

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

LIVING ENVIRONMENT

Friday, June 18, 2004 — 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 and Part B-1. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

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

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

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

Part A

Answer all questions in this part. [30]

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

1 Cloning an individual usually produces organisms that

- (1) contain dangerous mutations
- (2) contain identical genes
- (3) are identical in appearance and behavior
- (4) produce enzymes different from the parent

2 Which statement best describes the term *theory* as used in the gene-chromosome theory?

- (1) A theory is never revised as new scientific evidence is presented.
- (2) A theory is an assumption made by scientists and implies a lack of certainty.
- (3) A theory refers to a scientific explanation that is strongly supported by a variety of experimental data.
- (4) A theory is a hypothesis that has been supported by one experiment performed by two or more scientists.

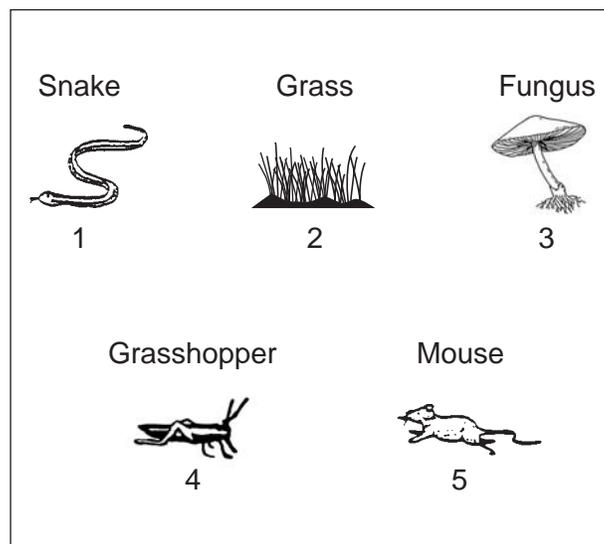
3 Which two systems are most directly involved in providing molecules needed for the synthesis of fats in human cells?

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

4 Which statements best describe the relationship between the terms *chromosomes*, *genes*, and *nuclei*?

- (1) Chromosomes are found on genes. Genes are found in nuclei.
- (2) Chromosomes are found in nuclei. Nuclei are found in genes.
- (3) Genes are found on chromosomes. Chromosomes are found in nuclei.
- (4) Genes are found in nuclei. Nuclei are found in chromosomes.

5 Organisms from a particular ecosystem are shown below.



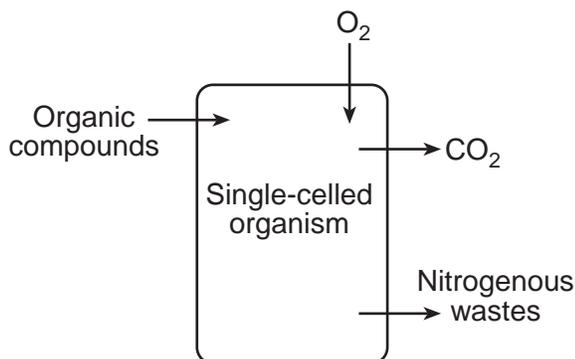
Which statement concerning an organism in this ecosystem is correct?

- (1) Organism 2 is heterotrophic.
- (2) Organism 3 helps recycle materials.
- (3) Organism 4 obtains all of its nutrients from an abiotic source.
- (4) Organism 5 must obtain its energy from organism 1.

6 In a cell, information that controls the production of proteins must pass from the nucleus to the

- (1) cell membrane
- (2) chloroplasts
- (3) mitochondria
- (4) ribosomes

7 The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



The movements indicated by all the arrows are directly involved in

- (1) the maintenance of homeostasis
- (2) photosynthesis, only
- (3) excretion, only
- (4) the digestion of minerals

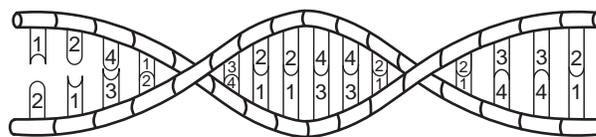
8 The chart below shows relationships between genes, the environment, and coloration of tomato plants.

Inherited Gene	Environmental Condition	Final Appearance
A	Light	Green
B	Light	White
A	Dark	White
B	Dark	White

Which statement best explains the final appearance of these tomato plants?

- (1) The expression of gene A is not affected by light.
- (2) The expression of gene B varies with the presence of light.
- (3) The expression of gene A varies with the environment.
- (4) Gene B is expressed only in darkness.

9 The diagram below represents a section of a molecule that carries genetic information.

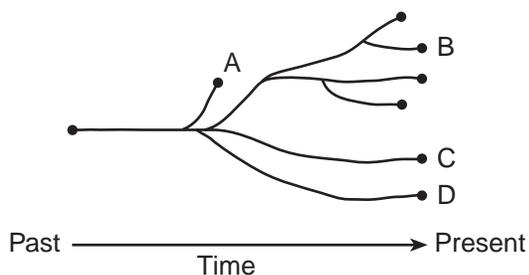


The pattern of numbers represents

- (1) a sequence of paired bases
 - (2) the order of proteins in a gene
 - (3) folds of an amino acid
 - (4) positions of gene mutations
- 10 In the human pancreas, acinar cells produce digestive enzymes and beta cells produce insulin. The best explanation for this is that
- (1) a mutation occurs in the beta cells to produce insulin when the sugar level increases in the blood
 - (2) different parts of an individual's DNA are used to direct the synthesis of different proteins in different types of cells
 - (3) lowered sugar levels cause the production of insulin in acinar cells to help maintain homeostasis
 - (4) the genes in acinar cells came from one parent while the genes in beta cells came from the other parent
- 11 If mitotic cell division is the only way a particular species of single-celled organism can reproduce, it is most likely that
- (1) mutations can *not* occur in this species
 - (2) the rate of evolution in this species is slower than in one that reproduces sexually
 - (3) the number of organisms of this species in an area will remain constant
 - (4) this species belongs to the animal kingdom
- 12 In order for new species to develop, there *must* be a change in the
- (1) temperature of the environment
 - (2) migration patterns within a population
 - (3) genetic makeup of a population
 - (4) rate of succession in the environment

- 13 Which statement is *not* part of the concept of natural selection?
- (1) Individuals that possess the most favorable variations will have the best chance of reproducing.
 - (2) Variation occurs among individuals in a population.
 - (3) More individuals are produced than will survive.
 - (4) Genes of an individual adapt to a changing environment.

- 14 The diagram below shows the evolution of some different species of flowers.

