

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 oval on the answer sheet. A choice may be used once, more than once, or not at all in each set.

Questions 1-3 refer to the following molecules:

- (A) proteins
- (B) monosaccharides
- (C) lipids
- (D) DNA
- (E) RNA

1. Contain carbon, hydrogen, and oxygen in a 1:2:1 ratio
2. Are often not soluble in water
3. This group includes enzymes

Questions 4-6 refer to the following groups:

- (A) producer
- (B) primary consumer
- (C) secondary consumer
- (D) tertiary consumer
- (E) decomposer

4. The group in the food pyramid with the fewest number of members
5. Creates glucose from carbon dioxide in the atmosphere
6. Omnivores most often fall into this group

Questions 7-9 refer to the following processes:

- (A) Krebs cycle
- (B) oxidative phosphorylation
- (C) aerobic respiration
- (D) glycolysis
- (E) anaerobic respiration

7. Stage at which one molecule of 6-carbon glucose is broken in half to produce two molecules of pyruvate. Two ATP are generated in this stage.
8. Process occurring in the mitochondria of eukaryotes and resulting in the total oxidation of acetyl-CoA to carbon dioxide. Two ATP are generated in this stage.
9. Occurs in the fermentation of alcohol

Questions 10-12 refer to the following behavior types:

- (A) imprinting
- (B) habituation
- (C) conditioning
- (D) insight learning
- (E) fixed-action patterns

10. When confronted with a nonharmful stimulus many times, an animal will learn to ignore it.
11. When an animal associates two unrelated events that occur simultaneously, this is known as
12. This behavior involves an animal's recognition of its mother.

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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 oval on the answer sheet.

13. Of the following, which group's members have the LEAST in common with each other?
- (A) Species
 - (B) Order
 - (C) Family
 - (D) Phylum
 - (E) Kingdom
14. A culture of animal cells and a culture of plant cells are pulverized and tested for the presence of several different molecules. Which of the following molecules should be significantly more prevalent in the plant cell sample?
- (A) Glucose
 - (B) Deoxyribonucleic acid
 - (C) Adenosine triphosphate
 - (D) Cholesterol
 - (E) Cellulose
15. Which of the following is the best example of exponential population growth?
- (A) A population of pigeons in a small town grows until there are few nesting areas left.
 - (B) The salmon population in the Yukon River grows rapidly, greatly increasing the food supply for bears in the area.
 - (C) Dandelions grow in a field until they cover the entire expanse.
 - (D) Bacteria in a laboratory grow in many petri dishes and are transferred to new, empty dishes as the old dishes begin to fill.
 - (E) The population of buffalo in the Great Plains is severely diminished by hunting and development.
16. A person becomes anemic when they are not getting enough oxygen to their body. Which of the following could cause someone to be anemic?
- (A) A deficiency in white blood cells
 - (B) A deficiency in red blood cells
 - (C) A low platelet count
 - (D) Too little plasma in the bloodstream
 - (E) An abnormally high T-cell count
17. Natural selection refers to all of the following EXCEPT
- (A) Individual organisms differ from one another.
 - (B) Competition exists between individuals.
 - (C) The best-adapted organisms are most likely to survive.
 - (D) The best-adapted organisms are most likely to reproduce.
 - (E) The traits an organism acquires in its lifetime are passed down to its offspring.
18. Which of the following is the best example of an ecological community?
- (A) All of the pigeons inhabiting a city
 - (B) A school of trout in the Mississippi River
 - (C) Tropical rain forests worldwide and all of the organisms that inhabit them
 - (D) All of the plants, insects, rodents, and predators inhabiting a small island
 - (E) An ant colony
19. Which of the following is the best description of a protein molecule?
- (A) Small building blocks called amino acids linked together in one or more chains
 - (B) Small building blocks called amino acids linked together in a ring
 - (C) Small building blocks called nucleotides linked together in a helical structure
 - (D) Small building blocks called monosaccharides linked together in a chain
 - (E) A glycerol molecule linked to three hydrocarbon chains
20. The DNA sequence TTATTAGACCT is transcribed to the RNA sequence
- (A) TCCAGATTATT
 - (B) GGCGGCUCAAG
 - (C) TTUTTUGUCCT
 - (D) UUTUUTCUGGU
 - (E) AAUAAUCUGGA

