The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Wednesday, August 16, 2000 — 12:30 to 3:30 p.m., only

The answer paper is stapled in the center of this examination booklet. Open the examination booklet, carefully remove the answer paper, and close the examination booklet. Then fill in the heading on your answer paper.

All of your answers are to be recorded on the separate answer paper. For each question in Part I and Part II and the multiple-choice questions in Part III, decide which of the choices given is the best answer. Then on the answer paper, in the row of numbers for that question, circle with pencil the number of the choice that you have selected. The sample below is an example of the first step in recording your answers.

SAMPLE: (1) 2 3 4

If you wish to change an answer, erase your first penciled circle and then circle with pencil the number of the answer you want. After you have completed all three parts of the examination and you have decided that all of the circled answers represent your best judgment, signal a proctor and turn in all examination material except your answer paper. Then and only then, place an X in ink in each penciled circle. Be sure to mark only one answer with an X in ink for each question. No credit will be given for any question with two or more X's marked. The sample below indicates how your final choice should be marked with an X in ink.

SAMPLE: (X) 2 3 4

For questions in Part III that are not multiple-choice questions, record your answers in accordance with the directions given in the examination booklet.

When you have completed the examination, you must sign the statement printed at the end of the answer paper, 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 paper cannot be accepted if you fail to sign this declaration.

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

Part I

Answer all 59 questions in this part. [65]

Directions (1–59): For *each* statement or question, select the word or expression that, of those given, best completes the statement or answers the question. Record your answer on the separate answer paper in accordance with the directions on the front page of this booklet.

1 The chart below shows the classification of three organisms. Certain categories are not shown.

Organism *A*	**Organism *B***	**Organism *C***
Animalia	Animalia	Animalia
Insecta	Mammalia	Mammalia
Diptera	Carnivora	Carnivora
Musca domestica	*Canis lupus*	*Felis domestica*

Which two organisms are most closely related?
(1) *A* and *B*
(2) *B* and *C*
(3) *C* and *A*
(4) Not enough information is given to answer the question.

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2 Which activity is a function of all living cells?
1 synthesis
2 locomotion
3 anaerobic respiration
4 extracellular digestion

3 Respiration is best described as a process by which
1 necessary nutrients are circulated
2 hydrogen is used to synthesize glucose
3 metabolic wastes are absorbed
4 chemical energy is converted into a usable form

4 Which piece of equipment would most likely be used to separate organelles from a mixture of crushed cells?
1 dissecting microscope
2 electron microscope
3 ultracentrifuge
4 microdissection instrument

5 One difference between plant and animal cells is that animal cells do *not* have
1 a nucleus
2 chloroplasts
3 a cell membrane
4 centrioles

6 Most organisms contain
1 organic compounds, only
2 inorganic compounds, only
3 both organic and inorganic compounds
4 neither organic nor inorganic compounds

7 The chemical reactions taking place in a cell will most likely speed up if the
1 genetic material in the nucleus stops replicating
2 size of the cell is increased
3 enzymes involved in the reaction become deaminated
4 concentration of the reactants is increased

8 Nutrition involves those activities by which organisms

1 remove cellular waste products
2 obtain and process materials needed for other activities
3 exchange gases with their environment
4 absorb and circulate materials

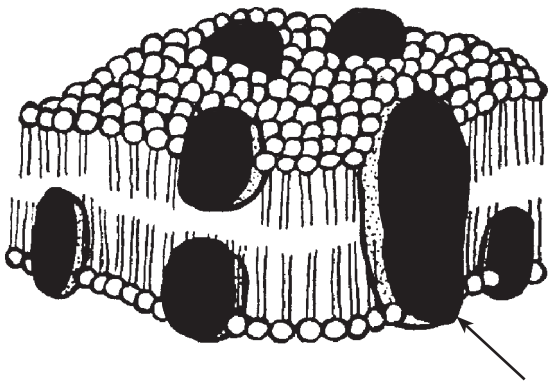
9 The use of CO_2 and H_2O by a geranium plant to synthesize glucose illustrates the process of

1 autotrophic nutrition
2 heterotrophic nutrition
3 protein production
4 carbohydrate hydrolysis

10 Leaves at the top of a giant redwood tree receive water from the

1 vascular tissue in the branches, trunk, and roots
2 epidermal cells in the trunk and branches
3 process of photosynthesis in the trunk and branches
4 activities of vacuoles in cells in the trunk and roots

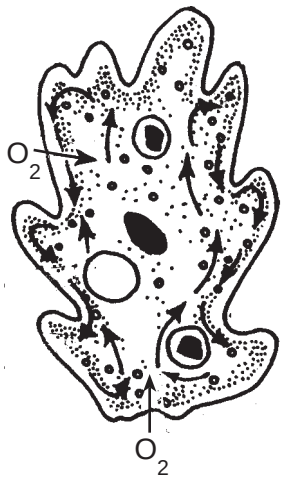
11 The diagram below represents the fluid-mosaic model of a cell membrane.



The arrow points to a component of the membrane that is best described as a

1 sugar floating in lipids
2 protein floating in lipids
3 lipid floating in proteins
4 lipid floating in sugars

12 Which life process is indicated by the arrows in the diagram of an ameba shown below?



1 digestion
2 excretion
3 fermentation
4 transport

13 Which process is used by animals to remove ingested foods that can *not* be digested?

1 reabsorption
2 egestion
3 emulsification
4 osmosis

14 Which organisms lack a respiratory system and exchange respiratory gases through thin, moist membranes directly with the environment?

1 bryophytes, tracheophytes, and reptiles
2 monerans, plants, and animals
3 monerans, protists, and fungi
4 chordates, arthropods, and coelenterates

15 Gases move into intercellular spaces in leaves through openings known as

1 stomates
2 lenticels
3 phloem tubes
4 xylem tubes

16 A blockage of the spiracles in a grasshopper would first affect the ability of the grasshopper to

1 reproduce sexually
2 synthesize proteins
3 exchange gases
4 excrete ammonia

17 Which substances are metabolic waste products?

1 carbon dioxide, water, urea
2 glucose, water, oxygen
3 carbon dioxide, water, sugar
4 oxygen, water, protein

18 In earthworms, an inability to excrete some nitrogenous wastes would indicate a malfunction of the

1 setae
2 nephridia
3 Malpighian tubules
4 contractile vacuoles

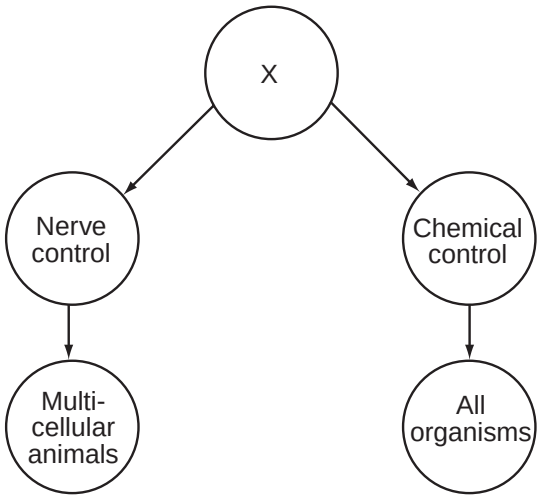
19 Which organism has a nervous system that includes a dorsal brain, ventral nerve cord, ganglia, peripheral nerves, eyes, and tympana?

1 human
2 grasshopper
3 earthworm
4 hydra

20 Which process in plants is *not* controlled by hormones?

1 transport of glucose downward in stems
2 production of flowers
3 development of seeds
4 growth of stem tips toward light

21 A graphic organizer is represented in the diagram below.



The letter *X* most likely represents the term

1 regulation
2 excretion
3 growth
4 transpiration

22 Protozoa are classified by the presence of cilia, flagella, and pseudopods or by their nonmotility. This classification method is based on their means of

1 growth
2 circulation
3 reproduction
4 locomotion

23 In humans, structures that absorb most of the products of digestion are the

1 ducts of the pancreas
2 cells of the esophagus
3 villi of the small intestine
4 muscular folds of the gallbladder

24 Which function is associated with phagocytes in the blood?

1 initiating blood clots
2 transporting dissolved nutrients
3 producing hormones
4 engulfing bacteria

25 In humans, the immediate result of a blockage in one ureter would be to

1 limit the ability to store urine
2 prevent filtration of the blood
3 stop the release of urine from the body
4 decrease the amount of urine entering the bladder

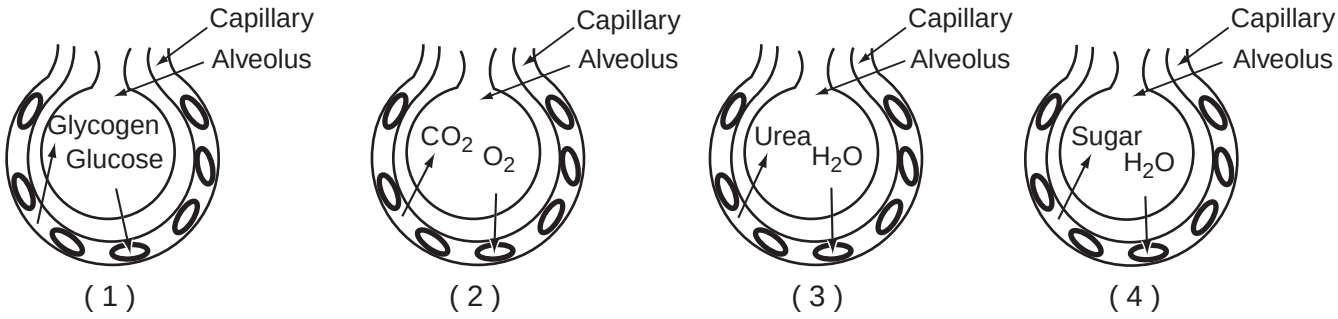
26 Which structures in a human transmit electrochemical messages?