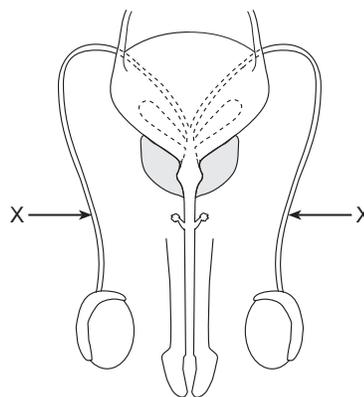


Which statement about the species is correct?

- (1) Species A, B, C, and D came from different ancestors.
 - (2) Species C evolved from species B.
 - (3) Species A, B, and C can interbreed successfully.
 - (4) Species A became extinct.
- 15 In sexually reproducing species, the number of chromosomes in each body cell remains the same from one generation to the next as a direct result of
- (1) meiosis and fertilization
 - (2) mitosis and mutation
 - (3) differentiation and aging
 - (4) homeostasis and dynamic equilibrium

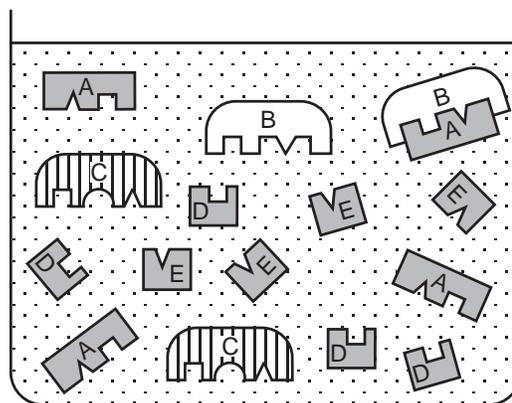
- 16 One function of the placenta in a human is to
- (1) surround the embryo and protect it from shock
 - (2) allow for mixing of maternal blood with fetal blood
 - (3) act as the heart of the fetus, pumping blood until the fetus is born
 - (4) permit passage of nutrients and oxygen from the mother to the fetus

- 17 Some body structures of a human male are represented in the diagram below.



An obstruction in the structures labeled X would directly interfere with the

- (1) transfer of sperm to a female
 - (2) production of sperm
 - (3) production of urine
 - (4) transfer of urine to the external environment
- 18 The diagram below represents a beaker containing a solution of various molecules involved in digestion.



Which structures represent products of digestion?

- | | |
|-------------|-------------|
| (1) A and D | (3) B and E |
| (2) B and C | (4) D and E |

22 Which statement best describes what will most likely happen when an individual receives a vaccination containing a weakened pathogen?

- (1) The ability to fight disease will increase due to antibodies received from the pathogen.
- (2) The ability to fight disease caused by the pathogen will increase due to antibody production.
- (3) The ability to produce antibodies will decrease after the vaccination.
- (4) The ability to resist most types of diseases will increase.

23 When a certain plant is without water for an extended period of time, guard cells close openings in the leaves of the plant. This activity conserves water and illustrates

- (1) cellular communication involving the action of nerve cells and receptor sites
- (2) an increase in rate of growth due to a low concentration of water
- (3) maintenance of a dynamic equilibrium through detection and response to stimuli
- (4) a response to one biotic factor in the environment

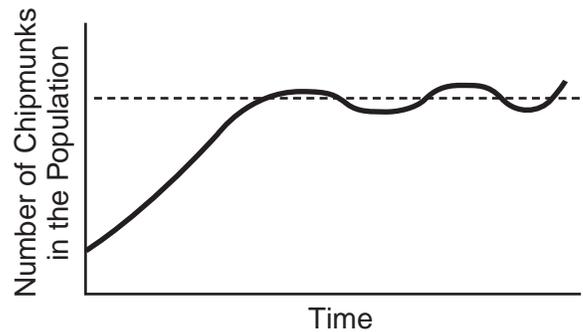
24 Which process usually uses carbon dioxide molecules?

- (1) cellular respiration
- (2) asexual reproduction
- (3) active transport
- (4) autotrophic nutrition

25 A particular species of unicellular organism inhabits the intestines of termites, where the unicellular organisms are protected from predators. Wood that is ingested by the termites is digested by the unicellular organisms, forming food for the termites. The relationship between these two species can be described as

- (1) harmful to both species
- (2) parasite/host
- (3) beneficial to both species
- (4) predator/prey

26 A population of chipmunks migrated to an environment where they had little competition. Their population quickly increased but eventually stabilized as shown in the graph.



Which statement best explains why the population stabilized?

- (1) Interbreeding between members of the population increased the mutation rate.
- (2) The population size became limited due to factors such as availability of food.
- (3) An increase in the chipmunk population caused an increase in the producer population.
- (4) A predator species came to the area and occupied the same niche as the chipmunks.

27 Which factor is a major cause of global warming?

- (1) increased burning of fuels
- (2) increased number of green plants
- (3) decreased mineral availability
- (4) decreased carbon dioxide in the atmosphere

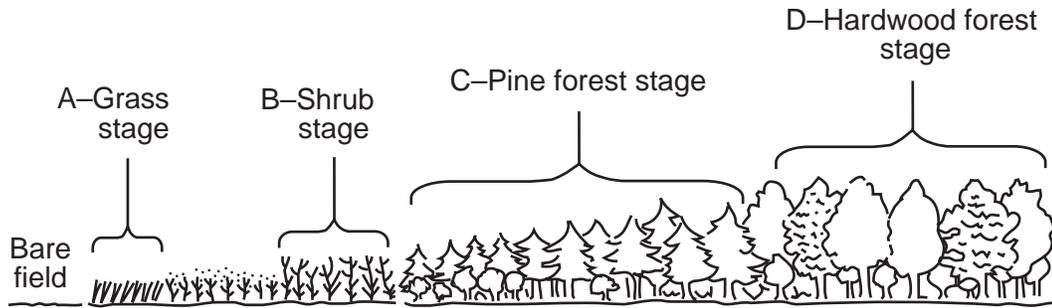
28 If humans remove carnivorous predators such as wolves and coyotes from an ecosystem, what will probably be the first observable result?

- (1) The natural prey will die off.
- (2) Certain plant populations will increase.
- (3) Certain herbivores will exceed carrying capacity.
- (4) The decomposers will fill the predator niche.

