The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Wednesday, January 24, 2001 — 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: ⊗ 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 Normally, when the concentration of glucose in the blood falls below a certain level, stored glucose reenters the blood until the original concentration is reached again. This regulation of the concentration of blood glucose is part of the process known as

1 synthesis
2 respiration
3 pinocytosis
4 homeostasis

2 The table below gives both the common and scientific names of five New York State vertebrates.

Vertebrate	Common Name	Scientific Name
A	white perch	*Morone americana*
B	grass pickerel	*Esox americanus*
C	varying hare	*Lepus americanus*
D	American toad	*Bufo americanus*
E	muskellunge	*Esox masquinongy*

Which two vertebrates are most closely related?

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

3 Which statement is *not* a part of the cell theory?

1 Cells are the basic unit of structure of living things.
2 Cells are the basic unit of function of living things.
3 Cell parts such as chloroplasts are self-replicating.
4 Cells come from preexisting cells.

4 Which cell organelle is most directly involved with the bonding of amino acids?

1 mitochondrion
2 endoplasmic reticulum
3 cell wall
4 ribosome

5 In a chemical analysis of a sample of animal tissue, which element would most likely be found in the *smallest* quantity?

1 hydrogen
2 carbon
3 iodine
4 oxygen

6 In the enzyme-controlled reaction represented by the word equation below, which molecules are considered the substrate?

monosaccharide + monosaccharide → disaccharide + water

1 monosaccharide and monosaccharide
2 disaccharide and water
3 monosaccharide and water
4 monosaccharide and disaccharide

7 Which statement about enzymes is *not* correct?

1 Enzymes are composed of polypeptide chains.
2 Enzymes form a temporary association with a reactant.
3 Enzymes are destroyed when they are used and must be synthesized for each reaction.
4 Enzymes are specific because of their shape and catalyze only certain reactions.

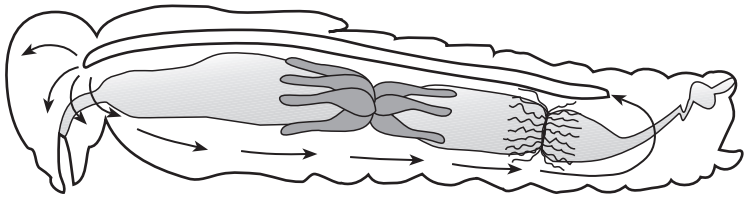
8 Some deep-sea bacteria live near submerged volcanoes and make their own food using energy derived from minerals coming from the volcanoes. These bacteria would be classified as

1 heterotrophic
2 autotrophic
3 photosynthetic
4 abiotic

9 The single opening of the hydra and the pseudopodia of the ameba are both involved in the process of

1 regulation
2 ingestion
3 active transport
4 sexual reproduction

10 In the diagram below, what do the arrows most likely illustrate?



1 the pathway of food within the digestive tract
2 the distribution of indigestible material by a pulsating blood vessel
3 the route blood takes as it is distributed into sinuses in an open circulatory system
4 the movement of hemoglobin throughout a closed circulatory system

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11 In most plants, specialized epidermal cells which absorb water and minerals are found in the

1 roots
2 stems
3 lenticels
4 flowers

12 In most simple multicellular plants and in hydra, transport throughout the organism is a result of diffusion through

1 tracheal tubes
2 vascular tissue
3 gastrovascular cavities
4 cell membranes

13 Bacteria that can survive without oxygen are described as

1 aerobic
2 anaerobic
3 heterotrophic
4 saprophytic

14 By which process is the potential energy of organic molecules transferred to a form of energy that is usable by the cells?

1 digestion
2 hydrolysis
3 photosynthesis
4 respiration

15 The exchange of oxygen and carbon dioxide between internal leaf cells and the external environment will occur most efficiently if

1 the surfaces of these cells are dry and the stomates are closed
2 these cells are dry and the stomates are open
3 the surfaces of these cells are moist and the stomates are open
4 these cells are moist and the stomates are closed

16 A metabolic waste of algae that can be recycled for use in cellular respiration is

1 sodium
2 organic acid
3 carbon dioxide
4 oxygen

17 A paramecium eliminates excess water by means of

1 contractile vacuoles
2 lysosomes
3 an oral groove
4 a nucleolus

18 Effectors are best described as

1 organs that interpret stimuli
2 structures that respond to stimuli
3 tissues that initiate stimuli
4 cells that transmit stimuli

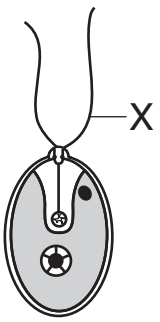
19 In the process of regulation, both dandelions and grasshoppers utilize

1 hormones, only
2 nerves, only
3 hormones and nerves
4 auxins and tropisms

20 The ability of an organism to obtain food, seek shelter, and avoid predators is most directly related to the function of

1 reproduction
2 egestion
3 locomotion
4 excretion

21 The diagram below represents a unicellular green alga known as chlamydomonas. Structure *X* helps chlamydomonas move through the pond in which it lives.



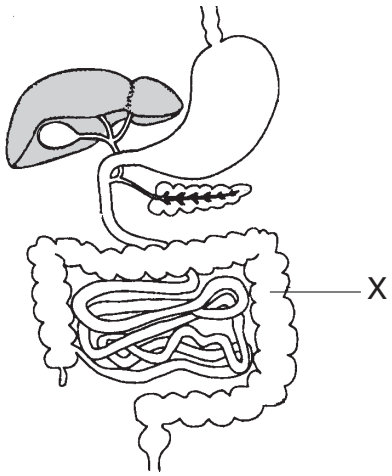
Structure *X* represents

1 a seta
2 an antenna
3 a tentacle
4 a flagellum

22 Which terms would most likely be included in the explanation of the production of starch in a potato?

1 proteins, hydrolysis, and amino acids
2 photosynthesis, glucose, and dehydration synthesis
3 protein synthesis, urea, and deamination
4 fatty acids, glycerol, and respiration

23 The diagram below represents a portion of the human body.



The principal function of structure *X* is to

1 produce salivary enzymes
2 secrete sex hormones
3 absorb water
4 digest bile

24 The immediate source of the intercellular fluid surrounding all human body cells is

1 blood plasma
2 enzymatic secretions
3 lymphatic tissue
4 glomerular filtrations

25 Veins are blood vessels that

1 deliver blood to the cells of the body
2 contain striated muscle
3 carry blood toward the heart
4 readily exchange materials between the blood and body cells

26 Which statement concerning gas transport in humans is correct?

1 Carbon dioxide is transported to body cells by lymphocytes.
2 Carbon dioxide is transported to body cells in the form of lactic acid.
3 Oxygen is transported to body cells in the form of oxyhemoglobin.
4 Oxygen is transported to body cells by lymph vessels.