1 veins
2 lymphocytes
3 neurons
4 nephrons

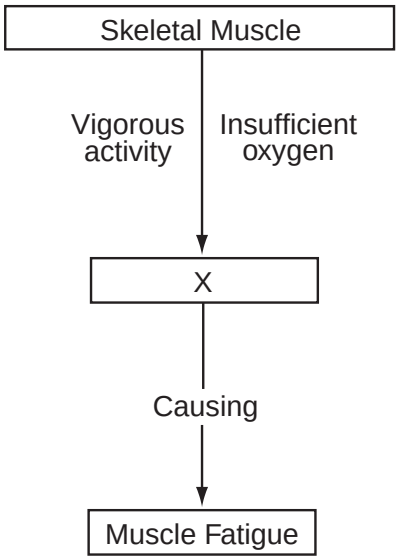
27 The part of the human central nervous system that conducts impulses from the brain to the peripheral nervous system is protected by the

1 vertebrae
2 effectors
3 receptors
4 glomeruli

28 Which diagram best illustrates the function of an alveolus?



29 The diagram below shows a sequence of events that often occurs in human muscle cells.



The substance represented by letter *X* is most likely

1 hemoglobin
2 glycogen
3 ethyl alcohol
4 lactic acid

30 Sperm cells of the Russian dwarf hamster, *Phodopus sungorus*, contain 14 chromosomes. What is the total number of chromosomes that would be contained in a normal, newly formed zygote of this species?

(1) 7
(2) 14
(3) 28
(4) 42

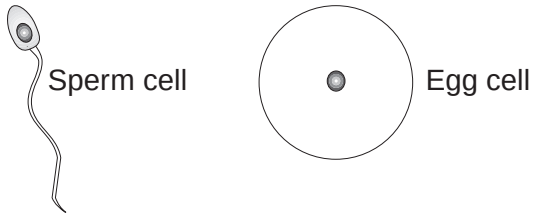
31 Uncontrolled cell division is a characteristic of

1 cleavage
2 oogenesis
3 cancer
4 regeneration

32 In hydra, new organisms can be produced from groups of cells that enlarge and stay attached to the parent for a time before breaking off and becoming independent. This method of reproduction is an example of

1 sporulation
2 binary fission
3 sexual reproduction
4 budding

33 The diagram below represents two human cells.



These cells are a direct result of

1 mitotic cell division
2 sex linkage
3 fertilization
4 gametogenesis

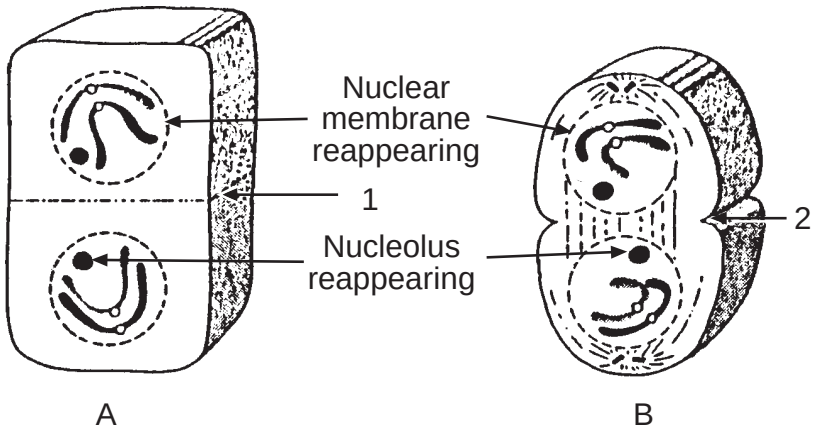
34 The meristematic tissue layer responsible for growth in the diameter of a stem is known as the

1 cuticle
2 cambium
3 epidermis
4 hypocotyl

35 Which conditions are necessary for the successful germination of a bean seed?

1 sufficient moisture and proper temperature
2 sufficient light and fertile soil
3 sufficient moisture and high chlorophyll concentration
4 sufficient light and high nitrate concentration

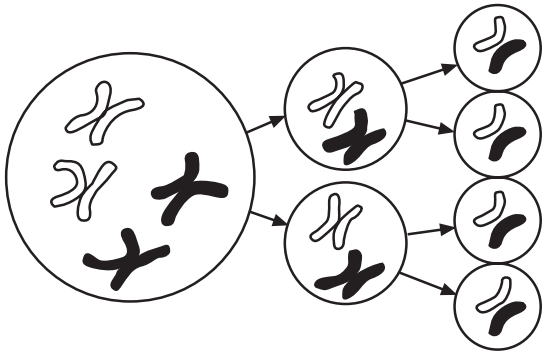
36 Diagrams *A* and *B* represent two cells in the final stage of cell division.



Which processes occur in regions 1 and 2 in these cells?

1 synthesis of a cell plate at 1, pinching in of the cell membrane at 2
2 pinching in of the cell membrane at 1, synthesis of a cell plate at 2
3 replication of a chromatid at 1, spindle apparatus joining the nuclear membrane with the cell membrane at 2
4 spindle apparatus joining the nuclear membrane with the cell membrane at 1, replication of a chromatid at 2

37 The distribution of chromosomes in one type of cell division is shown in the diagram below.



Which process is represented in the diagram?

1 asexual reproduction
2 meiosis
3 mitosis
4 vegetative propagation

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38 The ability of cells to pass on their characteristics to new cells is most directly related to the ability of

1 cytoplasm to excrete wastes
2 effectors to respond to environmental changes
3 ribosomes to use energy
4 chromosomes to replicate

39 Gregor Mendel developed heredity principles from his

1 mathematical analysis of the results of pea plant crosses
2 working model of the structure of DNA
3 mapping of the locations of human genes on chromosomes
4 extensive study of breeding *Drosophila*

40 A cross between two mice with long tails and brown fur produced the four types of offspring listed below:

long tailed with brown fur
long tailed with white fur
short tailed with brown fur
short tailed with white fur

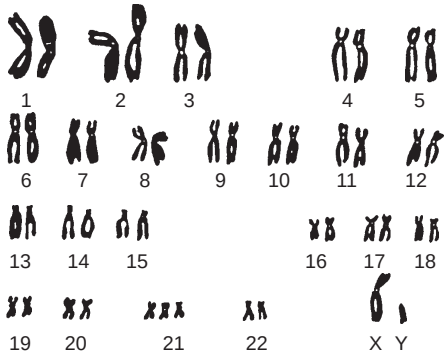
Which genetic mechanism best explains the results of this cross?

1 intermediate inheritance
2 gene linkage
3 independent assortment
4 crossing-over

41 A mother pregnant with her fourth child remarked, "This one just has to be a boy. It is almost certain, since my other three children are girls." Which statement best indicates the accuracy of the mother's comment?

1 The mother is wrong because the chance of having a boy is always 50%.
2 The mother is wrong because there is only a 25% chance that the child will be a boy.
3 The mother is right because the genes of the father are dominant over those of the mother.
4 The mother is right because a child usually inherits both sex chromosomes from the mother.

42 The chromosomes of a person with a genetic disorder are shown in the diagram below.



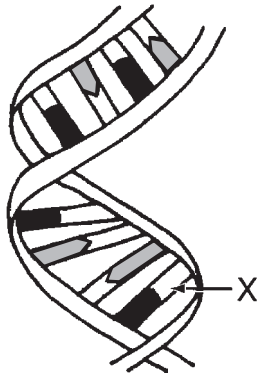
This genetic disorder resulted from

1 hybridization
2 nondisjunction
3 polyploidy
4 segregation

43 Which genotype illustrates codominance of alleles that control blood type in humans?

(1) *ii*
(2) I^Ai
(3) I^BI^B
(4) I^AI^B

44 The diagram below represents a portion of a nucleic acid molecule.



The part indicated by arrow *X* could be

1 adenine
2 ribose
3 deoxyribose
4 phosphate

45 A farmer found that one tree in his pear orchard produced especially delicious fruit. Which method would most quickly provide a large crop of these pears?