29 Which situation has had the most *negative* effect on the ecosystems of Earth?

- (1) use of air pollution controls
- (2) use of natural predators to control insect pests
- (3) recycling glass, plastic, and metals
- (4) increasing human population

30 Stage *D* in the diagram below is located on land that was once a bare field.



The sequence of stages leading from bare field to stage *D* best illustrates the process known as

- (1) replication
- (2) recycling
- (3) feedback
- (4) succession

Part B-1

Answer all questions in this part. [10]

Directions (31–40): 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.

Base your answers to questions 31 through 34 on the passage below and on your knowledge of biology.

. . . Some of the most common and deadly bacteria do their mischief by forming a sticky scum called biofilm. Individually, the microbes are easy to control, but when they organize themselves into biofilms they can become deadly, said Dr. Barbara Iglewski of the University of Rochester. . . .

Biofilms are actually intricately organized colonies of billions of microbes, all working in a coordinated way to defend against attack and to pump out a toxin that can be deadly.

Once they are organized, the bacteria are highly resistant to antibiotics and even strong detergents often cannot wash them away or kill them.

Iglewski and colleagues from Montana State University and the University of Iowa report in *Science* that they discovered how the microbes in the colonies communicate and found that once this conversation is interrupted, the deadly bugs can be easily washed away.

Using *Pseudomonas aeruginosa*, a common bacteria that is a major infection hazard in hospitals and among cystic fibrosis patients, the researchers isolated a gene that the bacteria uses to make a communications molecule. The molecule helps the microbes organize themselves into a biofilm — a complex structure that includes tubes to carry in nutrients and carry out wastes, including deadly toxins.

In their study, the researchers showed that if the gene that makes the communications molecule was blocked, the *Pseudomonas aeruginosa* could form only wimpy [weak], unorganized colonies that could be washed away with just a soap that has no effect on a healthy colony. . . .

Adapted from: Paul Recer, "Researchers find new means to disrupt attack by microbes,"
The Daily Gazette, April 26, 1998.

31 What is one characteristic of a biofilm?

- (1) presence of tubes to transport materials into and out of the colony
- (2) presence of a nervous system for communication within the colony
- (3) ease with which colonies can be broken down by detergents
- (4) lack of resistance of the bacterial colony to antibiotics

32 Which statement best describes *Pseudomonas aeruginosa* bacteria?

- (1) They cause mutations in humans.
- (2) They are easy to control.
- (3) They cause major infection problems in hospitals.
- (4) They are deadly only to people with cystic fibrosis.

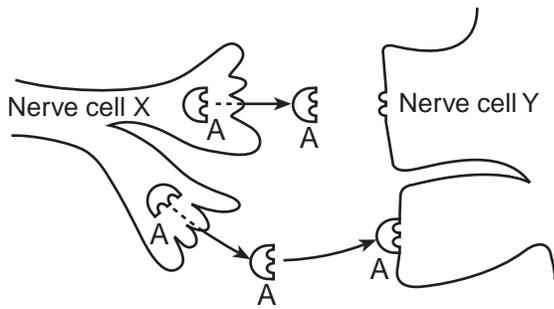
33 The tubes in biofilms function much like the human

- (1) muscular and nervous systems
- (2) circulatory and excretory systems
- (3) digestive and endocrine systems
- (4) reproductive and respiratory systems

34 Bacteria that form biofilms may be controlled most effectively by

- (1) antibiotics
- (2) detergents
- (3) cutting the tubes through which the bacteria communicate
- (4) blocking the expression of a gene that helps the colonies to organize

Base your answers to questions 35 through 37 on the diagram below and on your knowledge of biology.



35 The process represented in the diagram best illustrates

- (1) cellular communication
- (2) muscle contraction
- (3) extraction of energy from nutrients
- (4) waste disposal

36 Which statement best describes the diagram?

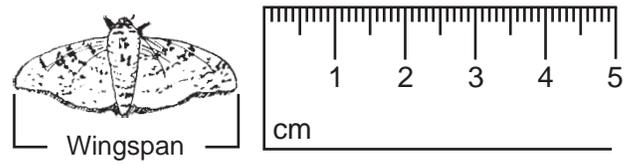
- (1) Nerve cell X is releasing receptor molecules.
- (2) Nerve cell Y is signaling nerve cell X.
- (3) Nerve cell X is attaching to nerve cell Y.
- (4) Nerve cell Y contains receptor molecules for substance A.

37 A drug is developed that, due to its molecular shape, blocks the action of substance A. Which shape would the drug molecule most likely resemble?



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

38 A peppered moth and part of a metric ruler are represented in the diagram below.



Which row in the chart below best represents the ratio of body length to wingspan of the peppered moth?

Row	Body Length:Wingspan
(1)	1:1
(2)	2:1
(3)	1:2
(4)	2:2

39 Enzymes are used in moving sections of DNA that code for insulin from the pancreas cells of humans into a certain type of bacterial cell. This bacterial cell will reproduce, giving rise to offspring that are able to form

- (1) human insulin
- (2) antibodies against insulin
- (3) enzymes that digest insulin
- (4) a new type of insulin

40 To determine which colors of light are best used by plants for photosynthesis, three types of underwater green plants of similar mass were subjected to the same intensity of light of different colors for the same amount of time. All other environmental conditions were kept the same. After 15 minutes, a video camera was used to record the number of bubbles of gas each plant gave off in a 30-second period of time. Each type of plant was tested six times. The average of the data for each plant type is shown in the table below.

Average Number of Bubbles Given Off in 30 Seconds

Plant Type	Red Light	Yellow Light	Green Light	Blue Light
<i>Elodea</i>	35	11	5	47
<i>Potamogeton</i>	48	8	2	63
<i>Utricularia</i>	28	9	6	39

Which statement is a valid inference based on the data?

- (1) Each plant carried on photosynthesis best in a different color of light.
 - (2) Red light is better for photosynthesis than blue light.
 - (3) These types of plants make food at the fastest rates with red and blue light.
 - (4) Water must filter out red and green light.
-

Part B-2

**For Teacher
Use Only**

Answer all questions in this part. [15]

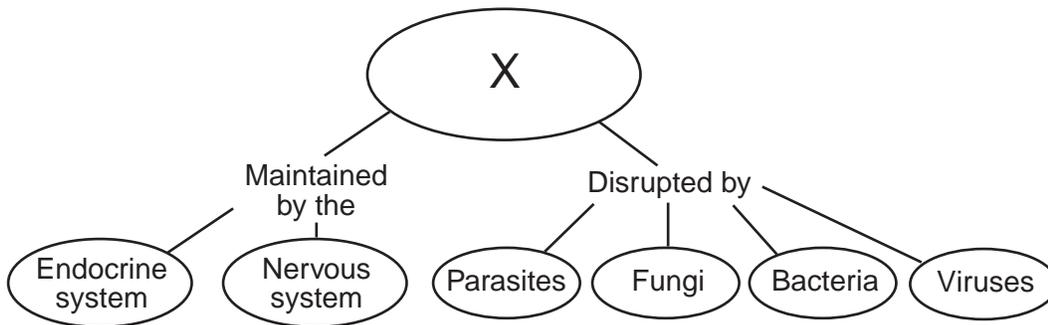
Directions (41-54): For those questions that are followed by four choices, circle the number of the choice that best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question.

