The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, June 19, 2003 — 1:15 to 4:15 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. 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.

This examination has three parts. You must answer all questions in this examination. Write your answers to the Part A multiple-choice questions on the separate answer sheet. Write your answers for the questions in Parts B and C 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 the Part A 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.

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

Part A

Answer all questions in this part. [35]

Directions (1–35): 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.

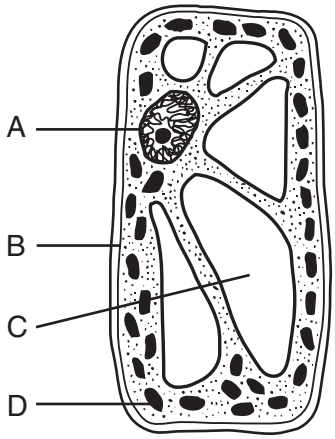
1 A student observes that an organism is green. A valid conclusion that can be drawn from this observation is that

(1) the organism must be a plant
(2) the organism cannot be single celled
(3) the organism must be an animal
(4) not enough information is given to determine whether the organism is a plant or an animal

2 Why do scientists consider any hypothesis valuable?

(1) A hypothesis requires no further investigation.
(2) A hypothesis may lead to further investigation even if it is disproved by the experiment.
(3) A hypothesis requires no further investigation if it is proved by the experiment.
(4) A hypothesis can be used to explain a conclusion even if it is disproved by the experiment.

3 Which letter indicates a cell structure that directly controls the movement of molecules into and out of the cell?

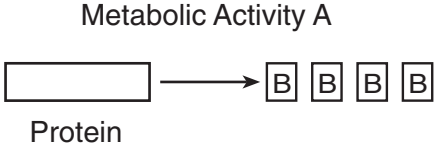


(1) *A*
(2) *B*
(3) *C*
(4) *D*

4 A great deal of information can now be obtained about the future health of people by examining the genetic makeup of their cells. There are concerns that this information could be used to deny an individual health insurance or employment. These concerns best illustrate that

(1) scientific explanations depend upon evidence collected from a single source
(2) scientific inquiry involves the collection of information from a large number of sources
(3) acquiring too much knowledge in human genetics will discourage future research in that area
(4) while science provides knowledge, values are essential to making ethical decisions using this knowledge

5 The diagram below represents one metabolic activity of a human.



Letters *A* and *B* are best represented by which row in the chart?

Row	Metabolic Activity A	B
(1)	respiration	oxygen molecules
(2)	reproduction	hormone molecules
(3)	excretion	simple sugar molecules
(4)	digestion	amino acid molecules

6 When a person does strenuous exercise, small blood vessels (capillaries) near the surface of the skin increase in diameter. This change allows the body to be cooled. These statements best illustrate

(1) synthesis
(2) homeostasis
(3) excretion
(4) locomotion

7 Which ecological term includes everything represented in the illustration below?

(1) ecosystem
(2) community
(3) population
(4) species

8 Which sequence represents the correct order of levels of organization found in a complex organism?

(1) cells → organelles → organs → organ systems → tissues
(2) tissues → organs → organ systems → organelles → cells
(3) organelles → cells → tissues → organs → organ systems
(4) organs → organ systems → cells → tissues → organelles

9 Scientific studies show that identical twins who were separated at birth and raised in different homes may vary in height, weight, and intelligence. The most probable explanation for these differences is that

(1) original genes of each twin increased in number as they developed
(2) one twin received genes only from the mother while the other twin received genes only from the father
(3) environments in which they were raised were different enough to affect the expression of their genes
(4) environments in which they were raised were different enough to change the genetic makeup of both individuals

10 When DNA separates into two strands, the DNA would most likely be directly involved in

(1) replication
(2) fertilization
(3) differentiation
(4) evolution

11 The instructions for the traits of an organism are coded in the arrangement of

(1) glucose units in carbohydrate molecules
(2) bases in DNA in the nucleus
(3) fat molecules in the cell membrane
(4) energy-rich bonds in starch molecules

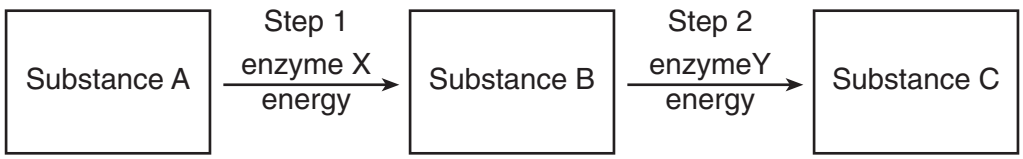
12 Which statement is true regarding an alteration or change in DNA?

(1) It is always known as a mutation.
(2) It is always advantageous to an individual.
(3) It is always passed on to offspring.
(4) It is always detected by the process of chromatography.

13 In heterotrophs, energy for the life processes comes from the chemical energy stored in the bonds of

(1) water molecules
(2) oxygen molecules
(3) organic compounds
(4) inorganic compounds

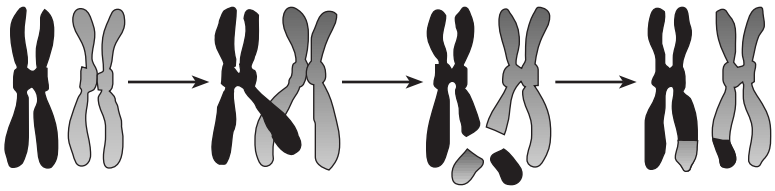
14 The diagram below represents the chemical pathway of a process in a human liver cell.



A particular liver cell is unable to make substance *C*. One possible explanation for the inability of this cell to make substance *C* is that

(1) excess energy for step 2 prevented the conversion of substance *B* to substance *C*
(2) an excess of enzyme *X* was present, resulting in a decrease in the production of substance *B*
(3) nuclear DNA was altered resulting in the cell being unable to make enzyme *Y*
(4) a mutation occurred causing a change in the ability of the cell to use substance *C*

15 The diagram below shows a process that can occur during meiosis.



The most likely result of this process is

(1) a new combination of inheritable traits that can appear in the offspring
(2) an inability to pass either of these chromosomes on to offspring
(3) a loss of genetic information that will produce a genetic disorder in the offspring
(4) an increase in the chromosome number of the organism in which this process occurs

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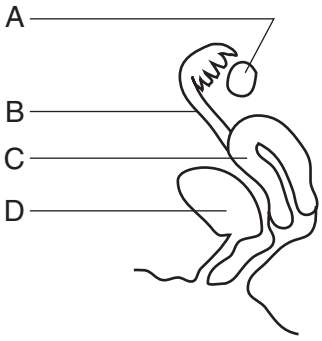
16 Structures in a human female are represented in the diagram below.