1 planting seeds of the pears from this tree
2 crossing this tree with another tree in the orchard
3 providing the tree with a special fertilizer containing minerals
4 grafting branches from this tree onto other trees in the orchard

46 The term "evolution" is best described as

1 a process of change in a population through time
2 a process by which organisms become extinct
3 the reproductive isolation of members of certain species
4 the replacement of one community by another

47 Which pair of structures are homologous?

1 wing of an insect and wing of a bird
2 tentacle of a hydra and flipper of a whale
3 front leg of an insect and bones in the leg of a human
4 bones in the front leg of a dog and bones in the wing of a bat

48 A man lifts weights and develops large arm muscles. His son has larger muscles than his father had at the same age. According to Lamarck's theory, this situation is due to

1 competition between father and son
2 survival of the fittest
3 inheritance of acquired characteristics
4 mutagenic agents

49 A key concept in the modern theory of evolution explains

1 how new organs arise according to the needs of an organism
2 how variations occur within a species
3 the continued increase in the human population
4 the presence of asexual reproduction within a species

50 Fossil records indicate that between 80 million and 60 million years ago the structure of the horned dinosaur frequently underwent rapid changes separated by long periods of stability. This pattern of change best illustrates the concept of

1 use and disuse
2 punctuated equilibrium
3 gradualism
4 enzyme specificity

51 The results provided by Stanley Miller's experiments involving a simulated primitive environment, as described in the heterotroph hypothesis, show that in this environment

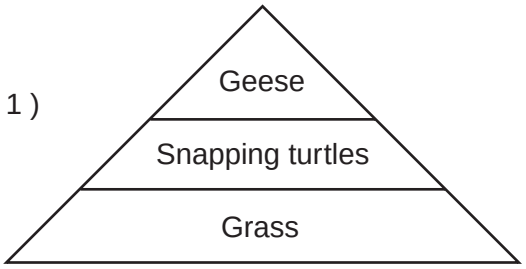
1 only inorganic molecules can be synthesized
2 there is little possibility for the synthesis of complex molecules
3 organic molecules can be synthesized
4 only complex nucleic acid molecules can be synthesized

52 The separation of a small group of individuals from the main population is known as

1 chromosomal mutation
2 fossil formation
3 geographic isolation
4 reduction division

53 A student observes a small pond community and notices that many geese are hatched there each spring. The baby geese feed on the grass surrounding the pond. The snapping turtles in the pond feed on the baby geese. Which pyramid of energy correctly illustrates these relationships?

(1)



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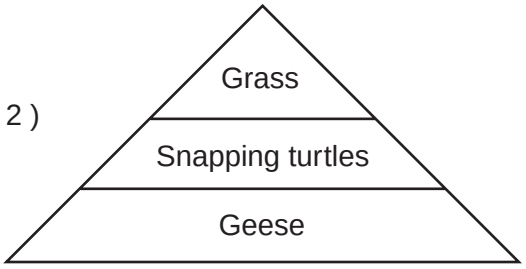

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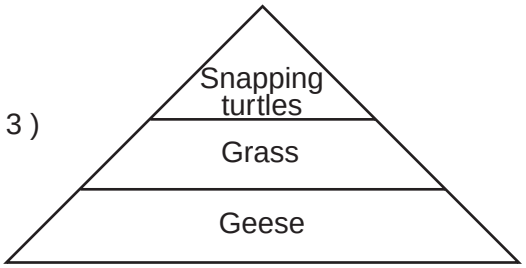
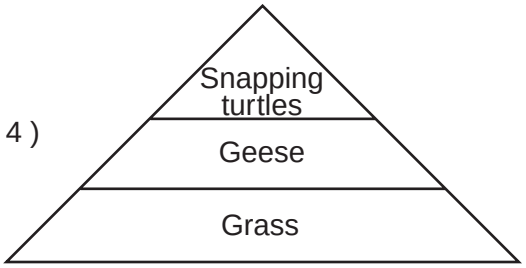
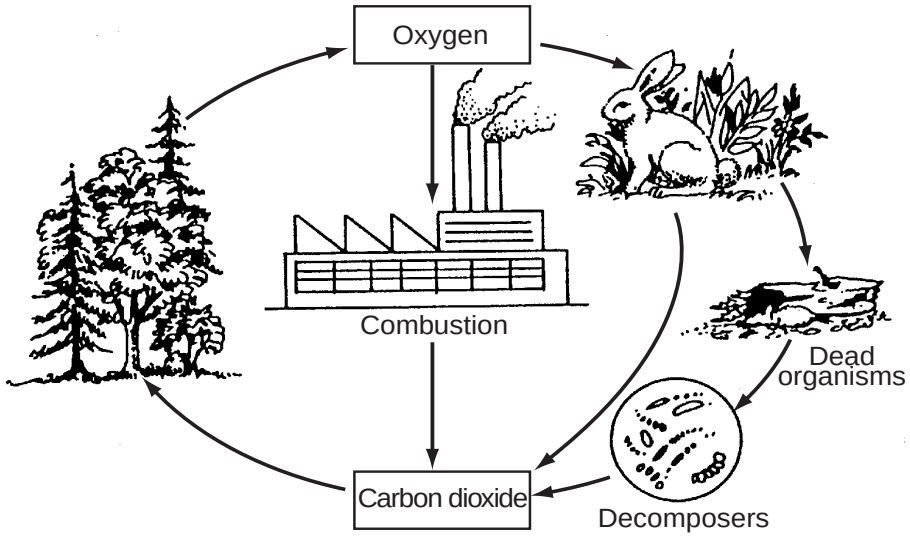


(4)

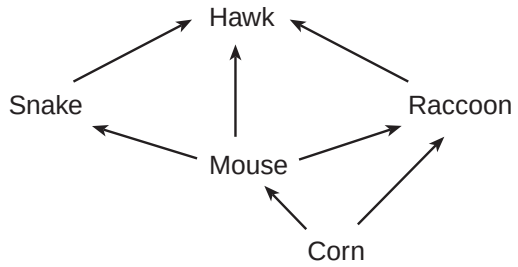


54 The diagram below shows some pathways in the cycling of materials in the environment.



Which two processes are involved in the cycling shown in the diagram?
1 succession and transpiration
2 photosynthesis and cellular respiration
3 artificial selection and deamination
4 enzymatic hydrolysis and regeneration

55 In the diagram below, which organism is classified as both a primary and a secondary consumer?



1 hawk
2 raccoon
3 snake
4 mouse

56 Which human activity would most likely have a positive impact on the environment?
1 using pesticides to decrease populations of birds of prey
2 increasing emissions into the atmosphere to decrease the pH of lakes
3 using parasites for biological control of pests to increase crop yields
4 engaging in uncontrolled hunting and trapping to reduce populations of carnivores

57 Which group of organisms is an example of a population?
1 leopard frogs in a stream
2 birds in Colorado
3 reptiles in the Sahara Desert
4 trees in a forest

58 Which statement concerning an ecosystem is correct?
1 It can exist with or without a constant source of energy input.
2 It must contain consumers but can exist without producers.
3 It involves interactions between biotic and abiotic factors.
4 It can exist on land, but it cannot exist in lakes, rivers, or oceans.

59 Which term refers to the behavior of two species attempting to use the same living space, food source, and water source?
1 saprophytic
2 competitive
3 predatory
4 symbiotic

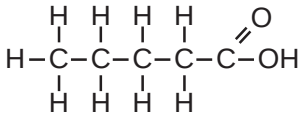
Part II

This part consists of five groups, each containing ten questions. Choose two of these five groups. Be sure that you answer all ten questions in each group chosen. Record the answers to these questions in accordance with the directions on the front page of this booklet. [20]

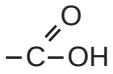
Group 1 — Biochemistry

If you choose this group, be sure to answer questions 60–69.

60 Molecular structures are represented in the diagrams below.



(1)



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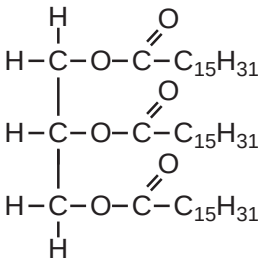

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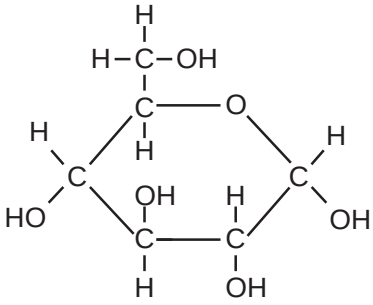
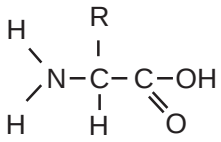


(4)



(5)

Structure 2 represents a chemical component of

1 molecule 1, only
2 molecules 1 and 5, only
3 molecules 1, 3, and 4, only
4 molecules 1, 3, 4, and 5

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61 Which organic compound is produced when three fatty acid molecules bond to one glycerol molecule?