41 Using appropriate information, fill in spaces *A* and *B* in the chart below. In space *A* identify an organ in the human body where molecules diffuse into the blood. In space *B* identify a specific molecule that diffuses into the blood at this organ. [2]

An organ in the human body where molecules diffuse into the blood	A specific molecule that diffuses into the blood at this organ
A	B

41

Base your answer to question 42 on the diagram below and on your knowledge of biology.



42 What term or phrase does letter *X* most likely represent? [1]

42

Base your answers to questions 43 through 46 on the information below and on your knowledge of biology.

**For Teacher
Use Only**

Three students each added equal volumes of pond water to four beakers and placed each beaker in a different water bath. Each student maintained the water baths at temperatures shown in the data table. The students then added an equal number of water fleas to each of their four beakers. After one hour, the students used microscopes to determine the average heart rate of the water fleas. The procedure was repeated for a total of three trials at each temperature. The results of the investigation are summarized in the data table.

Water Flea Heart Rate

Water Temperature (°C)	Average Water Flea Heart Rate (beats/minute)
5	40
15	119
25	205
35	280

Directions (43–44): Using the information in the data table, construct a line graph on the grid provided, following the directions below.

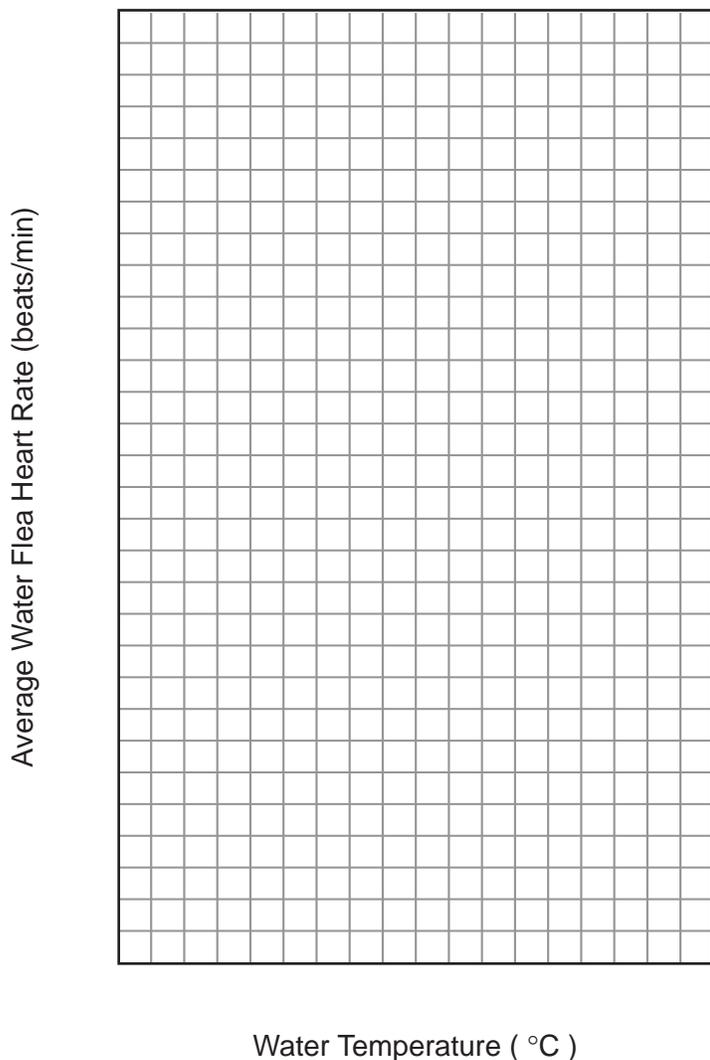
43 Mark an appropriate scale on each labeled axis. [1]

44 Plot the data for the average heart rate on the grid. Surround each point with a small circle and connect the points. [1]

Example:



The Effect of Temperature on Water Flea Heart Rate



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43

44

45 The independent variable in this investigation is the

- (1) number of trials
- (2) number of water fleas
- (3) temperature of the water
- (4) average heart rate

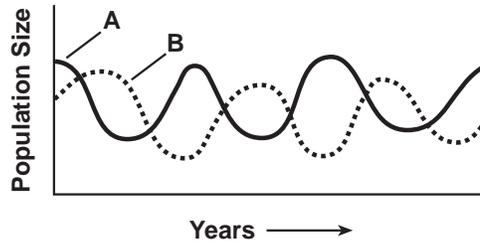
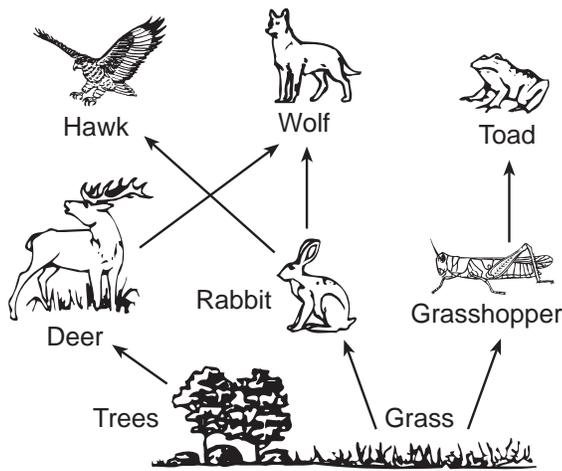
45

46 State the relationship between temperature and heart rate in water fleas. [1]

46

Base your answers to questions 47 through 49 on the food web and graph below and on your knowledge of biology. The graph represents the interaction of two different populations, A and B, in the food web.

