The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Friday, June 16, 2000 — 1:15 to 4:15 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.

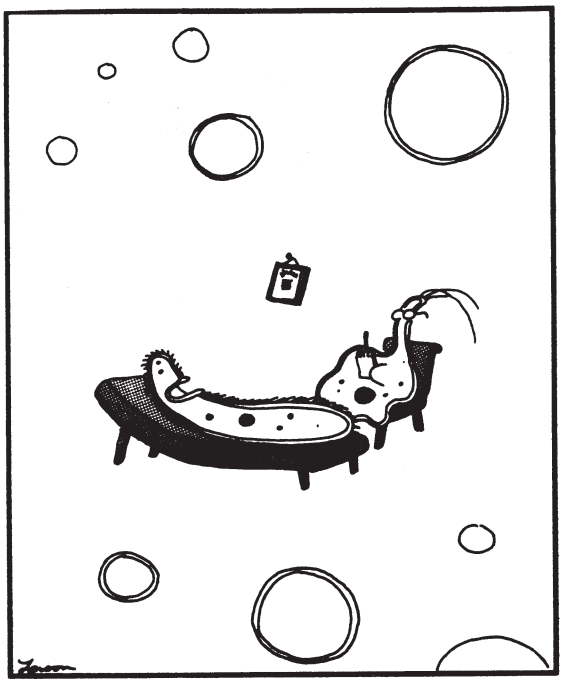
1 A hydra ingests a Daphnia, digests it, and later egests some materials. All of these events are most closely associated with the life process known as

1 transport
2 synthesis
3 growth
4 nutrition

2 Which function of human blood includes the other three?

1 transporting nutrients
2 transporting oxygen
3 maintaining homeostasis
4 collecting wastes

3 In the cartoon below, how would the organism on the couch be classified?



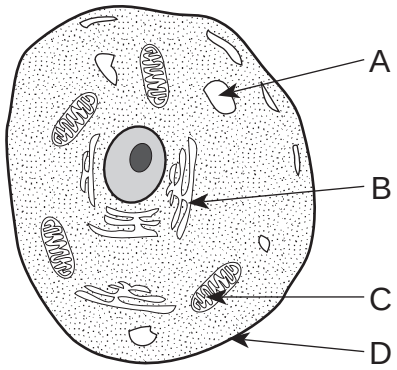
" I don't like living under a microscope."

1 tracheophyte
2 arthropod
3 fungus
4 protist

4 The invention of the compound light microscope enabled scientists to observe cells, helping them to

1 determine the number of atoms in a molecule
2 discover a basic similarity among organisms
3 study the behavior of chordates
4 develop techniques for growing plants in a laboratory

5 Which organelle in the diagram below represents an exception to the cell theory because it contains genetic material and can reproduce within the cell?



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

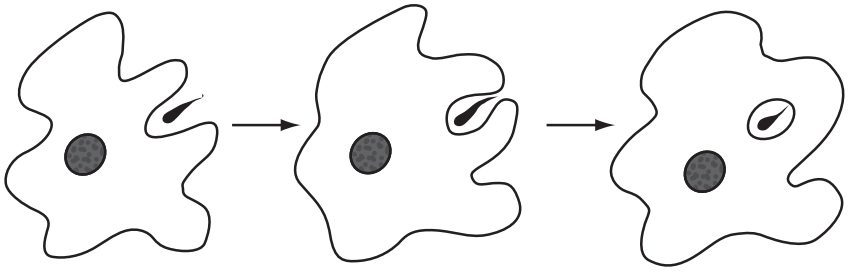
6 Water is classified as an inorganic compound because it

1 does not contain carbon
2 does not contain nitrogen
3 contains hydrogen
4 contains oxygen

7 A student placed groups of 50 seeds in a variety of temperatures ranging from 0 to 50°C. A difference in the rate of germination observed in the groups at different temperatures was most likely due to the effect of temperature on

1 ammonia
2 acids
3 enzymes
4 cellulose

8 The series of diagrams below represents a process carried out by a unicellular organism.



This process is known as

1 autotrophic nutrition
2 replication
3 sporulation
4 phagocytosis

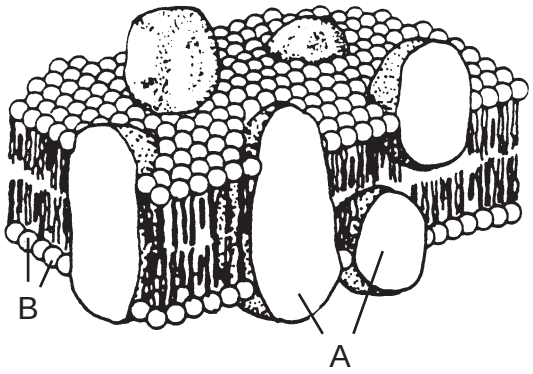
9 Glucose molecules that are produced by green plants can be

1 converted into starch by dehydration synthesis and stored in roots
2 converted into cellulose by hydrolysis and stored in leaves
3 used as catalysts for metabolic activity
4 used as a raw material for photosynthesis

10 Fungi, such as bread mold, use a method of digestion that is described as

1 chemical and intracellular
2 chemical and extracellular
3 mechanical and intracellular
4 mechanical and extracellular

11 In the diagram of the plasma membrane shown below, which structures are indicated by letters *A* and *B*?



(1) *A* — proteins; *B* — lipids
(2) *A* — fats; *B* — carbohydrates
(3) *A* — cellulose; *B* — fats
(4) *A* — water; *B* — proteins

12 A chewing insect damages the vascular tissue of a plant stem. This damage will most directly affect the

1 excretion of carbon dioxide by root cells
2 conduction of water and minerals between the roots and leaves
3 synthesis of auxins in the roots
4 diffusion of oxygen between root epidermal cells

13 In the chart below, which lettered section contains *incorrect* information?

Comparison of Circulation

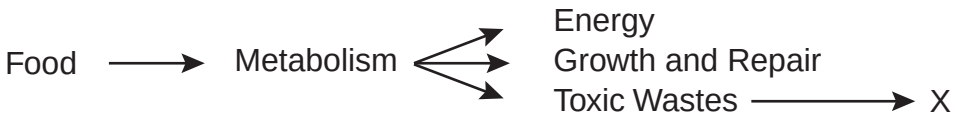
Grasshopper	Earthworm
(A) open system	closed system
tubular heart pumps blood	(B) aortic arches pump blood
(C) hemoglobin transports oxygen	(D) hemoglobin transports oxygen

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

14 One way human skeletal muscles and some bacteria are similar is that they both

1 reproduce asexually, using binary fission and regeneration
2 lack a nuclear membrane surrounding the chromosomes
3 carry out autotrophic nutrition when food becomes scarce in the environment
4 produce lactic acid when oxygen is not available for respiration

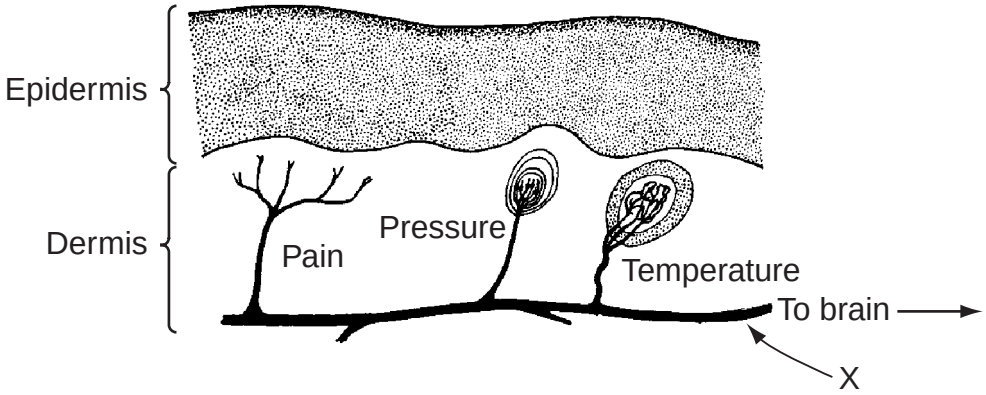
15 The diagram below shows how food is processed in an organism.



In animals, letter *X* most likely represents

1 digestion
2 synthesis
3 release into the environment
4 use as a neurotransmitter

16 Three types of skin receptors are represented in the diagram below.



Structure *X* is most likely

1 a sensory nerve
2 an effector
3 a ganglion
4 a tympanum

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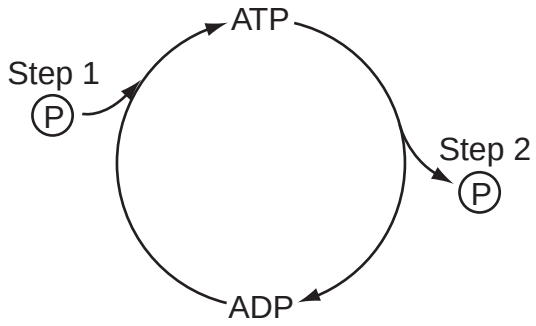
17 The diagram below represents part of the process of cellular respiration.



Energy is released and made available for metabolic activities at

1 step 1, only
2 step 2, only
3 both step 1 and step 2
4 neither step 1 nor step 2

18 Which statement correctly describes a characteristic of cells in the stems of plants?

1 They exchange gases through stomates for respiration.
2 They exchange gases by diffusion directly between the cells and root hairs.
3 They carry on photosynthesis and do not exchange gases.
4 They carry on respiration and exchange gases through lenticels.

