

**LIVING ENVIRONMENT  
REGENTS EXAMINATION**

**TEST SAMPLER DRAFT**

**Fall 2000**

The University of the State of New York  
THE STATE EDUCATION DEPARTMENT  
Office of Curriculum, Instruction, and Assessment  
Albany, New York 12234

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September 2000

Dear Colleagues:

Following several years of planning, piloting, and scoring different types of questions, the Living Environment Regents Test Sampler Draft is ready for distribution. School districts, science teachers, supervisors, and administrators have assisted the State Education Department in the development process in a variety of ways. Teachers have developed and reviewed the test items and scoring guides and pretested items with their students. Administrators have arranged for their students to participate in the pretest and field-test samples. Teachers and supervisors will continue to develop, pretest, and field-test questions for future Living Environment Regents Examinations.

This test sampler is being distributed to all high schools and middle schools, with the request to make additional copies available to all life science teachers. The test sampler provides examples of the types of questions, formats, and scoring guides that are being developed for the Living Environment Regents Examination that will be administered for the first time in June 2001. We expect that further refinements of the question formats and scoring guides will occur as a result of field tests that will be conducted this spring.

We are interested in receiving your feedback on these preliminary materials. A comment sheet is included on the inside back cover of the test sampler so that you may forward your responses to us. The comment sheet may be faxed to (518) 473-0858 or mailed to the address listed below:

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Sincerely,

Roseanne DeFabio

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## Introduction

The new Living Environment Regents Examination (Commencement Level) has been developed to assess student achievement of Standards 1 and 4 of the *Learning Standards for Mathematics, Science, and Technology*. Items for the new Living Environment Regents Examination were developed through the cooperative efforts of teachers, school districts, State Education Department staff, and science educators.

The concepts and skills identified in the introductions and major understandings for each key idea found in the *Living Environment Core Curriculum* and in the Laboratory Checklist will provide the material from which the examination items will be developed. The Laboratory Checklist is found in Appendix A of the original edition of the core curriculum, and right after the Standard 1 section in the newer editions. Questions will be content- and skills-based and may require students to graph, complete a data table, label diagrams, design experiments, analyze data, or write a response. In addition, questions will require students to hypothesize, interpret, evaluate, and apply their scientific knowledge and skills to real-world situations.

This examination will be administered in a three-hour period and will first be offered in June 2001. The examination will include three parts (A, B, and C). Students should be prepared to answer questions in multiple choice, constructed response, and extended constructed response formats. In the future, (not before June 2003) a Part D will be added that will focus on assessment of laboratory skills. It will be a written format based on a series of required laboratory experiences. The Part D assessment will reflect Standards 1 and 4, and the Living Environment Skills Checklist.

Students will be required to answer **ALL** of the questions on the examination. The general format of the examination follows:

### Test Format

PART	ITEM TYPE(S)	DESCRIPTION OF THE ITEMS	APPROXIMATE PERCENT OF TOTAL TEST RAW SCORE
A	Multiple-choice questions	Content-based questions assessing the student's knowledge and understanding of the core material	30–35
B	Multiple-choice and constructed-response questions	Content- and skills-based questions assessing the student's ability to apply, analyze, and evaluate material (Standards 1 and 4)	25–35
C	Constructed-response and/or extended constructed-response questions	Content and application questions assessing the student's ability to apply knowledge of science concepts and skills to address real-world situations (Standards 1, 4, and Appendix A)	15–25

Each examination will be scaled, and all examination forms equated, based on a standard-setting process. A chart for converting the student's total examination raw score to a scaled score will be provided in the rating guide for each administration. Teachers will score the examination in their districts, following guidelines provided by the New York State Education Department.

Appendix I, Examination Blueprint, indicates the approximate percentage of examination questions for each content standard in the living environment core curriculum. Appendices II and III, Mapping the Sampler to the Core Curriculum and Mapping the Core Curriculum to the Sampler, link each question in the test sampler to the living environment core curriculum. Individual questions may be linked to more than one standard or key idea.

Laboratory Requirements: Critical to understanding science concepts is the use of scientific inquiry to develop explanations of natural phenomena. Therefore, as a prerequisite for admission to the living environment Regents examination, students must have successfully completed 1,200 minutes of hands-on laboratory experience with satisfactory reports on file. Because of the strong emphasis on student development of laboratory skills, a minimum of 280 minutes of class and laboratory time per week is recommended.

Test modifications will be consistently provided to students with disabilities when it is determined that such accommodations are necessary. Such modifications must be documented either in an Individualized Education Plan (IEP) or in a Section 504 Accommodation Plan. Modifications are being redrawn to reflect the requirements of the new assessments. The revised State assessments are being developed by both special and general educators to ensure that they are appropriate for students with disabilities.

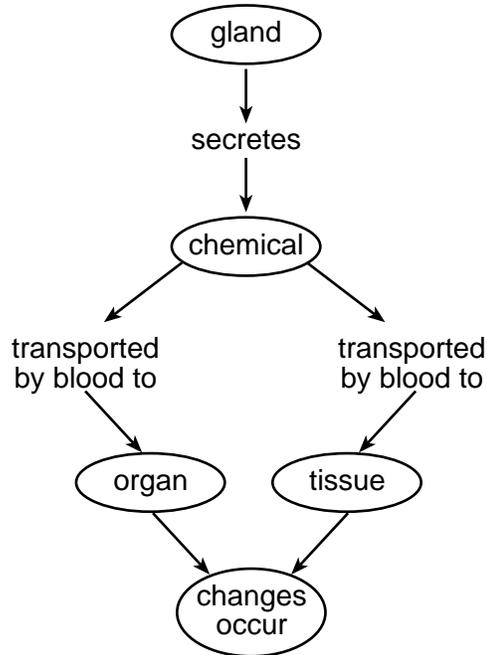
The Living Environment Regents Examination Test Sampler Draft may be used in the classroom to help teachers plan for instruction. Teachers are encouraged to use the sampler to introduce students to the test format, and to use the scoring rubrics for practice in scoring student papers.

## Sample Test Questions for the Living Environment Regents Examination Part A

*Directions (1-35):* For each statement or question, select the choice that best completes the statement or answers the question. Record your answer *on the separate answer paper*.

- 1 A biologist in a laboratory reports a new discovery based on experimental results. If the experimental results are valid, biologists in other laboratories should be able to
  - 1 repeat the experiment with a different variable and obtain the same results
  - 2 perform the same experiment and obtain different results
  - 3 repeat the same experiment and obtain the same results
  - 4 perform the same experiment under different experimental conditions and obtain the same results
  
- 2 Male reproductive cells from numerous grasshoppers, trout, and mice were examined and found to have flagella (a structure used for locomotion). A valid conclusion that can be made based on this observation is that
  - 1 only grasshoppers, trout, and mice produce reproductive cells with flagella
  - 2 all organisms produce male reproductive cells with flagella
  - 3 only male organisms produce reproductive cells with flagella
  - 4 all male grasshoppers, trout, and mice produce reproductive cells with flagella
  
- 3 To locate a specimen on a prepared slide with a compound microscope, a student should begin with the low-power objective rather than the high-power objective because the
  - 1 field of vision is smaller under low power than under high power
  - 2 field of vision is larger under low power than under high power
  - 3 specimen does not need to be stained for observation under low power but must be stained for observation under high power
  - 4 portion of the specimen that can be observed under low power is less than the portion that can be observed under high power
  
- 4 During a long-distance run on a hot day, an athlete produces large quantities of sweat. As a result, the kidneys change the rate of urine production. Why is this change important?
  - 1 Decreased urine production increases the amino acids in the blood.
  - 2 Increased urine production removes amino acids produced as a result of running.
  - 3 Decreased urine production allows the body to conserve water.
  - 4 Increased urine production allows more water to remain in the bloodstream.