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47 Population A is made up of living animals. The members of population B feed on these living animals. The members of population B are most likely

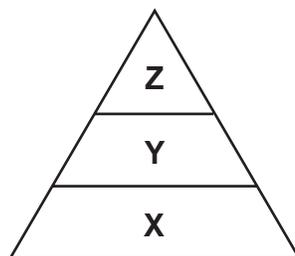
- (1) scavengers
- (2) autotrophs
- (3) predators
- (4) parasites

47

48 Identify one heterotroph from the food web that could be a member of population A. [1]

48

49 An energy pyramid is shown below.



Identify one organism shown in the food web that would be found at level X. [1]

49

Base your answers to questions 50 through 52 on the information and chart below and on your knowledge of biology.

**For Teacher
Use Only**

In DNA, a sequence of three bases is a code for the placement of a certain amino acid in a protein chain. The table below shows some amino acids with their abbreviations and DNA codes.

Amino Acid	Abbreviation	DNA Code
Phenylalanine	Phe	AAA, AAG
Tryptophan	Try	ACC
Serine	Ser	AGA, AGG, AGT, AGC, TCA, TCG
Valine	Val	CAA, CAG, CAT, CAC
Proline	Pro	GGA, GGG, GGT, GGC
Glutamine	Glu	GTT, GTC
Threonine	Thr	TGA, TGG, TGT, TGC
Asparagine	Asp	TTA, TTG

50 Which amino acid chain would be produced by the DNA base sequence below?

C-A-A-G-T-T-A-A-A-T-T-A-T-T-G-T-G-A

- (1) Val — Glu — Phe — Asp — Thr — Asp
- (2) Val — Pro — Phe — Asp — Asp — Thr
- (3) Val — Glu — Phe — Asp — Asp — Thr
- (4) Val — Glu — Phe — Thr — Asp — Asp

50

51 Identify one environmental factor that could cause a base sequence in DNA to be changed to a different base sequence. [1]

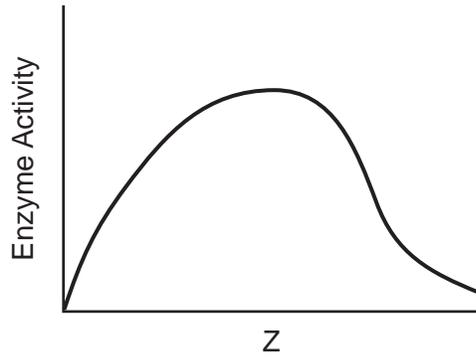
51

52 Describe how a protein would be changed if a base sequence mutates from GGA to TGA. [1]

52

53 An incomplete graph is shown below.

Effect of Z on Enzyme Activity



What label could appropriately be used to replace letter Z on the axis? [1]

53

54 A farmer has been growing only corn in his fields for several years. Each year the corn stalks were cut off near the ground and processed to be used as food for cattle. The farmer observed that with each passing year, corn production in his fields decreased. Explain why removing the dead corn stalks reduced corn production in these fields. [1]

54

**For Teacher
Use Only**

Part C

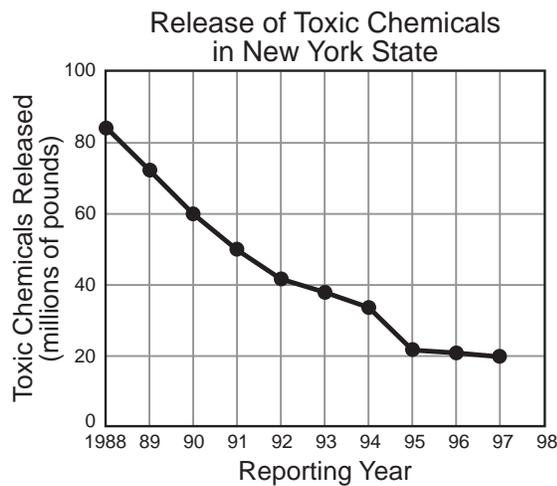
Answer all questions in this part. [17]

Directions (55–60): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 55 through 57 on the information and graph below.

Reducing toxic chemicals released into the environment often requires laws. When making decisions about whether or not to support the passing of such laws, individuals must weigh the benefits against the potential risks if the law is not passed.

The amounts of toxic chemicals released into the environment of New York State over a ten-year period are shown in the graph below.



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Use Only**

55 State one possible *negative* effect of passing a law to reduce the release of toxic chemicals. [1]

55

56 State one possible explanation for why the amount of toxic chemicals released remained relatively constant between 1995 and 1997. [1]

56

57 State one other type of environmental problem that has been reduced by passing laws. [1]

57

Part D

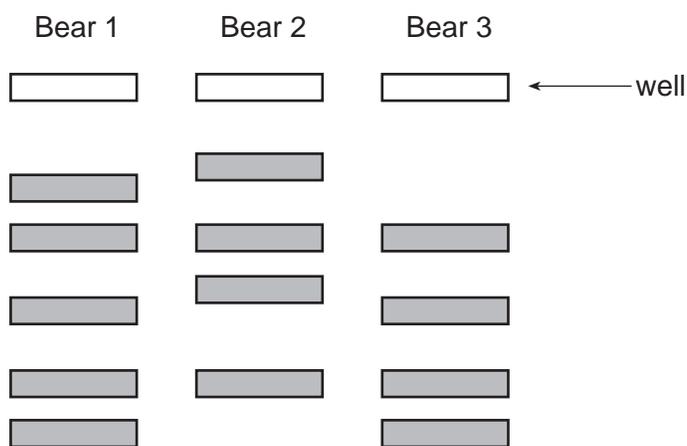
**For Teacher
Use Only**

Answer all questions in this part. [13]

Directions (61–67): 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.

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

The diagram below shows the results of a test that was done using DNA samples from three bears of different species. Each DNA sample was cut into fragments using a specific enzyme and placed in the wells as indicated below. The DNA fragments were then separated using gel electrophoresis.