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BIOLOGY E/M TEST—Continued

21. When a fertilized egg implants in the uterine lining, the lining is not shed in menstruation, but instead remains to support the pregnancy. What initially signals this change?
- (A) The release of hormones by the newly developing embryo
 - (B) The release of estrogen by the ovaries
 - (C) The release of enzymes by the uterine wall
 - (D) The release of enzymes by the placenta
 - (E) The release of hormones from the pituitary gland
22. Gaps in the fossil record, the only direct evidence for historical evolution, may be attributed to all of the following EXCEPT
- (A) fossilization is an improbable event
 - (B) fossilization requires sedimentary rock
 - (C) erosion
 - (D) many fossils have yet to be found
 - (E) specimens were enclosed in rocks formed from hardened sediments
23. You are told that an unidentified cell contains a single, circular DNA molecule but no defined nucleus. Which of the following is it also possible for the cell to possess?
- I. Chloroplasts
 - II. Cell wall
 - III. Ribosomes
- (A) I only
 - (B) III only
 - (C) I and II only
 - (D) II and III only
 - (E) I, II, and III
24. Nitrogen in the atmosphere gets converted into a usable form by
- (A) photosynthesis
 - (B) respiration
 - (C) digestion
 - (D) nitrogen-fixing bacteria
 - (E) decomposition
25. Monerans are
- (A) eukaryotes
 - (B) fungi
 - (C) prokaryotes
 - (D) multicellular
 - (E) plants
26. Which of the following was NOT a component of the Earth's early atmosphere?
- (A) Oxygen
 - (B) Water
 - (C) Methane
 - (D) Hydrogen
 - (E) Ammonia
27. A blood vessel has thick muscular walls. This blood vessel is
- I. an artery
 - II. carrying oxygenated blood
 - III. carrying blood away from the heart
- (A) I only
 - (B) III only
 - (C) I and II only
 - (D) I and III only
 - (E) I, II, and III

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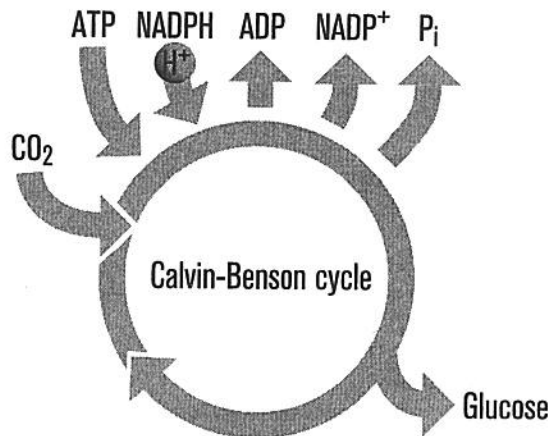
BIOLOGY E/M TEST—Continued

28. Which of the following statements is true about the flow of energy through the food pyramid?
- (A) The most energy is at the top of the pyramid, with the tertiary consumers, because the energy increases at each level.
 - (B) The most energy is at the bottom of the food pyramid because some is lost as it is passed from producer to each level of consumer.
 - (C) The energy is distributed equally at each level of the pyramid; very little is lost or added moving from producers to tertiary consumers.
 - (D) Energy doesn't flow through the food pyramid; each level receives energy from the sun.
 - (E) It depends on the ecological community; in some, there is more energy at the top of the food pyramid, and in others, there is more energy at the bottom.
29. The toxic chemical produced by anaerobic respiration is
- (A) pyruvate
 - (B) lactic acid
 - (C) acetyl-CoA
 - (D) NADH
 - (E) coenzyme
30. One of the functions of human white blood cells is to ingest and destroy harmful agents, such as bacteria, that find their way into the bloodstream. In order to perform this function, you could expect a white blood cell to have a higher than average number of
- (A) ribosomes
 - (B) peroxisomes
 - (C) chloroplasts
 - (D) lysosomes
 - (E) chromosomes

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BIOLOGY E/M TEST—Continued

Questions 31–35 refer to the diagram below.



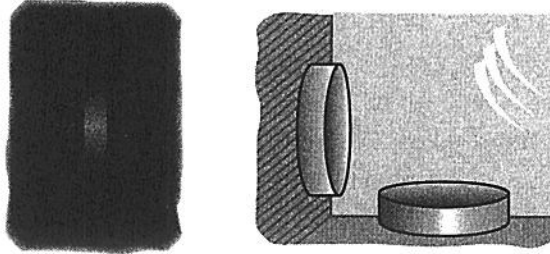
31. The depicted process is also known as
- (A) aerobic respiration
 - (B) photophosphorylation
 - (C) light-dependent photosynthesis
 - (D) light-independent photosynthesis
 - (E) anaerobic respiration
32. This process occurs in the
- (A) stroma of chloroplasts
 - (B) cytoplasm of palisade cells
 - (C) inner membrane of mitochondria
 - (D) nucleus
 - (E) endoplasmic reticulum
33. ATP stands for
- (A) accelerated transport protein
 - (B) adenosine triphosphate
 - (C) activated transphosphate
 - (D) adenine tripeptide
 - (E) adenosine diphosphate
34. The synthesized glucose will most likely be stored as
- (A) sucrose
 - (B) starch
 - (C) cellulose
 - (D) glycogen
 - (E) glucose
35. How is the Calvin cycle similar to the Krebs cycle?
- (A) The starting compound is regenerated at the end of the cycle.
 - (B) Multiple molecules of ATP are produced.
 - (C) Both occur in mitochondrial inner membranes.
 - (D) Both produce oxygen gas.
 - (E) Each is present in all prokaryotes.

