



BIOLOGY-E/M TEST

FOR BOTH BIOLOGY-E AND BIOLOGY-M, ANSWER QUESTIONS 1-60

Directions: Each set of lettered choices below refers to the numbered questions or statements immediately following it. Select the one lettered choice that best answers each question or best fits each statement and then fill in the corresponding circle on the answer sheet. A choice may be used once, more than once, or not at all in each set.

Questions 1-4 refer to the following.

- (A) Characteristic of plants but not animals
- (B) Characteristic of animals but not plants
- (C) Characteristic of eukaryotes but not prokaryotes
- (D) Characteristic of prokaryotes but not eukaryotes
- (E) Characteristic of all organisms

1. The cells of an organism contain mitochondria.
2. The cells of an organism contain ribosomes.
3. The cell wall is composed of cellulose.
4. The cytosol of an organism's cells is contained by the plasma membrane.

Questions 5-7 refer to the following mammalian structures.

- (A) Oviduct
- (B) Uterus
- (C) Ovary
- (D) Epididymis
- (E) Testes

5. Site of implantation of the blastocyst
6. Site of gametogenesis from puberty until death
7. Site of fertilization

Questions 8-10 refer to the following conditions of Hardy-Weinberg equilibrium.

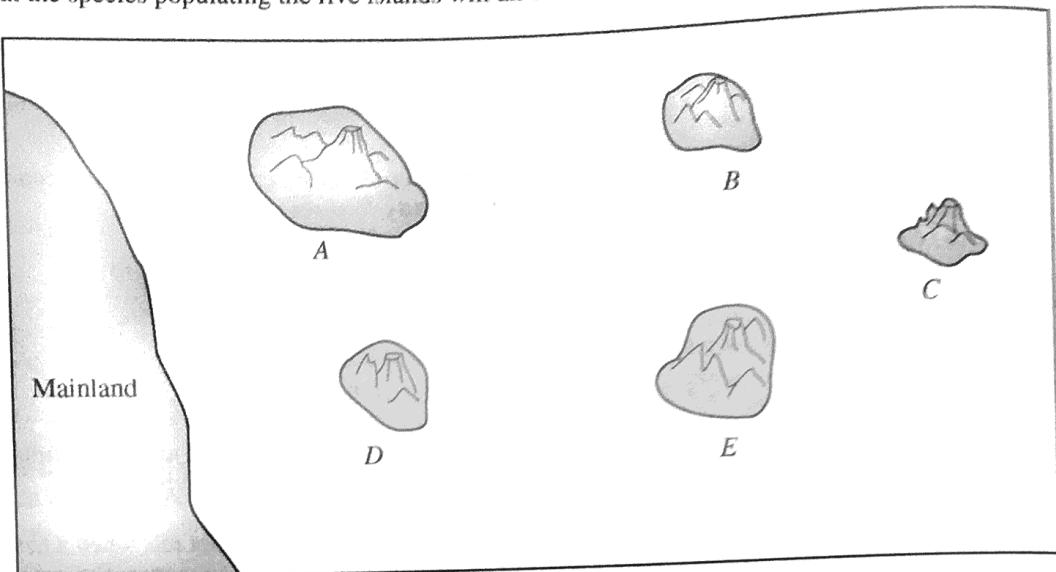
- (A) Very large population size
 - (B) No migration
 - (C) No net mutation
 - (D) Random mating
 - (E) No natural selection
8. The condition that is not met if individuals choose mates based on a phenotypic trait
 9. The condition that is not met when a new nucleotide sequence appears in the gene pool
 10. The condition that is not met if there is differential survival of one of the genotypes in the population



BIOLOGY-E/M TEST—Continued

Questions 11–14 refer to the following.

Islands A, B, C, D, and E are recently formed volcanic islands. They will all develop different levels of biodiversity. Assume that the species populating the five islands will all come from the mainland.



11. Island expected to have the greatest biodiversity
12. Island expected to have the lowest immigration rate of new species
13. Island expected to have the lowest extinction rate
14. Island expected to have the lowest biodiversity

Directions: Each completion. Select the best answer.

15. The pH of
- (A) 3.5
 - (B) 5.5
 - (C) 7.5
 - (D) 9.5
 - (E) 10.5

16. A geneticist is studying guinea pigs. Which of the following is a possible pattern of inheritance?
- (A) Examine for traits.
 - (B) Study with pedigree charts.
 - (C) Analyze pigments in membranes.
 - (D) Examine salivary glands.
 - (E) Matings and

17. Which of the following is a type of variability found in homologous structures?
- (A) Point mutations
 - (B) Linkage
 - (C) Polymorphism
 - (D) Nonhomologous genes
 - (E) Crosses



BIOLOGY-E/M TEST—Continued

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Some questions pertain to a set that refers to a laboratory or experimental situation. For each question, select the one choice that is the best answer to the question and then fill in the corresponding circle on the answer sheet.