5 An important method of communication between cells in an organism is shown in the diagram below.



What is the chemical referred to in the diagram?

- (1) a hormone important in maintaining homeostasis
- (2) an enzyme detected by a cell membrane receptor
- (3) DNA necessary for regulating cell functions
- (4) a food molecule taken in by an organism

6 Molecules *A* and *B* come in contact with the cell membrane of the same cell. Molecule *A* passes through the membrane readily, but molecule *B* does not. Which statement could describe molecules *A* and *B*?

- 1 Molecule *A* is a protein, and molecule *B* is a fat.
- 2 Molecule *A* is a starch, and molecule *B* is a simple sugar.
- 3 Molecule *A* is an amino acid, and molecule *B* is a simple sugar.
- 4 Molecule *A* is a simple sugar, and molecule *B* is a starch.

7 What occurs during the digestion of starch?

- 1 Specific enzymes break down starch into amino acids.
- 2 Specific hormones break down starch into simple sugars.
- 3 Specific hormones break down starch into complex starches.
- 4 Specific enzymes break down starch into simple sugars.

8 When the bacterium *Serratia marcescens* is grown on a sterile culture medium in a petri dish at 30°C, the bacterial colonies are cream colored. When this same bacterium is cultured under identical conditions, except at a temperature of 25°C, the colonies are brick red. This difference in color is most likely due to the

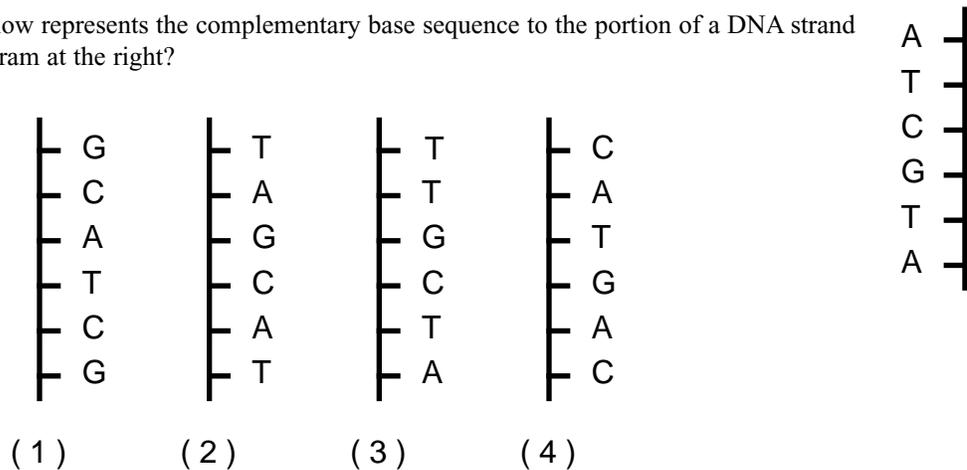
- 1 type of nutrients in the culture medium
- 2 sterilization of the culture medium
- 3 effect of temperature on the expression of the gene for color
- 4 effect of colony size on the synthesis of color pigments

- 9 A colony of bacteria is allowed to reproduce for 16 generations. A scientist examines the colony at the end of this time and notes that all the individuals are almost identical in all characteristics. This evidence suggests that the bacteria
- 1 did not receive the proper nutrients
  - 2 reproduced sexually
  - 3 exchanged genetic material
  - 4 reproduced asexually

- 10 A woman has a gene that causes a visual disorder. To prevent the disorder from appearing in her children, the defective gene would have to be repaired in the mother's

- 1 nervous system
- 2 reproductive cells
- 3 eye
- 4 uterus

- 11 Which DNA strand below represents the complementary base sequence to the portion of a DNA strand represented in the diagram at the right?



- 12 The presence of DNA is important for cellular metabolic activities because DNA

- 1 directs the production of proteins
- 2 is a structural component of cell membranes
- 3 directly increases the solubility of nutrients
- 4 is the major component of cytoplasm

- 13 Exposure to cosmic rays, x rays, ultraviolet rays, and radiation from radioactive substances may promote

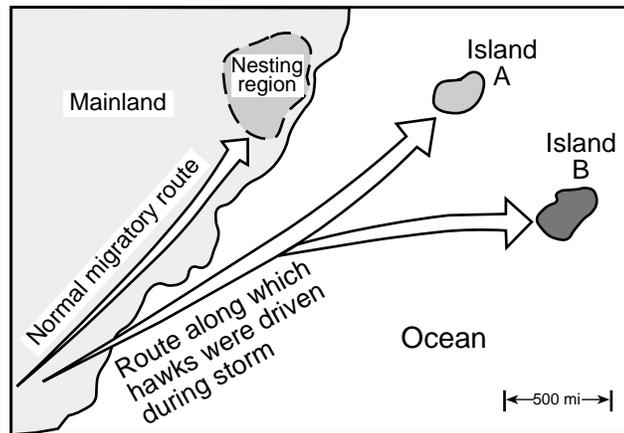
- 1 the production of similar organisms
- 2 new inheritable characteristics
- 3 an increase in population size
- 4 a change from sexual to asexual reproduction

- 14 The DNA sequences found in two different species are 95% the same. This similarity suggests that these species

- 1 are evolving into a single species
- 2 may have similar evolutionary histories
- 3 contain all the same proteins
- 4 have the same number of mutations

- 15 According to modern evolutionary theory, genes responsible for new traits that help a species survive in a particular environment will usually
- 1 not change in frequency
  - 2 decrease gradually in frequency
  - 3 decrease rapidly in frequency
  - 4 increase in frequency

- 16 Thousands of years ago, a large flock of hawks was driven from its normal migratory route by a severe storm. The birds scattered and found shelter on two distant islands, as shown on the map below. The environment of island *A* is very similar to the hawk s original nesting region. The environment of island *B* is very different from that of island *A*. The hawks have survived on these islands to the present day with no migration between the populations.

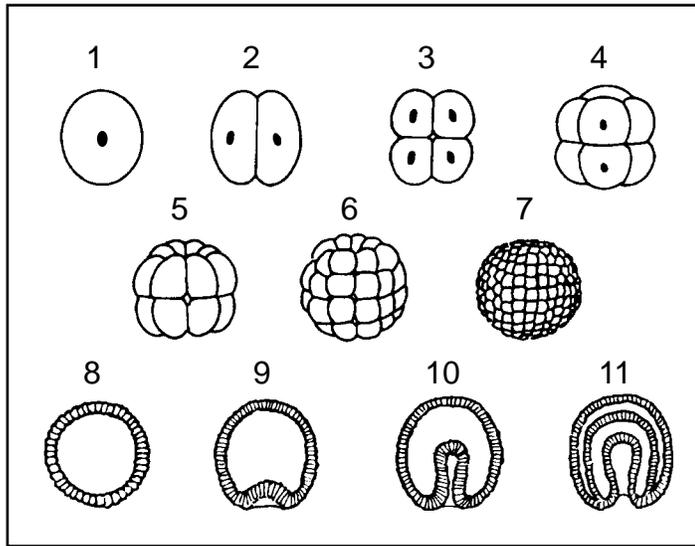


Which statement most accurately predicts the present-day condition of these island hawk populations?