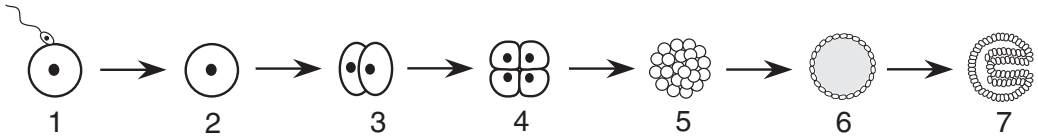
A heavy dose of radiation would have the greatest impact on genetic information in future offspring if it reached gametes developing within structure

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

17 Organism *X* appeared on Earth much earlier than organism *Y*. Many scientists believe organism *X* appeared between 3 and 4 billion years ago, and organism *Y* appeared approximately 1 billion years ago. Which row in the chart below most likely describes organisms *X* and *Y*?

Row	Organism X	Organism Y
(1)	simple multicellular	unicellular
(2)	complex multicellular	simple multicellular
(3)	unicellular	simple multicellular
(4)	complex multicellular	unicellular

18 The sequence of diagrams below represents some events in a reproductive process.



To regulate similar events in human reproduction, what adaptations are required?

(1) the presence of genes and chemicals in each cell in stages 1 to 7
(2) an increase in the number of genes in each cell in stages 3 to 5
(3) the removal of all enzymes from the cells in stage 7
(4) the elimination of mutations from cells after stage 5

---

19 Which statement best describes human insulin that is produced by genetically engineered bacteria?

(1) This insulin will not function normally in humans because it is produced by bacteria.
(2) This insulin is produced as a result of human insulin being inserted into bacteria cells.
(3) This insulin is produced as a result of exposing bacteria cells to radiation, which produces a mutation.
(4) This insulin may have fewer side effects than the insulin previously extracted from the pancreas of other animals.

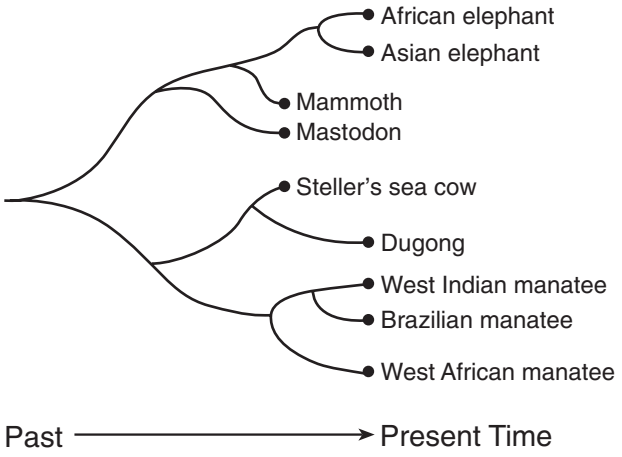
20 Which population of organisms would be in greatest danger of becoming extinct?

(1) A population of organisms having few variations living in a stable environment.
(2) A population of organisms having few variations living in an unstable environment.
(3) A population of organisms having many variations living in a stable environment.
(4) A population of organisms having many variations living in an unstable environment.

21 In animals, the normal development of an embryo is dependent on

(1) fertilization of a mature egg by many sperm cells
(2) production of new cells having twice the number of chromosomes as the zygote
(3) production of body cells having half the number of chromosomes as the zygote
(4) mitosis and the differentiation of cells after fertilization has occurred

22 The relationship of some mammals is indicated in the diagram below.



Which statement about the African elephant is correct?

(1) It is more closely related to the mammoth than it is to the West African manatee.
(2) It is more closely related to the West Indian manatee than it is to the mastodon.
(3) It is not related to the Brazilian manatee or the mammoth.
(4) It is the ancestor of Steller's sea cow.

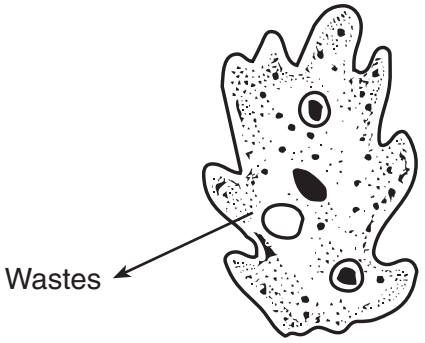
23 Which process normally occurs at the placenta?

(1) Oxygen diffuses from fetal blood to maternal blood.
(2) Materials are exchanged between fetal and maternal blood.
(3) Maternal blood is converted into fetal blood.
(4) Digestive enzymes pass from maternal blood to fetal blood.

24 Individual cells can be isolated from a mature plant and grown with special mixtures of growth hormones to produce a number of genetically identical plants. This process is known as

(1) cloning
(2) meiotic division
(3) recombinant DNA technology
(4) selective breeding

25 A single-celled organism is represented in the diagram below. An activity is indicated by the arrow.



If this activity requires the use of energy, which substance would be the source of this energy?

(1) DNA
(2) ATP
(3) a hormone
(4) an antibody

26 Which activity would stimulate the human immune system to provide protection against an invasion by a microbe?

(1) receiving antibiotic injections after surgery
(2) choosing a well-balanced diet and following it throughout life
(3) being vaccinated against chicken pox
(4) receiving hormones contained in mother's milk while nursing