15. The pH of human blood is closest to
- (A) 3.5
 - (B) 5.5
 - (C) 7.5
 - (D) 9.5
 - (E) 10.5
16. A geneticist wishes to determine whether a black guinea pig carries the recessive gene for white fur. Which of the following would best reveal the possible presence of the masked recessive trait?
- (A) Examining the undersurface of the guinea pig for white hairs dispersed among the black
 - (B) Studying one of the guinea pig's hair follicles with an electron microscope
 - (C) Analyzing the skin cells of the guinea pig chemically for the nature of its messenger RNA
 - (D) Examining the bands in the guinea pig's salivary gland chromosomes
 - (E) Mating the black guinea pig with a white one and observing whether any of the offspring are white
17. Which of the following can increase genetic variability by the exchange of segments between homologous chromosomes?
- (A) Point mutation
 - (B) Linkage
 - (C) Polyploidy
 - (D) Nondisjunction
 - (E) Crossing-over
18. Which of the following statements about thermoregulation is true?
- (A) Endotherms maintain body temperature with metabolic heat.
 - (B) Endotherm body temperature is always greater than ambient temperature.
 - (C) Endotherms always have much higher blood temperature than do ectotherms.
 - (D) Ectotherms do not have a method to maintain body temperature.
 - (E) Ectotherms can perform vigorous activity for longer periods of time than can endotherms.
19. The flowering plant *Mirabilis jalapa* produces flowers that may be red, white, or pink. When red-flowered plants are crossed with white-flowered plants, all offspring have pink flowers. In an experiment, pink-flowered plants were crossed with each other. Of the 200 offspring produced, approximately 50 had red flowers, 50 had white flowers, and 100 had pink flowers. The most likely inheritance pattern for flower color in the plant is
- (A) polygenic inheritance
 - (B) complete dominance
 - (C) multiple alleles
 - (D) incomplete dominance
 - (E) sex-linkage



BIOLOGY-E/M TEST—Continued



	G	g
G	GG	Gg
g	Gg	gg

20. In the cross represented in the Punnett square above, G is the allele for green, and g is the allele for yellow. Assuming a large number of offspring, the Punnett square predicts that
- 25% of the offspring will be yellow
 - 25% of the offspring will not survive
 - 50% of the offspring will be homozygous yellow
 - 50% of the offspring will be homozygous green
 - 75% of the offspring will be heterozygous green
21. A chemical compound formed by combining one adenine molecule, one ribose molecule, and one phosphate group is
- an amino acid
 - a nucleotide
 - ATP
 - RNA
 - DNA
22. Bacteria play an important role in the fixation of nitrogen by converting atmospheric nitrogen into
- DNA
 - oxygen
 - ammonia
 - a hydrocarbon
 - an amino acid
23. Characteristics found in fungi include all of the following EXCEPT
- asexual reproduction
 - cell walls composed of chitin
 - presence of membrane-bound organelles
 - production of spores
 - production of seed-containing fruit

24. A symbiotic relationship between two species that is beneficial to both is defined as

- mutualism
- commensalism
- neutralism
- parasitism
- predation

25. Which of the following is always required for successful sexual reproduction in multicellular plants or animals?

- Nonmotile eggs and sperm
- Gametes that are haploid
- A zygote produced by mitosis
- Two pairs of chromosomes per gamete
- Two pairs of centrioles

26. Which of the following is an accurate statement about endosperm and yolk?

- Both provide stored energy for the embryo.
- Both are found in flowering plants.
- Both contain triploid cells.
- Both contain toxins or bitter compounds for protection from animal predation.
- Both are produced by the male parent.

27. Which of the following organisms appeared earliest on Earth?

- Ferns
- Mosses
- Fungi
- Bacteria
- Lichens

28. Which of the following represents the normal path of blood flow in mammals?

- Lungs, right atrium, left atrium, right ventricle, left ventricle, aorta
- Right atrium, lungs, left atrium, right ventricle, left ventricle, aorta
- Right atrium, lungs, left atrium, left ventricle, right ventricle, aorta
- Right atrium, right ventricle, lungs, left atrium, left ventricle, aorta
- Left atrium, left ventricle, lungs, right atrium, right ventricle, aorta

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(C)
(D)
(E)



BIOLOGY-E/M TEST—Continued

29. Which of the following is the property of CO₂ that leads scientists to link increasing CO₂ levels with global warming?

- (A) CO₂ is a relatively dense gas, and higher levels cause the atmosphere to thin and distribute more of the equatorial heat to higher latitudes.
- (B) CO₂ is one of the greenhouse gases, and higher levels keep some heat trapped in Earth's atmosphere.
- (C) CO₂ molecules react chemically with gases in the ozone layer, thereby destroying the ability of these gases to block most of the Sun's harmful radiation.
- (D) CO₂ is the product of combustion and results primarily from forest fires that have heated Earth's atmosphere.
- (E) CO₂ transmits radiation, and increased CO₂ in the upper atmosphere will enable more short-wave radiation to reach Earth's surface.