- 1 The hawks that landed on island *B* have evolved more than those on island *A*.
  - 2 The hawks that landed on island *A* have evolved more than those on island *B*.
  - 3 The populations on islands *A* and *B* have undergone identical mutations.
  - 4 The hawks on island *A* have given rise to many new species.
- 17 Several white potato plants are grown from pieces of a potato placed in the ground. This method of reproduction is most similar to
- 1 sexual reproduction
  - 2 cloning
  - 3 genetic engineering
  - 4 zygote formation
- 18 Which statement best explains the significance of meiosis in the evolution of a species?
- 1 Meiosis produces eggs and sperm that are alike.
  - 2 Meiosis provides for genetic variation in the gametes produced by an organism.
  - 3 Equal numbers of eggs and sperm are produced by meiosis.
  - 4 The gametes produced by meiosis ensure the continuation of any particular species by asexual reproduction.

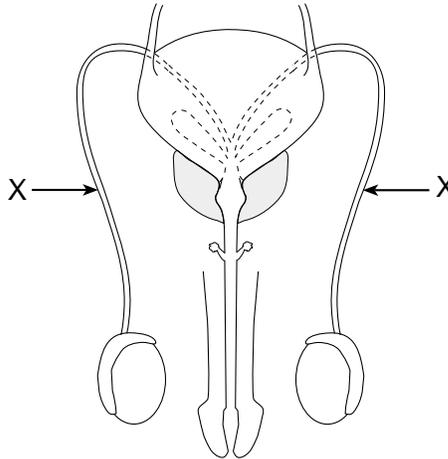
19 Which event does *not* occur between stages 2 and 11 in the process represented in the diagram below?

Early Embryonic Development of a Mouse



- (1) a decrease in cell size
- (2) DNA replication
- (3) mitotic cell division
- (4) fertilization

20 The diagram below represents the male reproductive system in humans.



If the structures labeled *X* were cut and tied off at the arrow, which change would occur immediately?

- 1 Hormones would no longer be produced.
- 2 Sperm would no longer be produced.
- 3 Sperm would be produced but no longer released from the body.
- 4 Urine would be produced but no longer released from the bladder.

21 The table below shows the rate of water loss in three different plants.

<b>Plant</b>	<b>Liters of Water Lost Per Day</b>
Cactus	0.02
Potato plant	1.00
Apple tree	19.00

One reason each plant loses a different amount of water is that each has

- 1 different numbers of guard cells which help to maintain homeostasis
- 2 different numbers of insulin-secreting cells that regulate water levels
- 3 the same number of chloroplasts but different rates of photosynthesis
- 4 the same rate of photosynthesis but different numbers of chloroplasts

22 Two test tubes were filled with a solution of bromthymol blue. A student exhaled through a straw into each tube, and the bromthymol blue turned yellow. An aquatic green plant was placed into each tube, and the tubes were corked. One tube was placed in the dark, and one was placed in direct sunlight. The yellow solution in the tube in sunlight turned blue, while the one in the dark remained yellow. Which statement best explains why the solution in the tube placed in sunlight returned to a blue color?

- 1 Oxygen was used for photosynthesis.
- 2 Oxygen was removed by respiration.
- 3 Carbon dioxide was removed by photosynthesis.
- 4 Carbon dioxide was produced by respiration.

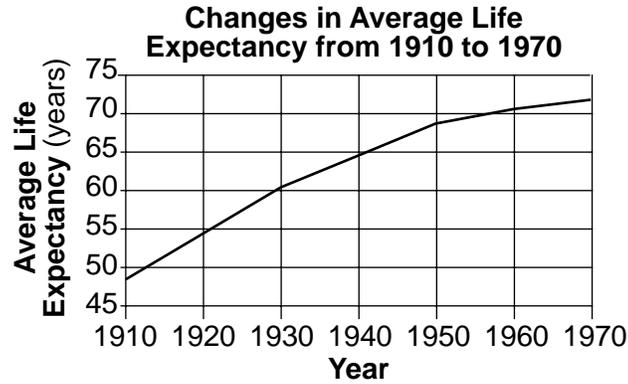
23 Cyanide is a poison that limits the ability of an animal cell to manufacture ATP. In a cell containing a small amount of cyanide, which process would be least affected?

- 1 movement
- 2 cell division
- 3 active transport
- 4 diffusion

24 One similarity between cell receptors and antibodies is that both

- 1 are produced by nerve cells
- 2 are highly specific in their actions
- 3 slow the rates of chemical reactions
- 4 are involved in digestion

25 The graph below shows data on the average life expectancy of humans.



The change in life expectancy from 1910 to 1970 is most likely the result of

- 1 an increase in poor land-use management that affected the quality of topsoil
- 2 the introduction of technology that had a negative impact on air quality
- 3 the development and introduction of new techniques to control disease
- 4 a widespread increase in the presence of lead and other heavy metals in water supplies

26 A person with AIDS is likely to develop infectious diseases because the virus that causes AIDS

- 1 destroys cancerous cells
- 2 damages the immune system
- 3 increases the rate of antibody production
- 4 increases the rate of microbe destruction

27 Which change would usually increase competition for food among the squirrel population in a certain area?

- 1 an epidemic of rabies among squirrels
- 2 an increase in the number of squirrels killed on the highways
- 3 an increase in the number of hawks that prey on squirrels
- 4 a temporary increase in the squirrel reproduction rate

Base your answers to questions 28 and 29 on the table below, which shows the type of food consumed by various animals in a community, and on your knowledge of biology.

Animals in the Community	Food Consumed in the Community				
	Shrews	Grasshoppers	Hawks	Snakes	Plants
Shrews		X			
Hawks	X			X	
Grasshoppers					X
Spiders		X			
Snakes	X				

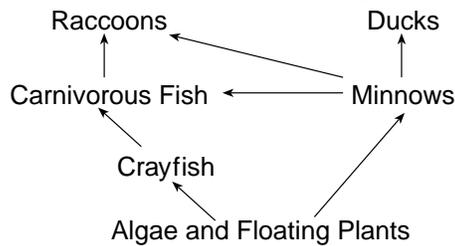
28 Under normal conditions, which organisms in this community would have the greatest amount of stored energy?

- 1 grasshoppers    3 plants
- 2 snakes            4 hawks

29 Which animals in the community would be classified as herbivores?

- 1 snakes            3 spiders
- 2 hawks            4 grasshoppers

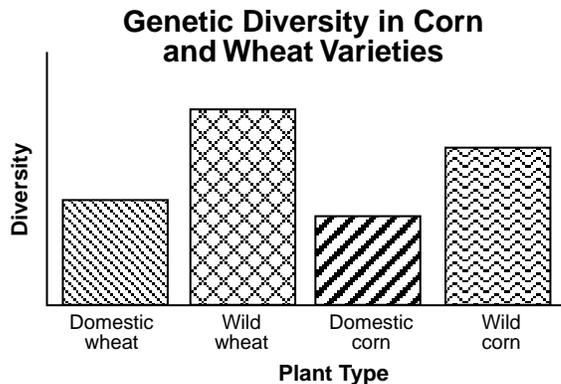
30 The diagram below illustrates the relationships between organisms in an ecosystem.



In addition to sunlight, which factor would need to be added to make this a stable ecosystem?

- 1 predators        3 decomposers
- 2 prey              4 herbivores

Base your answer to question 31 on the graph below and on your knowledge of biology.