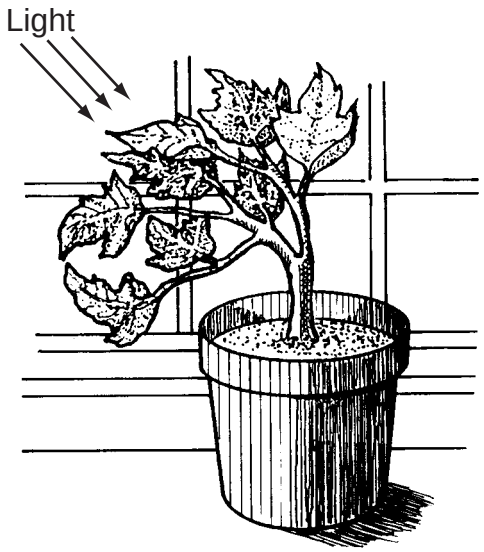
19 Earthworms move through soil by means of the interaction of muscles and

1 bones of an endoskeleton
2 bristlelike setae
3 appendages of an exoskeleton
4 hairlike cilia

20 The process of excretion in hydra is most similar to the process of excretion in

1 protozoans
2 grasshoppers
3 humans
4 annelids

21 The diagram below shows a growth response in a plant.



This growth response results from the

1 conversion of mechanical energy into radiant energy
2 action of contractile fibers
3 conversion of light energy into heat energy
4 action of plant hormones

22 An example of a reaction to a stimulus is

1 a boy smelling a flower
2 eyes blinking due to smoke in the air
3 a person tapping on the shoulder of a friend
4 a loud clap of thunder following lightning

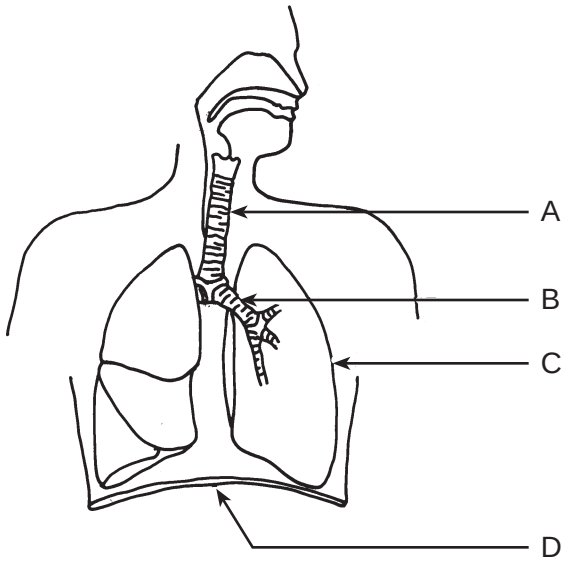
23 Which structures secrete chemicals utilized for the completion of digestion within the small intestine?

1 liver and pancreas
2 glomerulus and villi
3 esophagus and alveoli
4 gallbladder and pharynx

24 To determine heart rate, a student should count the pulsations per minute in

1 a vein
2 a capillary
3 an artery
4 a lymph vessel

25 Which structure shown in the diagram below contracts, causing a pressure change in the chest cavity during breathing?



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

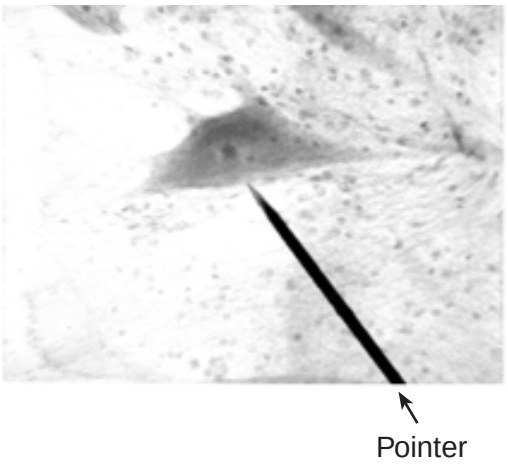
26 What is the main function of a nephron?

1 It breaks down red blood cells to form nitrogenous wastes.
2 It regulates the chemical composition of the blood.
3 It forms urea from the waste products of protein metabolism.
4 It absorbs digested food from the contents of the small intestine.

27 Which system is responsible for transporting hormones from endocrine glands to various body tissues?

1 circulatory
2 digestive
3 excretory
4 nervous

28 The photograph below shows tissue from a human spinal cord in the high-power field of a compound light microscope.



The cell indicated by the pointer would most likely be involved in

1 producing visual images
2 thought processes
3 reflex actions
4 remembering past experiences

29 Which two structures are directly involved in locomotion in humans?

1 visceral muscle and fibrous tendons
2 smooth muscle and ligaments
3 skeletal muscle and bones
4 cardiac muscle and immovable joints

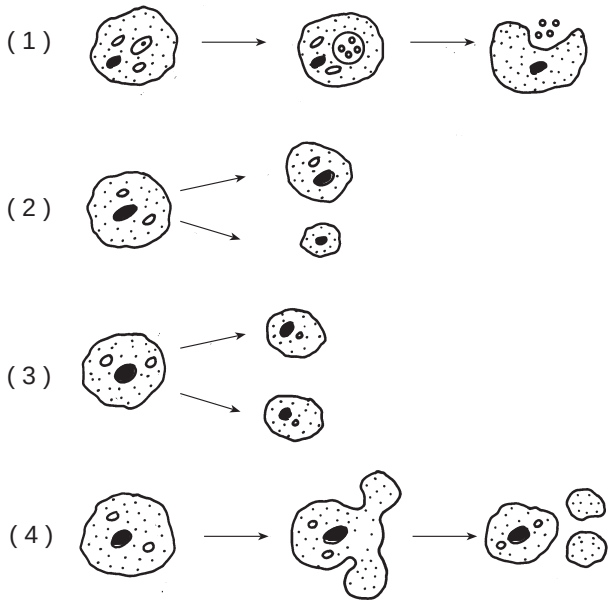
30 Which two processes are involved in mitotic cell division?

1 nuclear duplication and cytoplasmic division
2 nuclear duplication and cytoplasmic duplication
3 spermatogenesis and cytoplasmic duplication
4 oogenesis and cytoplasmic division

31 Compared to the number of chromosomes contained in a body cell of a parent, how many chromosomes would normally be contained in a gamete?

1 the same number
2 twice as many
3 one-fourth as many
4 half as many

32 Which diagram best shows the process of binary fission in an ameba?



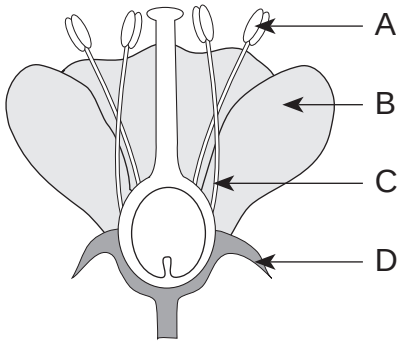
33 In which environment would internal fertilization occur in the greatest percentage of the species present?

1 forest
2 ocean
3 lake
4 swamp

34 For a human zygote to become an embryo, it must undergo

1 meiosis
2 cleavage
3 regeneration
4 disjunction

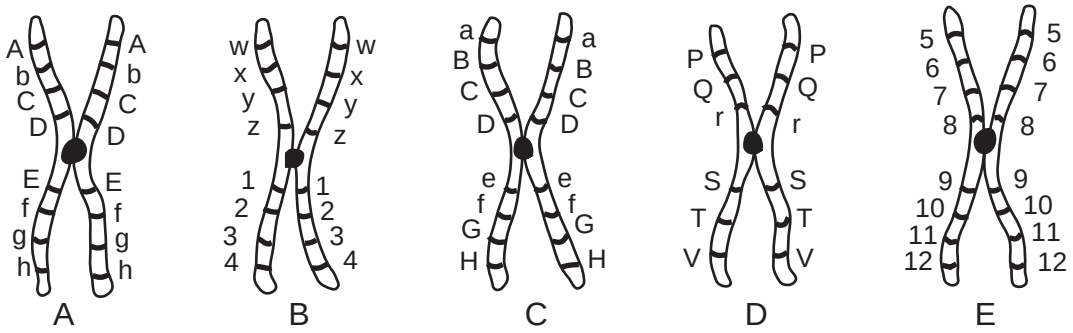
35 The diagram below shows parts of a flower.



In which structure does meiosis occur?