27 The correct pathway for urine to flow out of the human body is

1 bladder → ureter → kidney → urethra
2 kidney → ureter → bladder → urethra
3 urethra → bladder → kidney → ureter
4 kidney → urethra → bladder → ureter

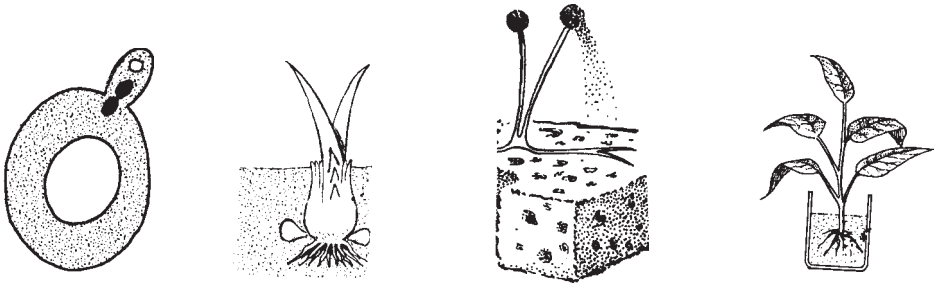
28 In humans, one function of an interneuron is to relay impulses directly from

1 receptors to the brain
2 receptors to other receptors
3 motor neurons to receptors
4 a sensory neuron to a motor neuron

29 Which type of connective tissue makes up the largest percentage of the endoskeleton of a human embryo?

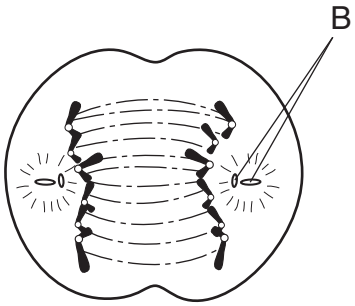
1 bone
2 cartilage
3 tendons
4 ligaments

30 Which diagram represents the reproductive process of budding?



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

31 The cell in the diagram below illustrates a stage of mitotic cell division.



Letter *B* indicates the

1 paired chromosomes
2 centrioles
3 cell plate
4 endoplasmic reticulum

32 An example of sexual reproduction is

1 regeneration in starfish
2 spore formation in mushrooms
3 fusion of the nuclei of gametes
4 development of new plants from undifferentiated tissue

33 In human females, how many egg cells are formed as a result of one primary sex cell undergoing normal meiotic cell division?

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

34 The series of rapid cell divisions that occur immediately after zygote formation is known as

1 fertilization 3 differentiation
2 meiosis 4 cleavage

35 External fertilization occurs most often in

1 mammals and birds
2 reptiles and birds
3 amphibians and reptiles
4 fish and amphibians

36 In a human, what is the ratio of the normal chromosome number in a nucleus produced by mitosis to the normal chromosome number in a nucleus produced by meiosis?

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

37 In flowering plants, the ripened ovary develops into a

1 seed 3 fruit
2 cotyledon 4 zygote

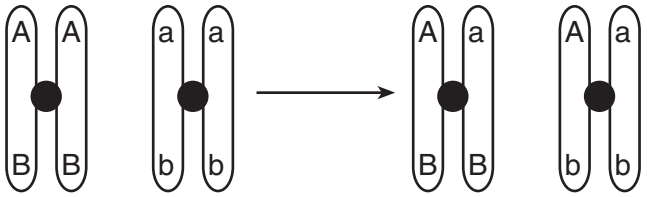
38 The principles of dominance, segregation, and independent assortment were first described by

1 Watson 3 Mendel
2 Linnaeus 4 Morgan

39 In humans, the gene for polydactyly (having extra fingers or toes) is dominant over the gene for the normal number of digits. If parents who are both homozygous dominant for polydactyly have four children, how many of these children would most likely have extra fingers or toes?

(1) 0 (3) 3
(2) 2 (4) 4

40 The diagram below represents a change in composition of homologous chromosomes during synapsis.



This change is most likely the result of the process of

1 nondisjunction
2 gene linkage
3 crossing-over
4 polyploidy

41 A cross between two plants that have pink flowers produced plants that have red, pink, or white flowers. Which is the most likely explanation for these results?

1 Intermediate inheritance involved alleles that were not clearly dominant or recessive.
2 Mutations occurred during gametogenesis.
3 Crossing-over of white and red alleles occurred during meiosis.
4 Nondisjunction of homologous pairs of chromosomes resulted in the production of abnormal offspring.

42 Chromosomal mutations occurring in gametes of humans can affect the appearance of offspring because

1 many traits are usually affected
2 only one trait is usually affected
3 these mutations usually speed up embryonic development
4 these mutations usually result in sex-linked traits

43 When 100 white corn seedlings were placed near a light source, 76 turned green within 48 hours. Which statement best explains why some of the plants turned green?

1 A white plant results only from the lack of light.
2 Genes are not affected by environmental conditions.
3 A white plant results only from a homozygous genotype.
4 The environment affects the expression of inherited traits.

44 The weakest bonds in a double-stranded molecule of deoxyribonucleic acid exist between the

(1) deoxyribose sugars
(2) phosphate groups
(3) nitrogenous bases
(4) 5-carbon sugars

45 The types of enzymes produced in a cell are regulated by the

1 order of nucleotides in DNA molecules
2 shape of DNA molecules
3 size of nucleotides in DNA molecules
4 location of DNA molecules

46 Many scientists believe that the earliest cells on Earth were relatively simple, lacking nuclear membranes and other organized cellular structures. Over time, more complex cells developed from these simple cells.

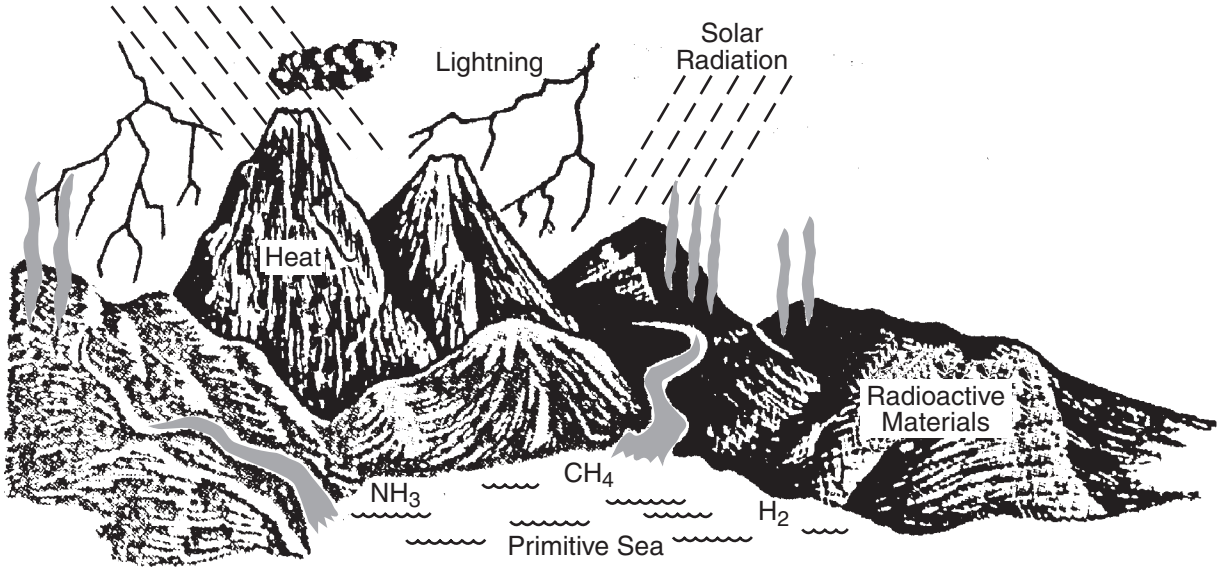
These statements describe the concept of

1 inheritance of acquired characteristics
2 evolution
3 dominance
4 use and disuse

47 In the early stages of development, the embryos of dogs, pigs, and humans resemble one another. This observation suggests that these animals may have

1 a similar number of chromosomes
2 similar habitat requirements
3 the same blood components
4 a common ancestry

48 According to some scientists, what resulted from the environmental conditions existing on primitive Earth illustrated below?