30. A man in his early twenties learns that his father has been diagnosed with Huntington's disease. This rare disease is caused by a dominant allele and usually does not manifest itself until middle age. There is no history of the disease in the young man's mother's family. What is the probability that the young man will develop the symptoms of the disease when he is older?

- (A) 0%
- (B) 25%
- (C) 50%
- (D) 66%
- (E) 75%

31. Which of the following hormones regulates water conservation in the human body?

- (A) Follicle-stimulating hormone (FSH)
- (B) Insulin
- (C) Prolactin
- (D) Antidiuretic hormone (ADH)
- (E) Oxytocin

32. Which of the following would be LEAST useful in constructing a phylogenetic tree of the mammals?

- (A) The fossil record
- (B) Nucleotide sequences
- (C) Amino acid sequences
- (D) Tooth structure
- (E) Dietary requirements

33. A factor associated with the opening of stomata is the movement of potassium ions into the guard cells. How do entering potassium ions affect guard cells?

- (A) They promote the movement of water into the cells by osmosis.
- (B) They cause the guard cells to shrink, opening the stomata.
- (C) They maintain the osmotic integrity of the cells.
- (D) They disrupt the normal function of the plasma membranes.
- (E) They activate water channels in the plasma membranes.

34. Which of the following is the best description of lymph?

- (A) Lymph consists of red and white blood cells, platelets, and plasma contained in lymph vessels.
- (B) Lymph consists of erythrocytes that have leaked out of blood vessels and bathe body cells.
- (C) Lymph contains antihistamines that are important in fighting bacterial infections.
- (D) Lymph consists of interstitial fluid re-collected into lymph vessels from the spaces between body cells.
- (E) Lymph is produced at specific sites called lymph nodes.

BIOLOGY-E/M TEST—Continued

35. In the illustrations below, animals with one opening to the digestive tract and two layers of tissues include which of the following?

I.



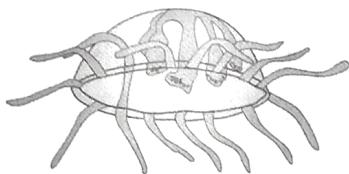
II.



III.



IV.



- (A) I only
- (B) II only
- (C) III only
- (D) II and IV
- (E) III and IV

36. A tree stands 6 meters high and is 0.20 meter in diameter. A branch falls leaving a scar that is 0.90 meter above the ground. In 20 years if the tree is 36 meters high, that scar will be how far from the ground?

- (A) 18.00 meters
- (B) 12.00 meters
- (C) 7.20 meters
- (D) 6.00 meters
- (E) 0.90 meter

37. Which of the following best describes different alleles of a single gene?

- (A) They exhibit an identical nucleotide base sequence.
- (B) They may code for related proteins affecting the same trait.
- (C) They code for unrelated proteins at different sites on the same chromosome.
- (D) They occupy different positions on the same chromosome.
- (E) They are found on complementary strands of the same DNA molecule.

38. The most dangerous aspect of the use of the pesticide DDT is that it

- (A) kills plants as well as insects
- (B) accumulates in higher trophic levels
- (C) leaches nitrogen from the soil
- (D) depletes the ozone layer
- (E) can be used as food by harmful bacteria

39. At the boundary between two major layers of rock in Earth's surface—the Cretaceous and Tertiary—geologists have found a thin layer of rock enriched in iridium, an element that is very rare on Earth. This is part of the evidence suggesting that dinosaurs became extinct because of

- (A) the impact of a meteor
- (B) brain function that was inferior to mammals'
- (C) a climate change that brought freezing temperatures to the Northern Hemisphere
- (D) extensive flooding from melting ice caps
- (E) a disease epidemic caused by unusual microorganisms



BIOLOGY-E/M TEST—Continued

40. Which of the following adaptations in vertebrates enabled them to colonize early terrestrial environments successfully?

- (A) Lungs, efficient kidneys, amniotic eggs
- (B) Ovaries and testes, wings, four-chambered heart
- (C) Backbone, teeth, waterproof skin
- (D) Binocular vision, closed circulatory system, lungs
- (E) Efficient kidneys, four-chambered heart, scales

41. In humans, color-blindness is a recessive, sex-linked trait. A woman with normal color vision, whose father was color-blind, marries a man with normal color vision. What percentage of their sons will probably be color-blind?