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BIOLOGY E/M TEST—Continued

Questions 36–39 refer to the diagram below.

In an experiment, presoaked bean seeds were placed in three sterile petri dishes. They were covered with tissue paper and cotton, which was subsequently wet with tap water. The dishes were closed and taped shut. Dish 1 was affixed to the wall of a dark box with the transparent bottom facing out. Dish 2 was attached to the side of the windowsill, and dish 3 was laid flat on the sill, each with bean seeds visible. After several days, the experimenter checked the new seedlings.

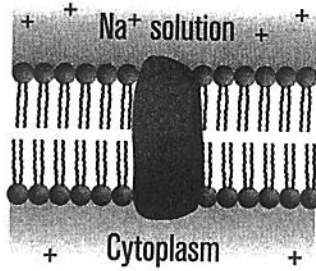


36. In dish 1, several pale shoots have started to reach downward. This is most likely an example of
- (A) thigmotropism
 - (B) negative phototropism
 - (C) positive gravitropism
 - (D) negative gravitropism
 - (E) wilting
37. The seeds in dish 1 were kept in a dark box to
- (A) study the effect of light on their emergence
 - (B) decrease experimental variables
 - (C) simulate conditions when planted
 - (D) study the effects of phototropism
 - (E) keep the temperature down
38. The physical growth associated with tropisms is caused by
- (A) auxin
 - (B) lactic acid
 - (C) associative behavior
 - (D) nitrogen
 - (E) excess carbon dioxide
39. What process is NOT occurring in the dish 1 seedlings?
- (A) Photosynthesis
 - (B) Respiration
 - (C) Mitosis
 - (D) Glycolysis
 - (E) Absorption

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BIOLOGY E/M TEST—Continued

Questions 40–44 refer to the following illustration of a cell in solution, where a “+” indicates the presence of a sodium ion.



40. The figure depicts an animal cell in a 10% sodium solution. What is likely to occur?
- (A) Water exits the cell by osmosis.
 - (B) Sodium ions enter by diffusion.
 - (C) The cell swells and bursts.
 - (D) Sodium is pumped out of the cell.
 - (E) No change
41. Relative to the cell, the sodium solution is
- (A) hypotonic
 - (B) hydrophobic
 - (C) isotonic
 - (D) hypertonic
 - (E) equivalent
42. The process by which the carrier protein might bring sodium into the cell is called
- (A) simple diffusion
 - (B) facilitated diffusion
 - (C) active transport
 - (D) osmosis
 - (E) phosphorylation
43. The cell membrane is composed of two layers of
- (A) phospholipids
 - (B) enzymes
 - (C) amino acids
 - (D) proteins
 - (E) steroids
44. Which of the following molecules could NOT easily and independently pass through the membrane?
- (A) Nitrogen
 - (B) Water
 - (C) Glucose
 - (D) Carbon dioxide
 - (E) Oxygen

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BIOLOGY E/M TEST—Continued

A copperhead snake (*Agkistrodon contortrix*) and a canary (*Serinus canarius*) are both being studied in a zoological laboratory.

45. During the night, the air temperature in the lab falls. What happens to the two organisms' metabolic rates?
- (A) Both remain stable
 - (B) Both increase
 - (C) Snake's decreases, canary's remains stable
 - (D) Both decrease
 - (E) Canary's decreases, snake's increases
46. The copperhead has tiny leg bones along its skeleton. These structures are
- (A) mutations
 - (B) homologous
 - (C) analogous
 - (D) vestigial
 - (E) convergent
47. All of the following are true about endotherms EXCEPT
- (A) They inhabit a wide range of environments.
 - (B) They typically become more active with warmer temperatures.
 - (C) They maintain body temperatures higher than their surroundings.
 - (D) They are all heterotrophs.
 - (E) They evolved relatively later than ectotherms.
48. Which of the following characteristics distinguishes the canary from the copperhead?
- (A) Four-chambered heart
 - (B) Thick-shelled eggs for survival on land
 - (C) Vertebral column
 - (D) Bony skeleton
 - (E) Closed circulatory system

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BIOLOGY E/M TEST—Continued

Red cabbage (*Brassica oleracea capitata rubra*) can serve as a natural indicator—its pigments change color in response to varying pH levels. A student chops and boils half a red cabbage head for ten minutes and then strains it to obtain a purple liquid. The liquid is then cooled to room temperature and separated into beakers. The student adds various substances to each beaker and observes the changes.