1 evolution of the first heterotrophs from aggregates of organic molecules
2 development of heterotrophic forms of life from plants
3 migration of vertebrates to cooler portions of Earth
4 decrease in asexual reproduction in primitive organisms

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49 Which scientist is correctly paired with his area of research?

1 August Weismann — common ancestry of species
2 Jean Lamarck — origin of life on Earth
3 Stanley Miller — survival of the fittest
4 Charles Darwin — natural selection

50 Differences between the members of a population will most likely be passed to future generations if they are

1 due to genetic changes and result in unfavorable variations
2 due to genetic changes and result in favorable variations
3 not due to genetic changes and result in unfavorable variations
4 not due to genetic changes and result in favorable variations

51 Geographic and reproductive isolation are most closely associated with

1 speciation
2 extinction
3 overproduction
4 competition

52 The idea that evolution takes place at a continuous but very slow rate is known as

1 succession
2 artificial selection
3 punctuated equilibrium
4 gradualism

53 An example of a population is

1 all the *Zapus hudsonicus* in New York State
2 all the fish in Lake Erie
3 the number of different species of *Felis* in a geographic area
4 the number of maples, white oaks, spruce, gray squirrels, and owls in a forest

54 The maintenance of a self-sustaining ecosystem requires a

1 constant temperature
2 greater number of herbivores than producers
3 cycling of materials between organisms and their environment
4 soil that is acidic

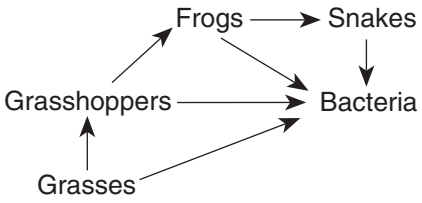
55 Animals that feed exclusively on herbivores are known as

1 primary consumers
2 carnivores
3 omnivores
4 producers

56 As water cycles through an ecosystem, which process returns it to the atmosphere?

1 hydrolysis
2 transpiration
3 condensation
4 cyclosis

57 A food web is shown below.



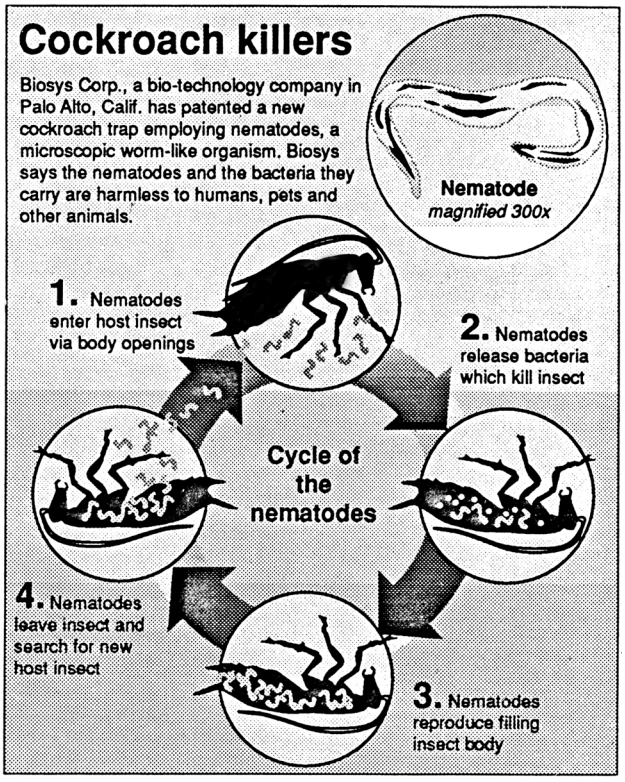
Which organisms are necessary for the recycling of nitrogen?

1 frogs
2 grasshoppers
3 snakes
4 bacteria

58 Which action by humans has had the most positive ecological impact on the environment?

1 use of pesticides to regulate insect populations
2 importation of organisms such as the Japanese beetle and the zebra mussel into the United States
3 overhunting of many predators to prevent the death of prey animals
4 reforestation and covercropping to prevent soil erosion

59 The diagram below shows how an insect trap is used to kill cockroaches.



This insect trap is an example of

1 exploitation of organisms
2 biological control
3 herbicide use
4 competition between species

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 Two chemical equations are shown below.

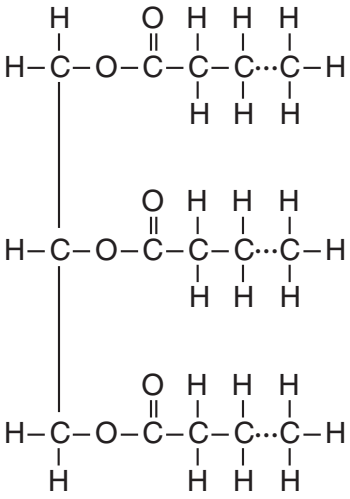
$$\text{maltose + water} \xrightarrow{A} \text{glucose + glucose}$$

$$\text{fat + water} \xrightarrow{B} \text{glycerol + fatty acids}$$

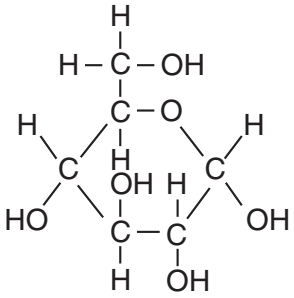
What do letters *A* and *B* represent?

(1) *A* — lipase; *B* — protease
(2) *A* — protease; *B* — maltase
(3) *A* — maltase; *B* — lipase
(4) *A* — maltase; *B* — protease

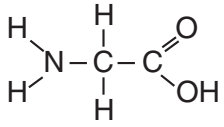
Directions (61–62): For *each* phrase in questions 61 and 62, select the molecule, *chosen from those shown below*, which is best described by that phrase. Then record its *number* on the separate answer paper.



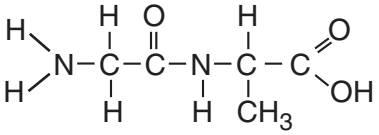
(1)



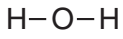
(2)



(3)



(4)

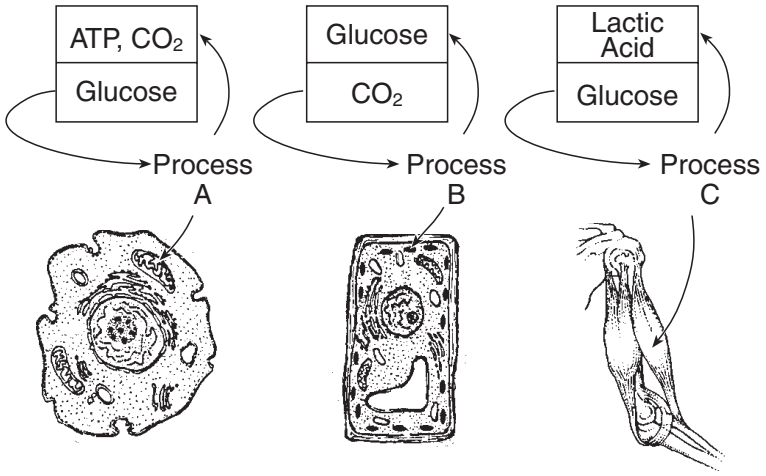


(5)

61 An example of a carbohydrate

62 A molecule that results from all dehydration synthesis reactions

Base your answers to questions 63 and 64 on the diagrams below and on your knowledge of biology. The arrow below each lettered process indicates where the process takes place.