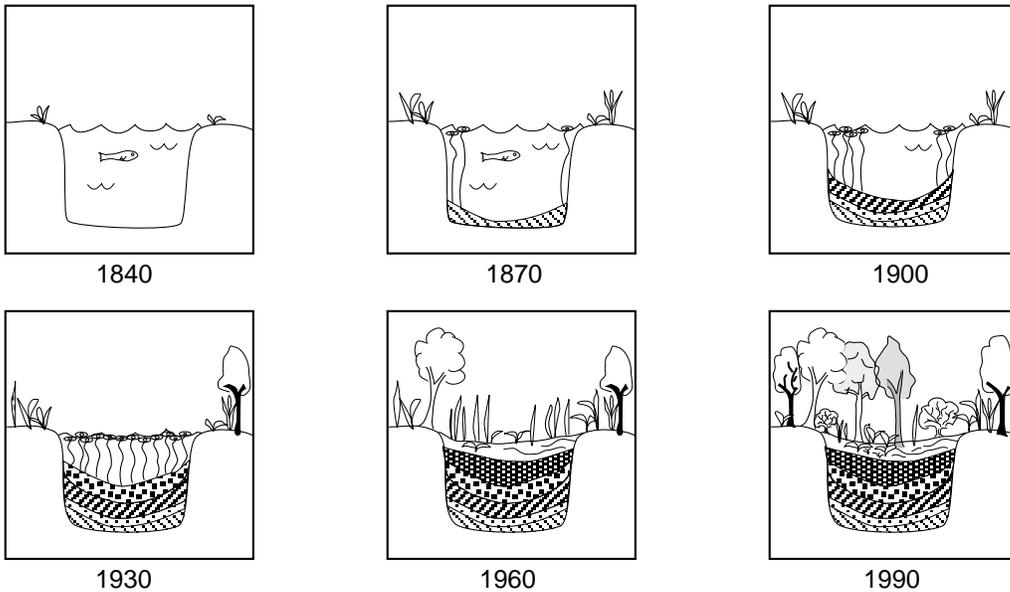
31 If the environment were to change dramatically or a new plant disease were to break out, which plant type would have the greatest chance of survival?

- 1 domestic wheat        3 domestic corn
- 2 wild wheat            4 wild corn

32 The use of technology often alters the equilibrium in ecosystems. With which statement would most scientists agree?

- 1 Humans should use their knowledge of ecology to consider the needs of future generations of humans and other species.
- 2 Humans should develop new technology to expand the influence of humans on natural communities.
- 3 Humans should learn how to control every aspect of the environment so that damage due to technology will be spread evenly.
- 4 Humans should develop the uninhabited parts of Earth for human population expansion.

Base your answer to question 33 on the sequence of diagrams below and on your knowledge of biology.



33 If no human intervention or natural disaster occurs, by the year 2050 this area will most likely be a

- 1 lake
- 2 swamp
- 3 desert
- 4 forest

34 Which human activity is most responsible for the other three human activities?

- 1 increasing demand for food
- 2 increasing loss of farmland
- 3 increasing human population
- 4 increasing air pollution

35 Endangered peregrine falcons have been bred in captivity and released in areas where they prey on pigeons and rodents. These activities are examples of

- 1 species preservation and biological pest control
- 2 overhunting and direct harvesting
- 3 recycling and technological development
- 4 conservation of resources and habitat destruction

## Part B

Answer all questions in this part. [30]

For those questions that are followed by four choices, select 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. Record your answers *on the separate answer paper*.

Base your answers to questions 36 through 41 on the information below and on your knowledge of biology.

A student performed a laboratory investigation to determine the effect of temperature on the heart rate of *Daphnia* (water flea). The following temperatures and heart rates were recorded:

20°C 260 beats/min; 10°C 152 beats/min;  
25°C 300 beats/min; 5°C 108 beats/min;  
15°C 200 beats/min

- 36 Organize the data by filling in the data table provided *on your answer paper*. Complete both columns in the data table so that the temperature either increases or decreases from the top to the bottom of the table. [1] The data table below is provided for practice purposes only. Be sure your final answer appears *on your answer paper*.

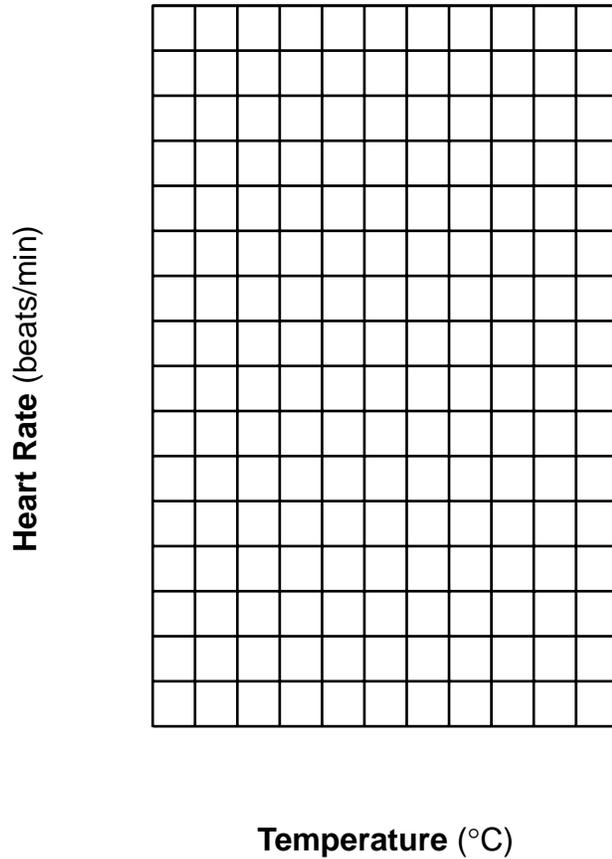
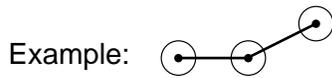
**Data Table**

Temperature (°C)	Heart Rate (beats/min)

*Directions (37-38):* Using the information provided, construct a line graph on the grid provided *on your answer paper*, following the directions below. The grid below is provided for practice purposes only. Be sure your final answer appears *on your answer paper*.

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

38 Plot the data from your data table. Surround each point with a small circle and connect the points. [ 1 ] (Do not extend the line beyond the data points.)



39 Which title would be appropriate for this graph?

- 1 Daphnia Heart Rate
- 2 Temperature and Heart Rate
- 3 Effect of Temperature on Daphnia Heart Rate
- 4 Effect of Daphnia Heart Rate on Temperature

40 During which temperature interval did the greatest change in Daphnia heart rate occur?

- (1) 5—10;C      (3) 15—20;C
- (2) 10—15;C    (4) 20—25;C

41 State a valid conclusion that relates increasing temperature to heart rate in Daphnia. [ 1 ]

Base your answers to questions 42 through 45 on the passage below and on your knowledge of biology.

### The Mystery of Deformed Frogs

Deformities, such as legs protruding from stomachs, no legs at all, eyes on backs, and suction cup fingers growing from sides, are turning up with alarming frequency in North American frogs. Clusters of deformed frogs have been found in California, Oregon, Colorado, Idaho, Mississippi, Montana, Ohio, Vermont, and Quebec.

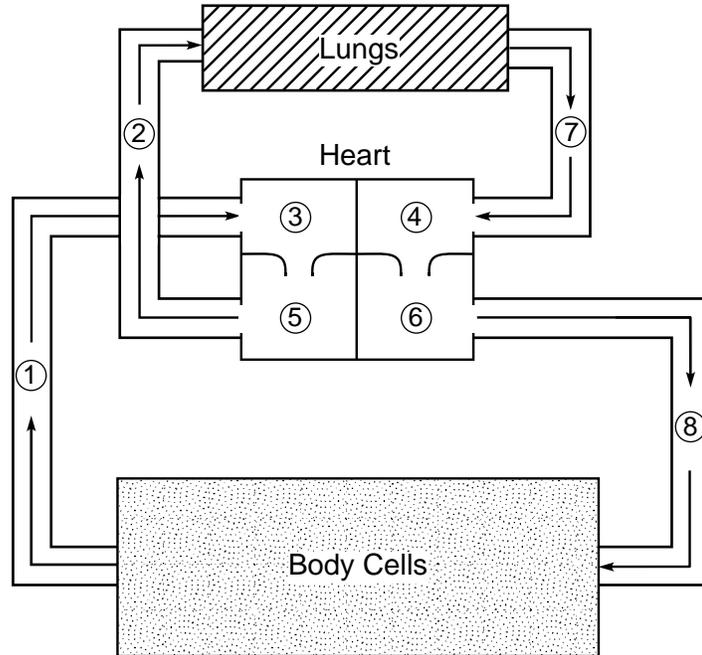
Scientists in Montreal have been studying frogs in more than 100 ponds in the St. Lawrence River Valley for the past four years. Normally, less than 1% of the frogs are deformed, but in ponds where pesticides are used on the surrounding land, as many as 69% of the frogs were deformed. A molecular biologist from the University of California believes that the deformities may be linked to a new generation of chemicals that mimic growth hormones. The same kinds of deformities found in the ponds have been replicated in laboratory experiments.