Additive	pH	Solution Color
Lemon juice	2.0	Pink
Vinegar	2.2	Pink-red
Baking soda	8.3	Blue-green

49. What can the student determine about red cabbage as a natural indicator?
- (A) It turns pink in the presence of acids.
 - (B) It turns red in the presence of bases.
 - (C) It turns blue-green in the presence of acids.
 - (D) It is purple at a pH lower than 7.
 - (E) It is a poor indicator of acidic or basic solutions.
50. What would the student observe if sodium hydroxide (NaOH) was slowly added to the vinegar solution?
- (A) The solution would turn from pink-red to purple to blue-green.
 - (B) The solution would turn from pink-red to pink to yellow.
 - (C) Nothing—the reaction has already occurred.
 - (D) A white precipitate would form at the bottom.
 - (E) The solution would turn clear.
51. Plants get much of their color from pigments, such as chlorophyll. What is the function of red cabbage pigments in nature?
- (A) Indicate the pH of the soil
 - (B) Contribute to photosynthesis
 - (C) Keep down heat absorption
 - (D) None: vestigial structure
 - (E) Attract animals
52. When added directly to leaves of red cabbage, such as in salad, vinegar effects no color change. What best explains why?
- (A) Vinegar is too weak a substance to change the indicator.
 - (B) Nothing can penetrate the epidermis of plant cells.
 - (C) Red cabbage neutralizes the vinegar.
 - (D) Hydrogen ions cannot independently cross cell membranes.
 - (E) The indicator only works at higher temperatures.

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BIOLOGY E/M TEST—Continued

The common fruit fly (*Drosophila melanogaster*) is usually found with red eyes and normal wings. A series of experimental crosses were run to examine their recessive traits: white eyes and vestigial (shrunken) wings. In the F_0 generation, a female with red eyes and normal wings was crossed with a male having white eyes and vestigial wings. The results are given below.

Phenotype	F_1 Males	F_1 Females
Red eyes, normal wings	21	20
White eyes, normal wings	0	0
Red eyes, vestigial wings	0	0
White eyes, vestigial wings	0	0

Phenotype	F_2 Males	F_2 Females
Red eyes, normal wings	62	123
White eyes, normal wings	59	0
Red eyes, vestigial wings	18	39
White eyes, vestigial wings	21	0

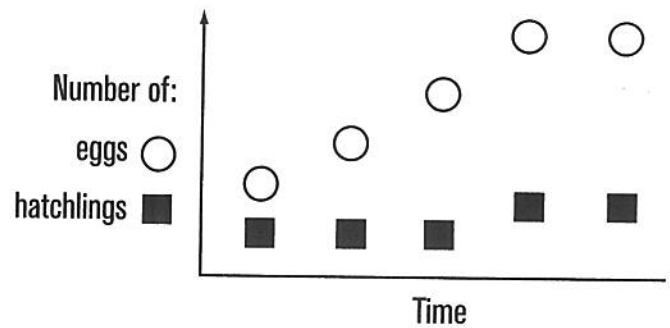
53. Based on the data, which of these characteristics is sex-linked in fruit flies?
- (A) Wing shape
(B) Eye color
(C) Vestigial wings
(D) Red eyes
(E) All of the above
54. What is the likelihood of observing female offspring with white eyes and vestigial wings in the F_3 generation?
- (A) Impossible; females cannot have white eyes
(B) Much less likely than any other phenotype
(C) As likely as seeing males with white eyes and vestigial wings
(D) As likely as seeing females with red eyes and vestigial wings
(E) Unable to determine without actually breeding flies
55. What is the ratio of phenotypes in F_2 males?
- (A) 4:1
(B) 3:1
(C) 3:3:1:1
(D) 3:0:1:0
(E) 1:1:1:1
56. If the allele for white eyes was dominant, approximately how many F_2 males would have white eyes (out of a possible 160 males)?
- (A) 20
(B) 40
(C) 60
(D) 80
(E) 120

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BIOLOGY E/M TEST—Continued

An experimenter was testing the effects of temperature on egg production and hatching rates in fruit flies. She kept separate communities of 50 fruit flies at different temperatures, counting the eggs produced and hatchlings for each day of the experiment.

