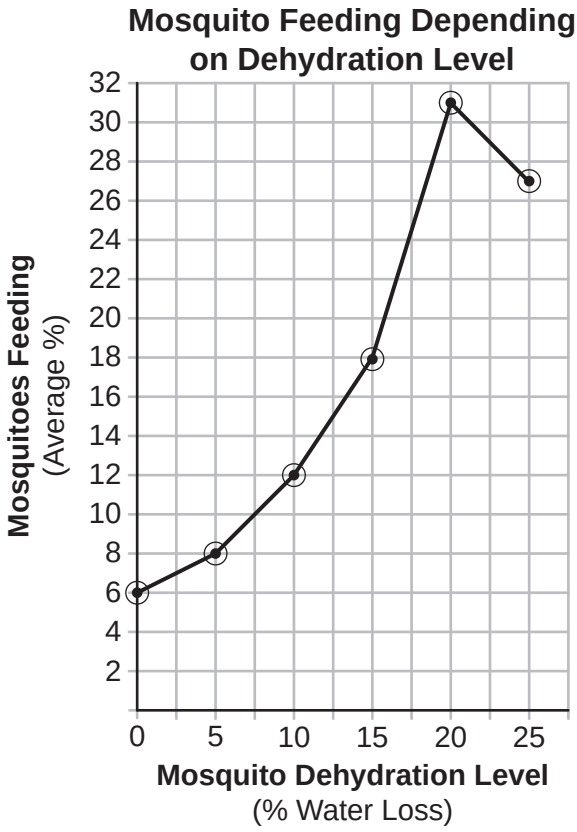
Part B–2

44 [1] Allow 1 credit for marking an appropriate scale on the axis labeled "Mosquitoes Feeding, (Average %)."

Note: Do *not* allow credit if the grid is altered to accommodate the scale.

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

Example of a 2-credit graph for questions 44-45:



Note: Allow credit if the points are plotted correctly, but not circled.

Do *not* assume that the intersection of the *x*- and *y*-axes is the origin (0,0) unless it is labeled. An appropriate scale only needs to include the data range in the data table.

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

46 [1] Allow 1 credit for stating that the claim is not supported and supporting the answer with specific data. Acceptable responses include, but are not limited to:

— The claim is not supported because as mosquitoes went from 0 to 20 percent water loss, there was an increase in feeding. This could result in passing on the virus.

— The claim is not supported because as dehydration increased, feeding increased, increasing disease transmission.

— The claim is not supported because as the weather got drier, the mosquitos bit more.

47 3

48 [1] Allow 1 credit for stating no and supporting the answer. Acceptable responses include, but are not limited to:

— No. Once trees that produce the bigger and sweeter apples are produced, they can be crossed with each other and most offspring would produce these newer apples.

— No. Genetic engineering could be used to produce many trees with the desired trait.

— No. The trees could be grown asexually.

49 2

50 3

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

— It would probably be a forest of maple or other trees and no longer a pine bush ecosystem.

— It would have undergone succession, and without fires would probably be all forest.

— It would have changed into a different type of ecosystem through ecological succession.

52 [1] Allow 1 credit for raccoon.

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

— Mitotic cell division produces new cells that will form the embryo.

— An embryo cannot grow unless it adds new cells. These new cells are formed by the process of mitosis.

— Mitosis copies the genetic information from the zygote, providing all the resulting cells with the information they need to develop.

54 [1] Allow 1 credit for explaining why scientists might classify *Eusthenopteron* as a species of fish that is not closely related to *Tiktaalik* and supporting the answer. Acceptable responses include, but are not limited to:

— It appears to have fins and no appendages.

— It appears to have scales.

— *Eusthenopteron* does not have a flat head with eyes on top.

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

— Scientists could use DNA/protein evidence if available.

— They could use other structural similarities revealed by the CT images.

Part C

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

— As the stocking rate is increased, the height of the seedlings decreases.

— As the sheep stocking rate goes up, the reduction in seedling height increases.

— As the stocking rate is increased, the probability of survival/seedling survival rate decreases.

— With 7x or 8x stocking rate of the sheep, the probability of seedling survival is nearly 0%.

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

— The trees helped sustain the lumber industry but became invasive in some areas, crowding out native species.

— The trees helped control erosion in hilly areas, but became a problem for native species as they spread out of control in other areas.

— The trees helped replace the native tree species, which helped the lumber industry, but they became invasive in other areas and had negative effects on other native plants and animals.

58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Trout and whitefish are not adapted to living in water with a low dissolved oxygen content.

— Whitefish and trout cannot survive in water that has a high level of sewage waste.

— The trout and whitefish disappeared because they were outcompeted by the carp population.

59 [1] Allow 1 credit for identifying *one* action a pregnant woman can take and explaining how that action would have a positive effect on the fetus. Acceptable responses include, but are not limited to:

— A proper diet for the mother will provide the necessary nutrients for the developing embryo/fetus.

— Regular visits to a doctor can identify any problems early and prevent them from getting worse.

— Taking certain vitamins can help to keep the embryo/fetus healthy.

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

— UV radiation can cause mutations in cells, which can lead to uncontrolled cell division.

— Radiation can damage the genetic information in a cell, causing it to become a cancer cell.

— UV radiation can alter DNA in skin cells.

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

— The temperature is more consistent than the outside environment.

— They eat underground stems (tubers) that grow in or near their tunnels.

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

— The bacteria digest the plant fibers so the nutrients can be used by both.

— Both mole rats and bacteria absorb the nutrients after the bacteria digest the fibers.