(1) glycogen
(2) ATP
(3) PGAL
(4) a lipid

62 Which pH value indicates the most acidic condition?

(1) 1.6
(2) 2.1
(3) 7.3
(4) 11.1

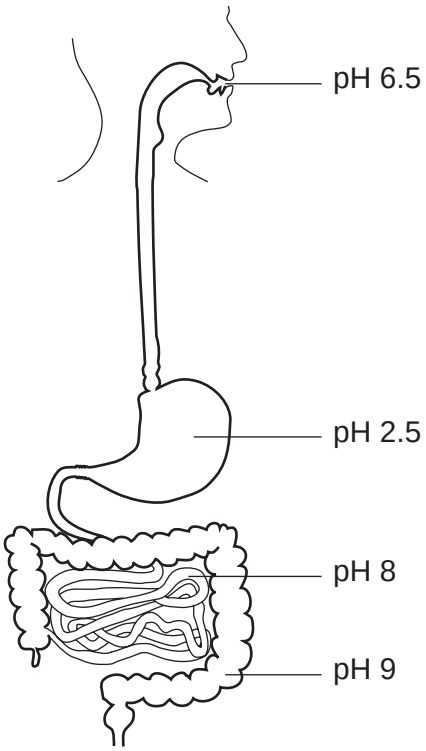
63 A general equation for a chemical reaction is shown below.

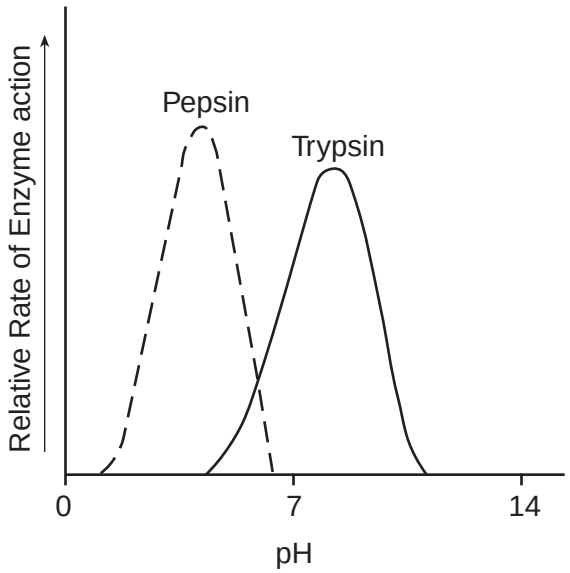
polypeptide + water $\xrightarrow{A}$ amino acids

Which substance is represented by letter *A*?

1 amylase
2 lipase
3 protease
4 maltase

Base your answers to questions 64 and 65 on the diagram and graph below and on your knowledge of biology. The diagram represents the human digestive system. Pepsin and trypsin are human digestive enzymes.





64 The graph indicates that pepsin would function best in the

1 mouth
2 stomach
3 small intestine
4 large intestine

65 Pepsin and trypsin are classified as

1 sugars
2 carbohydrates
3 lipids
4 proteins

GO RIGHT ON TO THE NEXT PAGE.

Base your answers to questions 66 through 69 on the equations shown below and on your knowledge of biology.

Equations

(*A*) glucose + 2 ATP $\xrightarrow{Y}$ 2 pyruvic acid + 4 ATP

(*B*) 2 pyruvic acid + oxygen $\xrightarrow{Y}$ carbon dioxide + water + 34 ATP

66 Two molecules of ATP are needed in equation *A* so that

1 oxygen is added to hydrogen in glucose
2 energy needed to activate this reaction is provided
3 energy needed to trap radiant energy is provided
4 glucose is split into hydrogen and oxygen atoms

67 In animals, the reaction in equation *B* occurs in the

1 lysosomes
2 chloroplasts
3 mitochondria
4 ribosomes

68 What does letter *Y* represent?

1 enzymes
2 hemoglobin
3 light and chlorophyll
4 water and minerals

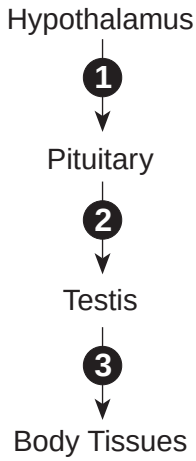
69 What is the combined net gain of ATP molecules at the completion of reactions *A* and *B*?

(1) 36
(2) 2
(3) 34
(4) 4

Group 2 — Human Physiology

If you choose this group, be sure to answer questions 70–79.

Base your answers to questions 70 through 72 on the diagram below and on your knowledge of biology. The arrows in the diagram indicate certain hormones in the human male body.



70 The hormone testosterone is represented by

(1) 1
(2) 2, only
(3) 3, only
(4) 2 and 3

71 A high level of hormone 3 in the blood inhibits the production of hormone 2. This situation is an example of

1 nervous regulation
2 hydrolysis
3 deamination
4 negative feedback

72 Which activity would most likely be a function of hormone 3?

1 stimulating the body tissues to produce secondary sex characteristics
2 causing the thyroid to produce thyroxin
3 increasing the blood-sugar level
4 promoting the conversion of body fat into glycogen

73 Maintenance of proper levels of intercellular fluid is most closely associated with

1 pulmonary circulation
2 coronary circulation
3 lymphatic circulation
4 systemic circulation

74 The peripheral nervous system consists of the

1 neurons located in the brain and spinal cord
2 nerves that extend from the brain and spinal cord
3 interneurons of the central nervous system
4 portions of the brain known as the medulla and cerebellum

75 The muscular nature of the walls of ventricles is most closely associated with their function of

1 storing blood from the body
2 producing red blood cells
3 maintaining pressure lower than that in the atria
4 forcing blood to the lungs and body

76 Newborn infants nursing from their mother receive milk containing antibodies against diseases to which the mother is immune. The infants, however, remain immune to those diseases for only a short time. This situation is an example of

1 active immunity
2 passive immunity
3 an oral vaccine
4 a phagocytic activity

77 When people who are allergic to pollen come in contact with pollen, their eyes begin to water and itch due to the release of

1 antigens from red blood cells
2 enzymes from platelets
3 histamines from body cells
4 hormones from the pituitary gland

78 Which nutrient should provide the largest percentage of calories in a well-balanced diet?

1 carbohydrates
2 incomplete proteins
3 saturated fats
4 water

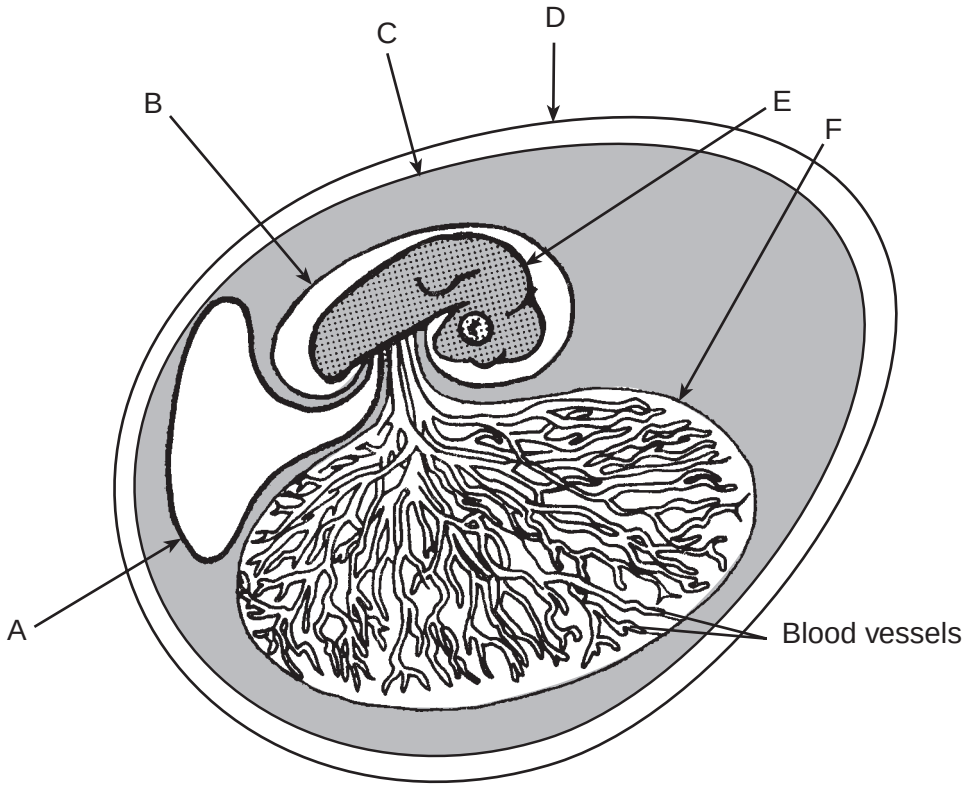
79 A disorder of the digestive system that can cause severe dehydration is known as

1 appendicitis
2 gallstones
3 constipation
4 diarrhea

Group 3 — Reproduction and Development

If you choose this group, be sure to answer questions 80–89.

Base your answers to questions 80 through 82 on the diagram below of a developing chicken embryo and on your knowledge of biology.



80 Which structure contains a fluid that protects the embryo from physical shock and prevents adhesion of embryonic tissues to the shell?