		Day 2	Day 3	Day 4	Day 5
5°C	Eggs (total)	0	8	19	31
	Hatchlings	0	0	0	0
20°C	Eggs (total)	3	15	45	51
	Hatchlings	0	0	13	39
30°C	Eggs (total)	4	20	62	76
	Hatchlings	0	1	44	69
45°C	Eggs (total)	0	2	4	4
	Hatchlings	0	0	1	1



57. According to this data, the experimenter can conclude fertility rates of fruit flies are highest at temperatures near
- (A) 5°
 (B) 15°
 (C) 30°
 (D) 40°
 (E) 50°
58. The majority of egg production occurs between days
- (A) 1–2
 (B) 2–3
 (C) 3–4
 (D) 4–5
 (E) after day 5
59. This graph best represents the experiment at
- (A) 10°
 (B) 20°
 (C) 30°
 (D) 40°
 (E) 50°
60. Constructing a hypothesis about fertility rates for fruit flies at different temperatures could be strengthened by
- (A) conducting tests at temperatures higher than 45°
 (B) measuring the growth of the individual organisms
 (C) increasing temperatures by 5° each day
 (D) testing different species of insects
 (E) charting the survival of the original 50 flies on each day

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BIOLOGY E SECTION

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.

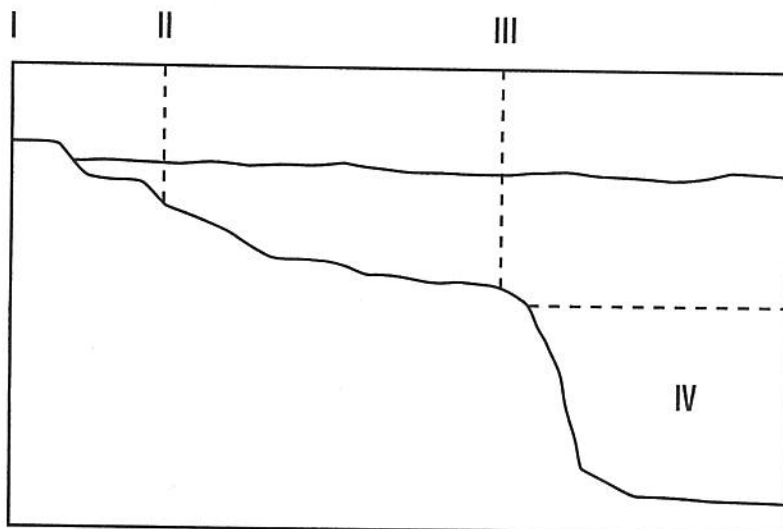
Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Some questions pertain to a set that refers to a laboratory or experimental situation. For each question, select the one choice that is the best answer to the question and then fill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

61. A particularly strong sensation is felt when
- (A) a neuron fires an action potential with a greater charge than normal
 - (B) a neuron fires an action potential with a lower charge than normal
 - (C) a neuron fires an action potential that lasts a longer time than usual
 - (D) a neuron fires action potentials more frequently than usual
 - (E) interneurons rather than sensory neurons carry the action potential
62. All of the following are part of the cytoskeleton EXCEPT
- (A) microtubules
 - (B) microfilaments
 - (C) flagella
 - (D) cilia
 - (E) ribosomes
63. As a means to avoid predators, an insect and a squirrel both develop flaps between their legs that allow them to glide in the air. This is an example of
- (A) divergent evolution
 - (B) speciation
 - (C) convergent evolution
 - (D) coevolution
 - (E) biological magnification
64. The common house cat is inadvertently introduced to a small island that previously contained no cats. The cats begin to feed on local rodents, and the cat population grows very rapidly in the first few years, after which it begins to level off. At this point, the population of cats has reached the
- (A) maximum yield
 - (B) carrying capacity
 - (C) tertiary level
 - (D) climax community
 - (E) extinction point
65. In addition to gas exchange, the respiratory system helps regulate
- (A) the immune response
 - (B) body temperature
 - (C) pH balance in the blood
 - (D) enzyme production
 - (E) osmotic pressure
66. A particular food chain consists of mice, which feed on grass, snakes that feed on the mice, and hawks, which feed on both mice and snakes. Rank the animals from most to least numerous in this particular environment.
- (A) mice, snakes, hawks
 - (B) hawks, snakes, mice
 - (C) hawks, mice, snakes
 - (D) mice, hawks, snakes
 - (E) snakes, mice, hawks

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BIOLOGY E SECTION—Continued

Questions 67–70 refer to the following diagram, depicting a cross-section view of the ocean divided into standard zones.