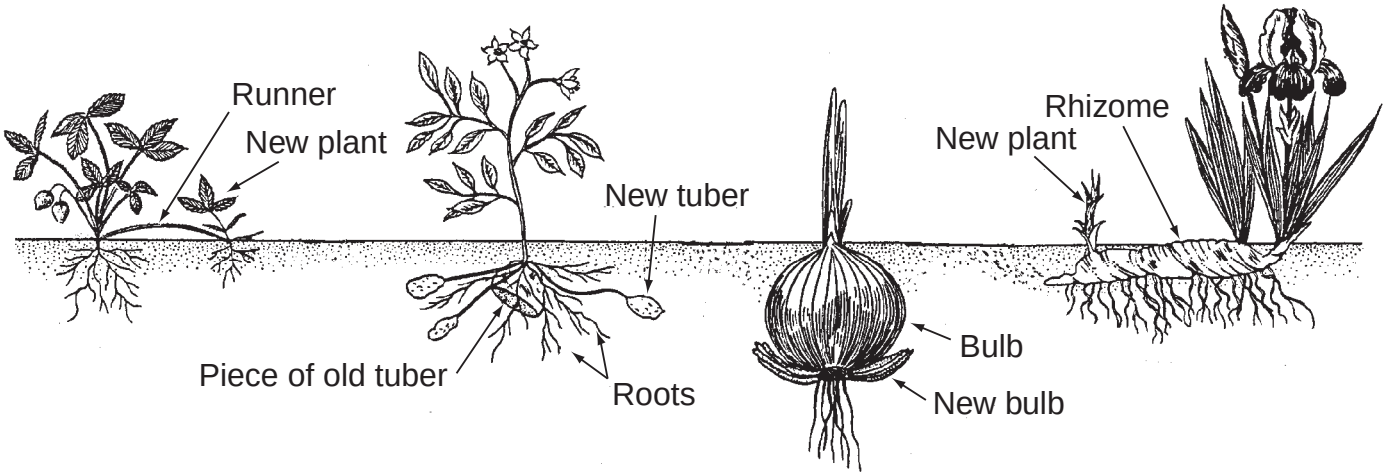
(1) *A*
(2) *B*
(3) *C*
(4) *D*

36 Which chromosomes shown below are homologous?



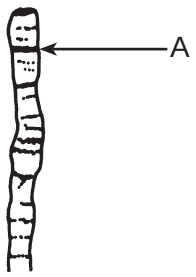
(1) *A* and *B*
(2) *B* and *C*
(3) *C* and *A*
(4) *D* and *E*

37 Which reproductive method is involved in the production of new organisms by all of the species shown below?



1 budding
2 inbreeding
3 artificial selection
4 vegetative propagation

38 The diagram below represents a portion of a chromosome of a fruit fly.

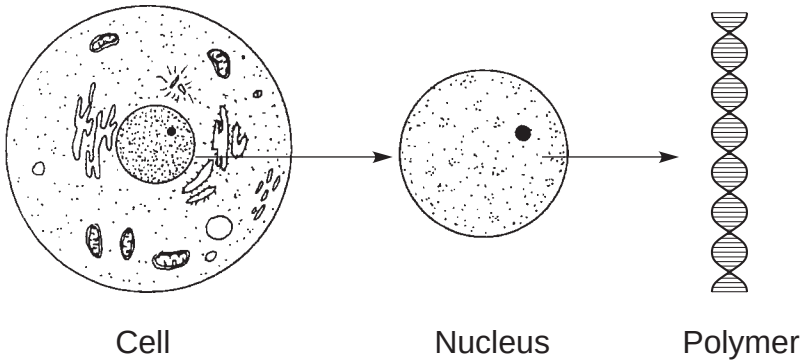


What would most likely be located at area *A*?
1 centrioles
2 spindle fibers
3 nucleolus
4 nucleic acid

39 Some weed killers, insecticides, and food additives alter the DNA of certain cells. Because of this effect, these substances are known as
1 auxins
2 mutagens
3 meristems
4 autosomes

40 Which reproductive process may be used in agriculture to maintain desirable mutations in plants?
1 cross-pollination
2 oogenesis
3 stem grafting
4 external fertilization

41 The structure and location of a cellular component is represented in the diagram below.



The polymer in the diagram most likely contains

1 adenosine triphosphate
2 lipids
3 genes
4 hydrolytic enzymes

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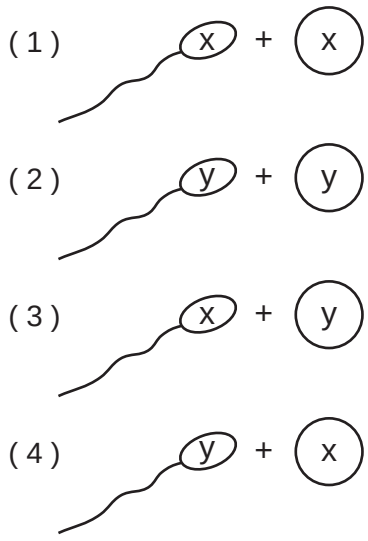
42 Which diagram correctly illustrates the fusion of normal gametes that will most likely produce a human male?



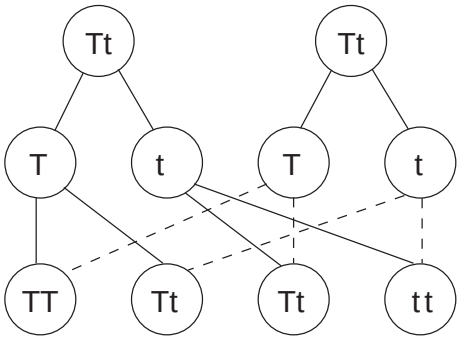
43 In a portion of a gene, the nitrogenous base sequence is T–C–G–A–A–T. Which nitrogenous base sequence would normally be found bonded to this section of the gene?

(1) A–C–G–T–A–A
(2) A–C–G–U–U–A
(3) A–G–C–T–T–A
(4) U–G–C–A–A–U

44 In a certain species of mouse, gray fur (*G*) is dominant over cream-colored fur (*g*). If a homozygous gray mouse is crossed with a cream-colored mouse, the genotype of the F_1 generation will most likely be

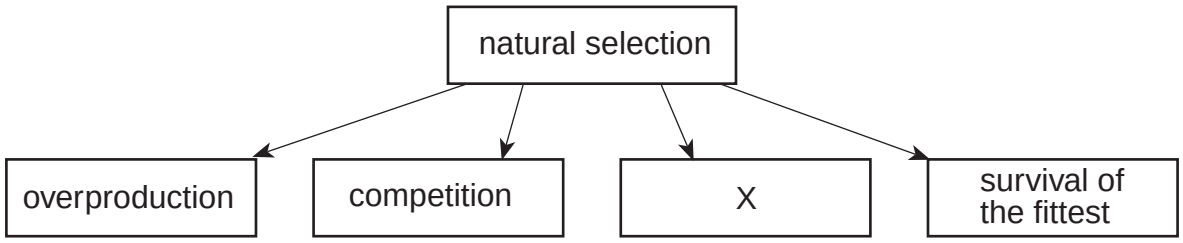
(1) 100% *Gg*
(2) 50% *GG* and 50% *gg*
(3) 25% *GG*, 50% *Gg*, and 25% *gg*
(4) 75% *Gg* and 25% *gg*

45 Which two processes are best represented by the diagram below?



1 recombination and codominance
2 segregation and intermediate inheritance
3 segregation and recombination
4 codominance and gene linkage

46 Some of the concepts included in Darwin's theory of natural selection are represented in the diagram below.



Which concept would be correctly placed in box *X*?

1 use and disuse
2 variation
3 changes in nucleic acids
4 transmission of acquired traits

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47 In a species of plant, the sudden appearance of one plant with a different leaf structure would most likely be the result of

1 stable gene frequencies
2 chromosomal mutations
3 slow environmental changes
4 asexual reproduction

48 In a certain area of undisturbed layers of rock, fossils of horseshoe crabs may be found in the upper layer, and a lower layer contains fossils of trilobites. Trilobites are extinct aquatic arthropods resembling modern horseshoe crabs. This information suggests that

1 horseshoe crabs will soon become extinct
2 horseshoe crabs and trilobites are completely unrelated organisms
3 horseshoe crabs may have evolved from trilobites
4 trilobites may have evolved from horseshoe crabs

49 Some scientists suggest that the mass extinction of dinosaurs resulted from sudden global weather changes caused by the impact of an asteroid on Earth. This event most likely promoted the evolution of new species of animals. These ideas best support the concept of

1 punctuated equilibrium
2 use and disuse
3 gradualism
4 geographic isolation

50 When penicillin was first introduced, it was very effective in destroying most of the bacteria that cause gonorrhea. Today, certain varieties of this bacterium are resistant to penicillin. Which statement best explains the appearance of these resistant varieties?

1 Penicillin stimulated the bacteria to become resistant, and this resistance was passed to the offspring.
2 Penicillin killed the susceptible bacteria, while naturally resistant varieties survived and reproduced.
3 Penicillin used today is not as strong as the penicillin used when it was first introduced.
4 Penicillin stimulated the production of antigens in the resistant bacteria.

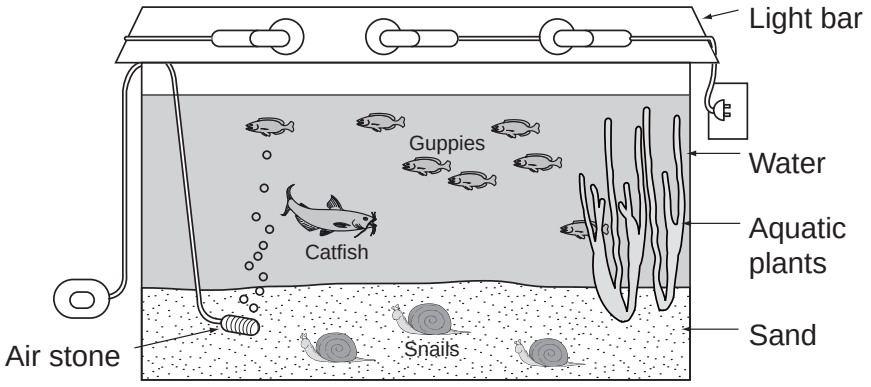
51 Although similar in many respects, two species of organisms exhibit differences that make each well adapted to the environment in which it lives. The process of change that may account for these differences is

1 evolution
2 germination
3 regeneration of lost structures
4 transmission of homologous structures

52 According to the heterotroph hypothesis, which gas was *lacking* in the atmosphere of primitive Earth?

1 ammonia
2 hydrogen
3 methane
4 oxygen

53 Which statement regarding the ecosystem shown in the diagram below is correct?



1 The community within this ecosystem consists of seven guppies and one catfish.
2 The energy source for this ecosystem is the gas from the air stone.
3 A population within this ecosystem is the three snails.
4 Cycling of materials is not necessary in this self-sustaining ecosystem.