- (A) 0%
- (B) 25%
- (C) 50%
- (D) 75%
- (E) 100%

42. What would most likely occur if an organism is homozygous for an allele that encodes a defective digestive enzyme?

- (A) More enzyme molecules would be produced to compensate.
- (B) Another gene would synthesize the normal, functional enzyme.
- (C) The organism's homeostasis would be compromised.
- (D) The organism would be more susceptible to mutations.
- (E) The evolution of the organism with this defect would progress at a faster rate.

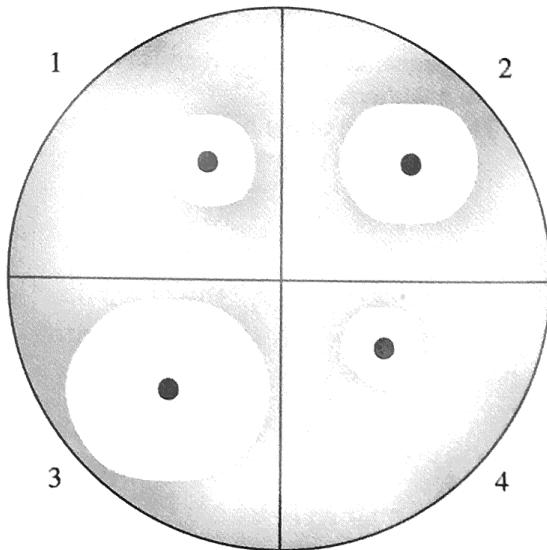


BIOLOGY-E/M TEST—Continued



Questions 43-45

The results of an experiment comparing the effects of four antibiotics on the growth of a strain of bacteria are shown below. The bacteria were grown on nutrient agar. The amount of antibiotic is the same on each paper disk. The diagram shows the results after one day. The areas of no growth are white.



- Quadrant 1 - Paper disk with Streptomycin
- Quadrant 2 - Paper disk with Erythromycin
- Quadrant 3 - Paper disk with Tetracycline
- Quadrant 4 - Paper disk with Penicillin

43. Based on the results of the experiment, the best treatment to eliminate an infection with this strain of bacteria would be

- (A) penicillin
- (B) tetracycline
- (C) streptomycin only
- (D) erythromycin only
- (E) erythromycin and streptomycin

44. The plate was examined the following day and small colonies were observed within the white area of the penicillin treatment. Which of the following is the best explanation for this new growth?

- (A) This strain of bacteria grows well on all types of media.
- (B) Penicillin is an ineffective antibiotic.
- (C) Penicillin resistance is present in all bacterial strains.
- (D) This strain of bacteria contained plasmids that promote growth in the presence of all antibiotics.
- (E) The new colonies represent bacteria with penicillin resistance.

45. Which of the following in a petri dish would be the most appropriate control for this experiment?

- (A) No antibiotics, no bacteria, and no agar
- (B) A mixture of other antibiotics on paper disks on nutrient agar
- (C) Antibiotics, but no bacteria on different nutrient agar
- (D) Bacteria and a paper disk with no antibiotic on the same plate
- (E) Bacteria placed in the dark on the same nutrient agar

46. Th

- (A)
- (B)
- (C)
- (D)
- (E)

47. Th

- (A)
- (B)
- (C)
- (D)
- (E)

BIOLOGY-E/M TEST—Continued

Questions 46–49

The following is a sequence of nucleotides found in a human gene.

I. TAG TAG AAA CCA CAA AGG ATA

Individuals with a certain genetic condition have the following sequence at the same position.

II. TAG TAG CCA CAA AGG ATA

46. The letters A, T, G, and C represent

- (A) nucleotides
- (B) amino acids
- (C) proteins
- (D) monosaccharides
- (E) phosphates

47. The condition occurs only when a person has two copies of sequence II, which indicates that the allele for the condition is

- (A) dominant
- (B) recessive
- (C) sex-linked
- (D) codominant
- (E) heterozygous

48. Which of the following is true about the difference in gene products of sequences I and II?

- (A) Sequence II will produce a protein with the same primary structure as a protein produced by sequence I.
- (B) Sequence II will produce a protein that is one amino acid longer than a protein produced by sequence I.
- (C) Sequence II will produce a protein with several different amino acids than a protein produced by sequence I.
- (D) Sequence II will produce a protein that is much longer than a protein produced by sequence I.
- (E) Sequence II will produce a protein that is one amino acid shorter than a protein produced by sequence I.

49. The mutation that led to the difference between sequence I and sequence II is best described as which of the following?

- (A) Frameshift
- (B) Substitution
- (C) Inversion
- (D) Translocation
- (E) Deletion



BIOLOGY-E/M TEST—Continued

Questions 50-53

In an experiment, five groups of germinating corn seeds were studied to determine the effects of pH on growth. Each group of ten corn seeds was germinated in a petri dish containing a paper towel moistened with an equal amount of an aqueous solution at a specific pH. All petri dishes were exposed to the same light and temperature conditions. After five days of germination, the radicles (embryonic roots) of all seeds in a pH group were measured. The table shows the results from the experiment.