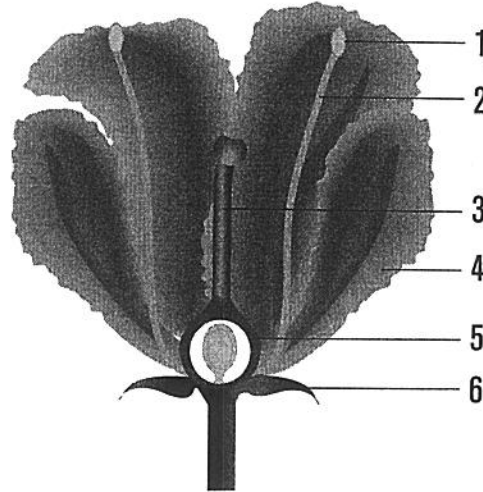


67. The area from II to III is known as the
- (A) pelagic zone
 - (B) neritic zone
 - (C) abyssal plain
 - (D) intertidal zone
 - (E) aphotic zone
68. What organismal characteristics are most likely found in zone IV?
- (A) Autotrophic
 - (B) Exclusively unicellular
 - (C) Heterotrophic
 - (D) Highly advanced eyesight
 - (E) Silicate shells
69. Of the following, which organism is LEAST likely to be found in the intertidal zone?
- (A) Heterotrophic clams
 - (B) Photosynthetic kelp
 - (C) Heterotrophic starfish
 - (D) Chemosynthetic bacteria
 - (E) Photosynthetic algae
70. The ocean participates in which of the following cycles?
- I. Water cycle
 - II. Carbon cycle
 - III. Nitrogen cycle
- (A) I only
 - (B) I and II only
 - (C) I and III only
 - (D) II and III only
 - (E) I, II, and III

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BIOLOGY E SECTION—Continued

Questions 71–75 refer to the following diagram.



71. Structure 6 is called a

- (A) petal
- (B) sepal
- (C) ovule
- (D) leaf
- (E) stamen

72. The pollen tube runs through structure

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

73. The function of structure 1 is to

- (A) spread pollen
- (B) receive gametes
- (C) photosynthesize
- (D) release pheromones
- (E) emit spores

74. If pollinated, fruit will grow from structure

- (A) 1
- (B) 3
- (C) 4
- (D) 5
- (E) 6

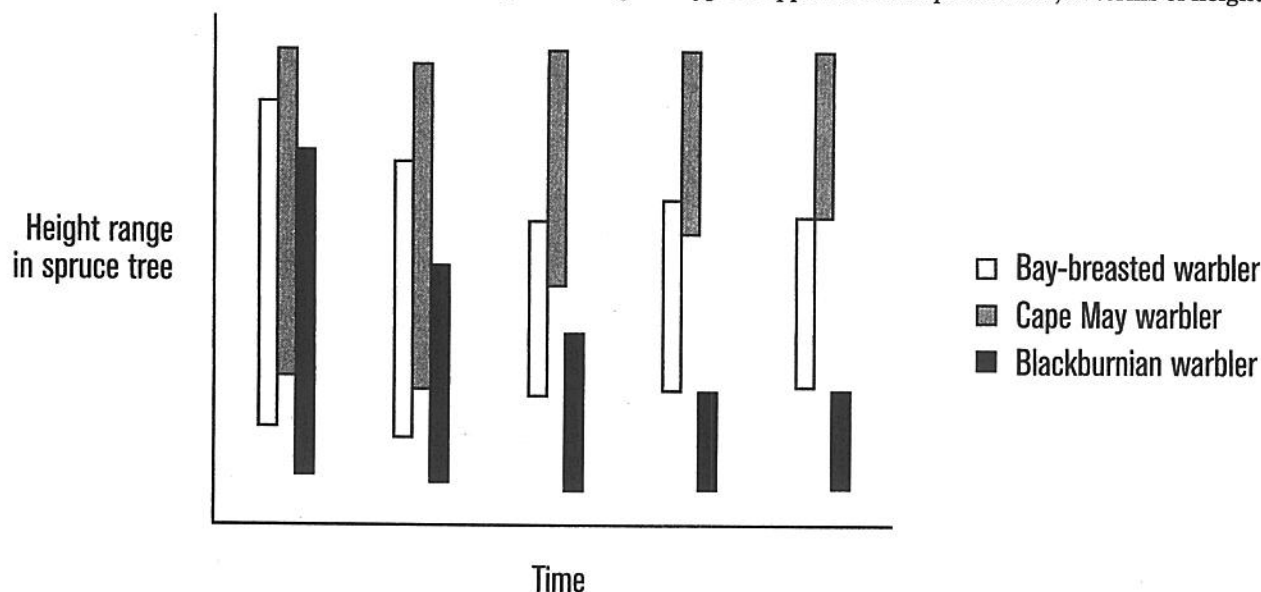
75. This could be an illustration of a

- (A) bracheophyte
- (B) conifer
- (C) fungus
- (D) dicot
- (E) fern

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BIOLOGY E SECTION—Continued

A field biologist was studying the behavior of several similar species of warblers that had all recently been introduced to a national park. All the birds fed on the same leaf-eating insects on the same spruce trees at the same time of day. Over a period of several years, she observed the species' ranges of typical appearance in spruce trees, in terms of height.