61 Which *two* bears are most closely related? Support your answer with data from the test results. [2]

61

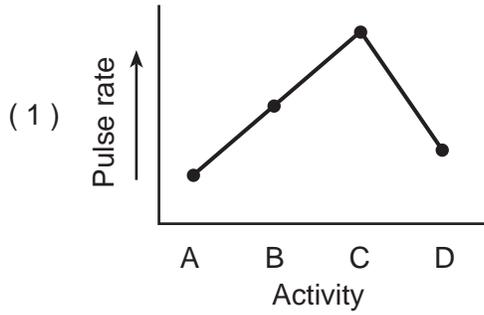
62 Identify one additional way to determine the evolutionary relationship of these bears. [1]

62

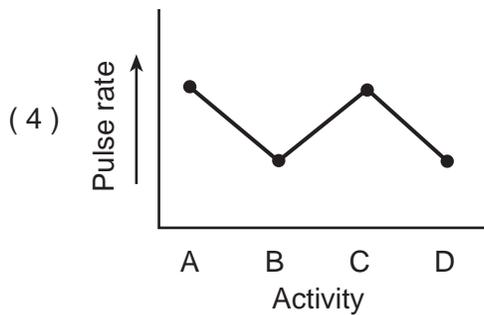
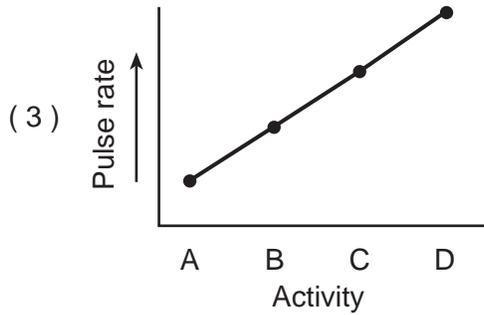
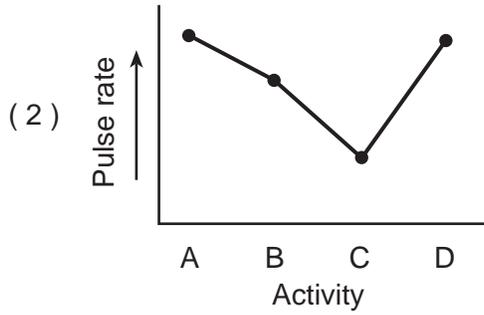
66 A student measures his pulse rate while he is watching television and records it. Next, he walks to a friend's house nearby and when he arrives, measures and records his pulse rate again. He and his friend then decide to run to the mall a few blocks away. On arriving at the mall, the student measures and records his pulse rate once again. Finally, after sitting and talking for a half hour, the student measures and records his pulse rate for the last time.

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Which graph below best illustrates the expected changes in his pulse rate according to the activities described above?



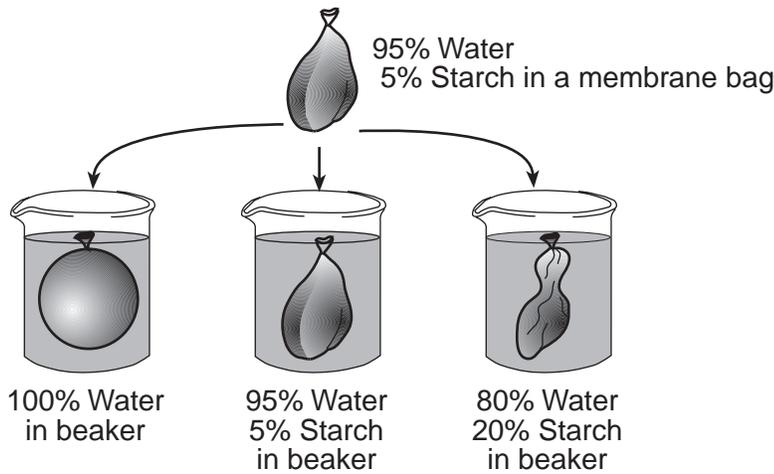
Key:Activity
 A = after watching television
 B = after walking to a friend's house
 C = after running to the mall
 D = after sitting and talking



66

67 An investigation was set up to study the movement of water through a membrane. The results are shown in the diagram below.

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Use Only**



Based on these results, which statement correctly predicts what will happen to red blood cells when they are placed in a beaker containing a water solution in which the salt concentration is much higher than the salt concentration in the red blood cells?

- (1) The red blood cells will absorb water and increase in size.
 - (2) The red blood cells will lose water and decrease in size.
 - (3) The red blood cells will first absorb water, then lose water and maintain their normal size.
 - (4) The red blood cells will first lose water, then absorb water, and finally double in size.
-

67



Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT

Friday, June 18, 2004 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Student Sex: Female
 Male

Teacher

School Grade

Part	Maximum Score	Student's Score
A	30	
B-1	10	
B-2	15	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
Raters' Initials		
Rater 1 Rater 2		

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

Part A

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

Part A Score

Part B-1

- | | |
|----------|----------|
| 31 | 36 |
| 32 | 37 |
| 33 | 38 |
| 34 | 39 |
| 35 | 40 |

Part B-1 Score

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

LIVING ENVIRONMENT

Tear Here

Tear Here

LIVING ENVIRONMENT

FOR TEACHERS ONLY

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

LE

LIVING ENVIRONMENT

Friday, June 18, 2004 — 1:15 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 and Part B-1

Allow one credit for each correct answer.

Part A					Part B-1				
1	2	11	2	21	2	31	1	36	4
2	3	12	3	22	2	32	3	37	2
3	1	13	4	23	3	33	2	38	3
4	3	14	4	24	4	34	4	39	1
5	2	15	1	25	3	35	1	40	3
6	4	16	4	26	2				
7	1	17	1	27	1				
8	3	18	4	28	3				
9	1	19	2	29	4				
10	2	20	2	30	4				

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. Visit the site <http://www.emsc.nysed.gov/osa/> and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

LIVING ENVIRONMENT – *continued*

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.

On the detachable answer sheet for Part A and Part B–1, 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 each of these parts.

At least two science teachers must participate in the scoring of the Part B–2, Part C, and Part D open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score all the open-ended questions on a student's answer paper.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. In the student's examination booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

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

Raters should enter the scores earned for Part A, Part B–1, Part B–2, Part C, and Part D on the appropriate lines in the box printed on the answer sheet and should add these 5 scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Friday, June 18, 2004. The student's scaled score should be entered in the box labeled "Final Score" on the student's answer booklet. The scaled score is the student's final examination score.

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

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

Part B–2

- 41 Allow a maximum of 2 credits, 1 credit for completing space *A* and 1 credit for completing space *B*.