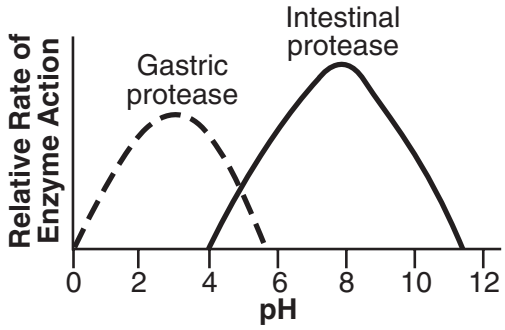
63 Process *A* is known as

1 photosynthesis
2 fermentation
3 dehydration synthesis
4 aerobic respiration

64 Glucose is a product of

1 process *A*, only
2 process *B*, only
3 process *B* and process *C*
4 process *A* and process *C*

Base your answers to questions 65 and 66 on the graph below and on your knowledge of biology.



65 The contents of the small intestine have a basic pH. When gastric protease enters the small intestine, the activity of this enzyme will most likely

1 increase, only
2 increase and then decrease
3 decrease, only
4 remain the same

66 What is the optimum pH for the action of intestinal protease?

(1) 5
(2) 8
(3) 10
(4) 12

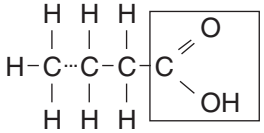
67 One type of anaerobic respiration results in the production of

1 water and oxygen
2 pyruvic acid and glycerol
3 nitrogen gas and ammonia
4 alcohol and carbon dioxide

68 The synthesis of carbohydrates occurs in the stroma of chloroplasts. This process uses energy supplied by

(1) ATP
(2) CO_2
(3) PGAL
(4) O_2

69 The structural formula of a molecule is shown below.



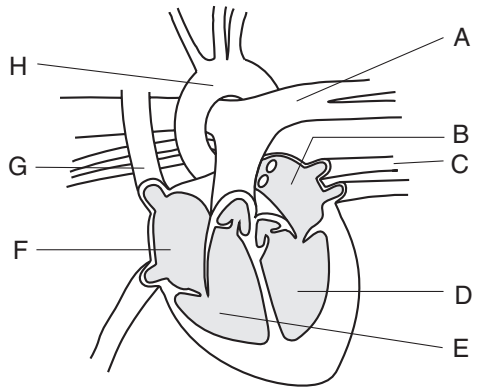
The part of the molecule in the box is known as

1 a carboxyl group
2 an amino group
3 a phosphate group
4 a nitrogenous base

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 of the human heart and on your knowledge of biology.



70 Which sequence represents part of the normal pathway of blood?

(1) $D \rightarrow B \rightarrow F \rightarrow E \rightarrow A$
(2) $G \rightarrow E \rightarrow F \rightarrow H \rightarrow D$
(3) $B \rightarrow D \rightarrow H \rightarrow G \rightarrow F$
(4) $C \rightarrow B \rightarrow D \rightarrow A \rightarrow G$

71 Which statement best describes the blood pumped from the structure labeled *E*?

1 It is deoxygenated and will be transported to the lungs.
2 It is oxygenated and will be transported to the brain.
3 It is deoxygenated and will be transported to the skin.
4 It is oxygenated and will be transported to the right atrium.

72 Systolic pressure is most directly related to the contraction of

(1) *A* (3) *G*
(2) *F* (4) *D*

73 A series of enzyme-controlled reactions that occur when platelets rupture is known as

1 passive immunity 3 asthma
2 blood clotting 4 anemia

74 An injection containing weakened forms of a disease-causing organism will usually trigger

1 absorption of histamines throughout the body
2 secretion of antigens by lymphocytes
3 production of temporary resistance to the disease
4 production of antibodies providing active immunity

75 Leukemia is a disease of the

1 liver 3 bone marrow
2 heart 4 islets of Langerhans

76 Which gland most directly regulates the metabolism of calcium within the human body?

1 adrenal 3 pituitary
2 parathyroid 4 testis

77 Which condition has been linked to a diet that is high in saturated fats?

1 angina pectoris 3 mental retardation
2 arthritis 4 emphysema

78 Glycogen is best described as a

1 complex carbohydrate that is often stored in red blood cells
2 complete protein necessary for the synthesis of cell membranes
3 polysaccharide that is synthesized and stored within the human liver
4 by-product of sucrose digestion within the pancreas

79 The digestion of starch begins in the

1 mouth 3 gallbladder
2 stomach 4 small intestine

Group 3 — Reproduction and Development

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

Directions (80–82): For *each* statement in questions 80 through 82, select the stage of the human menstrual cycle, *chosen from the list below*, that is most closely associated with that statement. Then record its *number* on the separate answer paper.

Stages of the Human Menstrual Cycle

(1) Follicle
(2) Ovulation
(3) Corpus luteum
(4) Menstruation

80 It is characterized by a yellow-bodied structure that secretes the hormone progesterone.

81 A mature egg is released.

82 It usually will *not* occur if a zygote is formed during the cycle.

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83 Identical twins develop from

1 one egg, fertilized by one sperm cell
2 one egg, fertilized by two separate sperm cells
3 two eggs, both fertilized by the same sperm cell
4 two eggs, each fertilized by a separate sperm cell

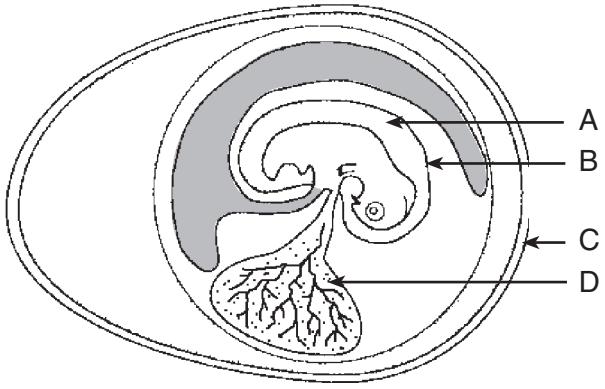
84 The outer layer of the skin of a human develops from an embryonic layer known as the

1 endoderm
2 mesoderm
3 meristem
4 ectoderm

85 In humans, a sperm cell and an egg cell normally fuse in the upper portion of the

1 cervix
2 vagina
3 oviduct
4 ovary

Base your answers to questions 86 through 88 on the diagram below and on your knowledge of biology.