76. The segregation of warblers in the tree demonstrates
- convergent evolution
 - adaptation
 - predation
 - mutation
 - climax community
77. An organism's niche is determined by which of the following factors?
- Habitat location
 - Food
 - Temperature
 - Behavior
 - All of the above
78. What is the primary consumer in this community?
- Cape May warbler
 - Spruce
 - Bay-breasted warbler
 - Insect
 - Blackburnian warbler
79. What can the experimenter conclude from her observations?
- Interspecies competition sorts warblers into different niches.
 - Competing warblers kill off any intruders in their zone.
 - The population of Blackburnian warblers falls dramatically in the presence of other species.
 - Warblers will change their diets under new selection pressure.
 - Spruce trees cannot support multiple species of warblers.
80. If a fungus killed off a large percentage of the spruces' insect populations in the park, which of the following is a predictable result?
- The warblers consume all the available insects and die off.
 - The bay-breasted warbler replaces the other species.
 - Each population of warbler species falls in number until a new carrying capacity is reached.
 - Warblers migrate to new insect-rich forests.
 - Different species mate to give rise to better-adapted warblers.

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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 oval 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 oval on the answer sheet.

81. A nitrogenous base found in RNA but not in DNA is

- (A) adenine
- (B) guanine
- (C) cytosine
- (D) thymine
- (E) uracil

	T	t
T	TT	Tt
t	Tt	tt

T=tall, t=short

82. Which of the following can be inferred from the Punnett square above?

- I. The genotypic ratio is 50% hybrid tall, 25% pure tall, and 25% pure short.
- II. The genotypic ratio is 75% tall, 25% short.
- III. The phenotypic ratio is 50% hybrid tall, 25% pure tall, and 25% pure short.
- IV. The phenotypic ratio is 75% tall, 25% short.
- V. These results are typically found in sex-linked inheritance.

- (A) I, IV
- (B) I, III, V
- (C) I, III
- (D) II, III
- (E) II, IV, V

83. Divergent evolution might result in

- (A) biological magnification
- (B) reproductive isolation
- (C) analogous traits
- (D) mutations
- (E) succession

84. Which of the following can greatly affect the speed of an enzymatic reaction?

- I. Temperature
- II. pH
- III. Presence of coenzymes or inhibitors

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

85. What principle states that in a large, randomly mating population in which evolutionary forces such as selection, migration, and mutation do not occur, the allele and genotype frequencies will remain constant from generation to generation?

- (A) Natural selection
- (B) Homeostasis
- (C) Balanced mutation
- (D) Stabilizing selection
- (E) Hardy-Weinberg equilibrium

86. Of the following, which statement is true of glycolysis?

- (A) Breaks glucose down to pyruvate
- (B) Also called fermentation
- (C) Produces no ATP
- (D) Not part of the aerobic respiratory pathway
- (E) Occurs inside mitochondria

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BIOLOGY M SECTION—*Continued*

Cystic fibrosis (CF) is caused by gene mutation on an autosomal chromosome, where a single nucleotide is omitted during the copying of a normal DNA sequence.

87. This type of mutation is known as
- (A) frameshift
 - (B) point mutation
 - (C) insertion
 - (D) silent mutation
 - (E) crossing-over
88. The CF gene is recessive. Assuming his genes are not the product of mutations, a CF patient must have inherited CF genes from
- (A) mother only
 - (B) father only
 - (C) both parents
 - (D) mother if the child is male
 - (E) one parent who is a CF patient
89. Mutations can occur during
- I. transcription
 - II. translation
 - III. meiosis
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I and II only
 - (E) I, II, and III
90. Why are frameshift mutations particularly dangerous?
- (A) They shorten the length of chromosomes.
 - (B) No other mutation changes phenotypes.
 - (C) They prevent transcription from occurring.
 - (D) They affect all codons following the mutation.
 - (E) Future offspring will be sterile.

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BIOLOGY M SECTION—Continued

Questions 91–96 refer to the following figures of molecules.