Examples of 2-Credit Responses

<i>A</i> Lung	<i>B</i> oxygen
<i>A</i> Small intestine	<i>B</i> glucose
<i>A</i> Large intestine	<i>B</i> water

- 42 Allow 1 credit for a correct term or phrase that letter *X* most likely represents in the diagram. Acceptable responses include, but are not limited to:

- homeostasis
- dynamic equilibrium
- steady state
- coordination
- regulation
- human body
- heart

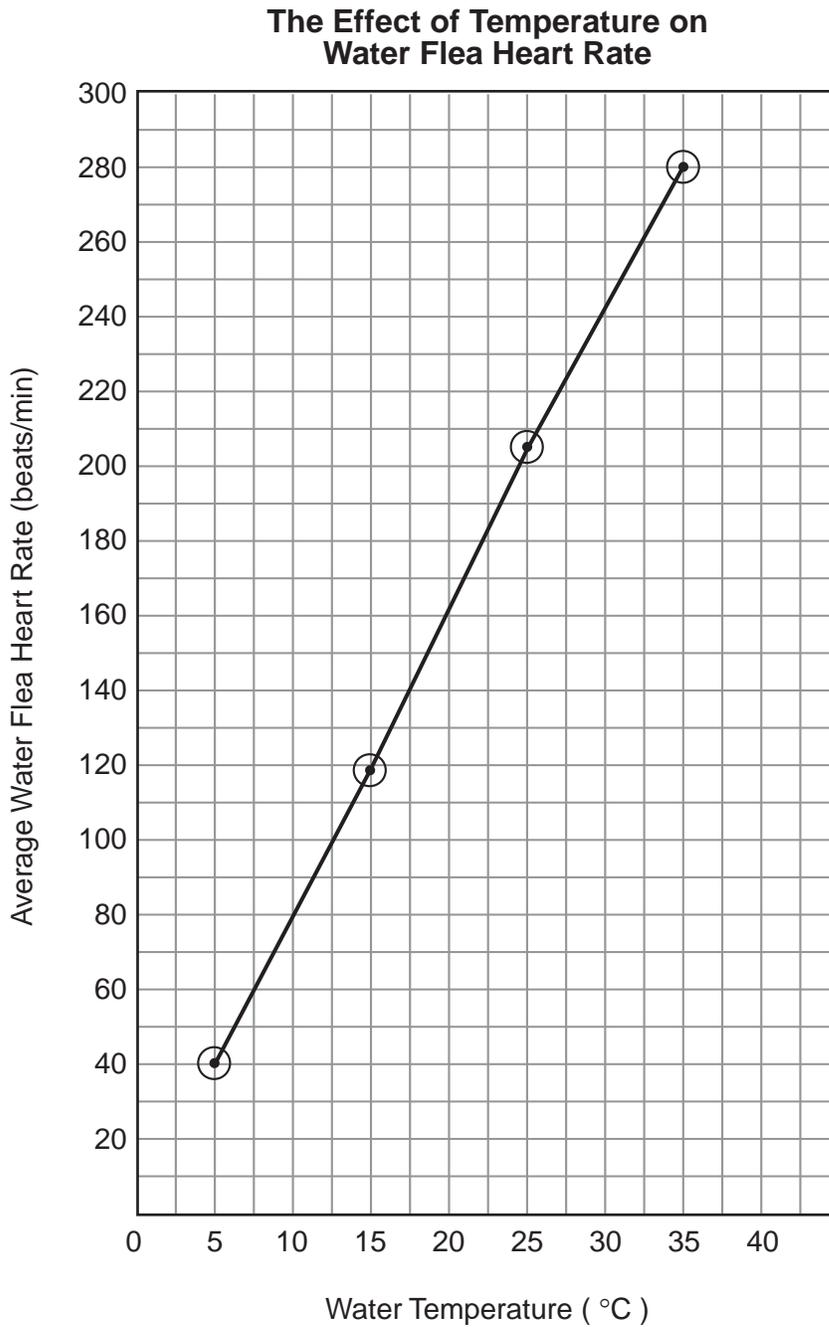
- 43 Allow 1 credit for marking an appropriate scale on each labeled axis.

Note: Make no assumptions about the origin unless it is labeled.

- 44 Allow 1 credit for plotting the data for the average heart rate correctly (based on the student's axes), surrounding each point with a small circle, and connecting the points.

Note: Credit may be allowed if the points are plotted correctly but not circled.

Example of a 2-Credit Graph



45 3

46 Allow 1 credit for stating the relationship between temperature and heart rate in water fleas. Acceptable responses include, but are not limited to:

- As the temperature increases, the heart rate increases.
- As temperature changes from 35°C to 5°C, heart rate in the water flea decreases.

47 3

48 Allow 1 credit for **rabbit** *or* **grasshopper** *or* **deer**.

49 Allow 1 credit for **trees** *or* **grass**.

50 3

51 Allow 1 credit for identifying one environmental factor that could cause a base sequence in DNA to be changed to a different base sequence. Acceptable responses include, but are not limited to:

- ultraviolet light
- radiation
- x rays
- chemicals

52 Allow 1 credit for describing how a protein would be changed if a base sequence mutates from GGA to TGA. Acceptable responses include, but are not limited to:

- The shape of the protein may be changed.
- The amino acid sequence would be different.
- The protein would contain threonine instead of proline.
- The protein being synthesized may not work correctly.
- The protein will not be able to function.

53 Allow 1 credit for identifying a label that could appropriately be used to replace letter Z on the axis. Acceptable responses include, but are not limited to:

- temperature
- pH
- time

54 Allow 1 credit for explaining why removing the dead cornstalks reduced corn production in these fields. Acceptable responses include, but are not limited to:

- Materials are not recycled.
- Soil minerals decrease.

Part C

- 55** Allow 1 credit for stating one possible negative effect of passing a law to reduce the release of toxic chemicals. Acceptable responses include, but are not limited to:
- Products will cost more money.
 - Jobs may be lost.
 - Businesses may move to states with fewer restrictions.
 - Tax revenues could be lost.
- 56** Allow 1 credit for stating one possible explanation for why the amount of toxic chemicals released remained relatively constant between 1995 and 1997. Acceptable responses include, but are not limited to:
- The laws had been in place long enough for businesses to reduce toxic chemical output to the lowest possible levels.
 - The laws may have set 20 million pounds as an acceptable limit.
 - stricter law enforcement
- 57** Allow 1 credit for identifying one other type of environmental problem that has been reduced by passing laws. Acceptable responses include, but are not limited to:
- pollution
 - endangered wildlife
 - landfills
 - poor air quality
 - litter

- 58 Allow a maximum of 6 credits for a brief explanation of some of the steps in the process of human development, allocated as follows:
- Allow 1 credit for explaining how a zygote is formed. Acceptable responses include, but are not limited to:
 - Gametes fuse.
 - Fertilization occurs.
 - Sperm and egg fuse.
 - Allow 1 credit for comparing the genetic content of the zygote to that of a body cell of the parents. Acceptable responses include, but are not limited to:
 - The zygote is not genetically identical to a body cell of either parent.
 - The zygote has the same chromosome number as a body cell of the parents.
 - Half of the zygote’s chromosomes come from each parent.
 - Allow 1 credit for identifying one developmental process involved in the change from a zygote into an embryo. Acceptable responses include, but are not limited to:
 - differentiation
 - mitosis
 - cell division
 - cleavage
 - Allow 1 credit for **uterus**.
 - Allow a maximum of 2 credits, 1 credit for each of two factors that can affect fetal development and an explanation of how each factor affects fetal development. Acceptable responses include, but are not limited to:
 - Alcohol can affect development of the brain.
 - Smoking can result in premature births/low birth weight.
 - Crack can cause the placenta to separate prematurely resulting in brain damage or death.
 - Malnutrition in the mother can result in low birth weight.
 - Genes will affect how the baby develops.
 - The amnion provides a watery environment and protection.
 - Good nutrition by the mother favors healthy development.