86 The developing embryo is nourished by

1 dissolved substances stored in *A*
2 parts of *B* that are digested
3 nutrients that diffuse in through *C*
4 food that is stored in *D*

87 At least one adaptation shown in the diagram is missing in most species of

1 fish
2 snakes
3 birds
4 turtles

88 Where does this embryonic development take place?

1 externally, in water
2 externally, on land
3 internally, in a gonad
4 internally, in a vagina

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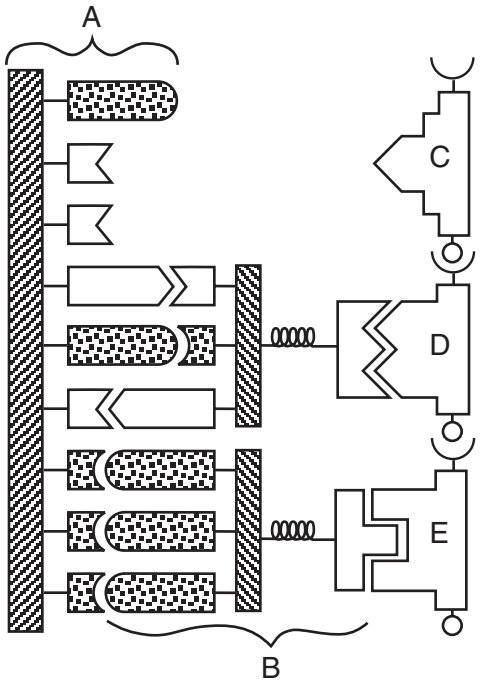
89 Which organ is correctly paired with its function?

1 uterus — serves as site of implantation of the embryo
2 penis — serves as site of semen formation
3 testis — produces follicle stimulating hormone
4 fallopian tube — produces the egg

Group 4 — Modern Genetics

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

Base your answers to questions 90 through 93 on the diagram below, which represents some components involved in cellular protein synthesis, and on your knowledge of biology.



90 Molecules *C*, *D*, and *E* will combine to form part of

(1) a polypeptide
(2) a polysaccharide
(3) DNA
(4) RNA

91 Structure *B* represents a molecule of

1 nuclear DNA
2 cytoplasmic DNA
3 ribosomal RNA
4 transfer RNA

92 How many codons are located on the messenger RNA molecule in the diagram?

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

93 The type of molecule represented at *A* is synthesized according to a template found in

(1) DNA
(2) RNA
(3) dipeptides
(4) amino acids

94 One similarity between DNA and messenger RNA molecules is that they both contain

1 the same sugar
2 genetic codes based on sequences of bases
3 a nitrogenous base known as uracil
4 double-stranded polymers

95 A homozygous condition resulting in the formation of abnormal hemoglobin that distorts certain blood cells is known as

1 hemophilia
2 phenylketonuria
3 Tay-Sachs
4 sickle-cell anemia

96 In 1994, a new tomato variety that ripens slowly was developed by a laboratory technique that did not involve methods of natural reproduction. This new variety contains a section of a DNA molecule not found in the tomato from which it was originally developed. Which technique was most likely used to develop this new variety of tomato?

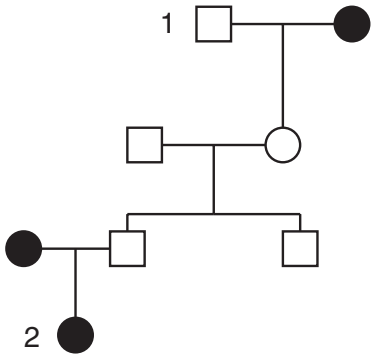
1 amniocentesis
2 cross-pollination
3 genetic engineering
4 karyotyping

97 A gene pool consists of

1 all the genes that mutate in a single generation
2 all the heritable genes for traits in a population
3 all the gametes produced by a population
4 the mutated alleles for a particular trait

GO RIGHT ON TO THE NEXT PAGE.

Base your answers to questions 98 and 99 on the pedigree chart below, which shows a history of ear lobe shape, and on your knowledge of biology.



KEY

E = Allele for free ear lobes (dominant)
e = Allele for attached ear lobes (recessive)

□ = Male with free ear lobes

○ = Female with free ear lobes

■ = Male with attached ear lobes

● = Female with attached ear lobes

98 The genotype of individual 1 could be

(1) *EE*, only
(2) *Ee*, only
(3) *ee*
(4) *EE* or *Ee*

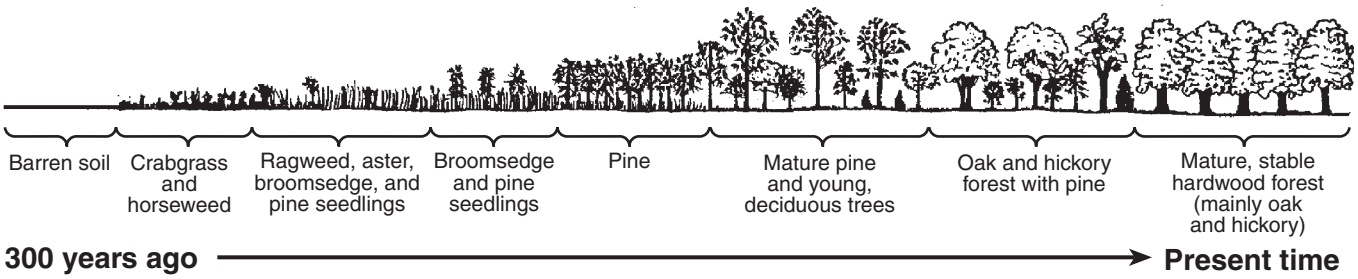
99 The genotype of individual 2 could be

(1) *EE*, only
(2) *Ee*, only
(3) *ee*
(4) *EE* or *Ee*

Group 5 — Ecology

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

Base your answers to questions 100 through 102 on the diagram below, which shows the sequence of plant communities that have occupied land that was left barren 300 years ago, and on your knowledge of biology.



100 Dominant plant species in the climax community include

1 pine trees
2 hickory trees
3 mosses
4 lichens

101 Which plant species represent pioneer organisms?

1 broomsedge and pine seedlings
2 ragweed and aster
3 crabgrass and horseweed
4 oak and hickory trees

102 In which biome would this sequence of plant communities most likely be found?

1 taiga
2 tundra
3 tropical rain forest
4 temperate deciduous forest

---

103 Why does each successive feeding level in a pyramid of energy have less biomass?

1 Carnivore biomass is less than producer biomass as a result of energy being lost as it flows from producers to carnivores.
2 The primary consumer level contains more stored energy than the producer level.
3 Consumers have more biomass than autotrophs because they must absorb all of the light energy in an ecosystem.
4 Biomass differences in an ecosystem result from competition between producers.