(1) *A* (3) *E*
(2) *B* (4) *F*

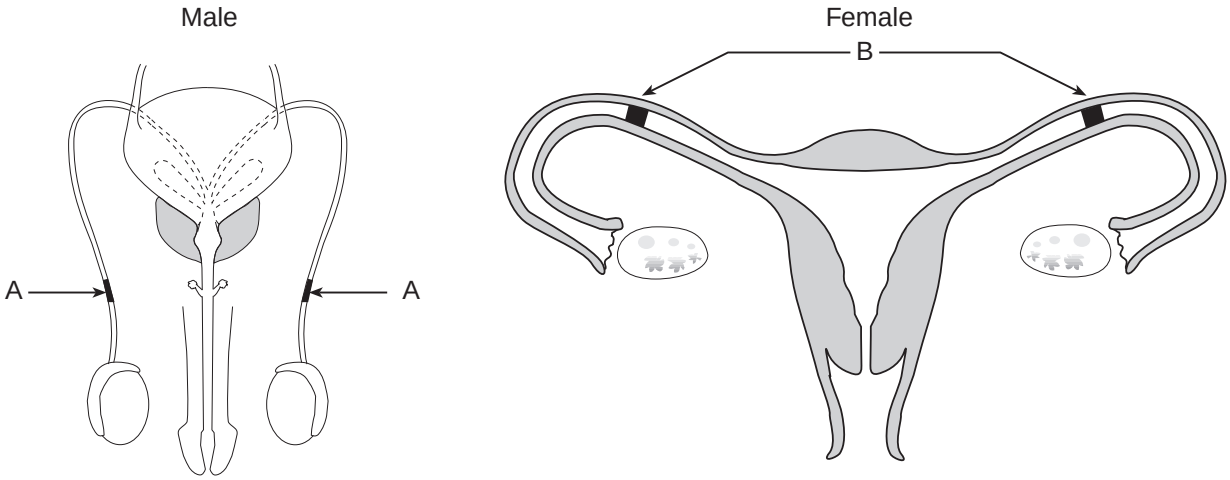
81 Which structure is an embryonic membrane that provides a storage site for nitrogenous waste and functions in the exchange of respiratory gases?

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

82 Which pattern of reproduction is most closely associated with the organism in the diagram?

1 external fertilization and external development
2 external fertilization and internal development
3 internal fertilization and external development
4 internal fertilization and internal development

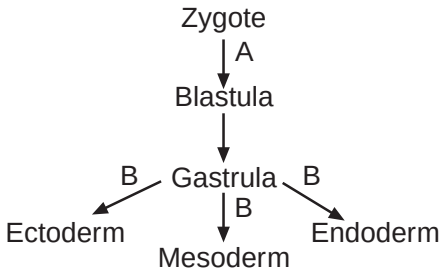
83 The diagrams below represent the reproductive systems in the human male and female.



The blockages shown at *A* and *B* would most likely interfere with the ability to

1 transport gametes
2 produce mature gametes
3 eliminate waste products through the urethra
4 express secondary sex characteristics

Base your answers to questions 84 through 86 on the diagram below and on your knowledge of biology. The arrows in the diagram represent processes.



84 Which process is represented by letter *A*?

1 ovulation
2 cleavage
3 spermatogenesis
4 synapsis

85 Process *B* is known as

1 meiosis
2 oogenesis
3 differentiation
4 germination

86 The changes represented in the entire diagram would most likely occur in a

1 fungus
2 tracheophyte
3 coelenterate
4 chordate

87 In a human female, what is the most direct result of the presence of the hormone FSH?

1 production of the corpus luteum
2 development of the ovarian follicle
3 breakdown of the uterine lining
4 disintegration of the ovum

88 Most embryos that develop internally obtain food and oxygen through the

1 allantois
2 chorion
3 amnion
4 placenta

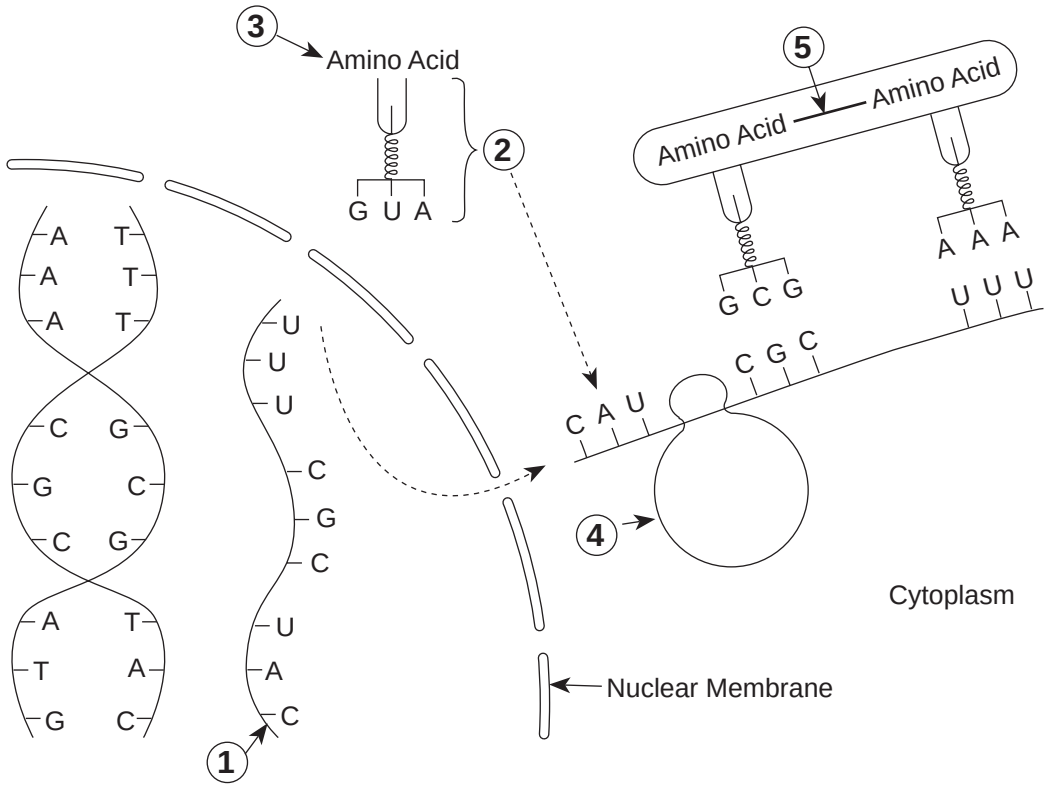
89 The human menstrual cycle is controlled by hormones produced and secreted by the

1 ovaries, only
2 uterus, only
3 pituitary gland and ovaries
4 pituitary gland and uterus

Group 4 — Modern Genetics

If you choose this group, be sure to answer questions 90–99.

Base your answers to questions 90 through 92 on the diagram below, which represents some biochemical reactions involved in a cellular process, and on your knowledge of biology.



90 The molecule coded directly from DNA is represented by number

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

91 What is an example of a molecule produced by this type of process?

1 glucose 3 a fatty acid
2 glycogen 4 a protein

92 The bond labeled 5, formed between two amino acids, is known as

1 a peptide bond 3 an ionic bond
2 a hydrogen bond 4 a carboxyl bond

---

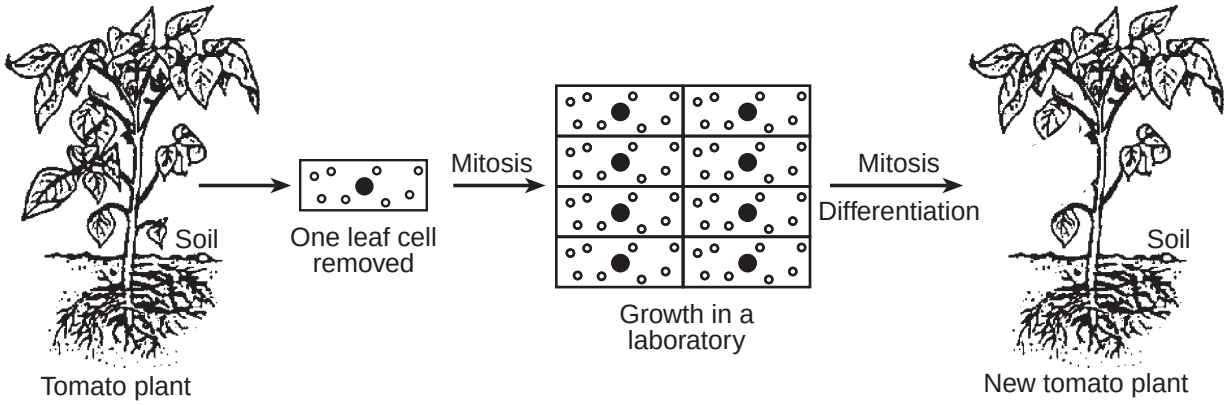
93 The Hardy-Weinberg principle of population genetics can be applied to a population that can reproduce only

1 by budding 3 asexually
2 by binary fission 4 sexually

94 A mutation may occur in a gene as a result of the

1 synthesis of a spindle apparatus
2 loss of a nucleotide
3 loss of a nucleolus
4 replication of centromeres

95 A process used in agriculture is represented in the diagram below.



The diagram illustrates a process known as

1 amniocentesis
2 translocation
3 cloning
4 nondisjunction

Base your answers to questions 96 and 97 on the information and diagram below and on your knowledge of biology.

In cats, gene *E* produces yellow fur and gene *B* produces black fur. A cat that inherits both of these genes has patches of yellow and black fur and is known as a calico. The alleles for black or yellow are located on the *X*-chromosome. The cross $X^BY \times X^BX^E$ is illustrated in the square below.