THE EFFECTS OF VARYING pH ON THE GERMINATION OF CORN SEEDS

Group Number	pH Used	Average Radicle Length (cm)
1	4	3
2	6	4.6
3	7	5.7
4	8	3.6
5	10	2.8

50. From the data, the optimal pH for the radicle growth of germinated corn seeds is most likely
- (A) pH 4
(B) pH 6
(C) pH 7
(D) pH 8
(E) pH 10

51. Which of the following is the independent (manipulated) variable in the experiment?

- (A) The number of days for germination
(B) The number of corn seeds used
(C) The growth of the radicles
(D) The pH used
(E) The temperature used

52. All of the following statements about radicle growth in the corn seeds are true EXCEPT:

- (A) Starch was digested in the seed to provide energy for growth.
(B) Uptake of water initiated the germination process.
(C) The temperature used was adequate for enzyme activity to occur in the seeds.
(D) The corn seeds have proven to be metabolically active.
(E) Low levels of light directly provided the energy needed for germination.

53. Which of the following conditions is (are) controlled in the experiment?

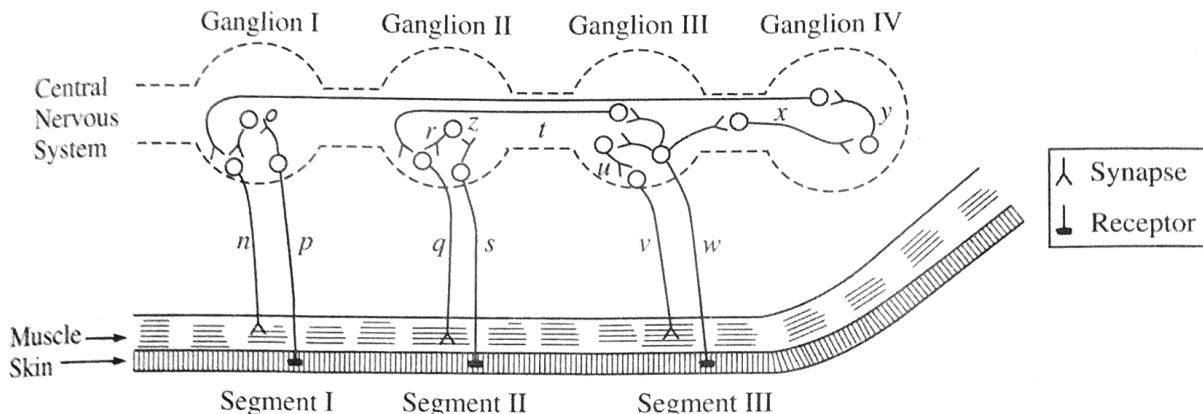
- I. Light
II. Temperature
III. pH used

- (A) I only
(B) II only
(C) III only
(D) I and II only
(E) I, II, and III

BIOLOGY-E/M TEST—Continued

Questions 54-57

The diagram below shows a terminal (end) portion of the nervous system of a segmented earthworm. The cell bodies of the neurons are arranged in groups, each of which is called a ganglion.



54. What effect would the destruction of neuron *n* have on the earthworm?

- (A) The skin at segment I would not receive stimuli.
- (B) The muscular movements at only segment I would be stopped.
- (C) The muscular movements at segment II as well as those at segment I would be stopped.
- (D) Neuron *p* would deteriorate.
- (E) Neuron *z* would deteriorate.

55. If the worm is touched at segment III, the muscles in that segment contract. Which of the following are the only neurons that must be involved in this stimulus-response action?

- (A) *q, r, s*
- (B) *q, t, w*
- (C) *w, u, v*
- (D) *n, z, y, x, w*
- (E) *s, r, t, u, v*

56. If the worm is touched at segment III and the muscles in segment II respond, which of the following neurons must be involved in the segment II response?

- (A) *s, r, q*
- (B) *s, t, v*
- (C) *w, u, v*
- (D) *w, t, q*
- (E) *q, t, u, v*