— Mole rats eat tubers, the bacteria digest the tubers, and both the mole rat and the bacteria get nutrients.

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

— Without repairing damaged DNA, there could be a greater risk of earlier death.

— DNA repair genes produce enzymes that repair mutations in naked mole rats that might cause cancer and death in mice.

— Repairing the DNA will result in cells producing proteins that are needed to keep the mole rats healthy.

— Damaged DNA can lead to a disruption of homeostasis.

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

— The starch can be broken down into glucose for use by the body since someone with GSD can't access their stored glucose.

— When someone with GSD has low blood sugar, the starch can be digested into glucose to maintain homeostasis.

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

— Glucose is a simple sugar that is small enough to be absorbed, but glycogen is a large molecule made of many glucose molecules and can't be absorbed until broken down.

— Glycogen is too large to be absorbed.

— Glucose is smaller than glycogen.

66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Before the rinderpest vaccination program, disease primarily limited the wildebeest population. After the rinderpest vaccination program, the habitat/food supply limited the size of the population.

— Initially, disease limited the wildebeest population. After, its population size was limited by resources such as predation and the availability of food and water as carrying capacity was reached.

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

— The animals might use up all of the available food. This would cause a massive decrease in the wildebeest population and would likely damage the environment for other populations.

— Many wildebeests in one area could result in the rapid spread of a new disease that would kill many wildebeests and other animals.

68 [1] Allow 1 credit for supporting the claim with data from the graph. Acceptable responses include, but are not limited to:

— The size of the population remained stable from about 1978 to 1991.

— Before 1963, the herd numbered 300,000 individuals. After 1978, the herd numbered 1,300,000 individuals. The population has remained stable for many years.

69 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The sharks use a yolk sac for food, not a placenta.

— The sharks develop in two uterine chambers, not just one.

— The sharks normally have two offspring, humans usually have only one.

— The sharks' development takes one year, not nine months.

70 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— They have two uterine chambers, which allows for the development of more offspring.

— Internal development provides a safe habitat for the embryos.

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

— The trend indicates that the Greenland ice sheet mass is decreasing, and a human activity contributing to this trend is burning fossil fuels.

— The Greenland ice is decreasing as a result of burning fossil fuels, which contributes to global warming.

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

— Solar can produce useful energy without continually producing carbon dioxide. With less carbon dioxide in the atmosphere, global temperatures could be lowered.

— Replacing some use of fossil fuels with solar power produces less CO_2, so global temperatures may decrease.

— Using solar power reduces the amount of CO_2 going into the air.

Part D

73 3

74 1

75 1

76 4

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

— When the starch indicator molecules moved into the cell, they reacted with the starch to turn it black/blue black.

— The starch indicator diffused in and reacted with the starch to produce a black color.

— The starch indicator diffused in and combined/mixed with the starch.

78 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Water will leave the blood cells, which would cause the cells to shrink/get smaller.

— The blood cells will shrivel up/shrink.

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

— The two iguana species occupy different niches.

— They have different resource requirements.

— They have some variation in their food sources.

— The pink land iguana can feed on shrubs that the other land iguana doesn't eat.

80 [1] Allow 1 credit for stating that the data in the table does not support the hypothesis the students proposed and supporting the answer. Acceptable responses include, but are not limited to:

— No, because we cannot tell how their ability to do the exercises changed after eating the candy bar.

— No, because there was no control in the experiment.

— We cannot tell if it does or not, because we don't know how many they could have done before they ate the candy bar.

81 2

82 4

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

— They were trying to figure out which plants are most similar.

— They were trying to figure out which plants are most closely related.

— By doing the tests, they could determine evolutionary relationships.

— They were trying to determine which varieties most likely contained the same medicinal chemical.

84 [1] Allow 1 credit for student *B* and supporting the answer. Acceptable responses include, but are not limited to:

— Student *B* was seated, so he/she is most likely to have a slower pulse than his/her friends who were more active.

— Student *B* was least active. His/her muscles were not very active and used less oxygen.

85 [1] Allow 1 credit for *W* and *Z* and supporting the answer. Acceptable responses include, but are not limited to:

— Individuals *W* and *Z* have identical lines (genes).

— The pattern of lines for *W* and *Z* is the same.

Map to Core Curriculum

August 2024 Living Environment

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

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

Regents Examination in Living Environment

August 2024

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

The *Chart for Determining the Final Examination Score for the August 2024 Regents Examination in Living Environment* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Tuesday, August 20, 2024. 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 https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.

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.

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

Regents Examination in Living Environment – August 2024

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

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

Raw Score	Scale Score
56	**78**
55	**77**
54	**76**
53	**76**
52	**75**
51	**74**
50	**73**
49	**73**
48	**72**
47	**71**
46	**70**
45	**69**
44	**68**
43	**67**
42	**66**
41	**65**
40	**64**
39	**63**
38	**62**
37	**61**
36	**60**
35	**59**
34	**58**
33	**57**
32	**55**
31	**54**
30	**53**
29	**52**
28	**50**

Raw Score	Scale Score
27	**49**
26	**48**
25	**46**
24	**45**
23	**43**
22	**42**
21	**40**
20	**39**
19	**37**
18	**36**
17	**34**
16	**32**
15	**31**
14	**29**
13	**27**
12	**25**
11	**24**
10	**22**
9	**20**
8	**18**
7	**16**
6	**14**
5	**11**
4	**9**
3	**7**
2	**5**
1	**2**
0	**0**

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

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

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Living Environment.