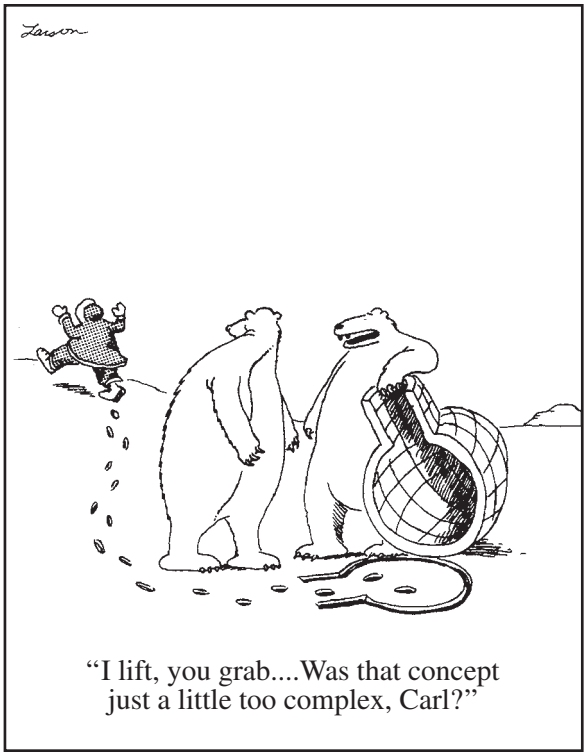
27 In an ecosystem, the presence of many different species is critical for the survival of some forms of life when

(1) ecosystems remain stable over long periods of time
(2) significant changes occur in the ecosystem
(3) natural selection does not occur
(4) the finite resources of Earth increase

28 The most immediate response to a high level of blood sugar in a human is an increase in the

(1) muscle activity in the arms
(2) blood flow to the digestive tract
(3) activity of all cell organelles
(4) release of insulin

29 Which ecological term best describes the polar bears in the cartoon below?



"I lift, you grab....Was that concept just a little too complex, Carl?"

(adapted)

(1) herbivores
(2) parasites
(3) carnivores
(4) producers

30 A new island formed by volcanic action may eventually become populated with biotic communities as a result of

(1) a decrease in the amount of organic material present
(2) decreased levels of carbon dioxide in the area
(3) the lack of abiotic factors in the area
(4) the process of ecological succession

31 Certain microbes, foreign tissues, and some cancerous cells can cause immune responses in the human body because all three contain

(1) antigens
(2) enzymes
(3) fats
(4) cytoplasm

32 Decomposers are important in the environment because they

(1) convert large molecules into simpler molecules that can then be recycled
(2) release heat from large molecules so that the heat can be recycled through the ecosystem
(3) can take in carbon dioxide and convert it into oxygen
(4) convert molecules of dead organisms into permanent biotic parts of an ecosystem

33 An environment can support only as many organisms as the available energy, minerals, and oxygen will allow. Which term is best described by this statement?

(1) biological feedback
(2) carrying capacity
(3) homeostatic control
(4) biological diversity

34 Communities have attempted to control the size of mosquito populations to prevent the spread of certain diseases such as malaria and encephalitis. Which control method is most likely to cause the *least* ecological damage?

(1) draining the swamps where mosquitoes breed
(2) spraying swamps with chemical pesticides to kill mosquitoes
(3) spraying oil over swamps to suffocate mosquito larvae
(4) increasing populations of native fish that feed on mosquito larvae in the swamps

35 Which animal has modified ecosystems more than any other animal and has had the greatest negative impact on world ecosystems?

(1) gypsy moth
(2) zebra mussel
(3) human
(4) shark

Part B

Answer all questions in this part. [30]

Directions (36–62): For those questions that are followed by four choices, circle the number of the choice that 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.

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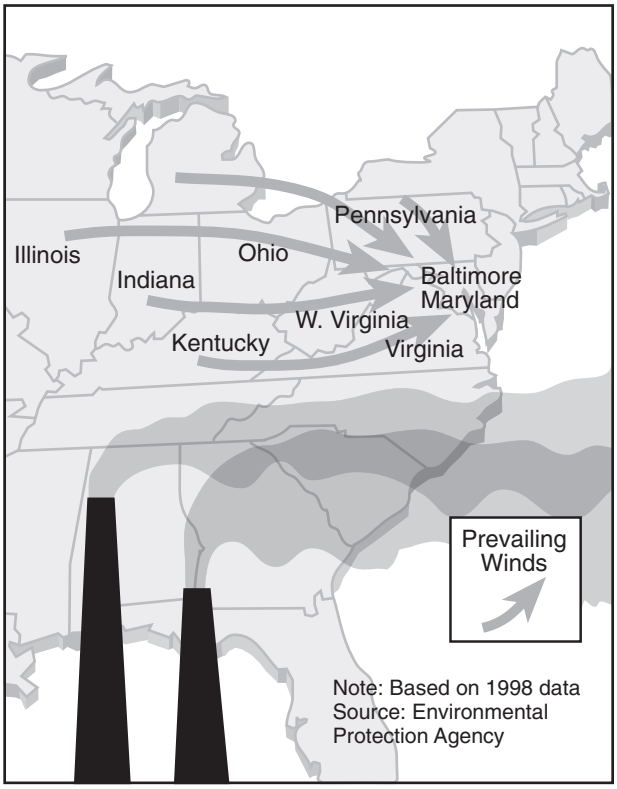
36 The map below shows the movement of some air pollution across part of the United States.

Movement of Air Pollution



Which statement is a correct inference that can be drawn from this information?

(1) Illinois produces more air pollution than the other states shown.

(2) The air pollution problem in Baltimore is increased by the addition of pollution from other areas.

(3) There are no air pollution problems in southern states.

(4) The air pollution problems in Virginia clear up quickly as the air moves toward the sea.

36 ☐

Base your answers to questions 37 and 38 on the graph below and on your knowledge of biology. The graph illustrates a single species of bacteria grown at various pH levels.

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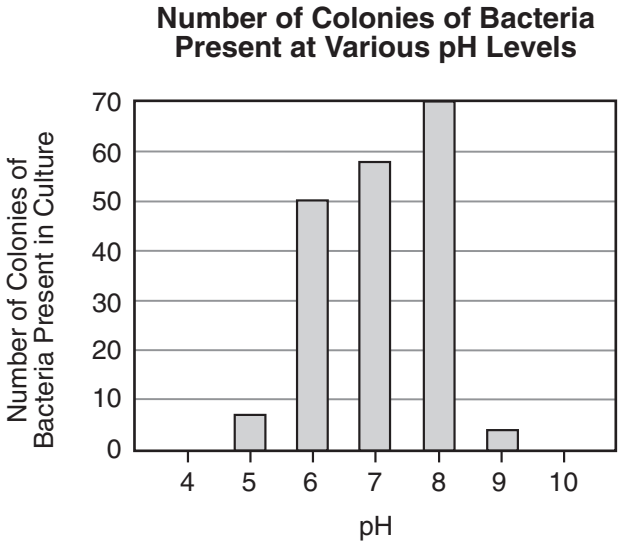

37 The most likely reason there are no colonies in cultures of this species at pH 4 and at pH 10 is that

(1) these bacteria could successfully compete with other species of bacteria at these pH values

(2) there are more predators feeding on these bacteria at pH 4 and pH 10 than at other pH levels

(3) at pH 4 and pH 10 the environment is too acidic or too basic for the bacteria to grow

(4) fertilization cannot occur in these bacteria at pH 4 or pH 10

37 ☐

38 Which statement is supported by data from this graph?

(1) All species of bacteria can grow well at pH 7.