	X^B	Y
X^B	1	2
X^E	3	4

96 Calico coat color is most likely due to

1 codominant autosomal genes
2 codominant sex-linked genes
3 recessive autosomal genes
4 recessive sex-linked genes

97 Yellow male offspring are represented by

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

98 Which concept provides an explanation for the process by which cellular activities are indirectly controlled by the nucleus?

1 one gene–one polypeptide hypothesis
2 fluid-mosaic model
3 theory of evolution
4 heterotroph hypothesis

99 Certain artificial sweeteners carry a warning label stating that they contain large amounts of the amino acid phenylalanine. This warning is important for individuals who have

(1) Tay-Sachs disease
(2) sickle-cell anemia
(3) PKU
(4) Down syndrome

Group 5 — Ecology

If you choose this group, be sure to answer questions 100–109.

Base your answers to questions 100 and 101 on the information below and on your knowledge of biology.

An ecologist passed through different biomes while driving up a high mountain. At the lowest elevation (sea level), the ecologist saw deep-green vegetation, many birds, and small mammals. At the highest elevation, the ecologist saw bare rock, very little vegetation, and few birds.

100 Which sequence of biomes did the ecologist most likely pass through while driving from the lowest elevation to the highest elevation of this mountain?

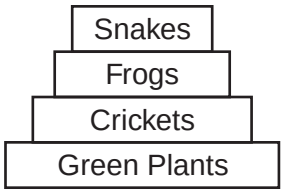
1 grassland → tundra → taiga
2 taiga → tundra → temperate deciduous forest
3 tundra → temperate deciduous forest → taiga
4 temperate deciduous forest → taiga → tundra

101 Which change was most likely encountered as the ecologist drove up the mountain?

1 an increase in the diversity of species
2 an increase in the amount of atmospheric oxygen
3 a decrease in temperature
4 a decrease in latitude

---

102 The diagram below shows a food pyramid.



Which level of the food pyramid contains consumers with the *least* biomass?

1 snakes
2 frogs
3 crickets
4 green plants

103 Acacia trees provide food for a species of ant that lives on them. The ants defend the acacia tree from grasshoppers and beetles. This relationship between the ant and acacia tree is best described as

1 commensalism
2 mutualism
3 parasitism
4 saprophytism

104 Which pair of organisms represents a predator-prey relationship?

1 owl and mouse
2 protozoan and termite
3 tapeworm and dog
4 deer and apple tree

105 Atmospheric nitrogen can only be used by most living things after it has been

1 converted to nitrates with the help of nitrogen-fixing bacteria
2 taken in by plants through the lenticels
3 converted to ammonia by bacteria of decay
4 combined with carbon dioxide to form protein

106 Which two factors are abiotic limiting factors that affect organisms in marine biomes?

1 amount of algae and wide temperature variations
2 amount of carbon dioxide and variety of producer organisms
3 amount of moisture and variety of consumer organisms
4 amount of oxygen and concentration of dissolved salts

107 The first living things to grow successfully on a newly formed sand dune are known as

1 saprophytes
2 pioneer organisms
3 carnivorous plants
4 heterotrophs

108 A pond surrounded by a beech-maple forest dries up. What will most likely happen if the pond remains dry for one more year?

1 A beech-maple forest will replace the pond.
2 No further change will occur in the area previously covered by the pond.
3 Grasses will most likely grow on the bottom of the dried-up pond.
4 The pond will fill in due to seasonal dieback of aquatic vegetation.

109 Male grizzly bears can maintain territorial control over many square miles. This role as a top predator in the territory is known as

1 a habitat
2 an ecosystem
3 a biosphere
4 a niche

Part III

This part consists of five groups. Choose three of these five groups. For those questions that are followed by four choices, record the answers on the separate answer paper in accordance with the directions on the front page of this booklet. For all other questions in this part, record your answers in accordance with the directions given in the question. [15]

Group 1

If you choose this group, be sure to answer questions 110–114.

Base your answers to questions 110 through 113 on the information and data table below and on your knowledge of biology.

Reaction time is a measure of how quickly an individual responds to a stimulus. An activity was performed to determine the reaction time of a student. To do this, one student suspended the zero end of a meterstick between the thumb and index finger of another student. The meterstick was dropped, and both the distance the meterstick dropped and the time it took for the student being tested to catch the meterstick were recorded. This procedure was repeated four more times. The results are shown in the data table below.

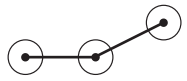
Data Table

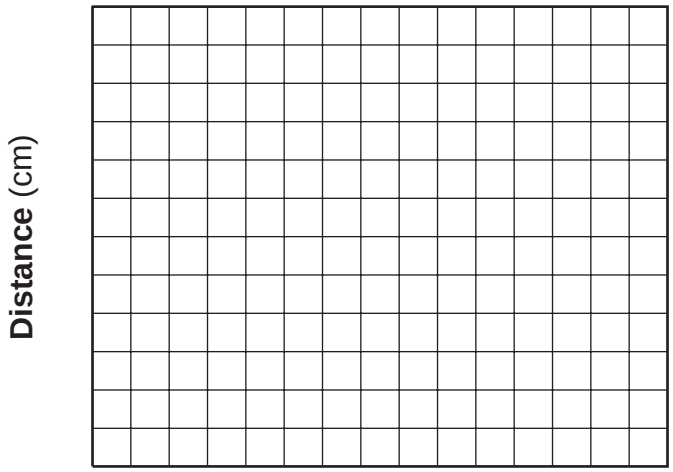
Trial	Distance (cm)	Time (sec)
1	90	0.43
2	75	0.39
3	50	0.32
4	45	0.30
5	35	0.29

Directions (110–111): Using the information in the data table, construct a line graph on the grid *provided on your answer paper*, following the directions below. The grid on the next page is provided for practice purposes only. Be sure your final answer appears *on your answer paper*. You may use pen or pencil for your answer.

110 Mark an appropriate scale on each labeled axis.

111 Plot the data for distance on the graph. Surround each point with a small circle and connect the points.

Example: 



112 If the meterstick was caught at the 70-centimeter mark, the amount of time needed to catch it would most likely have been between

(1) 0.1 and 0.15 sec
(2) 0.2 and 0.3 sec
(3) 0.3 and 0.32 sec
(4) 0.35 and 0.4 sec

113 Using one or more complete sentences, state the relationship between the number of trials and the reaction time. You may use pen or pencil for your answer.

114 In the hydra, impulses travel in both directions over a given nerve cell. Which inference could be made from this statement?

1 The ends of both axons and dendrites may secrete neurotransmitters.
2 Only the ends of axons secrete neurotransmitters.
3 Only the ends of dendrites secrete neurotransmitters.
4 The central nervous system of the hydra does not secrete neurotransmitters.

Group 2

If you choose this group, be sure to answer questions 115–119.

Base your answers to questions 115 through 118 on the passage below and on your knowledge of biology.

Chemicals and Blood Pressure Regulation

Blood pressure is regulated by the interaction of three chemicals: renin, angiotensin, and aldosterone. Renin is secreted from the kidneys, and it initiates the production of angiotensin. Angiotensin stimulates the constriction of arterial walls and the secretion of aldosterone by the adrenal glands. Aldosterone causes the kidneys to reabsorb sodium, which results in increased water content in the plasma. If excess renin is secreted, too much water is retained and blood pressure increases.

Scientists have recently discovered that the muscle fibers of the upper chambers of the heart produce a hormone known as ANP, which functions in the regulation of blood pressure. This hormone is secreted when the chambers are stretched, which usually occurs when blood pressure is high. ANP lowers blood pressure by increasing the excretion of sodium and water.

115 What effect does the presence of ANP have on the body?

1 It increases the production of renin.
2 It increases the excretion of sodium and water.
3 It stimulates the production of aldosterone.
4 It stimulates the production of angiotensin.

116 The interaction between the chemicals and organs that regulate the sodium and water content of the blood is an example of

1 egestion of wastes
2 nutrient transport
3 maintenance of homeostasis
4 antigen-antibody reaction

117 The hormone ANP is produced by the

1 adrenal glands
2 capillary walls
3 kidneys
4 atria

118 The secretion of aldosterone results in

1 an increase in water content in plasma
2 a decrease in blood pressure
3 the production of angiotensin
4 the reabsorption of renin

---

119 Which environmental factor could have a temperature of 39°C?

1 water temperature at the North Pole in March
2 water temperature in a lake in New York State in January
3 air temperature in a desert in the southwestern United States during a day in July
4 air temperature in the Adirondack Mountains of New York State in December

---

Group 3

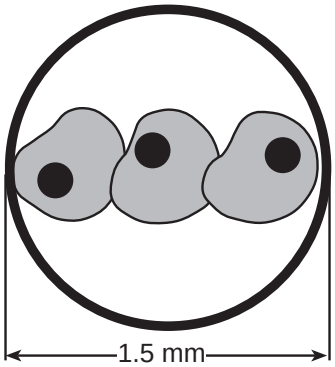
If you choose this group, be sure to answer questions 120–124.