57. If neuron *y* in ganglion IV were destroyed, which of the following would be the result?

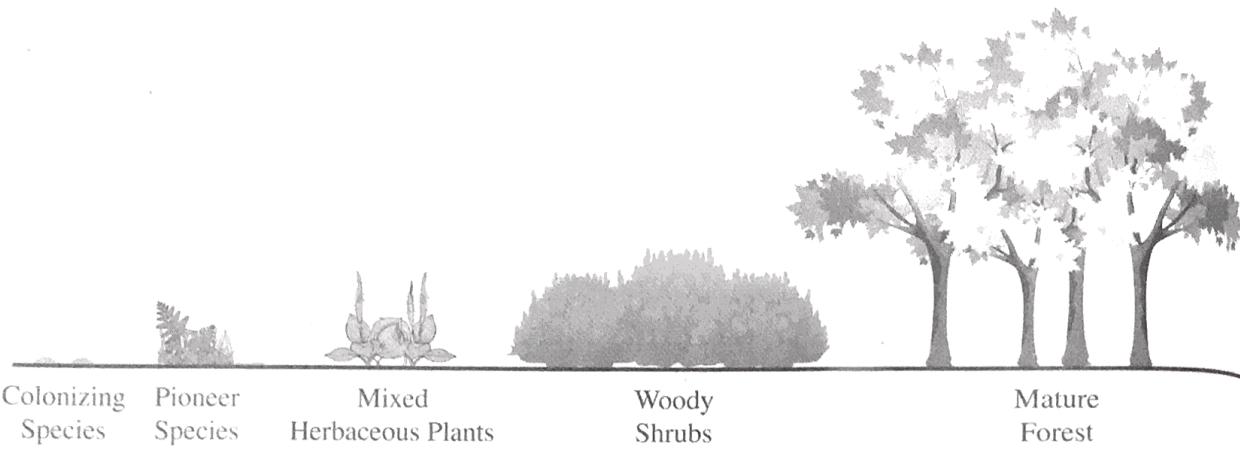
- (A) Segment I could not respond to a stimulus at the skin of segment I.
- (B) Segment I could not respond to a stimulus at the skin of segment III.
- (C) Segment II could not respond to a stimulus at the skin of segment II.
- (D) Segment II could not respond to a stimulus at the skin of segment III.
- (E) Segment III could not respond to a stimulus at the skin of segment III.



BIOLOGY-E/M TEST—Continued

Questions 58-60

Succession from bare rock to mature forest in a terrestrial ecosystem is diagrammed below.



58. Which of the following organisms are most likely to be the first colonizing species?

- (A) Mushrooms
- (B) Lichens
- (C) Grasses
- (D) Slime molds
- (E) Phytoplankton

59. Which of the following is the most logical explanation for why the colonizing species preceded the pioneer species in the ecological succession?

- (A) When the colonizers first inhabited the ecosystem, there was not enough sunlight to support the pioneer species.
- (B) The soils were initially too acidic for the pioneer species.
- (C) The colonizing species secreted chemicals that inhibited the growth of pioneer species.
- (D) The colonizing species made the habitat more suitable for the pioneer species.
- (E) The colonizing species had to accumulate enough mutations to become pioneer species.

60. The terrestrial ecosystem most likely belongs in which of the following biomes?

- (A) Tundra
- (B) Taiga (coniferous forest)
- (C) Temperate deciduous forest
- (D) Chaparral
- (E) Desert

If you are taking the Biology-E test,
continue with questions 61-80.

If you are taking the Biology-M test, go to question 81 now.



BIOLOGY-M SECTION

If you are taking the Biology-M test, continue with questions 81-100.
Be sure to start this section of the test by filling in circle 81 on your answer sheet.

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Some questions pertain to a set that refers to a laboratory or experimental situation. For each question, select the one choice that is the best answer to the question and then fill in the corresponding circle on the answer sheet.

81. When plant cells are placed in a saltwater solution, the volume of the cytoplasm decreases. Which of the following is the best explanation for this observation?

- (A) Cytoplasm leaks out through the cell wall.
- (B) The organelles in the cytoplasm are destroyed as the salt enters the cell.
- (C) The water, especially in the vacuole, leaves the cell.
- (D) Water from outside the cell fills the space between the cell wall and the plasma membrane.
- (E) The nucleus explodes and therefore takes up less space in the cytoplasm.

82. In fruit flies, the allele for red eyes is dominant over the allele for sepia eyes. This trait is not sex-linked. If a heterozygous red-eyed fruit fly mated with a sepia-eyed fruit fly, what percentage of the offspring would have sepia eyes?

- (A) 0%
- (B) 25%
- (C) 50%
- (D) 75%
- (E) 100%

83. An unidentified liquid is isolated from a sample of ground-up bean seeds. When the liquid is added to a test tube of water and shaken vigorously, the water and the unknown liquid separate into two layers after a few minutes. To which class of biological macromolecules should the unknown liquid most likely be assigned?