(2) This type of bacterium would grow well at pH 7.5.

(3) This type of bacterium would grow well at pH 2.

(4) Other types of bacteria can grow well at pH 4.

38 ☐

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39 In an experiment, DNA from dead pathogenic bacteria was transferred into living bacteria that do not cause disease. These altered bacteria were then injected into healthy mice. These mice died of the same disease caused by the original pathogens. Based on this information, which statement would be a valid conclusion?

(1) DNA is present only in living organisms.

(2) DNA functions only in the original organism of which it was a part.

(3) DNA changes the organism receiving the injection into the original organism.

(4) DNA from a dead organism can become active in another organism.

39 ☐

40 Dodder is a creeping vine that is parasitic on other plants. Which characteristic does dodder share with all other heterotrophs?

(1) It produces nutrients by photosynthesis.

(2) It must grow in bright locations.

(3) It consumes preformed organic molecules.

(4) It remains in one place for its entire life.

40 ☐

41 In a forest community, a shelf fungus and a slug live on the side of a decaying tree trunk. The fungus digests and absorbs materials from the tree, while the slug eats algae growing on the outside of the trunk. These organisms do not compete with one another because they occupy

(1) the same habitat, but different niches

(2) the same niche, but different habitats

(3) the same niche and the same habitat

(4) different habitats and different niches

41 ☐

42 Studies of fat cells and thyroid cells show that fat cells have fewer mitochondria than thyroid cells. A biologist would most likely infer that fat tissue

(1) does not require energy

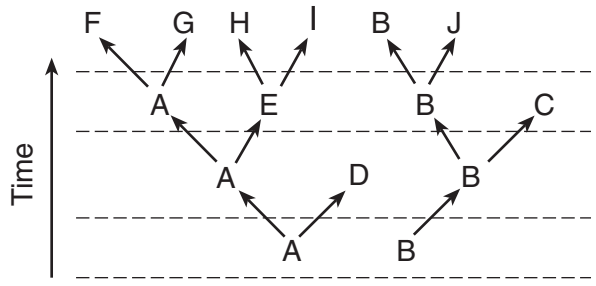
(2) has energy requirements equal to those of thyroid tissue

(3) requires less energy than thyroid tissue

(4) requires more energy than thyroid tissue

42 ☐

Base your answers to questions 43 and 44 on the diagram below and on your knowledge of biology. Letters *A* through *J* represent different species of organisms. The vertical distances between the dotted lines represent long periods of time in which major environmental changes occurred.



43 Which species was the first to become extinct?

(1) *E*

(2) *J*

(3) *C*

(4) *D*

43 ☐

44 Which species appears to have been most successful in surviving changes in the environment over time?

(1) *A*

(2) *B*

(3) *C*

(4) *H*

44 ☐

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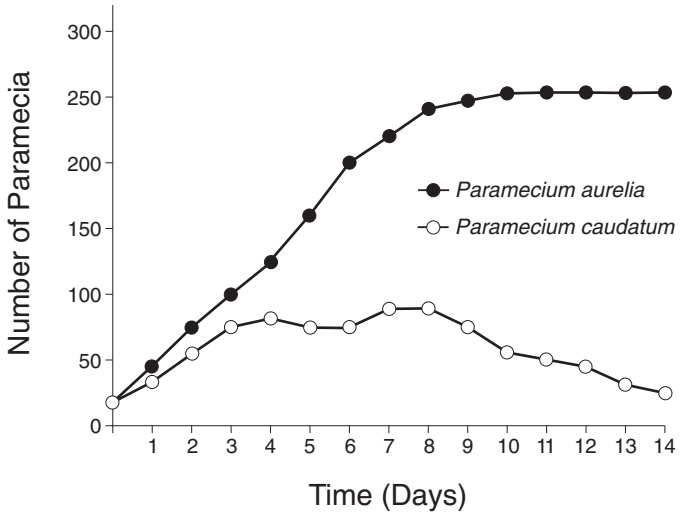
45 The graph below shows the growth of two populations of paramecia grown in the same culture dish for 14 days.



Which ecological concept is best represented by the graph?

(1) recycling

(2) equilibrium

(3) competition

(4) decomposition

45

46 Two different types of cells from an organism are shown below.

Explain how these two different types of cells can function differently in the same organism even though they both contain the same genetic instructions. [1]

_____

_____

_____

46

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Directions (47–49): The diagrams below represent organs of two individuals. The diagrams are followed by a list of sentences. For each phrase in questions 47 through 49, select the sentence from the list below that best applies to that phrase. Then record its *number* in the space provided.

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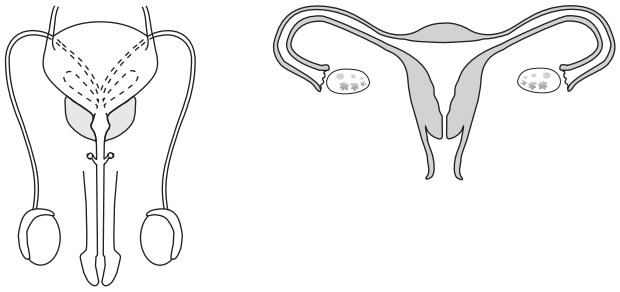

Individual A Individual B

Sentences

1. The phrase is correct for both Individual *A* and Individual *B*.
2. The phrase is not correct for either Individual *A* or Individual *B*.
3. The phrase is correct for Individual *A*, only.
4. The phrase is correct for Individual *B*, only

47 Contains organs that produce gametes [1]

_____ 47 ☐

48 Contains organs involved in internal fertilization [1]

_____ 48 ☐

49 Contains a structure in which a zygote divides by mitosis [1]

_____ 49 ☐

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

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Amphibians have long been considered an indicator of the health of life on Earth. Scientists are concerned because amphibian populations have been declining worldwide since the 1980s. In fact, in the past decade, twenty species of amphibians have become extinct and many others are endangered.