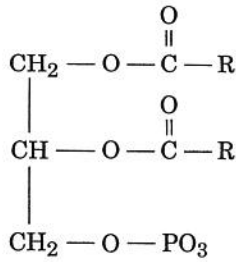


Figure 1

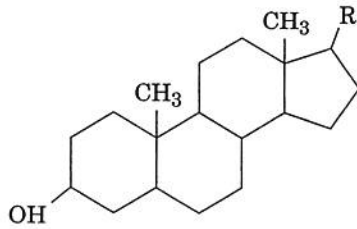


Figure 2

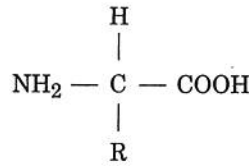


Figure 3

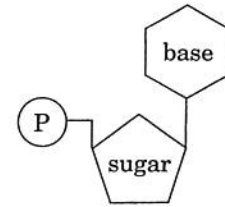


Figure 4

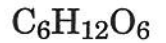


Figure 5

91. What reaction occurs when two molecules of Figure 3 combine?
- (A) Glycolysis
 (B) Dehydration synthesis
 (C) Hydrolysis
 (D) Phosphorylation
 (E) Oxidation
92. What type of bond is formed in the above reaction?
- (A) Hydrogen
 (B) Peptide
 (C) Double
 (D) Triple
 (E) Polymer
93. When two molecules of Figure 5 combine, what is the resulting chemical formula?
- (A) $C_nH_{2n}O_n$
 (B) $C_nH_nO_n$
 (C) $C_nH_{n-1}O_{n-1}$
 (D) $C_nH_{2n-1}O_{n-1}$
 (E) $C_nH_{2n-2}O_{n-1}$
94. Which of these molecules readily forms polymers?
- I. Figure 1
 II. Figure 2
 III. Figure 4
- (A) I only
 (B) II only
 (C) III only
 (D) II and III only
 (E) I, II, and III
95. The phosphate group in Figure 1 becomes the molecule's
- (A) hydrophilic head
 (B) hydrophobic head
 (C) active site
 (D) functional group
 (E) hydrophobic tail
96. Figure 2 is a
- (A) nucleotide
 (B) carbohydrate
 (C) polypeptide
 (D) steroid
 (E) triglyceride

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BIOLOGY M SECTION—Continued

In constructing evolutionary relationships, scientists examine sequences of nucleotides or amino acids from molecules common to all organisms, such as hemoglobin. By identifying the relative differences in the sequences between species, scientists can chart degrees of evolutionary relatedness: the smaller the dissimilarity, the closer the relation. The following table records differences in the amino acid sequences of beta-hemoglobin from seven different species of primates.

	human		chimpanzee		gorilla		gibbon		rhesus monkey		squirrel monkey		lemur
human													
chimpanzee	0												
gorilla	1	1											
gibbon	3	3	4										
rhesus monkey	8	8	8	8									
squirrel monkey	11	11	12	10	13								
lemur	31	30	30	31	29	30							

Figure 1

A phylogenetic tree can be built from this data to show when and how organisms diverged.

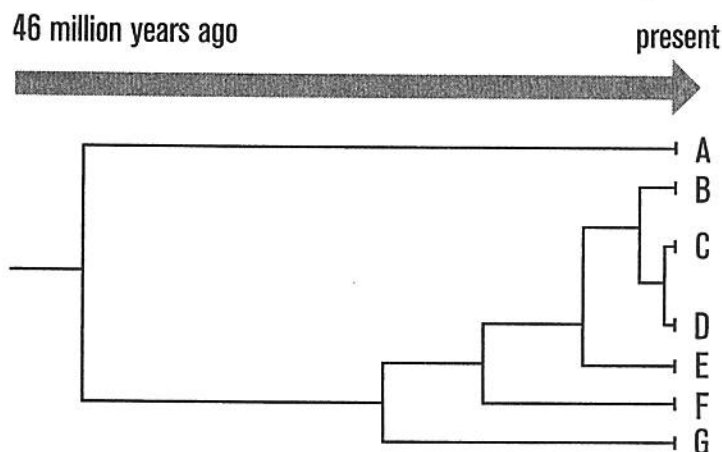


Figure 2

97. What organism should be listed in the branch labeled E?

- (A) Lemur
- (B) Squirrel monkey
- (C) Gorilla
- (D) Gibbon
- (E) Rhesus monkey

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BIOLOGY M SECTION—Continued

98. Based on this evidence, which of these organisms share the most recent common ancestor?
- I. Humans and gorillas
 - II. Gorillas and chimpanzees
 - III. Humans and gibbons
- (A) I
 - (B) II
 - (C) III
 - (D) I and II
 - (E) I, II, and III
99. Which of the following statements is true?
- (A) Humans evolved from modern-day lemurs.
 - (B) Humans and lemurs share a common ancestor.
 - (C) Humans are not related to lemurs.
 - (D) Lemurs look just like their ancestors did millions of years ago.
 - (E) Humans and lemurs demonstrate convergent evolution.
100. Relative to the other primates, a horse actually demonstrates fewer differences in amino acids (~28) for beta-hemoglobin than does a lemur. What best explains this?
- (A) Humans are more closely related to horses than lemurs.
 - (B) The horse is a mutant.
 - (C) The same amino acids can be coded for by very different sequences of nucleotides.
 - (D) Molecular methods for identifying evolutionary relationships don't work.
 - (E) The evolutionary tree for horses has few branches.

S T O P

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