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 movement of substances across the cell membrane.

(A) Exocytosis
(B) Endocytosis
(C) Osmosis
(D) Facilitated diffusion
(E) Active transport

1. Requires ATP

2. Process by which water crosses a cell membrane

3. Occurs when a vesicle fuses with the cell membrane and releases its contents into the outside

Questions 4–6 refer to structures found in plants.

(A) Stigma
(B) Ovary
(C) Anther
(D) Tuber
(E) Bulb

4. Can develop into fruit

5. Part of the stamen

6. Fleshy underground storage structures that are enlarged parts of the stem

Questions 7–9 refer to concepts used in community ecology.

(A) Mutualism
(B) Biome
(C) Community
(D) Commensalism
(E) Niche

7. The functional role of a species in an ecosystem

8. A type of symbiosis in which one species benefits and the other remains unaffected

9. Refers to all of the populations that interact with each other in a given environment and geographical area

Questions 10–12 refer to evidence of evolution.

(A) Analogous structures
(B) Vestigial structures
(C) Fossils
(D) Comparative embryology
(E) Molecular clocks

10. Mineralized remains or traces of prehistoric life

11. Bodily structures that evolved in the past but that no longer serve an apparent function

12. Certain genes or proteins in organisms that change at a constant rate over time

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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 best answer to the question and fill in the corresponding oval on the answer sheet.

13. The exoskeleton of an arthropod is made of

    (A) cellulose
    (B) keratin
    (C) peptidoglycan
    (D) chitin
    (E) hair

14. Rank the following in order from most inclusive to least inclusive:

    (A) Biome, biosphere, ecosystem, community, population
    (B) Biosphere, biome, ecosystem, community, population
    (C) Population, community, ecosystem, biosphere, biome
    (D) Population, community, biome, ecosystem, biosphere
    (E) Biosphere, ecosystem, biome, community, population

15. Movement first evolved in which phylum of kingdom Animalia?

    (A) Porifera
    (B) Mollusca
    (C) Cnidaria
    (D) Arthropoda
    (E) Annelida

16. During which phase of mitosis is DNA replicated?

    (A) Prophase
    (B) Metaphase
    (C) Telophase
    (D) Interphase
    (E) Anaphase

17. A culture of animal cells and a culture of plant cells are pulverized and analyzed for the presence of certain molecules. Which of the following is most likely?

    (A) The plant and animal cells will contain identical molecules in identical proportions.
    (B) The plant and animal cells will contain identical molecules in different proportions.
    (C) The animal cells will contain adenosine triphosphate, while the plant cells will not.
    (D) The plant cells will contain glucose, while the animal cells will not.
    (E) The plant cells will contain chlorophyll, while the animal cells will not.

18. Which of the following is true regarding the genotype of an individual organism?

    I. The genotype depends on the phenotype.
    II. The genotype is acquired during an individual's lifetime.
    III. The genotype can be homozygous or heterozygous.
    IV. The genotype determines the phenotype.

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

19. Stomach fluid has a pH of 2. The fluid in the stomach

    (A) is basic
    (B) has a low hydrogen ion concentration
    (C) has a high hydrogen ion concentration
    (D) has the same pH as water
    (E) is neutral

20. Lions and hyenas both live in Serengeti National Park. Why are they both able to live in the same community?

    (A) They are both predators.
    (B) They occupy different niches.
    (C) They are both in Hardy-Weinberg equilibrium.
    (D) They cannot. They will compete until one population eliminates the other.
    (E) They are in the same genus.

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21. Which of the following is the correct listing of kingdom Plantae from least to most evolutionarily advanced?

(A) Gymnosperms, angiosperms, seedless vascular plants, bryophytes
(B) Bryophytes, seedless vascular plants, gymnosperms, angiosperms
(C) Bryophytes, seedless vascular plants, angiosperms, gymnosperms
(D) Seedless vascular plants, bryophytes, gymnosperms, angiosperms
(E) Angiosperms, gymnosperms, seedless vascular plants, bryophytes

22. A scientist isolates a single strand of DNA that had bonded with an mRNA strand and analyzes the proportions of nitrogenous bases in the bonded string. Which of the following could be the proportions discovered by the scientist?