120 Two views of the same onion epidermal cells, as seen with a compound light microscope, are shown in the diagram below.

What was most likely done to change the view from *A* to *B*?

1 Lugol's iodine solution was added to the cells.
2 The 40× objective was switched to the 10× objective.
3 The 10× objective was switched to the 40× objective.
4 Salt water was added to the cells.

121 The diagram below shows three cells in the field of view of a microscope. The diameter of the field of view is 1.5 millimeters.



What is the approximate diameter of each cell?

(1) 50 µm
(2) 250 µm
(3) 500 µm
(4) 4,500 µm

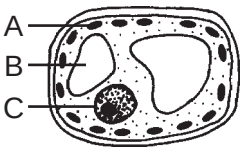
122 Which statement best describes the procedure for removing excess methylene blue from a wet-mount slide preparation?

1 Remove the coverslip and drop water onto the specimen.
2 Place a piece of paper towel at one edge of the coverslip to absorb the methylene blue, and then add water at the opposite edge of the coverslip.
3 Insert a pipette under the coverslip and withdraw some methylene blue.
4 Remove the coverslip, allow the methylene blue to dry, and then replace the coverslip.

123 A student views a wet mount of a specimen with the low-power objective of a compound light microscope. After the student switches to high power, which procedure would most likely produce a better view of the specimen?

1 increasing the amount of light by adjusting the diaphragm
2 increasing the distance between the slide and the low-power objective, using the coarse adjustment
3 removing the water from the slide
4 removing the coverslip from the slide

124 The diagram below represents a cell viewed using a compound light microscope.

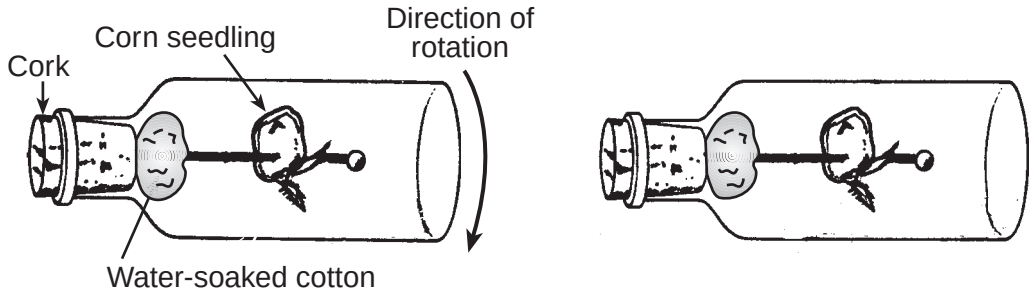


Select *one* of the lettered parts from the diagram. Record the letter of the part chosen in the space *provided on your answer paper* and, using one or more complete sentences, state the function of the part. You may use pen or pencil for your answer.

Group 4

If you choose this group, be sure to answer questions 125–129.

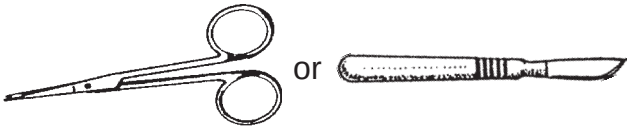
125 The diagram below shows two germinating corn seeds that have been placed in identical bottles and kept in the dark. Bottle *A* will be rotated 90 degrees each day for the next 6 days. Bottle *B* will not be rotated.



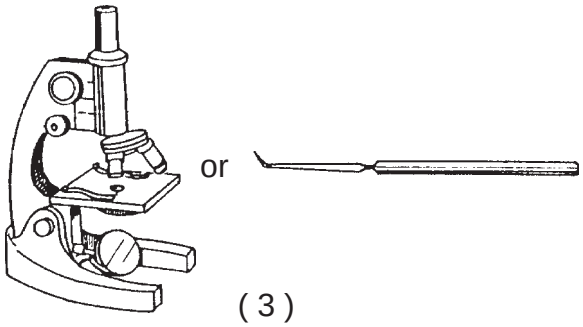
Which hypothesis is most likely being tested in this experiment?

1 The amount of light received affects chlorophyll production.
2 Water is needed for proper plant growth.
3 Gravity affects plant growth.
4 Enzymes promote seed development.

126 Which piece of laboratory equipment should a student use to remove the legs of a preserved grasshopper for further study?

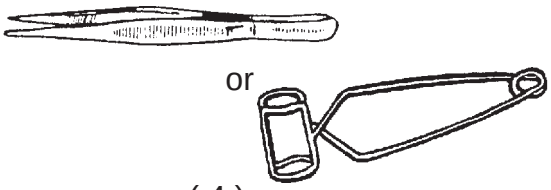


(1)



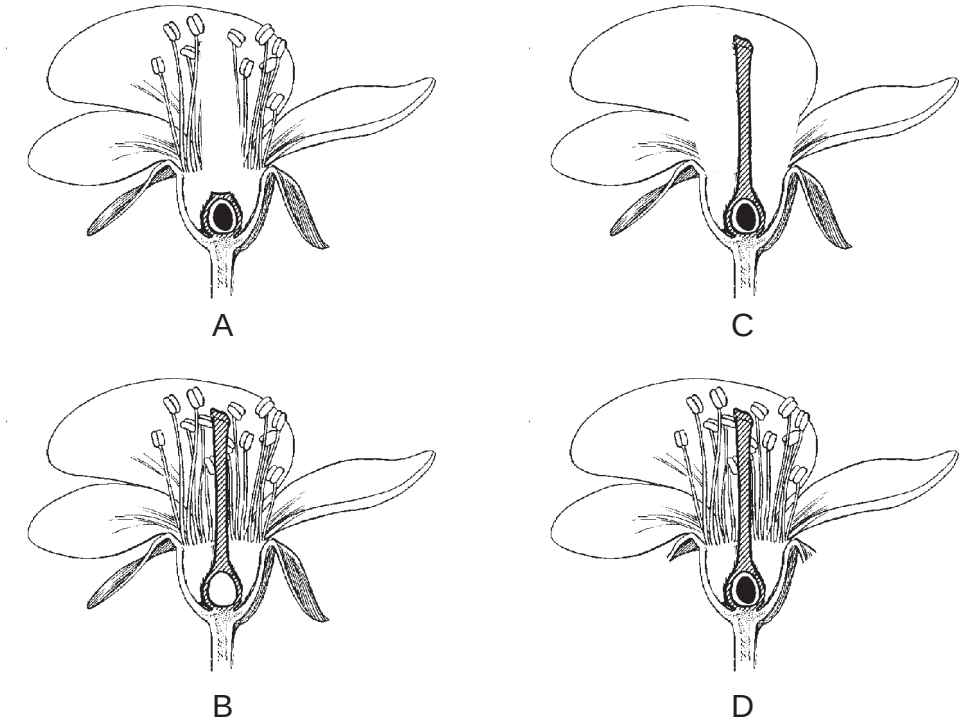
(3)

(2)



(4)

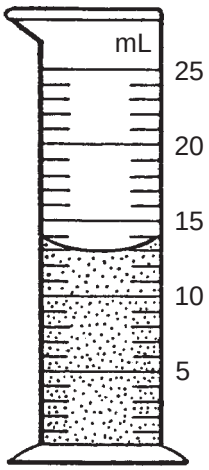
127 Four views of the same type of flower are shown in the diagrams below.



In which flower have all the stamens been removed?

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

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



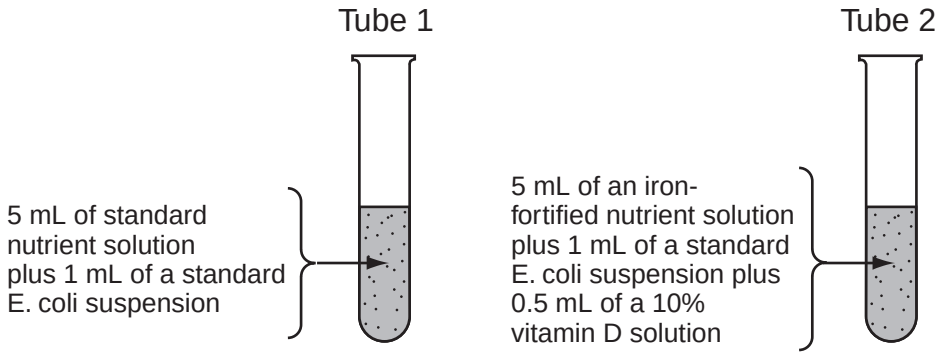
(1) 10.3 mL
(2) 13.0 mL
(3) 13.5 mL
(4) 14.0 mL

129 The red blood cells from 100 different human blood samples were studied. All the red blood cells observed lacked nuclei. From this study, the investigator concluded that the red blood cells of all vertebrate animals do not contain nuclei. Using one or more complete sentences, state whether or not this conclusion is valid and explain the reason for your answer. You may use pen or pencil for your answer.

Group 5

If you choose this group, be sure to answer questions 130–134.

130 The controlled experiment shown in the diagrams below is testing the effect of vitamin D on the growth of *E. coli* bacteria.



Using one or more complete sentences, state one error in the experimental setup. You may use pen or pencil for your answer.