Scientists have linked this decline in amphibians to global climatic changes. Warmer weather during the last three decades has resulted in the destruction of many of the eggs produced by the Western toad. Warmer weather has also led to a decrease in rain and snow in the Cascade Mountain Range in Oregon, reducing the water level in lakes and ponds that serve as the reproductive sites for the Western toad. As a result, the eggs are exposed to more ultraviolet light. This makes the eggs more susceptible to water mold that kills the embryos by the hundreds of thousands.

50 The term used to identify the worldwide climatic changes referred to in the passage is

(1) global warming

(2) deforestation

(3) mineral depletion

(4) industrialization

50 ☐

51 State *two* ways the decline in amphibian populations could disrupt the stability of the ecosystems they inhabit. [2]

1. _____

_____

_____

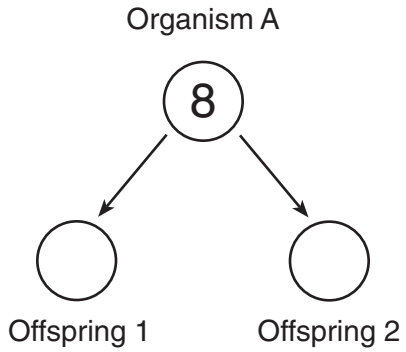
2. _____

_____

_____

51 ☐

52 The diagram below represents reproduction of single-celled organism *A*, which has a normal chromosome number of 8.



In the circles representing offspring 1 and offspring 2, write the number of chromosomes that result from the normal asexual reproduction of organism *A*. [1]

52 ☐

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Base your answers to questions 53 and 54 on the structures in the diagram of human blood below that help to maintain homeostasis in humans.

53 Identify the cell labeled *X*. [1]

_____

53 ☐

54 State *one* way a cell such as cell *X* helps to maintain homeostasis. [1]

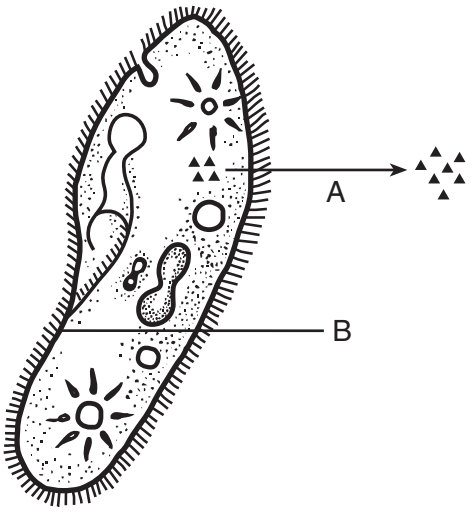
_____

_____

_____

54 ☐

Base your answers to questions 55 and 56 on the diagram below, which represents a unicellular organism in a watery environment. The ▲s represent molecules of a specific substance.



55 Arrow *A* represents active transport. State *two* ways that active transport is different from diffusion. [2]

1. _____

_____

_____

2. _____

_____

_____

55 ☐

56 In cells of multicellular organisms, structure *B* often contains molecules involved in cell communication. What specific term is used to identify these molecules? [1]

_____

56 ☐

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57 Diagram *A* below represents a microscopic view of the lower surface of a leaf. Diagram *B* represents a portion of the human body.

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Diagram A

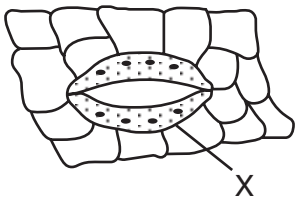
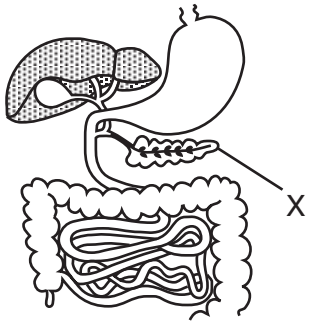


Diagram B



a Choose *one* diagram and record its letter, *A* or *B*, in the space provided.

Diagram: _____

b Identify the structure labeled *X* in the diagram you chose. [1]

_____

c State *one* problem for the organism that would result from a malfunction of the structure you identified. [1]

_____

_____

_____

57 ☐

Base your answers to questions 58 through 62 on the information below and on your knowledge of biology.

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In an investigation, plants of the same species and the same initial height were exposed to a constant number of hours of light each day. The number of hours per day was different for each plant, but all other environmental factors were the same. At the conclusion of the investigation, the final height of each plant was measured. The following data were recorded:

8 hours, 25 cm; 4 hours, 12 cm; 2 hours, 5 cm; 14 hours, 35 cm; 12 hours, 35 cm; 10 hours, 34 cm; 6 hours, 18 cm

58 Organize the data by completing both columns in the data table provided, so that the hours of daily light exposure *increase* from the top to the bottom of the table. [1]

Data Table

Daily Light Exposure (hours)	**Final Height** (cm)

58 ☐

59 State *one* possible reason that the plant exposed to 2 hours of light per day was the shortest. [1]

_____

_____

_____

59 ☐

Directions (60–61): Using the information given, construct a line graph on the grid provided, following the directions below.

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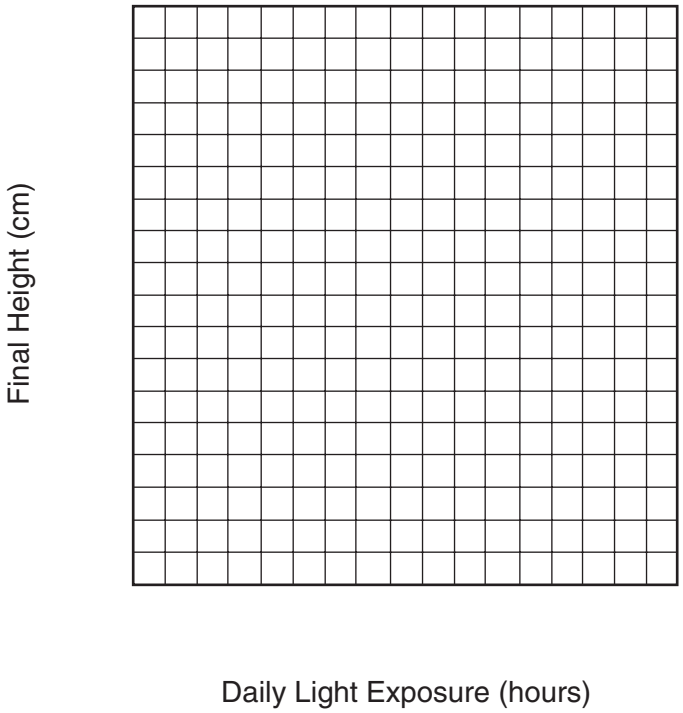
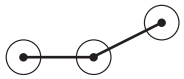
Effect of Light Exposure on Plant Growth