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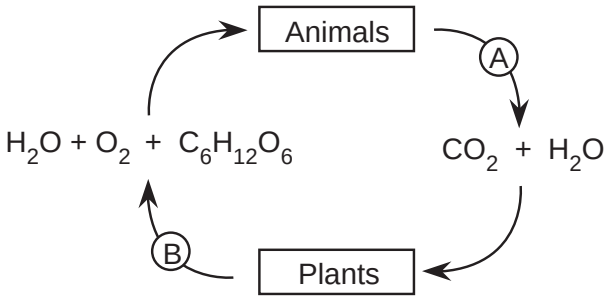
54 Which statement best illustrates the concept of the interrelationship of living things with the physical environment, as found in the definition of ecology?

1 Hawks and eagles often compete with each other.
2 White-tailed deer shed their antlers.
3 Algae release oxygen and absorb carbon dioxide from pond water.
4 Frogs produce many eggs in a single reproductive cycle.

55 In the material cycle shown below, which processes are represented by letters *A* and *B*?



1 *A*–excretion, *B*–respiration
2 *A*–transpiration, *B*–excretion
3 *A*–photosynthesis, *B*–transpiration
4 *A*–respiration, *B*–photosynthesis

56 Which abiotic factor has the *least* effect on the ability of aerobic organisms to live and reproduce in a cave?

1 shape of rocks in the cave
2 amount of energy present in the cave
3 amount of oxygen in the cave
4 availability of moisture in the cave

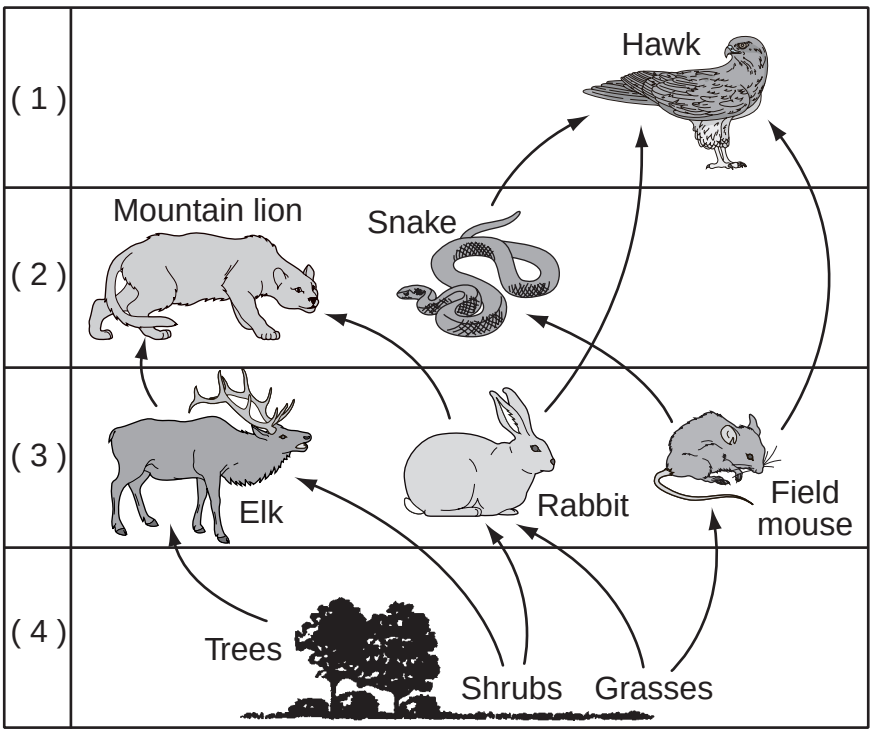
57 Intense competition would most likely occur between

1 owls and deer inhabiting the same forest
2 squirrels and chipmunks using the same food source in a certain habitat
3 pine trees and grass seedlings growing in adjacent fields
4 whales and sharks living in the same ocean

58 Which human activity would be more likely to have a negative impact on the environment than the other three?

1 using reforestation and cover cropping to control soil erosion
2 using insecticides to kill insects that compete with humans for food
3 developing research aimed toward the preservation of endangered species
4 investigating the use of biological controls for pests

59 In the diagram below, which level of organisms contains the greatest amount of available energy?



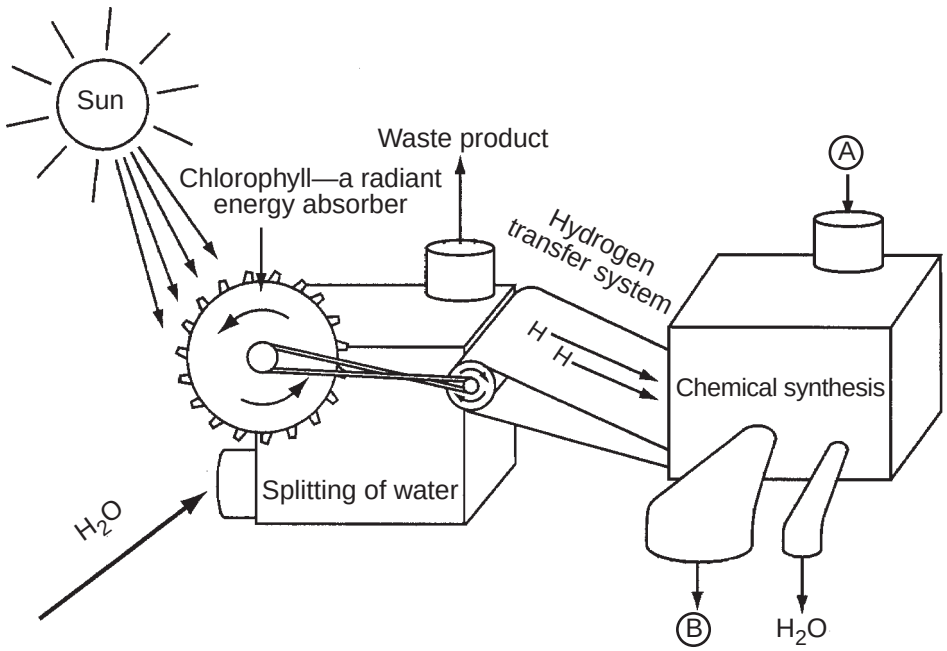
Part II

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.

Base your answers to questions 60 through 62 on the diagram below and on your knowledge of biology. The diagram represents plant photosynthetic activities taking place in a "food factory."



60 Which gas is represented by letter *A*?

1 oxygen
2 nitrogen
3 methane
4 carbon dioxide

61 Which substance is most likely represented by letter *B*?

(1) RNA
(2) glucose
(3) alcohol
(4) auxin

62 The chemical synthesis area most likely contains

1 enzymes necessary for fermentation
2 structural components known as grana
3 enzymes necessary for carbon-fixation reactions
4 structural components known as mitochondria

Base your answers to questions 63 and 64 on the two stages of a metabolic process shown below and on your knowledge of biology.

Stage 1

X + 2 ATP → 2 pyruvic acid + 4 ATP

Stage 2

2 pyruvic acid + oxygen →

carbon dioxide + water + 34 ATP

63 Which raw material, represented by letter *X*, is needed for the stage 1 reaction to occur?

(1) chlorophyll
(2) nitrogen
(3) PGAL
(4) $C_6H_{12}O_6$

64 What is the net gain in ATP from the two stages of this metabolic process?

(1) 40
(2) 36
(3) 34
(4) 30

65 Which substance plays a major role in most of the chemical reactions that occur in a living cell?

1 water
2 glycogen
3 glycerol
4 maltose

Base your answers to questions 66 through 68 on the two chemical reactions shown below and on your knowledge of biology.

Chemical Reactions

(1) maltose + water $\xrightarrow{\textbf{A}}$ glucose + **B**

(2) fat + water $\xrightarrow{\textbf{C}}$ glycerol + fatty acids

66 Letter *A* most likely represents

1 a hormone
2 a neurotransmitter
3 an organic catalyst
4 a hemoglobin molecule

67 Letter *B* represents a

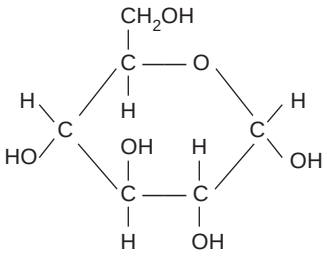
1 glycerol molecule
2 monosaccharide
3 dipeptide molecule
4 polymer

68 Substance *C* is most likely

1 lipase
2 sucrase
3 maltase
4 amylase

GO RIGHT ON TO THE NEXT PAGE.