- (A) Carbohydrates
- (B) Enzymes
- (C) Lipids
- (D) Nucleic acids
- (E) Proteins

84. The secondary and tertiary structures of a protein molecule are ultimately due to which of the following?

- (A) The length of the mRNA molecule being transcribed
- (B) A group of cells specialized to alter protein shape
- (C) A special cellular organelle that fits a protein to its function
- (D) The primary structure (amino acid order) of the protein molecule
- (E) Ionic bonds within the specific amino acid tryptophan



85. Which of the following biological processes would provide the energy for the reaction above?

- (A) The synthesis of proteins from amino acids
- (B) The combination of glycerol and fatty acids to form a fat
- (C) The combination of glucose and fructose to form sucrose
- (D) The hydrolysis of protein to amino acids
- (E) The oxidation of glucose

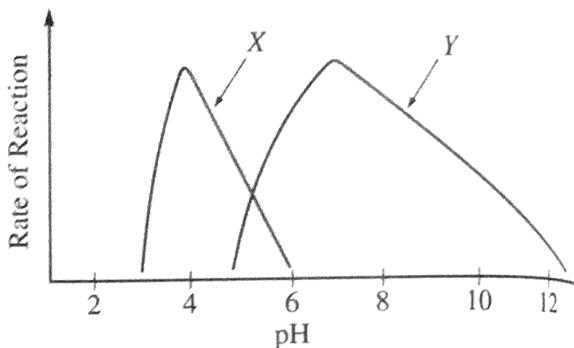
86. How many different types of gametes can be produced by an individual who is heterozygous for each of three different genes (e.g., *AaBbCc*), each of which is located on a different chromosome?

- (A) 2
- (B) 4
- (C) 6
- (D) 8
- (E) 16



BIOLOGY-M SECTION—Continued

87. In interphase, DNA is observed in which of the following forms?
- (A) Chromosomes aligned at the metaphase plate
 - (B) Sister chromatids attached to spindle fibers
 - (C) Chromatin
 - (D) Tetrads
 - (E) Bivalents
88. The rate of exchange of nutrients and water between a living eukaryotic cell and its environment is a function of which of the following properties?
- (A) The ratio of surface area to volume of the cell
 - (B) The number of chromosomes
 - (C) The rate of DNA transcription in the cell
 - (D) The mass of the cell
 - (E) The number of organelles in the cell
89. Nondisjunction during meiosis typically results in
- (A) gametes containing an extra chromosome
 - (B) gametes having identical DNA
 - (C) offspring lacking genetic variation
 - (D) cells unable to carry out DNA replication
 - (E) circular chromosomes
90. Which of the following combinations of parental genotypes is LEAST likely produce blood type O offspring?
- (A) $I^A i$ and $I^A i$
 - (B) $I^B i$ and ii
 - (C) ii and $I^A I^B$
 - (D) $I^B i$ and $I^B i$
 - (E) $I^A i$ and ii



91. The graph above shows the rates of reaction of two enzymes (X and Y) at varying pH levels. Which of the following statements is the best interpretation of this graph?

- (A) Enzyme X has an optimal pH of 6.
- (B) Enzyme X is active over a broader pH range than enzyme Y.
- (C) The optimal pH for enzyme Y is 4.
- (D) Both enzymes X and Y are active between pH 5 and pH 6.
- (E) Enzyme Y works better than enzyme X at higher temperatures.

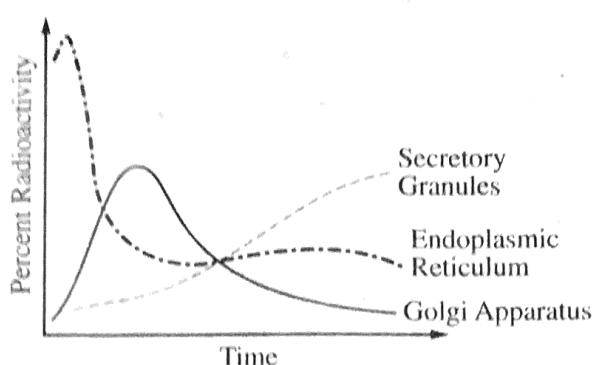
92. Which of the following is a function of lipids?
- (A) Active transport of ions
 - (B) Long-term energy storage
 - (C) Oxygen transport
 - (D) Transcription
 - (E) DNA replication

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BIOLOGY-M SECTION—Continued

Questions 93–95

Radioactive amino acids were administered to the secretory cells of the pancreas of a guinea pig. Cell samples were then removed at various intervals of time and analyzed for radioactivity in three parts of the cells. The results of the experiment are presented below.



93. Based on the results of the experiment, which of the following molecules would most likely contain the radioactive amino acids?

- (A) Phospholipid
- (B) Cholesterol
- (C) RNA polymerase
- (D) Insulin
- (E) DNA

94. The experiment was designed to answer which of the following questions?

- (A) In what way are cells harmed by radioactivity?
- (B) Through what pathway do proteins pass en route to being secreted?
- (C) In what cellular organelle is cholesterol inserted into the membrane?
- (D) In what cellular organelle are nucleotides polymerized to form nucleic acids?
- (E) What is the final extracellular destination of molecules secreted by the pancreas?