60 Mark an appropriate scale on each axis. [1]

60 ☐

61 Plot the data for final height on the grid. Surround each point with a small circle and connect the points. [1]

Example: 

61 ☐

62 If another plant of the same species had been used in the investigation and exposed to 16 hours of light per day, what would the final height of the plant probably have been? Support your answer. [1]

_____

_____

_____

62 ☐

Part C

Answer all questions in this part. [20]

Directions (63–72): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 63 through 65 on the article below which was written in response to an article entitled "Let all predators become extinct."

For Teacher Use Only

Predators Contribute to a Stable Ecosystem

In nature, energy flows in only one direction. Transfer of energy must occur in an ecosystem because all life needs energy to live, and only certain organisms can change solar energy into chemical energy.

Producers are eaten by consumers that are, in turn, eaten by other consumers. Stable ecosystems must contain predators to help control the populations of consumers.

Since ecosystems contain many predators, exterminating predators would require a massive effort that would wipe out predatory species from barnacles to blue whales. Without the population control provided by predators, some organisms would soon overpopulate.

63 Draw an energy pyramid in the space below that illustrates the information underlined in the second paragraph. Include *three* different, specific organisms in the energy pyramid. [1]

63 ☐

64 Explain the phrase "only certain organisms can change solar energy into chemical energy," in the underlined portion of the first paragraph. In your answer be sure to identify:

- the type of nutrition carried out by these organisms [1]
- the process being carried out in this type of nutrition [1]
- the organelles present in the cells of these organisms that are directly involved in changing solar energy into chemical energy [1]

64

65 Explain why an ecosystem with a variety of predator species might be more stable over a long period of time than an ecosystem with only one predator species. [1]

65

For Teacher Use Only

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

For Teacher Use Only

Trout and black bass are freshwater fish that normally require at least 8 parts per million (ppm) of dissolved oxygen (O_2) in the water for survival. Other freshwater fish, such as carp, may be able to live in water that has an O_2 level of 5 ppm. No freshwater fish are able to survive when the O_2 level in water is 2 ppm or less.

Some factories or power plants are built along rivers so that they can use the water to cool their equipment. They then release the water (sometimes as much as 8°C warmer) back into the same river.

The Rocky River presently has an average summer temperature of about 25°C and contains populations of trout, bass, and carp. A proposal has been made to build a new power plant on the banks of the Rocky River. Some people are concerned that this will affect the river ecosystem in a negative way.

The data table below shows the amount of oxygen that will dissolve in fresh water at different temperatures. The amount of oxygen is expressed in parts per million (ppm).

Data Table

Temperature (°C)	**Fresh Water Oxygen Content** (ppm)
1	14.24
10	11.29
15	10.10
20	9.11
25	8.27
30	7.56

66 State *one* effect of temperature change on the oxygen content of fresh water. Support your answer using specific information from the data table. [2]

_____

_____

_____

_____

_____

_____

66 ☐

67 Explain how a new power plant built on the banks of the Rocky River could have an environmental impact on the Rocky River ecosystem downstream from the plant. Your explanation must include the effects of the power plant on:

- water temperature [1]
- dissolved oxygen [1]
- fish species [1]

For Teacher Use Only

67 ☐

68 Enzyme molecules are affected by changes in conditions within organisms.

Explain how a prolonged, excessively high body temperature during an illness could be fatal to humans. Your answer must include:

- the role of enzymes in a human [1]
- the effect of this high body temperature on enzyme activity [1]
- the reason this high body temperature can result in death [1]

68 ☐

Base your answers to questions 69 through 71 on the quotation below and on your knowledge of biology.

For Teacher Use Only

> "Today I planted something new in my vegetable garden — something very new, as a matter of fact. It's a potato called the New Leaf Superior, which has been genetically engineered — by Monsanto, the chemical giant recently turned "life sciences" giant — to produce its own insecticide. This it can do in every cell of every leaf, stem, flower, root, and (here's the creepy part) spud [the potato]."
>
> Source: *New York Times Sunday Magazine,* Michael Pollan, 10/25/98

69 State *two* reasons that a gardener might choose to grow this new variety of plant. [2]

1. _____

_____

_____

2. _____

_____

_____ 69 ☐

70 State *one* possible *disadvantage* of the synthesis of an insecticide by potatoes. [1]

_____

_____

_____ 70 ☐

71 Explain why every cell in the New Leaf Superior potato plant is able to produce its own insecticide. [1]

_____

_____

_____ 71 ☐

72 Select *one* of the following ecological problems.

Ecological Problems

Acid rain
Increased amounts of nitrogen and phosphorous in a lake
Loss of biodiversity

For the ecological problem that you selected, briefly describe the problem and state *one* way to reduce it. In your answer be sure to:

- state the ecological problem you selected
- state how humans have caused the problem you selected [1]
- describe *one* specific effect that the problem you selected will have on the ecosystem [1]
- state *one* specific action humans could take to reduce the problem you selected [1]

For Teacher Use Only

72 ☐

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Thursday, June 19, 2003 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Student ..... Sex: ☐ Female ☐ Male

Teacher .....

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

Part	Maximum Score	Student's Score
A	35	
B	30	
C	20	
Total Raw Score (maximum Raw Score: 85)		
Final Score (from conversion chart)		

Raters' Initials

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

Record your answers to Part A on this answer sheet.

Part A

1	13	25 .....
2	14	26 .....
3	15	27 .....
4	16	28 .....
5	17	29 .....
6	18	30 .....
7	19	31 .....
8	20	32 .....
9	21	33 .....
10	22	34 .....
11	23	35 .....
12	24	

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

Tear Here

Tear Here

Tear Here

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

Le

LIVING ENVIRONMENT

Thursday, June 19, 2003 — 1:15 p.m. to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 before rating student papers.