69 Some structural formulas of organic molecules are shown below.



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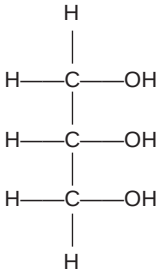

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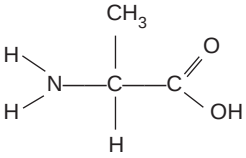

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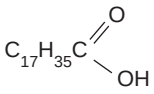
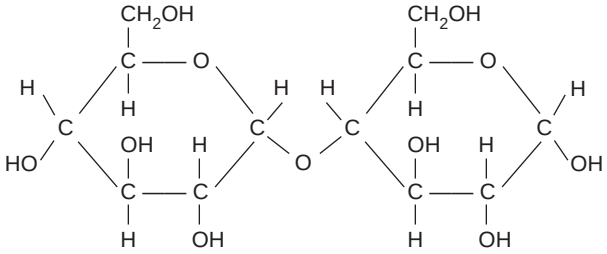


(4)



(5)

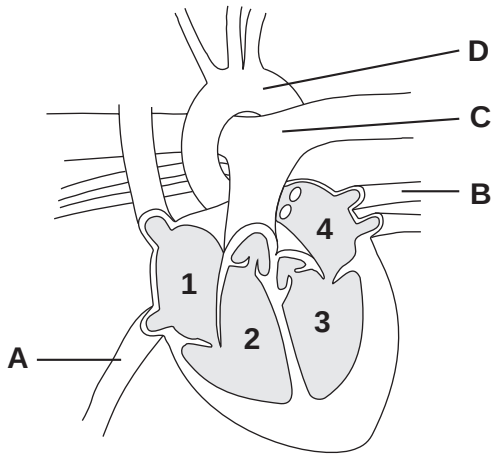
Which structural formulas represent carbohydrate molecules?

(1) 1 and 5
(2) 2 and 4
(3) 3 and 2
(4) 4 and 3

Group 2 — Human Physiology

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

Base your answers to questions 70 and 71 on the diagram below of the human heart and on your knowledge of biology.



70 Deoxygenated blood from the body is returned to the heart by way of structure

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

71 Which heart chamber pumps blood toward the alveoli by way of the pulmonary arteries?

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

72 Which hormone stimulates the release of sugar from the liver into the blood?

(1) parathormone (3) glucagon
(2) insulin (4) FSH

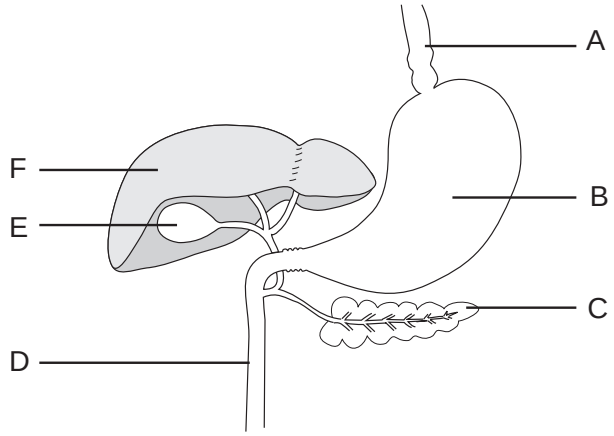
73 A person who is given an injection containing only antibodies would most likely develop

1 allergies 3 leukemia
2 sickle-cell anemia 4 passive immunity

74 If only the ABO group is considered, an individual with type A blood can safely receive a pint of blood from a donor whose genotype is

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

Base your answers to questions 75 and 76 on the diagram below and on your knowledge of biology.



75 A digestive function of organ *C* is the synthesis and secretion of

1 salivary amylase 3 hydrochloric acid
2 protease 4 bile

76 Peristalsis occurs in structures

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

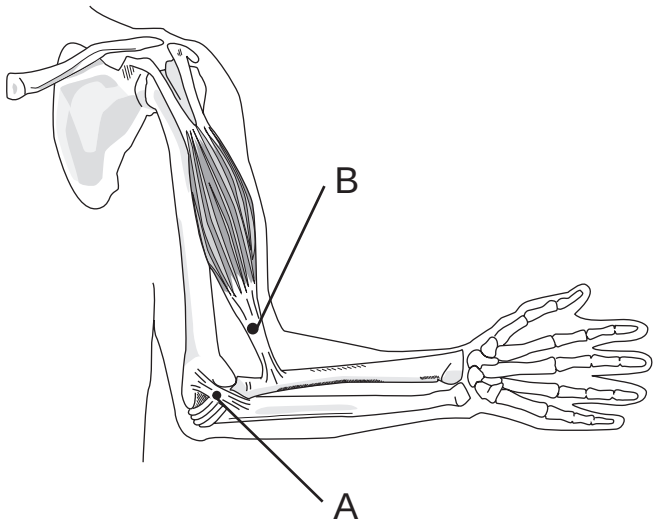
77 Which structures secrete hormones that influence proper bone structure and development?

1 pituitary and parathyroid
2 thyroid and adrenal cortex
3 ovaries and testes
4 hypothalamus and islets of Langerhans

78 High blood pressure can usually be reduced if a person

1 eats a diet high in salt and reduces physical activity
2 eats a diet high in saturated fats and reduces stress
3 reduces physical activity and decreases the consumption of complex carbohydrates
4 exercises regularly and lowers the amount of saturated fats consumed

79 Which two disorders are most closely associated with regions *A* and *B* in the diagram below?

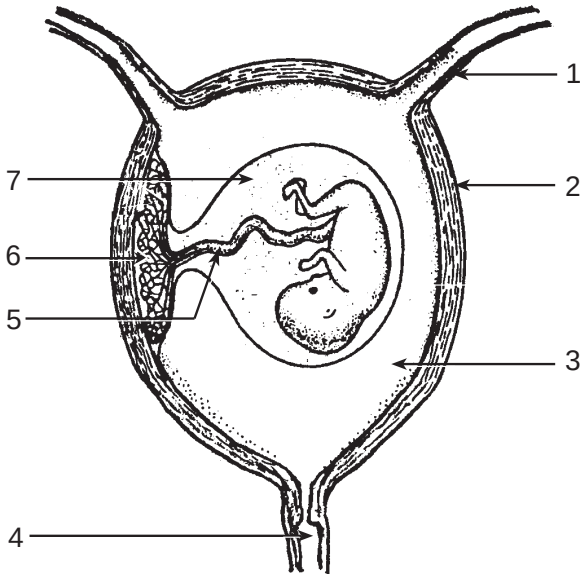


1 diabetes and goiter
2 arthritis and tendinitis
3 stroke and meningitis
4 angina pectoris and coronary thrombosis

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 human fetus and on your knowledge of biology.



80 Estrogen stimulates the production of additional blood vessels in structure

(1) 1 (3) 5
(2) 2 (4) 7

81 The embryo is protected from shock by a substance located at

(1) 6 (3) 3
(2) 7 (4) 4

82 Within which structure does fertilization normally occur?

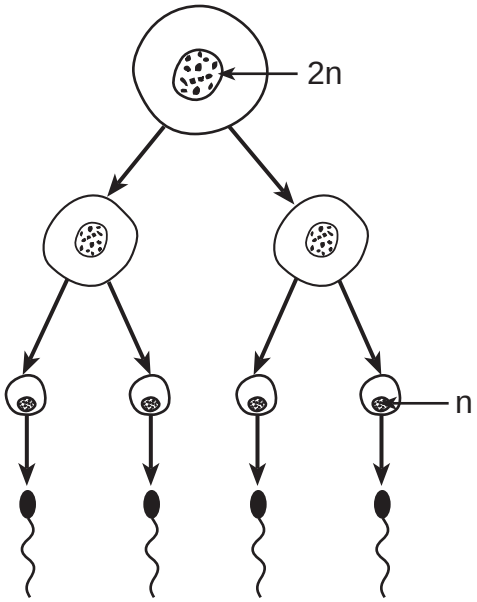
(1) 1 (3) 6
(2) 2 (4) 4

---

83 Gestation for a human embryo ends when

1 birth occurs
2 puberty is reached
3 differentiation ends
4 menstruation begins

Base your answers to questions 84 through 86 on the diagram below, which represents a necessary part of human reproduction, and on your knowledge of biology.



84 This diagram represents the process of

1 ovulation 3 mitotic cell division
2 gastrulation 4 gametogenesis

85 In humans, this process is most influenced by the presence of

1 egg cells 3 thyroxin
2 testosterone 4 progesterone

86 This process occurs within the

1 corpus luteum 3 testes
2 ovaries 4 sperm duct

---

87 Eggs that develop externally on land contain a substance that provides food for the embryo. This substance is called

1 amnion 3 yolk
2 chorion 4 allantois

88 An adaptation that has enabled animals to reproduce successfully on land is

1 semen as a transport medium for sperm
2 egg cells with the ability to locomote
3 fertilization outside the body of the female
4 diploid gametes that undergo differentiation

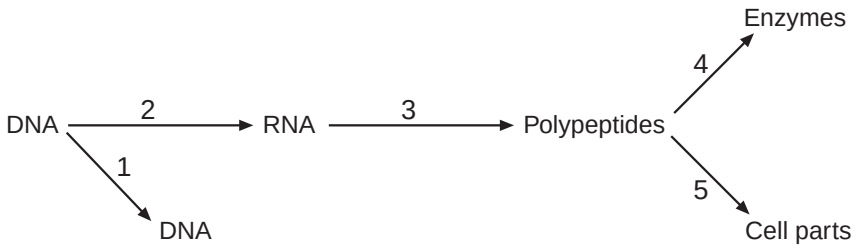
89 The material that flows from the human female reproductive tract during menstruation is produced by the breakdown of the lining of the

1 ovary
2 oviduct
3 vagina
4 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 contains arrows representing different processes occurring in a cell, and on your knowledge of biology.