95. Which of the following conclusions is supported by the data obtained in the experiment?

- (A) The membranes of secretory cells are assembled in the Golgi apparatus.
- (B) Amino acids are incorporated into the membrane of the Golgi apparatus.
- (C) RNA made in the nucleus is transported to the endoplasmic reticulum, where protein synthesis occurs.
- (D) Proteins synthesized on the endoplasmic reticulum are transported to the Golgi apparatus, where they are packaged into secretory vesicles.
- (E) Some macromolecules synthesized by the pancreas are secreted into the bloodstream, and others are secreted into ducts leading to the small intestine.



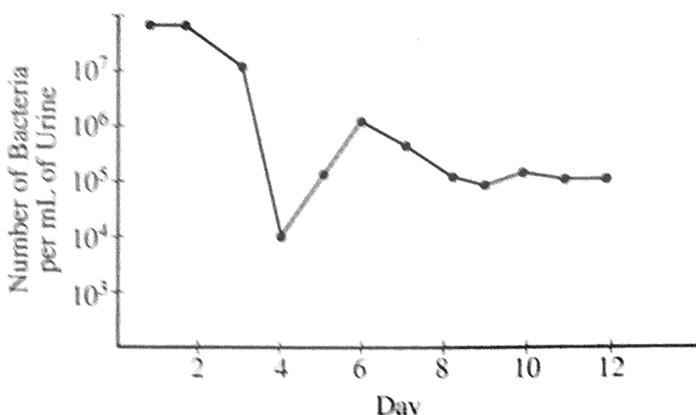
BIOLOGY-M SECTION—Continued



Questions 96–97

Questions

A hospital patient suffering from a chronic internal infection caused by a bacterium was treated with daily injections of the antibiotic streptomycin (0.5 mg/mL) over a period of 12 days, with the result shown in the figure below.



96. How much more bacteria is present per mL of urine on day 12 than on day 4?

- (A) 2 times as much
- (B) 5 times as much
- (C) 10 times as much
- (D) 20 times as much
- (E) 100 times as much

97. Which of the following conclusions might be drawn from the data?

- (A) By day 8, the number of bacteria had steadily declined.
- (B) Streptomycin caused a genetic mutation for antibiotic resistance that manifested itself on about day 4.
- (C) Initiating treatment with an alternate antibiotic on day 4 or 5 would have been ineffective in eliminating the bacteria.
- (D) Some of the bacteria that caused the infection were resistant to streptomycin.
- (E) By day 12, the amount of bacteria in the urine had returned to normal.

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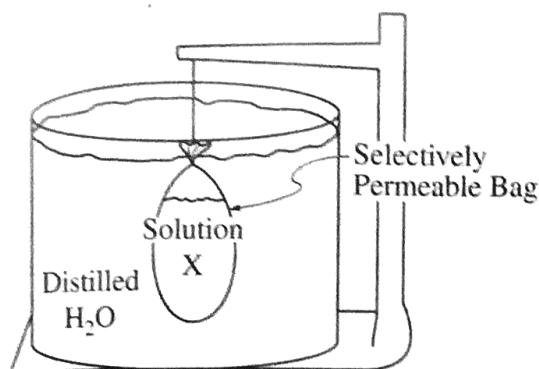
Content
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Bag

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BIOLOGY-M SECTION—Continued

Questions 98–100



Solution X was placed in a bag made of a selectively permeable dialysis membrane. The bag was securely tied, rinsed off with distilled water, and then suspended within a large beaker of distilled water, as shown above. The contents of the bag and the beaker were tested for the presence of sugar, starch, lipid, and protein at the start of the experiment and 24 hours later. The volume of the bag increased during this time. The results of these tests are presented in the table below.

(+ = present; – = absent)

		Start of Experiment	24 hours Later
Contents of Bag	Sugar	+	+
	Starch	+	+
	Lipid	+	+
	Protein	+	+
Contents of Beaker	Sugar	–	+
	Starch	–	–
	Lipid	–	–
	Protein	–	–

98. Which of the following processes accounts for the presence of sugar in the beaker after 24 hours?

- (A) Diffusion
- (B) Active transport
- (C) Pinocytosis
- (D) Osmosis
- (E) Absorption

99. Which of the following hypotheses is supported by this experiment?

- (A) Only organic compounds can move across semipermeable dialysis membranes.
- (B) The movement of sugar requires the expenditure of cellular energy.
- (C) Starch molecules are smaller than lipid molecules.
- (D) Sugar is more soluble in water than is starch.
- (E) The movement of molecules across a dialysis membrane depends on molecular size.

100. Correct statements about this experiment include which of the following?

- I. There is a net movement of water from the beaker into the bag.
 - II. Toward the end of the experiment, movement of sugar molecules across the membrane stops.
 - III. After 24 hours, the solutions in the bag and in the beaker are isotonic.
- (A) I only
 - (B) II only
 - (C) I and III only
 - (D) II and III only
 - (E) I, II, and III

STOP

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THE ENTIRE BIOLOGY-M TEST. DO NOT TURN TO ANY OTHER TEST IN THIS BOOK.