58 continued

Example of a 6-Credit Response

- In humans, when the male and female gametes fuse, a zygote is formed. This process is fertilization and the result is a cell with the same amount of genetic information as a body cell of the parents. The zygote will develop into an embryo by the processes of mitosis and differentiation. Most fetal development occurs in the uterus. Many factors affect development. If the genetic information is incomplete or faulty, the embryo may not develop correctly or may die. The environment is also very important. X rays can cause mutations and alcohol can result in brain damage.

59 Allow a maximum of 5 credits for describing the nature of AIDS and identifying two ways to prevent or control the spread of infectious diseases, such as AIDS, allocated as follows:

- Allow 1 credit for indicating that AIDS is caused by a virus.
- Allow 1 credit for indicating that the virus attacks the immune system of the body.
- Allow 1 credit for indicating that when the immune system is weakened, the body is less able to defend itself from other infections or cancer than the body would often be able to overcome.
- Allow a maximum of 2 credits, 1 credit for each of two ways to prevent or control the spread of infectious diseases, such as AIDS. Acceptable responses include, but are not limited to:
 - good hygiene
 - vaccination
 - Avoid transfer of body fluids from sexual contact.
 - Avoid sharing of needles used for injection of drugs.
 - antibody injections

- 60** Allow a maximum of 3 credits for explaining what the problem of loss of biodiversity is and describing some ways humans are involved in both the problem and the possible solutions, allocated as follows:
- Allow 1 credit for stating the meaning of the term biodiversity. Acceptable responses include, but are not limited to:
 - Biodiversity means many different species live in a particular habitat.
 - A particular habitat has much variation in the types of organisms found there.
 - Allow 1 credit for stating one negative effect on humans if biodiversity continues to be lost. Acceptable responses include, but are not limited to:
 - Lost organisms may have possible medical use.
 - Genes from lost organisms are not available to use for development of new varieties of organisms.
 - disruption of food chains
 - Allow 1 credit for suggesting one practice that could be used to preserve biodiversity in New York State. Acceptable responses include, but are not limited to:
 - laws that protect habitat
 - setting aside of wilderness areas
 - hunting and fishing laws
 - reducing pollution

Example of a 3-Credit Response

- Biodiversity is present when a habitat has a wide variety of species living there. Continued loss of biodiversity could result in loss of species that may have genetic information we could use to treat human diseases or engineer into farm animals or crops. A law that protects a large forest or wetland area from development would allow the species there to remain undisturbed.

Part D

- 61** Allow a maximum of 2 credits, 1 credit for indicating that bears 1 and 3 are most closely related and 1 credit for indicating that they have more DNA bands (4) in common.
- 62** Allow 1 credit for identifying one additional way to determine the evolutionary relationship of these bears. Acceptable responses include, but are not limited to:
- Compare proteins from the bears.
 - Compare embryonic similarities.
 - Compare structural similarities.

Note: Do not allow credit for comparison of life functions or habitats.

63 1

- 64** Allow 1 credit for identifying one procedure, other than electrophoresis, that is used in the laboratory to separate the different types of molecules in a liquid mixture. Acceptable responses include, but are not limited to:
- chromatography
 - centrifugation
 - diffusion through a membrane
 - filtering

65 Allow a maximum of 6 credits for describing a controlled experiment to test the claim, allocated as follows:

- Allow 1 credit for stating the purpose of the experiment. Acceptable responses include, but are not limited to:
 - Determine if exercise improves the rate at which math problems are solved.
 - Test the guest’s claim.

Note: Credit may be given if time/rate is not mentioned in the purpose but is addressed in the other parts of the response.

- Allow 1 credit for indicating that a large sample size will increase the validity/reliability of the experiment.
- Allow a maximum of 2 credits, 1 credit for indicating that one group (the experimental group) will exercise and 1 credit for indicating that the other group (the control group) will not exercise.
- Allow 1 credit for stating the specific data to be collected during the experiment. Acceptable responses include, but are not limited to:
 - speed of solving math problems
 - number of math problems solved in a certain amount of time
 - how fast math problems can be solved
- Allow 1 credit for stating one way to determine if the results support the claim. Acceptable responses include, but are not limited to:
 - See if the experimental group solves math problems more rapidly than the control group.
 - Compare the number of math problems solved by the experimental and control groups in a given time period.

66 1

67 2

Regents Examination in Living Environment

June 2004

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

The *Chart for Determining the Final Examination Score for the June 2004 Regents Examination in Living Environment*, normally located on this page, will be posted on the Department's web site <http://www.emsc.nysed.gov/osa> on Friday, June 18, 2004. 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.

Map to Core Curriculum

June 2004 Living Environment

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

Part D 61-67	
Lab 1	61,62,63,64
Lab 2	65,66
Lab 5	67

Regents Examination in Living Environment June 2004

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

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
85	100	56	76	27	51
84	99	55	75	26	50
83	98	54	75	25	48
82	97	53	74	24	47
81	96	52	73	23	46
80	95	51	73	22	44
79	94	50	72	21	43
78	93	49	71	20	41
77	92	48	70	19	40
76	91	47	70	18	38
75	90	46	69	17	37
74	89	45	68	16	35
73	88	44	67	15	33
72	87	43	67	14	31
71	87	42	66	13	29
70	86	41	65	12	28
69	85	40	64	11	26
68	84	39	63	10	24
67	84	38	62	9	22
66	83	37	62	8	19
65	82	36	61	7	17
64	81	35	60	6	15
63	81	34	59	5	13
62	80	33	58	4	10
61	79	32	57	3	8
60	79	31	56	2	5
59	78	30	54	1	3
58	77	29	53	0	0
57	77	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 for that administration be used to determine the student's final score. The chart above is usable only for this administration of the living environment examination.