Some scientists have associated the deformities with a by-product of retinoid, which is found in acne medication and skin rejuvenation creams. Retinoids inside a growing animal can cause deformities. For this reason, pregnant women are warned not to use skin medicines that contain retinoids. Recent laboratory experiments have determined that a pesticide can mimic a retinoid.

A developmental biologist from Hartwick College in Oneonta, New York, questioned whether a chemical could be the culprit because there were no deformed fish or other deformed animals found in the ponds where the deformed frogs were captured. He believes parasites are the cause. When examining a three-legged frog from Vermont, the biologist found tiny parasitic flatworms packed into the joint where a leg was missing. In a laboratory experiment, he demonstrated that the invasion of parasites in a tadpole caused the tadpole to sprout an extra leg as it developed. Scientists in Oregon have made similar observations.

- 42 Pregnant women are advised not to use skin medicines containing retinoids because retinoid by-products
- 1 may cause fetal deformities
  - 2 may cause parasites to invade developing frogs
  - 3 are the main ingredient in most pesticides
  - 4 reduce abnormalities in maternal tissue
- 43 Which statement is most likely true, based on the information in the passage?
- 1 Only a few isolated incidents of frog deformities have been observed.
  - 2 If frog parasites are controlled, all frog deformities will stop.
  - 3 Deformities in frogs are of little significance.
  - 4 Factors that affect frogs may also affect other organisms.
- 44 A possible reason for the absence of deformed fish in the ponds that contained deformed frogs is that
- 1 fish can swim away from chemicals introduced into the pond
  - 2 fish cannot develop deformities
  - 3 parasites that affect frogs usually do not affect fish
  - 4 frogs and fish are not found in the same habitat
- 45 State how pesticides could cause deformities in frogs. [ 1 ]
-

46 The diagram below represents the pathway of blood throughout the body.



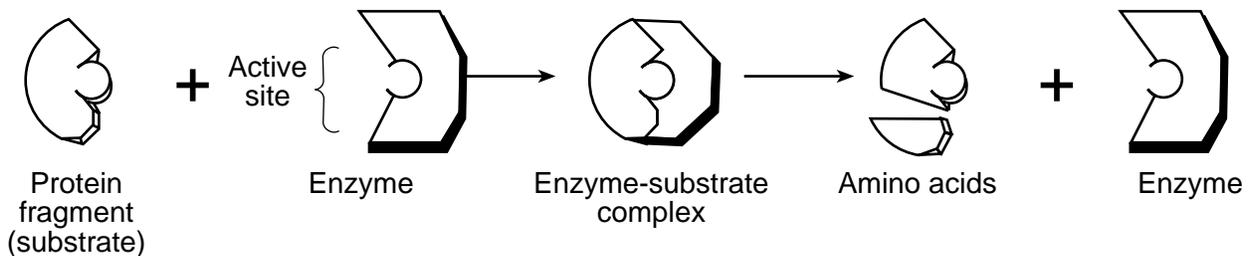
State one specific change that occurs in the oxygen concentration of the blood as the blood moves from structure 6 to structure 3. [ 1 ]

47 Part of an aquatic food web is represented in the diagram below.



Predict how one of the other populations in the food web will most likely change if the yellow perch population increases over a period of 3 years. [ 1 ]

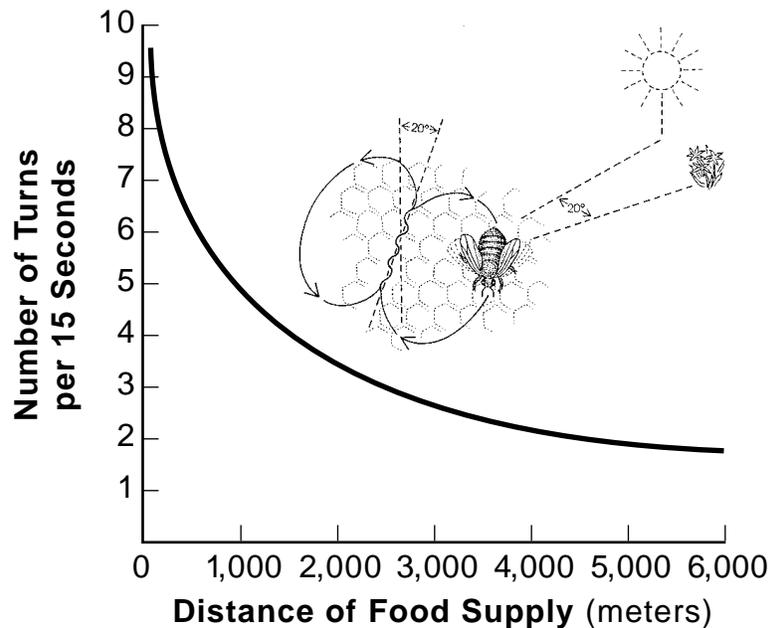
48 A process that occurs in the human body is shown in the diagram below.



What would happen if the temperature increased to 45°C and caused the shape of the active site to be altered?

- 1 The protein fragment would be digested faster.
- 2 The protein fragment would be digested slower or not at all.
- 3 The amino acids would combine faster.
- 4 The amino acids would combine slower or not at all.

- 49 Worker bees acting as scouts are able to communicate the distance of a food supply from the hive by performing a waggle dance. The graph below shows the relationship between the distance of a food supply from the hive and the number of turns in the waggle dance every 15 seconds.



State the relationship between the distance of the food supply from the hive and the number of turns the bee performs in the waggle dance every 15 seconds. [ 1 ]

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

As part of an investigation, 10 bean seedlings in one setup were grown in the dark, while 10 seedlings in another setup were grown in sunlight. In both setups, all other growth conditions were kept the same. The seedlings grown in the dark were white with long, slender stems. These seedlings soon died. The seedlings grown in the sunlight were green and healthy.

- 50 Which hypothesis would most likely be supported by this investigation?

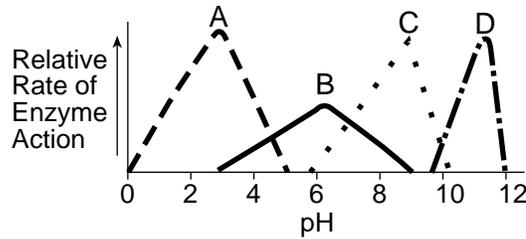
- 1 Plants grown in the dark cannot perform the process of respiration.
- 2 Sunlight is necessary for the normal growth of bean plants.
- 3 Light is necessary for bean seeds to begin growing.
- 4 Light is necessary for proper mineral absorption by plants.

- 51 Identify the independent variable in this investigation. [ 1 ]

- 
- 52 An investigator treated cells with a stain. He found that the stain was selectively concentrated within the mitochondria of many types of cells. Which conclusion could the investigator correctly draw regarding the results of this investigation?