Part A (35 credits)

Allow a total of 35 credits for Part A, one credit for each correct answer.

(1)	**4**	**(13)**	**3**	**(25)**	**2**
(2)	**2**	**(14)**	**3**	**(26)**	**3**
(3)	**2**	**(15)**	**1**	**(27)**	**2**
(4)	**4**	**(16)**	**1**	**(28)**	**4**
(5)	**4**	**(17)**	**3**	**(29)**	**3**
(6)	**2**	**(18)**	**1**	**(30)**	**4**
(7)	**1**	**(19)**	**4**	**(31)**	**1**
(8)	**3**	**(20)**	**2**	**(32)**	**1**
(9)	**3**	**(21)**	**4**	**(33)**	**2**
(10)	**1**	**(22)**	**1**	**(34)**	**4**
(11)	**2**	**(23)**	**2**	**(35)**	**3**
(12)	**1**	**(24)**	**1**		

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 Administering and 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 in Part A and Part B.

On the detachable answer sheet for Part A, indicate by means of a checkmark 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 that part.

At least two science teachers must participate in the scoring of the Part B and Part C 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 to 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, and Part C on the appropriate lines in the box printed on the answer sheet and should add these 3 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 printed at the end of this Scoring Key and Rating Guide. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

Part B

(36) 2

(37) 3

(38) 2

(39) 4

(40) 3

(41) 1

(42) 3

(43) 4

(44) 2

(45) 3

(46) Allow 1 credit for explaining how the two cells can function differently in the same organism, even though they both contain the same genetic instructions. Acceptable responses include, but are not limited to:

— Different types of cells express different genes.
— They contain different proteins.

(47) 1

(48) 1

(49) 4

(50) 1

(51) Allow a maximum of 2 credits, 1 for each of two ways that the decline in amphibian populations could disrupt the stability of the ecosystems they inhabit. Appropriate responses include, but are not limited to:

— Prey populations increase.
— It reduces the biodiversity in these areas.
— Food chains are disrupted.
— Predators are denied food.

(52) Allow 1 credit for indicating that the chromosome number in offspring 1 and 2 is **8**.

(53) Allow 1 credit for indicating that the cell labeled *X* is a white blood cell.

(54) Allow 1 credit for stating one way a cell such as cell *X* helps to maintain homeostasis. Acceptable responses include, but are not limited to:

— destroys foreign antigens
— produces antibodies
— engulfs bacteria

Note: Allow credit for an answer that is consistent with the student's answer to question 53.

(55) Allow a maximum of 2 credits, 1 for each of two ways that active transport is different from diffusion. Acceptable responses include, but are not limited to:

— Active transport requires the use of energy by the organism.
or
Diffusion does not require the use of energy by the organism.

— In active transport, molecules move from a region of lower concentration to a region of higher concentration of those molecules.
or
In diffusion, molecules move from a region of higher concentration to a region of lower concentration of those molecules.

(56) Allow 1 credit for **receptor molecules, receptor proteins, cell receptors,** or **receptors.**

(57) Allow a maximum of 2 credits, 1 credit for correctly identifying the structure labeled *X* in the diagram chosen and 1 credit for stating a problem for the organism that would result from a malfunction of the structure identified in part *b*. Appropriate responses include, but are not limited to:

Diagram *A*: Structure *X* is a guard cell. If the guard cells do not function properly, the plant can lose too much water *or* gas exchange could be affected.

Diagram *B*: Structure *X* represents the pancreas. If the pancreas does not produce enough insulin, a person will develop diabetes.

Note: Do *not* allow credit for indicating the diagram chosen.
Allow credit for an answer to part *c* that is consistent with the student's answer to part *b*.

(58) Allow 1 credit for completing both columns of the data table correctly.

Example of an Appropriate Data Table

Data Table

Daily Light Exposure (hours)	**Final Height** (cm)
2	5
4	12
6	18
8	25
10	34
12	35
14	35

(59) Allow 1 credit for stating one possible reason that the plant exposed to 2 hours of light per day was the shortest. Acceptable responses include, but are not limited to:

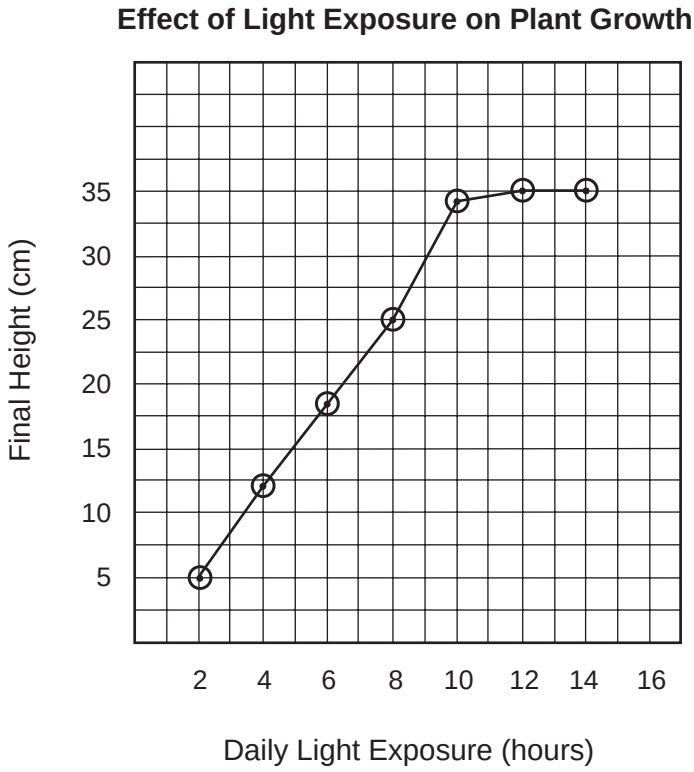
— The plant exposed to 2 hours of light per day produced the smallest amount of food.
— Plants require 12–14 hours of light per day to reach optimum growth.
— The plant exposed to 2 hours of light per day carried on photosynthesis for the shortest time.

(60) Allow 1 credit for marking an appropriate scale on each axis.

(61) Allow 1 credit for plotting the data correctly and connecting the points.