90 Which processes occur in the nucleus?

(1) 1 and 2
(2) 2 and 3
(3) 3 and 4
(4) 4 and 5

91 Process 1 is known as

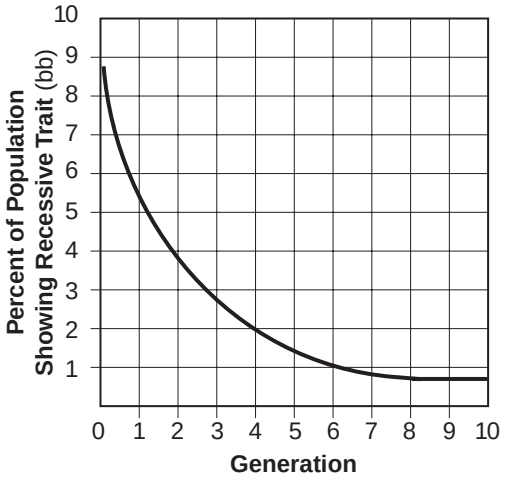
1 replication
2 mutation
3 nondisjunction
4 translocation

92 What is the product of process 3?

1 a strand of DNA
2 two complementary strands of DNA
3 a strand of RNA
4 a chain of amino acids

---

93 The graph below shows the percentage of a large population that expresses a certain recessive trait (*bb*) through 10 generations.



What would most likely happen if a mutation of allele *b* occurred after the tenth generation?

1 Random mating would not take place in the population.
2 The entire population would migrate and become established in a different habitat.
3 The percent of the population showing this recessive trait would change in some way.
4 The gene frequency for this recessive trait would remain the same.

94 A condition caused by the lack of an enzyme needed to metabolize a specific amino acid is known as

1 Down syndrome
2 hemophilia
3 Tay-Sachs
4 phenylketonuria

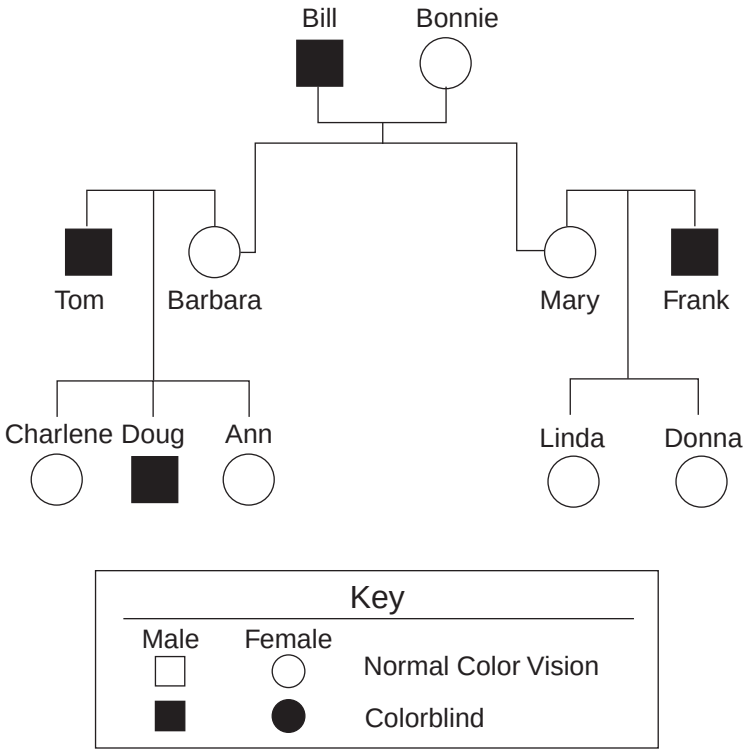
95 If an adenine nucleotide is deleted from a nucleotide sequence in a DNA molecule, the result is a

1 clone
2 mutation
3 polypeptide
4 hybrid

96 Using special enzymes, scientists have successfully removed the gene that controls the production of interferon and have inserted this gene into the DNA of certain bacteria. These bacteria can now produce interferon. This technique is known as

1 amniocentesis
2 differentiation
3 genetic engineering
4 karyotyping

Base your answers to questions 97 through 99 on the pedigree chart below and on your knowledge of biology. The pedigree chart represents the inheritance of color blindness through three generations.



97 Barbara is expecting another child. What is the probability that the new baby will be colorblind?

(1) 0%
(2) 25%
(3) 50%
(4) 100%

98 The allele for color blindness is carried on

1 the *Y*-chromosome, only
2 the *X*-chromosome, only
3 both the *X*- and *Y*-chromosomes
4 neither the *X*- nor the *Y*-chromosome

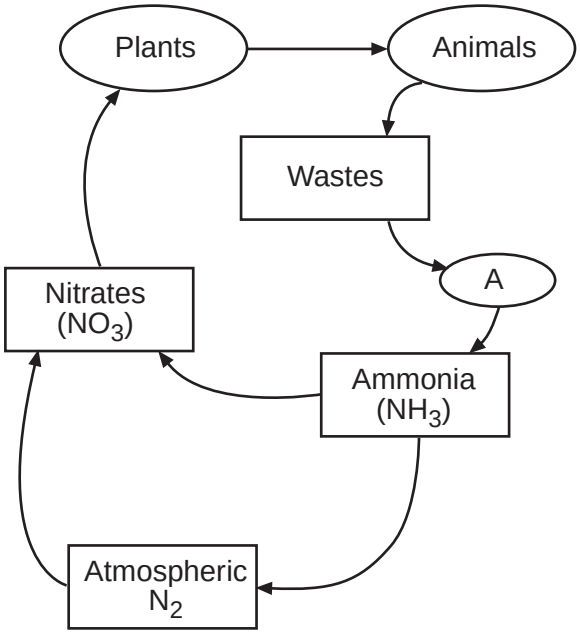
99 Which statement about the genotype of Linda and Donna regarding color blindness is correct?

1 Both carry one recessive allele.
2 Linda is a carrier, and Donna is homozygous dominant.
3 Both are homozygous recessive.
4 Linda is homozygous dominant, and Donna is a carrier.

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 diagram of the nitrogen cycle below and on your knowledge of biology.



100 What is the role of NO_3 in the cycle?

1 It is converted to atmospheric nitrogen.
2 It is used by animals for carbohydrate synthesis.
3 It is used by plants for protein synthesis.
4 It is used by bacteria to synthesize ammonia.

101 Which substance, acted on by *A* in the cycle, would most likely be included in the area labeled "Wastes"?

1 urea
2 sulfur
3 carbon dioxide
4 mineral salt

---

102 Knowing the type of food consumed by an organism helps to identify the role of the organism in the community. This role is known as its

1 nesting site
2 territorial range
3 biomass
4 niche

Base your answers to questions 103 and 104 on the key below and on your knowledge of biology.

Key

0 = organism is not affected
+ = organism is benefited
– = organism is adversely affected

103 A small shrimp feeds on parasites on the skin of a marine fish. Which set of symbols represents the relationship between the fish and the other two organisms?

(1) + with shrimp; – with parasite
(2) – with shrimp; 0 with parasite
(3) 0 with shrimp; – with parasite
(4) + with shrimp; 0 with parasite

104 Which set of symbols indicates a relationship that is *least* likely to exist in nature?

(1) +, 0
(2) –, –
(3) +, +
(4) +, –

---

105 Which factor determines the type of terrestrial plants that grow in an area?

1 percentage of nitrogen in the air
2 depth of the ponds in the area
3 number of secondary consumers present
4 climate of the area

106 Which animal species are part of the climax fauna throughout most of New York State?

1 caribou, crow, and snowy owl
2 elk, moose, and black bear
3 grey squirrel, fox, and deer
4 water snake, grizzly bear, and mayfly

Base your answers to questions 107 through 109 on the information below and on your knowledge of biology.

> The Long Island pine barrens is a natural woodland that once covered more than a quarter of a million acres. The dominant tree in this woodland is the pitch pine. Plant and animal distribution and abundance are controlled by fire and soil conditions. Dry, sandy soils encourage frequent wildfires, which periodically consume all or part of the vegetation. Fires are natural and important in maintaining the pine barrens. Pine barrens plants and animals must be fire adapted; that is, they must have the ability to survive fires or to colonize burned areas rapidly. Some pine barrens insects, for example, escape fire by burrowing deep into the ground during times of the year when fires are likely to occur.

107 Which event normally takes place *after* a fire in the pine barrens?

1 ecological succession, which helps reestablish the pine barrens
2 hibernation of the insects in the ground
3 increased mutations in the pitch pines
4 rapid interbreeding of animal species that survive the fire

108 In the pine barrens, pitch pine trees are part of a

1 tundra biome
2 pioneer community
3 climax community
4 grassland biome

109 A pioneer organism in the pine barrens is one that

1 migrates to a different habitat
2 is the first to repopulate areas where fire destroyed the vegetation
3 burrows out of the ground after the fire is extinguished
4 is destroyed by the fire

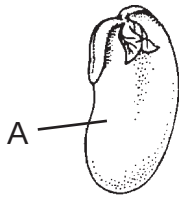
Part III

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.