104 Which type of biome occupies the largest area of Earth?

1 marine
2 grassland
3 tropical rain forest
4 temperate deciduous forest

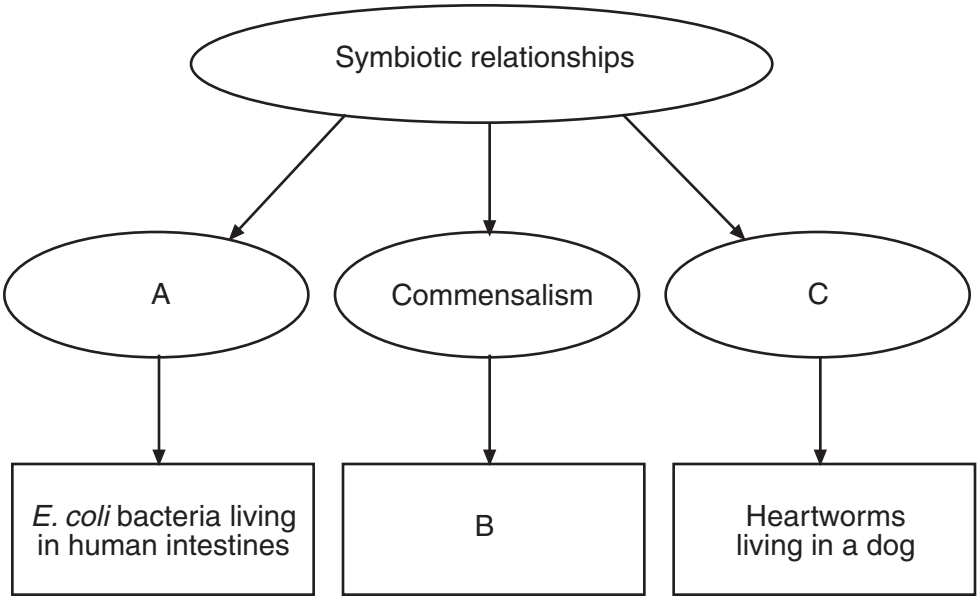
105 The action of decomposers in the nitrogen cycle most directly aids in the

1 synthesis of proteins from nitrates
2 removal of nitrogen compounds from the atmosphere
3 restoration of nitrogen compounds to the soil
4 fixation of atmospheric nitrogen

106 Many more species of plants and animals live in a tropical forest than live in a desert. This difference is most likely due to the fact that, compared to a tropical forest, a desert

1 has less available sunlight
2 contains soil with sand
3 contains less water
4 has more carbon dioxide in the atmosphere

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



107 Which term belongs in area *A*?

1 mutualism
2 prey
3 saprophytism
4 host

108 Which phrase belongs in area *B*?

1 protozoa within termites
2 athlete's foot fungus on humans
3 nitrogen-fixing bacteria within legume nodules
4 orchids on tropical trees

109 Organisms that are always part of the relationship indicated by letter *C* may be classified as

1 bryophytes
2 parasites
3 scavengers
4 carnivores

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 passage below and on your knowledge of biology.

Plants Use Chemical Warfare Against Insects

In a study, seeds of wild radishes were planted in three separate groups. When the plants reached the four-leaf stage, a caterpillar known as the cabbage worm was allowed to chew at least one leaf on each plant in group *A*. One leaf was trimmed from each plant in group *B*. The leaves of group *C* were not treated in any way.

After being attacked by the cabbage worm, the plants in group *A* started making a sap containing large amounts of mustard glycoside. This chemical is responsible for the hot taste in horseradish. Insects find this chemical distasteful and tend to avoid it. Thus, it serves as a natural defense for the plant. In addition, new leaves on the plants in group *A* had more spikelike hairs, another type of defense against insects.

As the growing season progressed, the plants in groups *B* and *C*, none of which had been chewed by the cabbage worm, were heavily attacked by garden pests. The herbivorous insects avoided the plants in group *A* that had spicy sap and spiky leaves.

As a result of studies such as this, scientists are attempting to develop hormones that can be sprayed on crops to stimulate them to produce their own defenses against insects. This could allow farmers to obtain high yields of crops without having to use chemical pesticides, which would mean less harm to the environment.

110 The initial attack by insect herbivores is beneficial because

1 chemicals that protect the plant against early herbivores are produced and passed to offspring through sexual reproduction
2 the plants produce chemicals that protect them against herbivores that appear later
3 chemical pesticides are produced, which are used by humans to protect the plants against herbivores
4 spikelike hairs that attract predators of the early herbivores are produced

111 Later in the growing season, insects attacked the plants in

1 group *A*
2 group *B*, only
3 group *C*, only
4 groups *B* and *C*

112 Using one or more complete sentences, state the function of group *C* in this investigation.

113 Using one or more complete sentences, explain why the use of chemicals produced in nature against insects is better than the use of insecticides produced by humans.

---

114 To collect data about the rate of photosynthesis in a certain type of algae when it is exposed to different colors of light, a student could measure the change in the

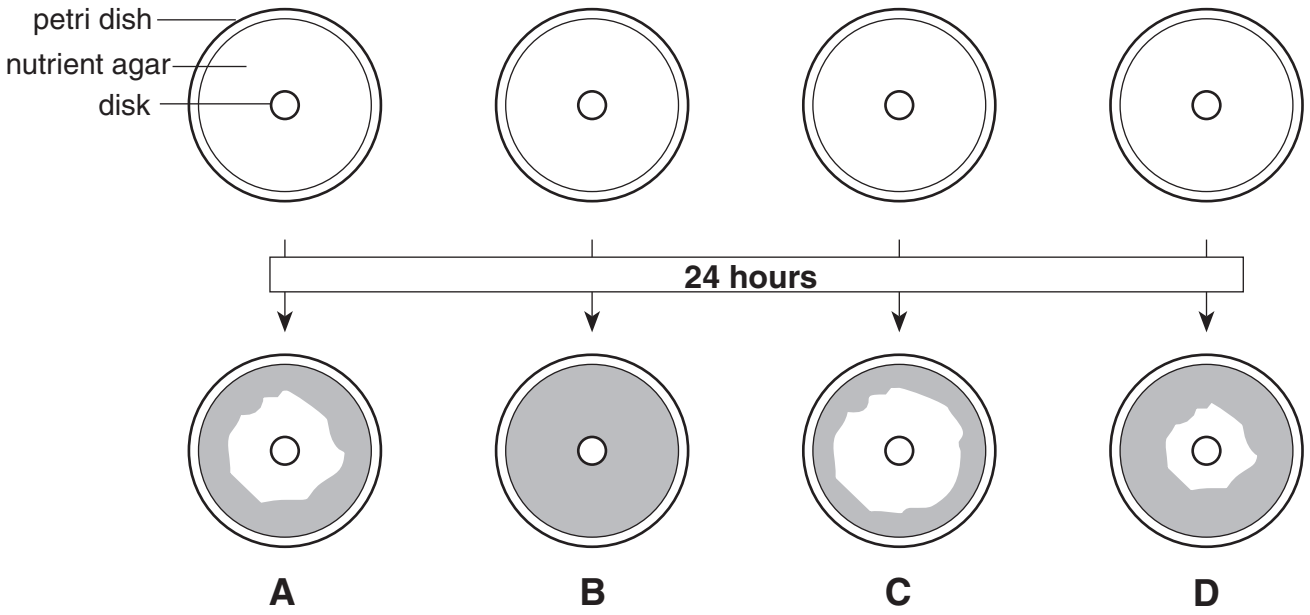
1 temperature of the water surrounding the algae
2 number of ribosomes in the algae cells
3 color of algae cells
4 number of gas bubbles given off by the algae

Group 2

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

Base your answers to questions 115 and 116 on the information and diagram below and on your knowledge of biology.

A student investigated the effectiveness of four different mouthwashes in destroying bacteria. He innoculated the nutrient agar in four petri dishes with bacteria. Each of four paper disks, 1 centimeter in diameter, was soaked in a different mouthwash sample and placed on a different agar surface. Sterile procedures were used throughout the experiment. Each petri dish was placed in an incubator at a temperature of 37°C for a 24-hour period. The diagram below represents the sequence of events in this investigation. The shaded areas in the petri dishes represent regions of bacterial growth.