(A) 20% adenine, 30% cytosine, 30% guanine, 20% thymine
(B) 20% adenine, 30% cytosine, 30% guanine, 20% uracil
(C) 20% adenine, 20% cytosine, 20% guanine, 20% thymine, 20% uracil
(D) 20% adenine, 30% cytosine, 30% guanine, 10% thymine, 10% uracil
(E) 40% adenine, 20% cytosine, 10% guanine, 15% thymine, 15% uracil

23. Two diploid plants are crossed, and the resulting offspring are tetraploid. The type of nondisjunction event that occurred is called

(A) polyploidy
(B) monosomy
(C) trisomy
(D) matrimony
(E) parthenogenesis

24. All of the following characteristics differentiate between monocots and dicots EXCEPT for

(A) the number of petals on the flowers
(B) whether or not the plant has vascular tissue
(C) the venation pattern of the leaves
(D) the arrangement of the vascular bundles
(E) the number of cotyledons that the plant has during embryonic development

25. In glycolysis, the net gain of ATP per molecule of glucose is

(A) 2
(B) 4
(C) 6
(D) 18
(E) 36

26. Which of the following is NOT found in the nucleus?

(A) Messenger RNA
(B) Lysosomes
(C) Nucleolus
(D) Chromosomes
(E) DNA

27. The person who discovered the Law of Dominance, the Law of Segregation, and the Law of Independent Assortment was

(A) Liam Hooke
(B) Charles Darwin
(C) Gregor Mendel
(D) Alfred Russell Wallace
(E) Rosalind Franklin

28. What is the purpose of the myelin sheath?

(A) To receive information from other cells
(B) To insulate the axon and make the impulse go faster
(C) To stop the nerve impulse
(D) To reverse the direction of the nerve impulse
(E) To regulate temperature

29. A still pond contains many strings of jelly-coated eggs. These eggs could have been laid by a member of

(A) class Mammalia
(B) class Aves
(C) phylum Reptilia
(D) class Reptilia
(E) class Amphibia

30. A tree growing on the top of a mountain is exposed to very high winds from the north. The trunk of the tree is thicker on the side that faces the wind. This is an example of

(A) phototropism
(B) thigmotropism
(C) gravitropism
(D) aquatropism
(E) photoperiodism

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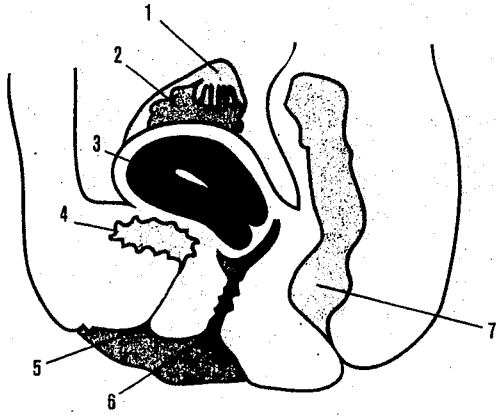
Questions 31–34 refer to the following drawing of the female anatomy.



31. Which two systems are best represented in this drawing?

(A) Reproductive and respiratory systems
(B) Skeletal and endocrine systems
(C) Nervous and excretory systems
(D) Reproductive and excretory systems
(E) Respiratory and digestive systems

32. In what structure are the egg cells produced?

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

33. Which of the following is a function of Structure 3?

(A) Produce progesterone
(B) Connect the uterus with the ovaries
(C) Store urine
(D) House the placenta and developing fetus
(E) Produce milk

34. In what structure is estrogen produced?

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

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Questions 35–38 refer to the following two-part experiment.

In Part 1, populations of two different species were grown separately under constant conditions, and each population was given the same amount of food each day. In Part 2, the two species were cultured together under constant conditions and given the same amount of food each day.