- 1 The stain could be used to identify mitochondria in living cells.
- 2 The stain could be used to determine if cells were alive or dead.
- 3 All stains will be absorbed by mitochondria.
- 4 All mitochondria synthesize stains.

53 The graph below shows the relative rates of action of four enzymes, *A*, *B*, *C*, and *D*.



Which enzyme shows the greatest change in its rate of action with the least change in pH?

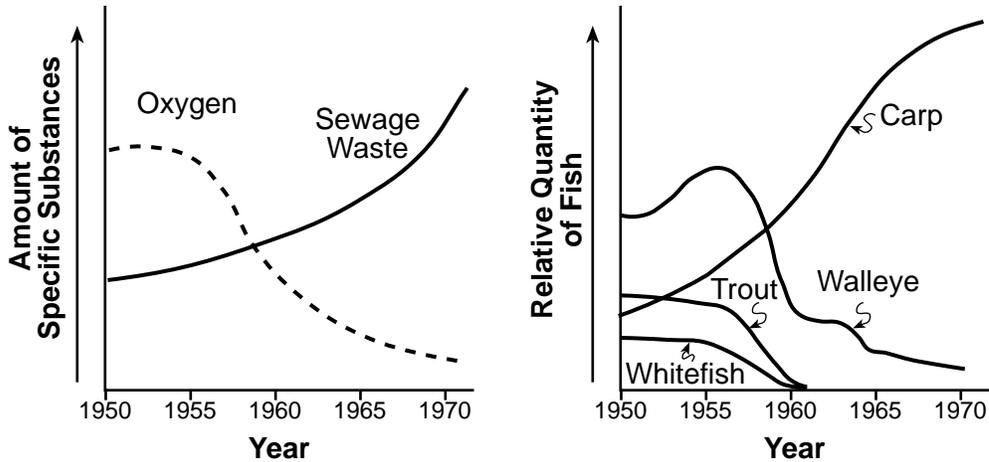
- (1) A    (3) C
- (2) B    (4) D

54 An investigation was designed to determine the effect of ultraviolet light on mold spore growth. Two groups of mold spores were grown under identical conditions, except one group was exposed only to ultraviolet light, while the other group was grown in total darkness. In this investigation, the group of mold spores grown in total darkness is known as the

- 1 control            3 dependent variable
- 2 hypothesis        4 limiting factor

55 Which relationship can correctly be inferred from the data presented in the graphs below?

### Oxygen Content and Fish Population in a Lake



- 1 As sewage waste increases, oxygen content increases.
- 2 As the carp population increases, the whitefish population increases.
- 3 As oxygen content decreases, carp population decreases.
- 4 As oxygen content decreases, trout population decreases.

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

Purple loosestrife is a plant that was imported from Europe. It has spread rapidly in many wetland areas. The loosestrife is crowding out native plants and it does not provide adequate shelter or food for native insects and birds. Scientists are attempting to stop the spread of loosestrife by importing and releasing European beetles that feed on loosestrife plants.

- 56 Explain why the introduction of the beetle is an advantage over the use of chemical weed killers to control the purple loosestrife population. [ 1 ]
- 57 Describe how this beetle may become an environmental problem. [ 1 ]
- 

Base your answers to questions 58 through 60 on the information below and on your knowledge of biology.

When a drug manufacturer develops a new drug to treat some form of disease, the drug should be tested to ensure that it does what it is supposed to do. Usually, the drug is tested on animals and, if these tests are successful, it is then tested on humans.

A drug called Lowervil was developed by a drug company to lower blood pressure. Lowervil has been tested successfully on animals, and the drug company is now ready to test it on humans. The drug company claims that one dose of Lowervil per day will decrease blood pressure in individuals experiencing high blood pressure.

A researcher has been hired to determine whether or not Lowervil lowers blood pressure in people with high blood pressure. Answer the following questions related to the experimental testing of the new drug Lowervil.

- 58 How should the experimental group and control group be treated differently? [ 1 ]
- 59 Why would it be important to use a large number of people in this experiment? [ 1 ]
- 60 The researcher reported that the average blood pressure of the people taking Lowervil had been reduced from  $\frac{180}{110}$  to  $\frac{135}{90}$ .  
What other data should the researcher report in order to support the claim that the drug is effective in reducing blood pressure? [ 1 ]
-

Base your answers to questions 61 through 63 on the information and data tables below and on your knowledge of biology.

Drinking alcohol during pregnancy can cause the class of birth defect known as fetal alcohol syndrome (FAS). Scientists do not yet understand the process by which alcohol causes damage to the fetus. There is evidence, however, that the more a pregnant woman drinks, the greater the chance that the child will be affected and the birth defects will be serious. Some evidence indicates that even low levels of alcohol consumption can cause intellectual and behavioral problems.

**Infant Characteristics**

<b>Characteristics</b> (Average)	<b>Alcohol Use During Pregnancy</b>	
	<b>Drinker</b>	<b>Nondrinker</b>
Weeks of development before birth	36.9	38.7
Birth weight (g)	2,555	3,094
Birth length (cm)	46.8	50.1
Head circumference (cm)	32.1	34.5

**Physical Abnormalities Detected in Infants at Birth**

<b>Physical Abnormalities</b>	<b>Alcohol Use During Pregnancy</b>	
	<b>Drinker</b> (Percentage of 40 Infants)	<b>Nondrinker</b> (Percentage of 80 Infants)
Low birth weight	73	12
Small brain	33	0
Flattened nasal bridge	8	0
Abnormal facial features	25	0
Spinal defects	8	0
Heart defects	8	0

- 61 Do the data in the tables justify scientists' conclusions that alcohol causes physical abnormalities at birth by interfering with the normal development of the fetus? Defend your position with specific information from either table. [ 1 ]
- 62 State one additional piece of information that would be needed to better support the scientists' conclusions. [ 1 ]
- 63 Explain why alcohol consumption by the mother is especially harmful during the early stages of pregnancy. [ 1 ]
- 
- 64 Using a specific example, illustrate how a feedback mechanism maintains homeostasis in a living organism. [ 2 ]

## Part C

Answer all questions in this part. [20]