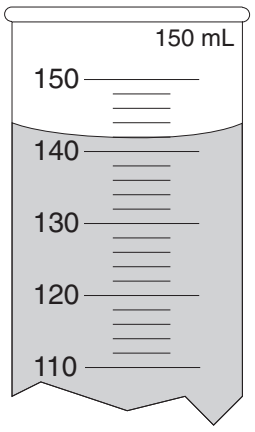


115 Which petri dish contains the most effective mouthwash?

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

116 Using one or more complete sentences, state an observation that supports your answer for question 115.

117 A chicken bone was placed in a graduated cylinder containing 100 milliliters of water. The diagram below illustrates the new level of water.



What is the volume of the chicken bone?

(1) 41 mL
(2) 42 mL
(3) 141 mL
(4) 142 mL

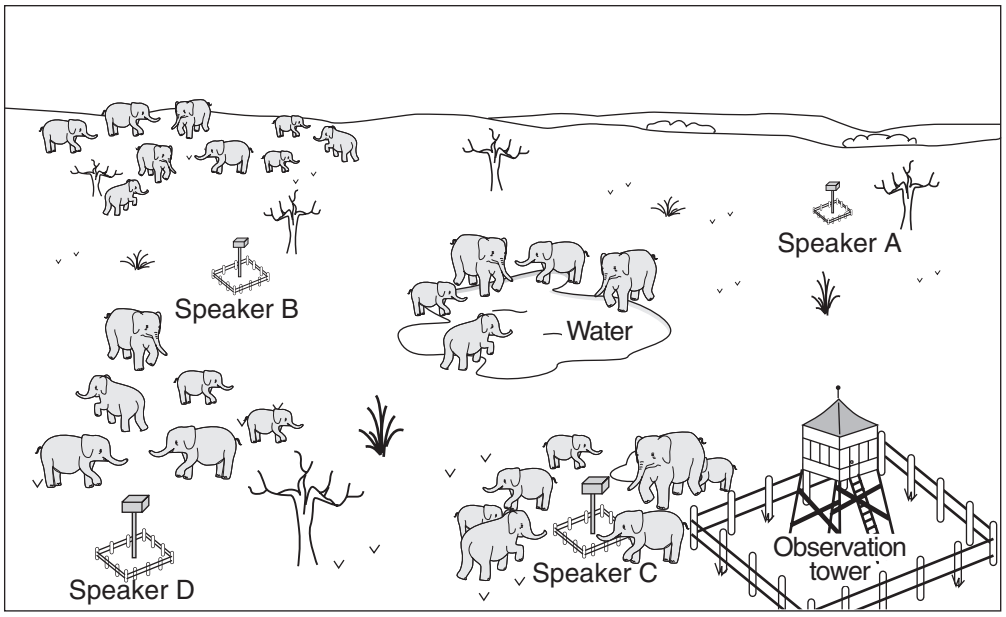
118 A student is investigating the internal organs of an earthworm. Which piece of equipment should the student use to move the intestine aside without damaging it?

1 a glass slide
2 a metric ruler
3 a dissecting needle
4 a dropping pipette

119 A group of biology students participated in a prey-predator laboratory investigation. Fifty green bean seeds and 50 white bean seeds, both representing prey, were scattered in a 25-square-meter area of the school lawn. Three students representing predators were then given 30 seconds to search the area and collect the "prey." This procedure was repeated five times. Using one or more complete sentences, state the hypothesis being tested in this activity.

Group 3
If you choose this group, be sure to answer questions 120–124.

120 The diagram below shows the results of a field study on the effect of low-pitched sounds on elephant behavior. Four speakers were placed on the elephant range and different low-pitched sounds were transmitted from each speaker.

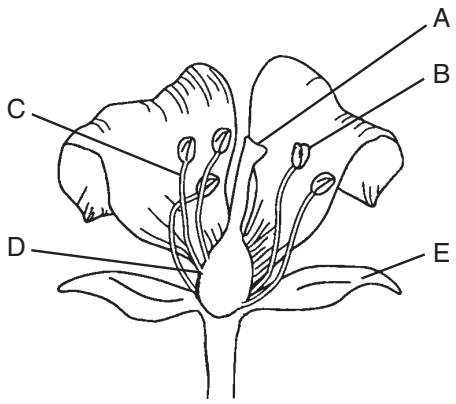


If speaker *A* was moved to the edge of the waterhole, what change in elephant behavior, if any, would most likely occur?

1 The elephants would go to the waterhole only when they needed water.
2 A larger number of elephants would gather at the waterhole.
3 All the elephants would gather around speaker *C*.
4 No change would occur, because elephant behavior cannot be modified.

---

121 From the diagram of a flower shown below, record the letter of a part that produces monoploid cells.



122 A large island in the Pacific Ocean supports isolated populations of two groups of frogs. The following observations of these frogs were recorded by scientists.

(*A*) Are different in color
(*B*) Excrete different products
(*C*) Live in different, isolated habitats
(*D*) Can interbreed and produce fertile offspring

Which observation best supports the inference that these frogs belong to the same species?

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

123 A gas resulting from aerobic respiration is released into water. Which substance could be used to indicate a change in the water due to the release of the gas?

1 bromthymol blue
2 Benedict's solution
3 iodine solution
4 methylene blue

124 Using one or more complete sentences, describe a laboratory activity during which a person should wear safety goggles.

Group 4

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

Base your answers to questions 125 through 128 on the information and data table below and on your knowledge of biology.

Three biology students wanted to find out if adding fertilizer to some potting soil would affect the germination of radish seeds. Each student added an equal amount of potting soil from the same bag to each of 10 cups. Student *A* added 1 gram of fertilizer to each cup of soil in group *A*. Student *B* added 2 grams of fertilizer to each cup of soil in group *B*. Student *C* added 3 grams of fertilizer to each cup of soil in group *C*. After stirring the mixture to obtain an even distribution of fertilizer, 8 radish seeds were placed in each cup and covered with 0.5 centimeter of soil. Over the next 6 days, all conditions, including the amounts of water and sunlight, were kept the same. The results are recorded in the data table below.

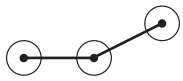
Data Table

	Total Number of Seedlings Visible Above the Soil		
Days After Planting	Group A	Group B	Group C
1	0	0	0
2	5	7	0
3	10	14	0
4	17	24	0
5	20	40	0
6	30	52	0

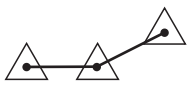
Directions (125–127): Using the information in the data table, construct a line graph on the grid provided *on your answer paper*, following the directions below. The grid on the next page is provided for practice purposes only. Be sure your final answer appears on your answer paper.