Figure 1 – Species A grown in isolation

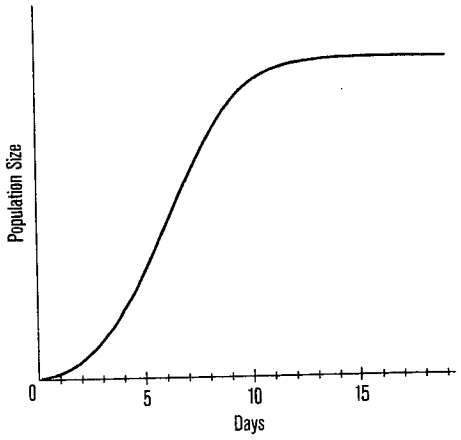


Figure 2 – Species B grown in isolation

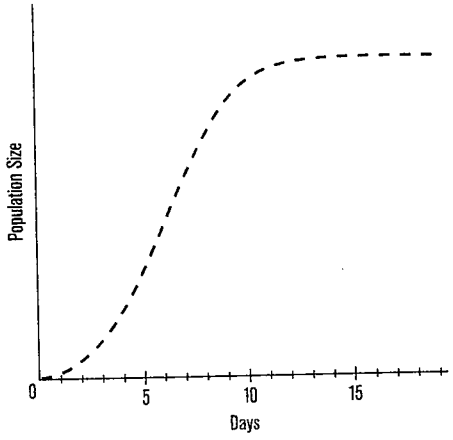
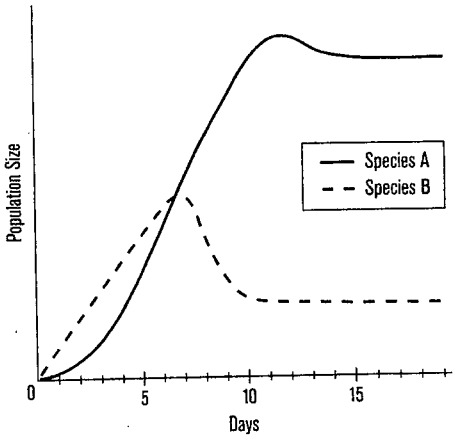


Figure 3 – Species A & B grown together



35. In Figure 1, the point on the curve at which the population growth levels off is called the

(A) carrying capacity
(B) niche
(C) high point
(D) displacement point
(E) birth rate

36. When grown separately, what is the factor that likely limits the growth of each population?

(A) Predation
(B) Parasitism
(C) Disease
(D) Competition among individuals of different species
(E) Competition among individuals of the same species

37. Which of the following statements is supported by the data in Figure 3?

(A) When grown together, Species A has the larger population size on Day 2.
(B) When grown together, Species B outcompetes Species A.
(C) When cultured separately, Species A and Species B both have similar growth patterns.
(D) When grown together, Species B has the larger population size on Day 12..
(E) When cultured separately, Species A and B both reach their maximum population size on Day 8.

38. Of the following, which might be hypothesized from the data recorded when Species A and Species B were cultured together?

(A) Species B is a stronger competitor than Species A.
(B) When resources were abundant, there was little need for competition between Species A and B.
(C) Species A will soon eliminate all individuals in Species B.
(D) Species A and B are mutualistic.
(E) If the population of Species A were to suddenly die off, while the rest of the environment in the culture remained the same, the population of Species B would also diminish.

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Questions 39–42 relate to the genetics of goats on a farm.

A farmer has three breeds of goat.

Breed X – White, large, low milk production

Breed Y – Gray, small, high milk production

Breed Z – Black, large, high milk production

The inheritance patterns for the traits are summarized in the table below.