131 The chart below lists characteristics of five species of bacteria.

Organism	Shape or Form	Type of Cell Wall	Capsule	Flagella	Endospores	Aerobic	Causes Lysis of Red Blood Cells	Grows Well at 20°C	Sugars Fermented		
									Glucose	Maltose	Lactose
1 Bacillus anthracis	Bacillus	A	+	–	+	+	–	–	+	+	+
2 Bacillus subtilis	Bacillus	A	–	–	+	+	–	+	+	+	+
3 Clostridium botulinum	Bacillus	A	–	+	+	–	+	–	+		–
4 Diplococcus pneumoniae	Diplococcus	A	+	–	–	+	+	–			
5 Escherichia coli	Bacillus	B	–	–	–	+	–	–	+	+	+

An unknown organism has a type A cell wall, a capsule, flagella, and endospores. The organism is aerobic and ferments glucose, lactose, and maltose. It does not cause red blood cell lysis and does not grow well at 20°C. Based on the chart, the best conclusion that can be drawn is that this organism is

1 closely related to *Diplococcus pneumoniae*
2 *Bacillus anthracis*
3 *Bacillus subtilis*
4 not identifiable from the information given

132 The materials from four different laboratory investigations are listed below.

Set 1	Set 2	Set 3	Set 4
Test tubes Beaker Water Hot plate Pipette Test-tube clamp Benedict's solution	Brown paper Source of light	Beaker Drinking straw Bromthymol blue	Compound microscope Slide Coverslip Lugol's iodine solution

Select one of the four sets of materials. Record the number of the set chosen in the space *provided on your answer paper* and, using one or more complete sentences, state a laboratory investigation that could be carried out using this set. You may use pen or pencil for your answer.

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133 An investigation was set up to determine the effect of various surfaces on the amount of time it takes a snail to move between two points. A ramp was made, covered with a piece of glass, and placed on a table at a 25-degree angle. Two lines, 15 centimeters apart, were drawn on the glass. A snail was placed on the upper line, and a stopwatch was used to measure the amount of time it took the snail to move to the lower line. The results were recorded in a data table. The investigation was repeated using sandpaper and cardboard on the surface of the ramp.

What must be done to show that the results of this investigation are valid?

1 The angle of the ramp must be increased to 35 degrees.
2 The times in the data table must be averaged.
3 The investigation must be repeated several times.
4 The ramp must be replaced with a log found in the habitat of the snail.

134 When heating a solution in a test tube, a student should

1 point the test tube in any direction
2 hold the test tube with two fingers
3 cork the test tube
4 wear goggles

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Wednesday, August 16, 2000 — 12:30 to 3:30 p.m., only

Part I Score (Use table below)	. . . . .
Part II Score	. . . . .
Part III Score	. . . . .
Total Score	. . . . .
Rater's Initials:	. . . . .

ANSWER PAPER

Student . . . . . Sex: ☐ Male ☐ Female

Teacher . . . . . School . . . . . .

All of your answers should be recorded on this answer paper.

Part I (65 credits)

1	1	2	3	4	**21**	1	2	3	4	**41**	1	2	3	4
2	1	2	3	4	**22**	1	2	3	4	**42**	1	2	3	4
3	1	2	3	4	**23**	1	2	3	4	**43**	1	2	3	4
4	1	2	3	4	**24**	1	2	3	4	**44**	1	2	3	4
5	1	2	3	4	**25**	1	2	3	4	**45**	1	2	3	4
6	1	2	3	4	**26**	1	2	3	4	**46**	1	2	3	4
7	1	2	3	4	**27**	1	2	3	4	**47**	1	2	3	4
8	1	2	3	4	**28**	1	2	3	4	**48**	1	2	3	4
9	1	2	3	4	**29**	1	2	3	4	**49**	1	2	3	4
10	1	2	3	4	**30**	1	2	3	4	**50**	1	2	3	4
11	1	2	3	4	**31**	1	2	3	4	**51**	1	2	3	4
12	1	2	3	4	**32**	1	2	3	4	**52**	1	2	3	4
13	1	2	3	4	**33**	1	2	3	4	**53**	1	2	3	4
14	1	2	3	4	**34**	1	2	3	4	**54**	1	2	3	4
15	1	2	3	4	**35**	1	2	3	4	**55**	1	2	3	4
16	1	2	3	4	**36**	1	2	3	4	**56**	1	2	3	4
17	1	2	3	4	**37**	1	2	3	4	**57**	1	2	3	4
18	1	2	3	4	**38**	1	2	3	4	**58**	1	2	3	4
19	1	2	3	4	**39**	1	2	3	4	**59**	1	2	3	4
20	1	2	3	4	**40**	1	2	3	4					

PART I CREDITS

Directions to Teacher:

In the table below, draw a circle around the number of right answers and the adjacent number of credits. Then write the number of credits (not the number right) in the space provided above.

No. Right	Credits	No. Right	Credits
59	**65**	29	**36**
58	**64**	28	**35**
57	**63**	27	**34**
56	**62**	26	**33**
55	**61**	25	**32**
54	**60**	24	**31**
53	**59**	23	**31**
52	**58**	22	**30**
51	**57**	21	**29**
50	**56**	20	**28**
49	**55**	19	**27**
48	**54**	18	**26**
47	**54**	17	**25**
46	**53**	16	**24**
45	**52**	15	**23**
44	**51**	14	**21**
43	**50**	13	**20**
42	**49**	12	**18**
41	**48**	11	**17**
40	**47**	10	**15**
39	**46**	9	**14**
38	**45**	8	**12**
37	**44**	7	**11**
36	**43**	6	**9**
35	**42**	5	**8**
34	**41**	4	**6**
33	**40**	3	**5**
32	**39**	2	**3**
31	**38**	1	**2**
30	**37**	0	**0**

No. right . . . . . .

Part II (20 credits)

Answer the questions in only two of the five groups in this part. Be sure to mark the answers to the groups of questions you choose in accordance with the instructions on the front page of the test booklet. Leave blank the three groups of questions you do not choose to answer.

Group 1
Biochemistry

60	1	2	3	4
61	1	2	3	4
62	1	2	3	4
63	1	2	3	4
64	1	2	3	4
65	1	2	3	4
66	1	2	3	4
67	1	2	3	4
68	1	2	3	4
69	1	2	3	4

Group 2
Human Physiology

70	1	2	3	4
71	1	2	3	4
72	1	2	3	4
73	1	2	3	4
74	1	2	3	4
75	1	2	3	4
76	1	2	3	4
77	1	2	3	4
78	1	2	3	4
79	1	2	3	4

Group 3
Reproduction and Development

80	1	2	3	4
81	1	2	3	4
82	1	2	3	4
83	1	2	3	4
84	1	2	3	4
85	1	2	3	4
86	1	2	3	4
87	1	2	3	4
88	1	2	3	4
89	1	2	3	4

Group 4
Modern Genetics

90	1	2	3	4
91	1	2	3	4
92	1	2	3	4
93	1	2	3	4
94	1	2	3	4
95	1	2	3	4
96	1	2	3	4
97	1	2	3	4
98	1	2	3	4
99	1	2	3	4

Group 5
Ecology

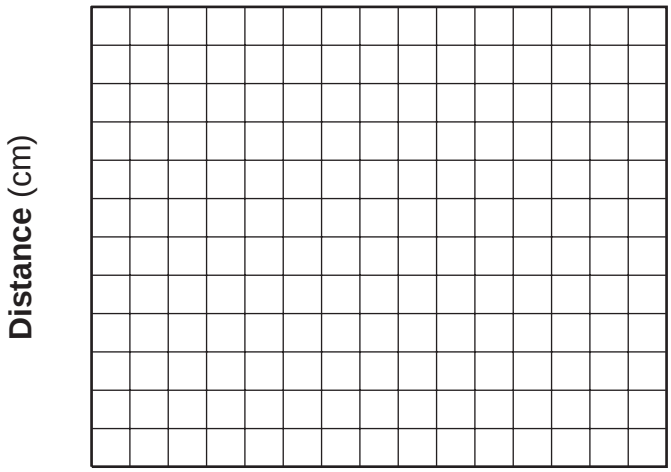
100	1	2	3	4
101	1	2	3	4
102	1	2	3	4
103	1	2	3	4
104	1	2	3	4
105	1	2	3	4
106	1	2	3	4
107	1	2	3	4
108	1	2	3	4
109	1	2	3	4

Part III (15 credits)

Answer the questions in only three of the five groups in this part. Leave blank the two groups of questions you do not choose to answer.

Group 1

110 – 111



112 1 2 3 4

113 _____

_____

114 1 2 3 4

Group 2

115 1 2 3 4

116 1 2 3 4

117 1 2 3 4

118 1 2 3 4

119 1 2 3 4

Group 3

120 1 2 3 4

121 1 2 3 4

122 1 2 3 4

123 1 2 3 4

124 _____

_____

Group 4

125 1 2 3 4

126 1 2 3 4

127 1 2 3 4

128 1 2 3 4

129 _____

_____

Group 5

130 _____

_____

131 1 2 3 4

132 _____

_____

_____

133 1 2 3 4

134 1 2 3 4

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