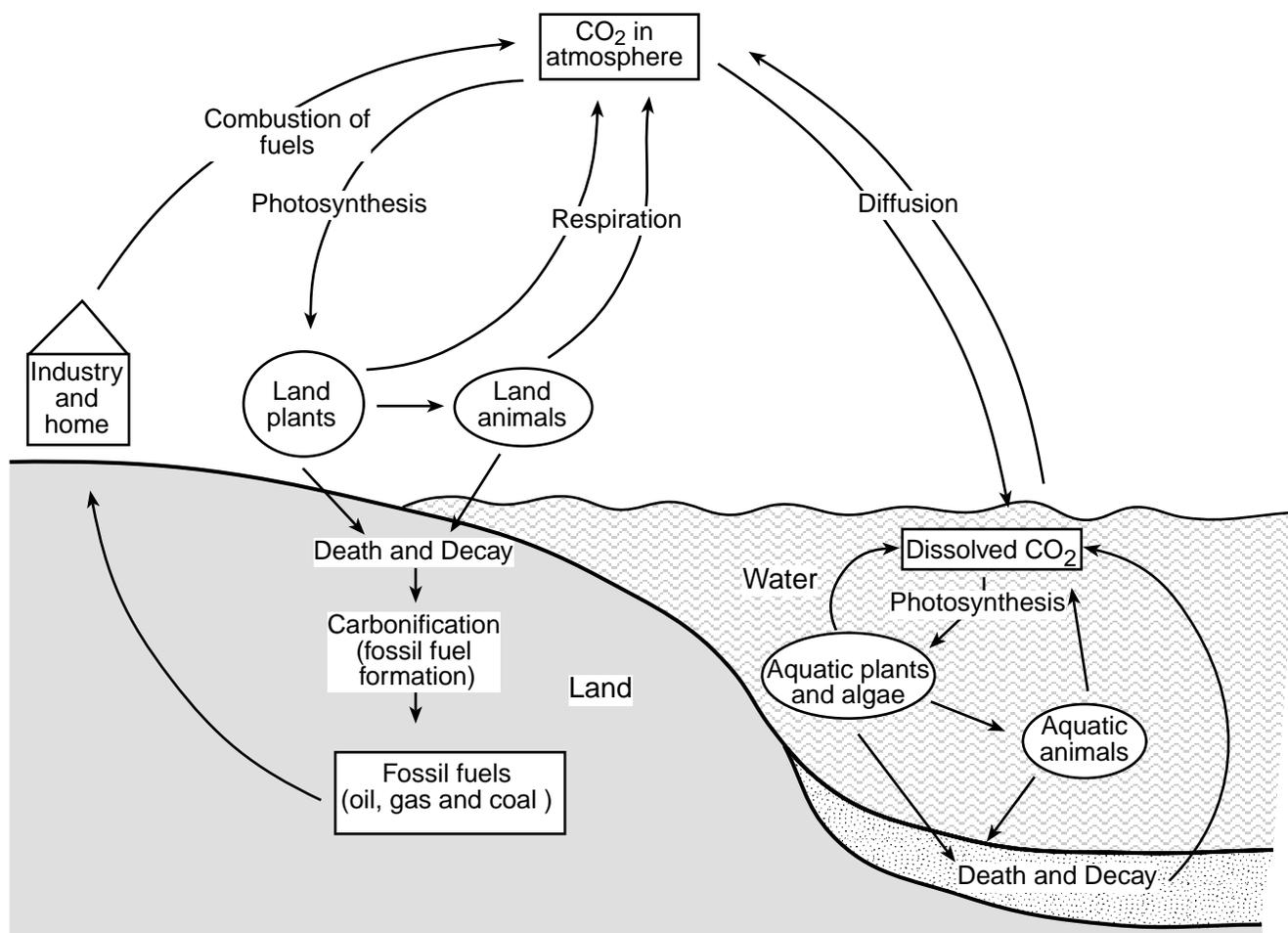
Answers to the following questions are to be written on paper provided by the school.

- 65 Habitat destruction is an environmental problem that affects our own generation and will affect future generations if it is not solved. Write one or more paragraphs in which you identify a specific habitat that is being destroyed. Explain how the destruction of this habitat relates to humans and the overall ecosystem. Your answer must include at least:
- ¥ the name of the habitat and *two* human activities that contribute to the destruction of this habitat [ 2 ]
  - ¥ *one* way the destruction of this habitat has affected humans [ 1 ]
  - ¥ *one* way the destruction of this habitat has affected other organisms [ 1 ]
  - ¥ *two* ways to limit further destruction of this habitat [ 2 ]
- 66 Name or describe a technique used in genetic engineering that can be used to alter the genetic makeup of an organism. Give a specific example of how a product of genetic engineering has been used in the field of health care or agriculture. [ 2 ]
- 67 State two specific reasons why it is important to preserve biodiversity. [ 2 ]
- 68 The DNA sequences of a baby are similar to but not identical to the DNA sequences of its mother. Explain why. [ 1 ]
- 69 The production of a normal baby involves protecting the developing embryo from harmful environmental factors. Explain *two* ways in which a pregnant woman could avoid exposing the developing embryo to environmental risks. [ 2 ]

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

Carbon is found in many of the molecules that make up living organisms. The atmosphere contains an abundance of carbon in the form of carbon dioxide ( $\text{CO}_2$ ). The activities of living organisms are an essential part of the carbon cycle shown below.

The level of  $\text{CO}_2$  present in the atmosphere has increased to the point where it traps heat energy. This increase in atmospheric  $\text{CO}_2$  has been suggested as one cause of the greenhouse effect that leads to global warming.



- 70 Name one group of organisms from the diagram that is able to remove  $\text{CO}_2$  from the environment. [ 1 ]
- 71 State one possible *negative* effect of a warming trend on Earth. Specify how this effect will have a *negative* impact on the living environment. [ 2 ]
- 72 It has been suggested that the two actions listed below might help reduce the amount of  $\text{CO}_2$  in the atmosphere.
- a Increase the number of trees through reforestation.
  - b Increase the number of animals through wildlife preservation.

Write one or more paragraphs in which you indicate whether or not a process associated with each action (a and b) would contribute to reducing the  $\text{CO}_2$  level of the atmosphere and explain why. [ 4 ]

# Sample Answer Paper for Part B

Answer all questions in Part B

36

**Data Table**

Temperature ( $^{\circ}\text{C}$ )	Heart Rate (beats/min)

42 .....

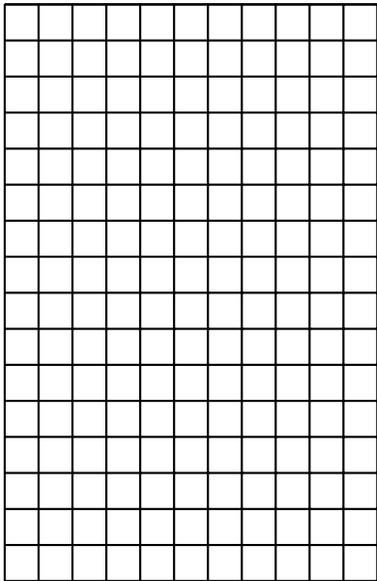
43 .....

44 .....

45 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

37–38

Heart Rate (beats/min)



Temperature ( $^{\circ}\text{C}$ )

46 \_\_\_\_\_  
\_\_\_\_\_

47 \_\_\_\_\_  
\_\_\_\_\_

48 .....

49 \_\_\_\_\_  
\_\_\_\_\_

39 .....

50 .....

51 \_\_\_\_\_  
\_\_\_\_\_

40 .....

41 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

52 .....

53 .....	60
54 .....	
55 .....	
56	61
57	62
58	63
59	64

Your answers for Part C should be placed on paper provided by the school.

**Sample Scoring Materials  
for Parts A, B, and C**

**Scoring Key for Multiple-Choice Questions in Part A**

**Part A**

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

## Scoring Guide for Parts B and C

### Part B

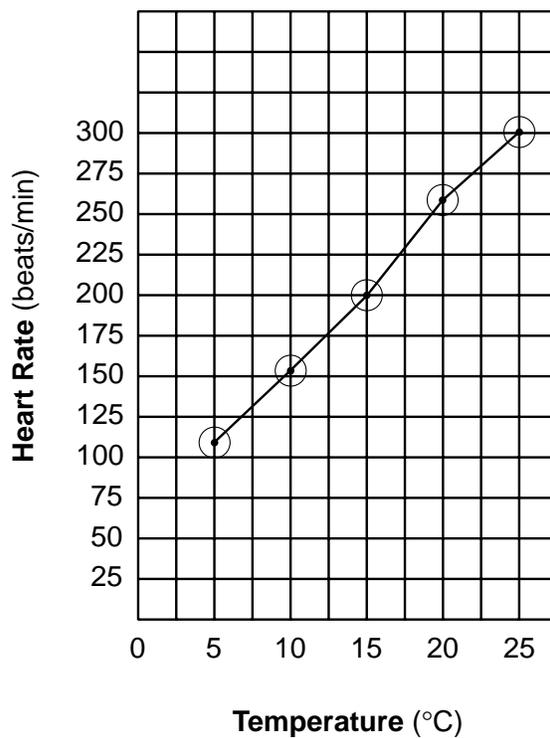
36 Allow 1 credit for a correctly completed data table.