110 The diagram below represents one-half of a dissected bean seed.



Which solution should be used to determine if structure *A* contains starch?

1 Benedict's solution
2 salt solution
3 Lugol's iodine solution
4 methylene blue solution

111 Which instrument would be most appropriate to use to observe where the Malpighian tubules attach to the digestive system of a grasshopper?

1 compound light microscope
2 dissecting microscope
3 ultracentrifuge
4 pipette

112 Which sentence represents a hypothesis?

1 Environmental conditions affect germination.
2 Boil 100 milliliters of water, let it cool, and then add 10 seeds to the water.
3 Is water depth in a lake related to available light in the water?
4 A lamp, two beakers, and elodea plants are selected for the investigation.

113 How does the control setup in an experiment differ from the other setups in the same experiment?

1 It tests a different hypothesis.
2 It has more variables.
3 It differs in the one variable being tested.
4 It utilizes a different method of data collection.

114 State *one* type of measurement data that can be obtained from the proper use of a graduated cylinder. You may use pen or pencil for your answer.

Group 2

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

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

A student studied the effect of gibberellin, a plant hormone, on the growth of corn seedlings of the same height and species. A different concentration of gibberellin in a fixed volume of water was applied to each plant in seven equal groups containing 10 plants each. These plants were maintained under the same environmental conditions for a period of 25 days. At the end of this period, the height of each plant was measured. The data are shown in the table below.

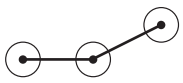
Data Table

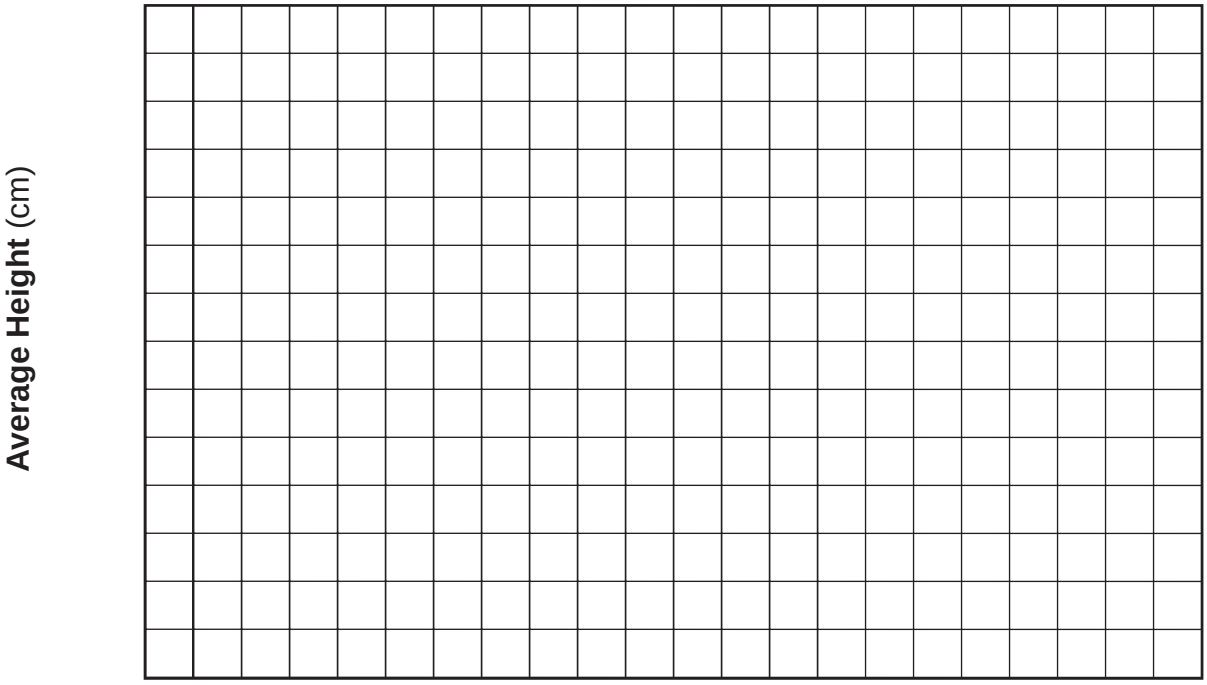
Micrograms of Gibberellin in a Water Solution	**Average Height** (cm)
0.00	20
0.05	40
0.10	60
0.25	70
0.50	75
1.00	80
2.00	80

Directions (115–116): 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.

115 Mark an appropriate scale on each labeled axis.

116 Plot the data from the data table. Surround each point with a small circle and connect the points.

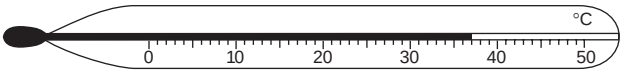
Example: 



117 Using one or more complete sentences, explain how increasing the application amount of gibberellin from 0.05 to 0.50 microgram affects the height of corn seedlings. You may use pen or pencil for your answer.

118 Using one or more complete sentences, identify the control used in this investigation. You may use pen or pencil for your answer.

119 The diagram below represents a thermometer that is inside an incubator.



A student needs to incubate a bacterial culture at 43°C. According to the reading on the thermometer, how many degrees must the temperature in the incubator be increased to reach this temperature?

(1) 3
(2) 6
(3) 9
(4) 12

Group 3

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

Base your answers to questions 120 through 123 on the reading passage below and on your knowledge of biology.

The Study of Yeast Cells May Give a Clue to One Cause of Aging in Humans

Scientists have discovered a fundamental mechanism involved in aging in yeast cells. The process involves the accumulation of small pieces of DNA inside dividing cells until the cells can no longer function. As a result, the cells become fragile and die.

Before this discovery, a precise molecular cause for aging had not been found. However, this recent discovery shows that the excess pieces of DNA that pile up inside the crescent-shaped nucleolus in a yeast cell lead to premature aging and a shorter life span. The fragments of DNA, known as extrachromosomal ribosomal (ECR) DNA, are small circles that are somehow separated from normal chromosomes and copied more frequently each time the cell divides. These circles are stored in the nucleolus. After approximately 15 repetitions of the cell division process, the nucleolus contains so much of this DNA that it becomes enlarged and bursts. After the nucleolus ruptures, the yeast cell can no longer function. The discovery of this fact has led to the belief that the fragmentation of the nucleolus is one cause of aging in yeast cells.

It is not known whether this same process occurs in human cells; however, some scientists believe that there is genetic evidence to suggest that this process does occur. Their main clue is that yeast cells contain a gene similar to a mutant gene in humans responsible for Werner syndrome, a rapid-aging disorder. This similar gene in yeast cells also speeds up the aging process, providing a possible link between the process of aging in yeast cells and in people with Werner syndrome.

This mechanism has apparently been conserved through evolution, as it is found in a wide variety of species. It is important in organisms, including humans, that some old cells die to make room for new ones. This mechanism could be one cause of death in old cells. If this process does occur in humans, this discovery may lead to ways of slowing or even controlling the aging process.

120 A possible cause of the inability of "old" human cells to function properly may be

1 the presence of yeast cells
2 the rupturing of the nucleolus
3 too much DNA in the chromosomes
4 too much DNA in the ribosomes

121 Which statement is true regarding a mechanism or process that is seen in a wide variety of species?

1 It has probably been conserved through evolution.
2 It is probably not significant to life.
3 It is probably caused by DNA in the nucleolus.
4 It is probably caused by RNA in the nucleolus.

122 Using one or more complete sentences, state the source of ECR DNA. You may use pen or pencil for your answer.

123 Using one or more complete sentences, explain what may happen to the body cells of an individual with Werner syndrome. You may use pen or pencil for your answer.

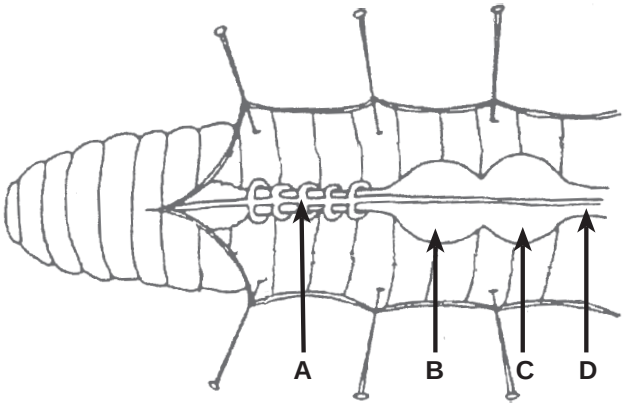
124 A culture of euglena, an autotrophic unicellular organism, was prepared in a laboratory. During the first 80 hours, the population increased. After this period of time, the population decreased until the organisms died out completely. Which statement is the most probable explanation for the decrease in this population?

1 The euglenas destroyed their hosts.
2 The euglenas began to carry out photosynthesis.
3 Toxic waste products accumulated in the euglena culture.
4 Euglena cannot successfully reproduce in a laboratory culture.

Group 4

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

Base your answers to questions 125 and 126 on the diagram below, which represents a partially dissected earthworm, and on your knowledge of biology.