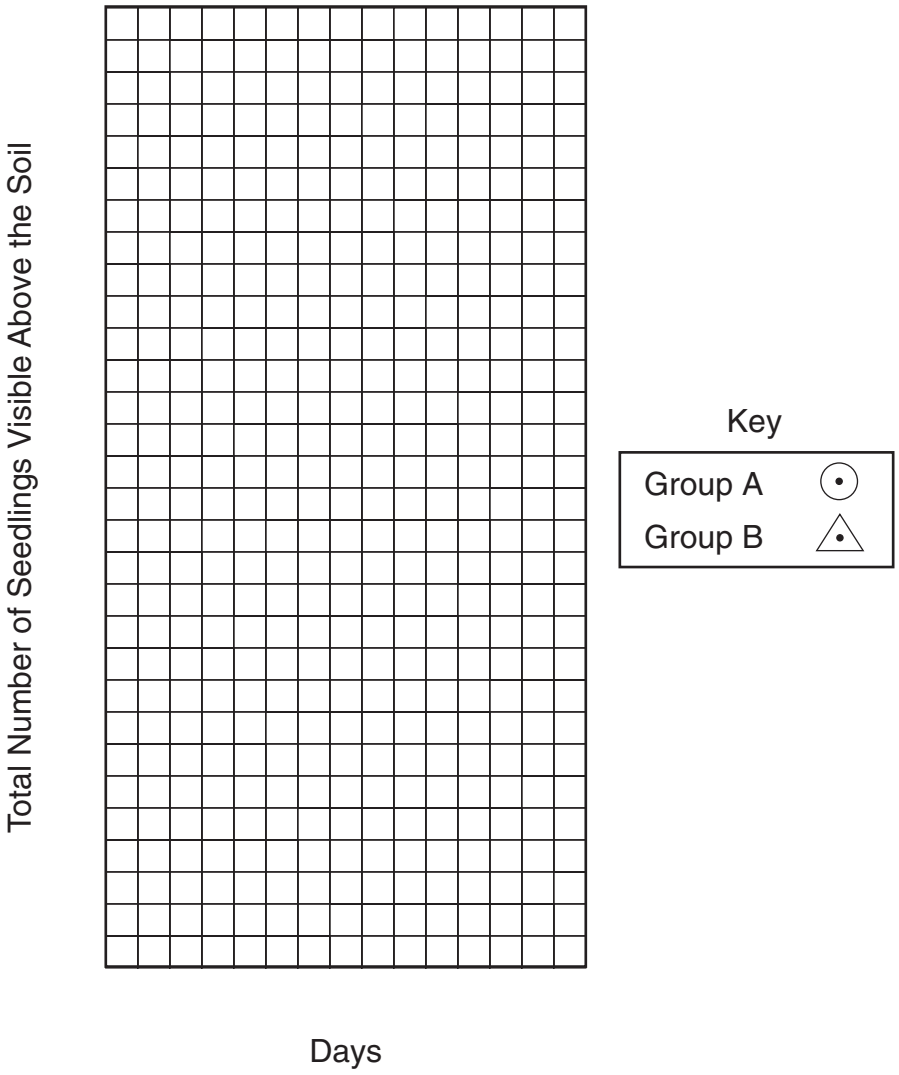
125 Mark an appropriate scale on each labeled axis.

126 Plot the data for group *A* on the grid. Surround each point with a small circle and connect the points.

Example: 

127 Plot the data for group *B* on the grid. Surround each point with a small triangle and connect the points.

Example: 



128 Using one or more complete sentences, state *one* error in the design of this experiment.

_____

129 Which procedure must be followed for the results of an experiment to be considered valid?

1 The experiment must be repeated a number of times and yield similar results.
2 After one trial, the results of the experiment must be published.
3 The results must be expressed in the form of a table or graph.
4 The data must include metric measurements.

_____

Group 5

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

130 What information from the list below must be used to estimate the length of a cell under the low-power objective of a compound light microscope?

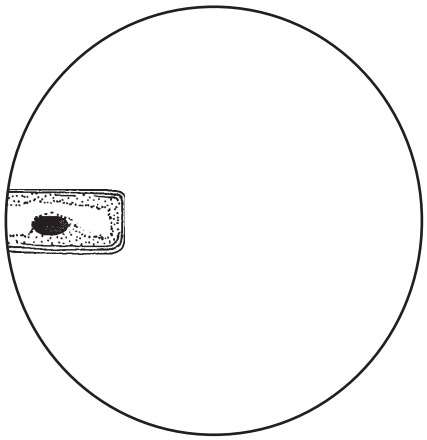
Information

A Type of cell in the field
B Magnification of the low-power objective
C Magnification of the high-power objective
D Diameter of the low-power field of view
E Number of cells that fit end-to-end across the diameter of the low-power field of view

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

Base your answers to questions 131 and 132 on the information and diagram below and on your knowledge of biology.

The diagram below represents a specimen on a slide as seen with the low-power objective of a compound light microscope.



131 Using one or more complete sentences, explain how the slide should be moved to observe the entire specimen.

132 Which type of cell is most likely represented in this diagram?

133 A student observing a specimen using the low-power objective of a compound light microscope has difficulty viewing the image because the field of view is too dark. The student can correct the problem by

1 adjusting the diaphragm
2 using the coarse adjustment
3 switching to the high-power objective
4 cleaning the high-power objective

134 When onion cells are observed with a compound light microscope, which laboratory technique is used to make the nucleus more visible?

1 centrifugation
2 chromatography
3 microdissection
4 staining

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

BIOLOGY

Wednesday, January 24, 2001 — 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	**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	5
62	1	2	3	4	5
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 groups of questions you do not choose to answer.

Group 1

110 1 2 3 4

111 1 2 3 4

112 _____

_____

_____

113 _____

_____

_____

114 1 2 3 4

Group 2

115 1 2 3 4

116 _____

_____

_____

_____

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_____

117 1 2 3 4

118 1 2 3 4

119 _____

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_____

_____

Group 3

120 1 2 3 4

121 _____

122 1 2 3 4

123 1 2 3 4

124 _____

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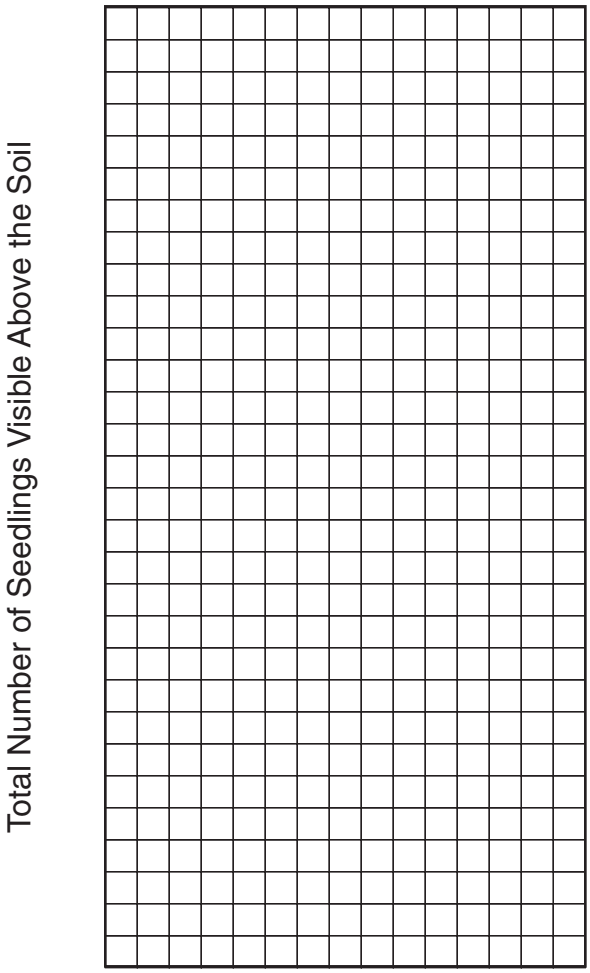
Group 4

125–127



128 _____

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_____

129 1 2 3 4

Key

Group A ⊙

Group B △

Group 5

130 1 2 3 4

131 _____

_____

_____

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