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

Example of a 2-Credit Graph

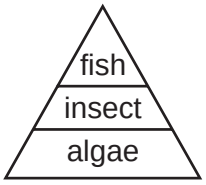


(62) Allow 1 credit for indicating what the final height of a plant of the same species exposed to 16 hours of light per day would probably be (either as an exact height, or taller, shorter, or the same) and supporting the prediction. Acceptable responses include, but are not limited to:

— 35 centimeters, because the plant reached optimal growth
— shorter, because of dehydration, stress on the plant
— taller, because more light, more growth

Part C

(63) Allow 1 credit for drawing an energy pyramid that illustrates the information underlined in the second paragraph. Appropriate responses include, but are not limited to:



Note: Do *not* allow credit for stating only producer, consumer, etc.

(64) Allow a maximum of 3 credits for explaining the phrase "only certain organisms can change solar energy into chemical energy," allocated as follows:

- Allow 1 credit for indicating that autotrophic nutrition is carried out by these organisms.
- Allow 1 credit for indicating that photosynthesis is the process being carried out.
- Allow 1 credit for identifying chloroplasts as the organelles that are directly involved in changing solar energy into chemical energy.

(65) Allow 1 credit for explaining why an ecosystem with a variety of predator species might be more stable over a long period of time than an ecosystem with only one predator species. Appropriate responses include, but are not limited to:

— Different populations of prey in an ecosystem are controlled by different kinds of predators.
— More biodiversity in an ecosystem provides more stability.

(66) Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for stating one effect of temperature change on the oxygen content of fresh water. Appropriate responses include, but are not limited to:

  — As the temperature increases, the oxygen content decreases.
  — As the temperature decreases, the oxygen content increases.

- Allow 1 credit for correctly supporting the answer using specific information from the data table. Appropriate responses include, but are not limited to:

  — As the temperature increases from 15°C to 20°C the oxygen decreases by 0.99 ppm.
  — At 10°C fresh water holds 11.29 ppm and at 15°C only 10.10 ppm.

(67) Allow a maximum of 3 credits for explaining how a new power plant built on the banks of the Rocky River could have an environmental impact on the Rocky River ecosystem downstream from the plant, allocated as follows:

- Allow 1 credit for stating that the power plant will increase the temperature of the river water.
- Allow 1 credit for stating that the dissolved oxygen content of the river water will decrease.
- Allow 1 credit for stating the effect on fish species. Appropriate responses include, but are not limited to:

  — The population of trout (and/or bass) may decrease.
  — The carp population may increase.
  — If the oxygen level decreases below 2 ppm, no fish survive.
  — Some species may increase in number while others may decrease.

(68) Allow a maximum of 3 credits for explaining how a prolonged, excessively high body temperature during an illness could be fatal to humans, allocated as follows:

- Allow 1 credit for stating the role of enzymes in a human. Appropriate responses include, but are not limited to:
  — Enzymes catalyze chemical reactions.
  — affect the rate of reaction
  — help synthesize proteins
  — speed up digestion

- Allow 1 credit for stating the effect of this high body temperature on enzyme activity. Appropriate responses include, but are not limited to:
  — the activity of enzymes will slow down
  — enzymes will not catalyze reactions as quickly

- Allow 1 credit for stating the reason that this high body temperature can result in death. Appropriate responses include, but are not limited to:
  — Enzymes don't work.
  — Chemical reactions necessary for life don't take place fast enough to maintain life.
  — The distorted shape of the enzyme no longer matches the substrate.

(69) Allow a maximum of 2 credits, 1 for each of *two* reasons that a gardener might choose to grow this new variety of plant. Appropriate responses include, but are not limited to:

— New Leaf Superior produces its own insecticide.
— This variety of plant is not eaten by some insects.
— Other insecticides may cause environmental harm.
— This variety requires less work to grow.

(70) Allow 1 credit for stating one possible disadvantage of the synthesis of an insecticide by potatoes. Appropriate responses include, but are not limited to:

— The insecticide in the potato may be harmful to humans.
— Insecticides sprayed on can be washed off; those produced in cells cannot.
— Insects may develop a resistance to the insecticide produced by potatoes.

(71) Allow 1 credit for explaining why every cell in the New Leaf Superior potato plant is able to produce its own insecticide. Appropriate responses include, but are not limited to:

— All cells have the same genetic information.
— All cells have common DNA.
— Genetic information in one cell is passed to other cells through cell division.

(72) Allow a maximum of 3 credits. For the *one* ecological problem selected, allow 1 credit for stating how humans have caused the problem, 1 credit for describing one specific effect the problem will have on the ecosystem, *and* 1 credit for stating one specific action humans could take to reduce the problem. Appropriate responses include, but are not limited to:

- Acid rain
  Cause — industry producing air pollution (sulfides, nitrates, etc.)
  — cars/burning fossil fuels

  Note: Do *not* allow credit for pollution or air pollution unless the source is identified.

  Effect — lowers pH of certain lakes which kills some fish
  Action — remove the chemicals from the exhaust before it leaves the factory

- Increased amounts of nitrogen and phosphorous in a lake
  Cause — fertilizer runoff
  Effect — rapid aging of lakes
  Action — use less fertilizer

- Loss of biodiversity
  Cause — overhunting
  — habitat destruction
  Effect — unstable ecosystem
  — loss of sources for new medicines
  Action — enforce game laws
  — habitat rehabilitation

Regents Examination in Living Environment

June 2003

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

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	56	75	27	51
84	99	55	74	26	49
83	98	54	74	25	48
82	96	53	73	24	47
81	95	52	72	23	45
80	94	51	72	22	44
79	93	50	71	21	43
78	92	49	70	20	41
77	91	48	69	19	40
76	90	47	69	18	38
75	89	46	68	17	36
74	88	45	67	16	35
73	87	44	67	15	33
72	87	43	66	14	31
71	86	42	65	13	29
70	85	41	64	12	28
69	84	40	63	11	26
68	83	39	63	10	24
67	83	38	62	9	22
66	82	37	61	8	19
65	81	36	60	7	17
64	80	35	59	6	15
63	80	34	58	5	13
62	79	33	57	4	10
61	78	32	56	3	8
60	78	31	55	2	5
59	77	30	54	1	3
58	76	29	53	0	0
57	76	28	52		

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 scaled score that corresponds to that raw score. The scaled 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 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 in the scoring key for the administration be used to determine the student's final score. The chart above is usable only for this administration of the living environment examination.

Map to Core Curriculum

June 2003 Living Environment

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