125 Which lettered structure is an aortic arch?

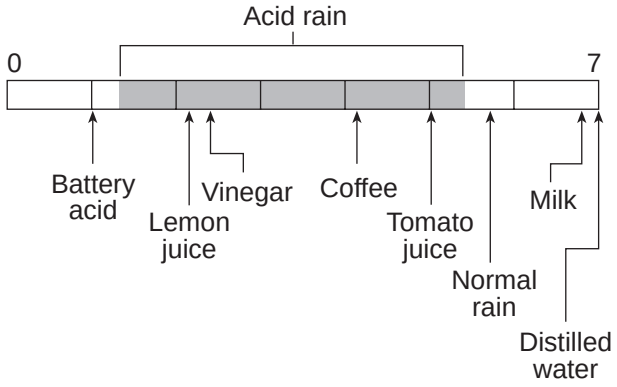
(1) *A*
(2) *B*
(3) *C*
(4) *D*

126 Which statement correctly identifies the functions of structures *B* and *C*?

1 Structure *B* hydrolyzes the food, and structure *C* stores the food temporarily.
2 Structure *B* stores the food temporarily, and structure *C* grinds the food mechanically.
3 Structure *B* excretes nitrogenous wastes from the food, and structure *C* hydrolyzes the food.
4 Structure *B* grinds the food mechanically, and structure *C* excretes nitrogenous wastes from the food.

127 In preparing to dissect a preserved grasshopper, a student put on a laboratory apron. Then the student obtained the specimen, dissecting pins, instruments, and trays and returned to the laboratory work area. Using one or more complete sentences, state a safety procedure not mentioned that the student should follow before beginning the dissection. You may use pen or pencil for your answer.

128 A portion of a pH scale is shown below.



Which substance identified on the scale has a pH closest to the pH of the most acidic acid rain?

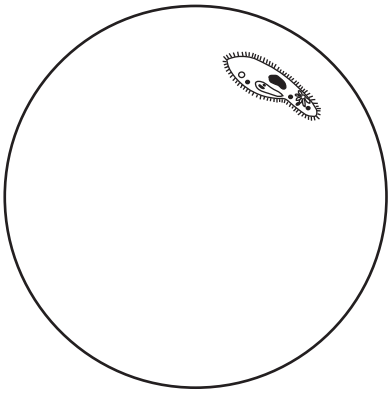
129 Carp, a type of fish, consume zebra mussels. To investigate the percentage of zebra mussels in the diet of carp, a student spent one summer fishing at various locations on Lake Ontario and caught 35 carp. Once the stomach contents of the carp were analyzed, the student concluded that zebra mussels comprise 20% of the diet of the carp population in Lake Ontario. This conclusion may not be valid because the

1 student could infer that the carp ate only zebra mussels
2 sample size was too small and the investigation may not show the same results if repeated
3 fish should have been taken from only one area of Lake Ontario
4 stomach contents of other fish species were not analyzed

Group 5

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

130 A cell in the field of view of a compound light microscope is shown in the diagram below.



In which direction should the slide be moved to center this cell in the microscopic field?

1 to the right and up
2 to the right and down
3 to the left and up
4 to the left and down

131 The table below shows the position of slides of the letter "e" on the stages of four microscopes. The image of the "e" as seen using each microscope is also shown.

	Microscope A	Microscope B	Microscope C	Microscope D
Position of slide on the stage				
Image of specimen as seen using the microscope				

Which letters correctly identify the microscopes most likely used to provide the information in the table?

(1) *A* and *D* — compound light microscopes; *B* and *C* — dissecting microscopes
(2) *B* and *C* — compound light microscopes; *A* and *D* — dissecting microscopes
(3) *C* and *D* — compound light microscopes; *A* and *B* — dissecting microscopes
(4) *B* and *D* — compound light microscopes; *A* and *C* — dissecting microscopes

132 A wet mount of unstained elodea (a green aquatic plant) is observed using high power (400×) of a compound light microscope. Which structures would most likely be observed?

1 cytoplasm, endoplasmic reticulum, and nucleolus
2 ribosome, Golgi complex, and vacuole
3 nucleus, chloroplast, and cell wall
4 centrosome, lysosome, and plasma membrane

133 A compound light microscope has a 10× eyepiece, 10× objective, 40× objective, and low-power field diameter of 1,600 micrometers. What is the diameter of the field of view when the high-power objective lens is used?

(1) 10 μm
(2) 40 μm
(3) 400 μm
(4) 1,600 μm

134 Two students were working together on a laboratory assignment to view microscopic pond organisms with a compound light microscope. The students used an eye dropper to obtain a sample of pond water and placed the sample on a clean slide. They put the slide on the stage of the microscope and observed the sample first under low power and then under high power to see the organisms. Using one or more complete sentences, state one error in the students' procedures. You may use pen or pencil for your answer.

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Friday, June 16, 2000 — 1:15 to 4:15 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	**37**
58	**64**	28	**36**
57	**63**	27	**36**
56	**62**	26	**35**
55	**61**	25	**34**
54	**60**	24	**33**
53	**59**	23	**32**
52	**59**	22	**31**
51	**58**	21	**30**
50	**57**	20	**29**
49	**56**	19	**28**
48	**55**	18	**27**
47	**54**	17	**26**
46	**53**	16	**25**
45	**52**	15	**25**
44	**51**	14	**23**
43	**50**	13	**22**
42	**49**	12	**20**
41	**48**	11	**18**
40	**48**	10	**17**
39	**47**	9	**15**
38	**46**	8	**13**
37	**45**	7	**12**
36	**44**	6	**10**
35	**43**	5	**8**
34	**42**	4	**7**
33	**41**	3	**5**
32	**40**	2	**3**
31	**39**	1	**2**
30	**38**	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 two 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 1 2 3 4

111 1 2 3 4

112 1 2 3 4

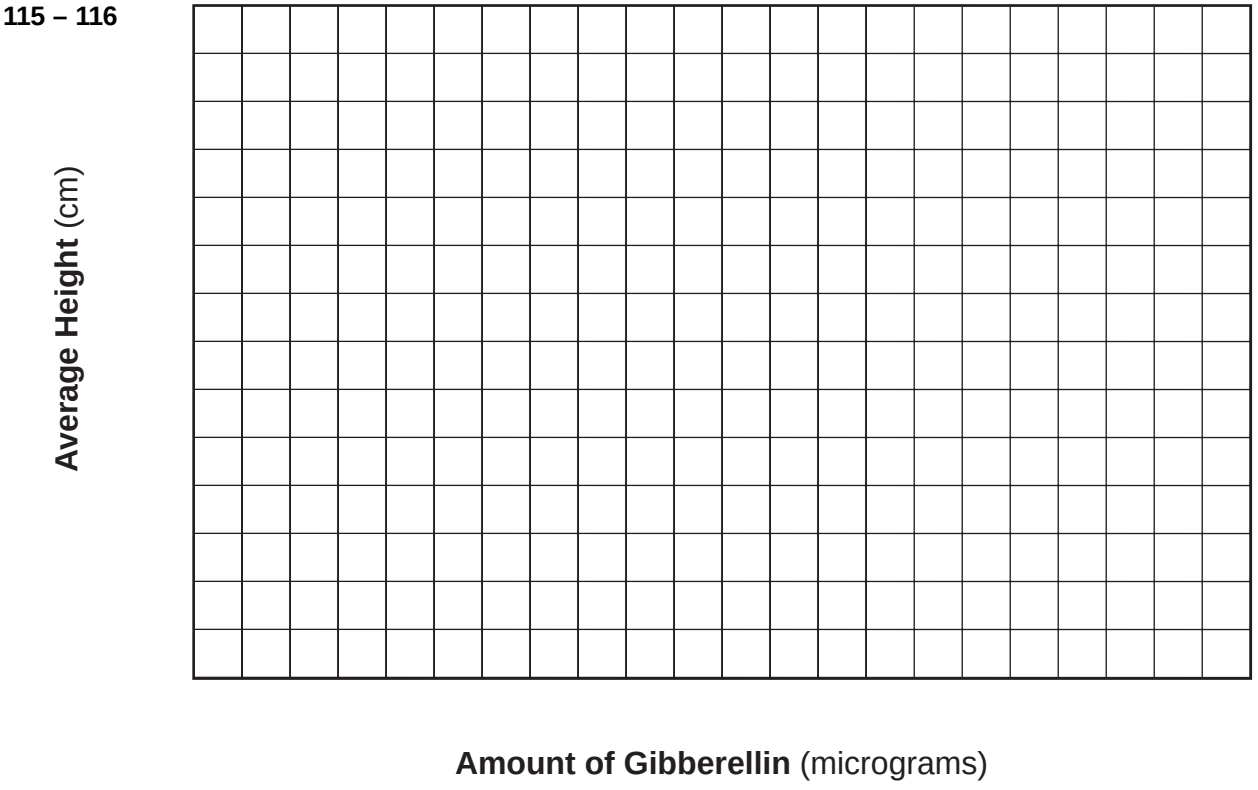
113 1 2 3 4

114 _____

_____

Group 2

115 – 116



117 _____

_____

118 _____

_____

119 1 2 3 4

Group 3

120 1 2 3 4

121 1 2 3 4

122 _____

_____

123 _____

_____

124 1 2 3 4

Group 4

125 1 2 3 4

126 1 2 3 4

127 _____

_____

128 _____

129 1 2 3 4

Group 5

130 1 2 3 4

131 1 2 3 4

132 1 2 3 4

133 1 2 3 4

134 _____

_____

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