**Data Table**

Temperature ( $^{\circ}\text{C}$ )	Heart Rate (beats/min)
5	108
10	152
15	200
20	260
25	300

The data table may also be completed with temperature decreasing from the top to the bottom of the data table.

37—38



Rating instructions for questions 37—38.

Allow 1 credit for each of the following:

37 Marking an appropriate scale on each axis

38 Plotting the data correctly, surrounding each point with a small circle, and connecting points

- 39 3
- 40 3
- 41 Allow 1 credit for indicating that the heart rate of *Daphnia* increases as temperature increases by mentioning both variables. The student may make a general statement or cite specific data points.
- 42 1
- 43 4
- 44 3
- 45 Allow 1 credit for describing a possible way pesticides could cause deformities in frogs. Correct answers could simply make a direct connection between chemicals mentioned in the passage and deformities or state that chemicals can cause mutations. Acceptable responses include but are not limited to:  
 ¥ the pesticide could mimic growth hormones  
 ¥ the pesticide could alter DNA
- 46 Allow 1 credit for stating that the oxygen concentration decreases.
- 47 Allow 1 credit for specifying the effect on one of the other populations of an increase in the yellow perch population. The student must identify one other population and state whether it increases or decreases. (Note: Only the zooplankton population would decrease.)
- 48 2
- 49 Allow 1 credit for indicating that the further away the food supply, the fewer the turns in the waggle dance or the closer the food supply the more turns in the waggle dance.
- 50 2
- 51 Allow 1 credit for indicating that the independent variable is light or sunlight.
- 52 1
- 53 4
- 54 1
- 55 4
- 56 Allow 1 credit for explaining an advantage of using a biological control (the beetle) rather than a chemical weed killer or a disadvantage of using the weed killer. Acceptable responses include but are not limited to:  
 ¥ beetles would not cause pollution  
 ¥ chemicals would pollute  
 ¥ chemicals could destroy valuable plants
- 57 Allow 1 credit for describing how the beetles could become an environmental problem by referring to a problem normally associated with unintended effects of importing species. Acceptable responses include but are not limited to:  
 ¥ the beetle might eat other plants  
 ¥ the beetle might compete with native species  
 ¥ the beetle might carry diseases

- 58 Allow 1 credit for indicating that the experimental group should receive the medication and the control group should not.
- 59 Allow 1 credit for indicating that large sample sizes lead to more valid results or individual differences have less impact.
- 60 Allow 1 credit for indicating other data the researcher would need to report to support his claim. Acceptable responses include but are not limited to:  
¥ average blood pressure of control group  
¥ number of people involved in the study  
¥ length of the study
- 61 Allow 1 credit for taking a position either agreeing or disagreeing that the scientists conclusions are justified *and* supporting the position with specific information from either table. Data on infant size and physical abnormalities generally support the scientists conclusions while sample size may not.
- 62 Allow 1 credit for indicating that the scientists conclusions would be more valid if factors other than alcohol use were eliminated as causes of physical abnormalities detected at birth. Some factors students could point out include but are not limited to mother s age, eating habits, drug use or health during pregnancy. Students could also suggest follow-up studies to see if the children outgrew the conditions.
- 63 Allow 1 credit for indicating that embryonic development of essential organs occurs in early stages of pregnancy.
- 64 Allow 1 credit for providing a specific example of a regulating factor that helps maintain homeostasis. Acceptable responses include but are not limited to:  
¥ insulin is used to regulate the level of glucose in the blood  
¥ hormones are used to regulate life functions in humans
- Allow 1 credit for illustrating how the factor mentioned maintains homeostasis in a living organism. Acceptable responses include but are not limited to:  
¥ As the glucose level in the blood increases, insulin in the blood is increased. As insulin increases, the level of glucose decreases.

Note: A correctly labeled diagram may be used to answer this question.

## Part C

- 65 Allow a maximum of 6 credits for the answer to question 65; 1 credit for each of two human activities contributing to the destruction of the habitat, 1 credit for the way the destruction affected humans, 1 credit for the way the destruction affected other organisms, and 1 credit for each of the two ways to limit further destruction of this habitat.

The answer below represents a 6-credit response.

The rain forest is being destroyed by logging and by burning to clear the land. Plants with possible medical uses for treating human diseases are being destroyed. The breeding areas of some organisms are being destroyed. The destruction may be limited by legislation and strict enforcement of laws prohibiting logging in these areas and by methods to increase the crop yield on existing farmland, reducing the necessity for opening up more farmland.

Other scientifically correct answers are acceptable.

- 66 Allow 1 credit for indicating a gene change caused by human manipulation. The answer should include the name or a description of a technique that alters the genetic makeup of an organism. Acceptable responses include but are not limited to:

☒ insertion, deletion, substitution and transfer of DNA from one organism to another

Allow 1 credit for correctly explaining how a genetic engineering technique has been applied in the field of health or agriculture. Acceptable responses include but are not limited to:

☒ Substances such as hormones or enzymes formed by genetic engineering may reduce the side effects of replacing missing body chemicals.

- 67 Allow a total of 2 credits for stating two possible ways that the preservation of biodiversity is important, 1 credit for each correctly stated response. Acceptable responses include but are not limited to:

☒ Biodiversity increases the chances that at least some members of a species can survive environmental change.

☒ Biodiversity increases the stability of ecosystems.

☒ Biodiversity can provide a variety of genetic materials that may lead to advances in agriculture (or medicine). Two specific examples of this might be transfer of insect-resistant genes from tropical plants to crop plants, or finding a chemical in a wild species of animal that may cure AIDS in humans.

- 68 Allow 1 credit for explaining that in organisms that reproduce sexually, each parent contributes only part of the genetic information to the offspring. Acceptable responses include but are not limited to:

☒ the baby receives half of its DNA from its mother (and the other half from its father)

- 69 Allow one credit each, for a maximum of 2 credits, for explaining how a pregnant woman could avoid exposing the developing embryo to environmental risks. Acceptable responses include but are not limited to:

☒ eat a healthy diet

☒ do not drink alcohol

☒ do not smoke

☒ do not use drugs

☒ avoid poisons (toxins) in the environment

☒ practice safe sex

☒ check with a doctor before taking any medication.

- 70 Allow 1 credit for any one of the following:

☒ land plants

☒ aquatic plants

☒ algae

☒ plants

- 71 Allow 1 credit for indicating a negative effect of a warming trend on Earth and 1 credit for specifying a negative impact this would have on the living environment. Acceptable 2-credit responses include, but are not limited to:  
¥ Increased global temperatures could result in rise in ocean levels. This would destroy coastal organisms (or farmland).  
¥ Global warming could cause some parts of the world to experience changed weather patterns. High temperatures or decreased rainfall could make it impossible for the same plants and animals to survive in their present habitats.
- 72 Allow 1 credit for indicating that action *a* would reduce the CO<sub>2</sub> level and 1 credit for indicating that action *b* would not reduce (or would increase) the CO<sub>2</sub> level for a total of 2 credits.

Allow 1 credit for *each* correct explanation of how a process associated with each action would change the CO<sub>2</sub> level for a total of 2 credits.

¥ trees would use more CO<sub>2</sub> in photosynthesis (food making)

¥ animals give off CO<sub>2</sub> during respiration

Acceptable 4-credit responses include but are not limited to:

¥ Increasing the number of trees through reforestation would cause a decrease in the amount of CO<sub>2</sub> through the process of photosynthesis. Trees would absorb the CO<sub>2</sub> from the atmosphere, thereby causing a reduction in the amount of this gas in the air. Increasing the number of animals through wildlife preservation would increase the amount of carbon dioxide in the air because, in respiration, animals release carbon dioxide.