Trait	Homozygous Dominant	Heterozygous	Homozygous Recessive
Coat color (B)	Black (BB)	Gray (Bb)	White (bb)
Size (L)	Large (LL)	Large (Ll)	Small (ll)
Milk production (M)	High (MM)	High (Mm)	Low (mm)

39. What is a possible genotype of Breed X?

(A) BB, LL, MM
(B) bb, LL, mm
(C) bb, ll, mm
(D) BB, ll, Mm
(E) Bb, Ll, MM

40. The alleles for coat color exhibit

(A) incomplete dominance
(B) codominance
(C) simple dominance
(D) crossing-over
(E) mutation

41. To determine whether Breed Y is homozygous or heterozygous for milk production, one could

(A) cross Breed Y with Breed Z and observe the number of offspring that have low milk production
(B) cross Breed Y with Breed Z and observe the number of offspring that have high milk production
(C) mutate the gene with radioactive isotopes
(D) cross Breed Y with Breed X and observe the number of offspring that have high milk production
(E) perform a Punnett square test

42. Assume that Breed X and Breed Z are both homozygous for all traits. If you were to cross Breed X with Breed Z, what would be the phenotype of their offspring?

(A) Gray, large, high milk production
(B) Gray, small, high milk production
(C) White, large, high milk production
(D) Black, large, low milk production
(E) Black, small, low milk production

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Questions 43–45 refer to evolution in a population of turtles.

A species of turtle was observed by scientists on a small, isolated island in the Caribbean. Scientists counted the number of turtles and measured the size of each turtle.

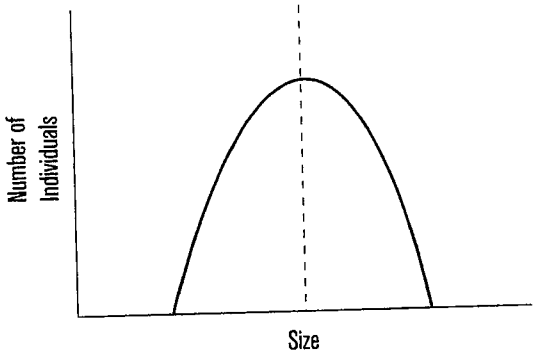


Fig. 1 Turtle Size in 1940

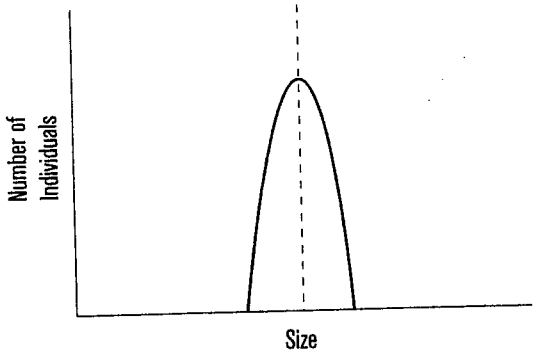


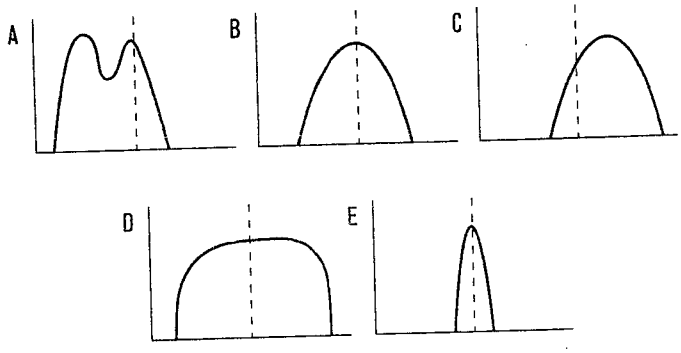
Fig. 2 Turtle Size in 1990

Fifty years later, a second team of scientists came to observe the turtles. They counted the number of turtles and again measured the size of each turtle.

43. What happened to the population over time?

(A) Evolution
(B) Stabilizing selection
(C) Disruptive selection
(D) Directional selection
(E) Hardy-Weinberg equilibrium

44. A large turtle can better withstand extreme high winds than a small turtle. What do you think would happen to turtle size on the island if the island became subject to regular and repeated high winds for a decade or more?



45. The population of turtles on the island grew from a few turtles that came to the island from a nearby continent. In a breeding experiment, scientists discovered that the turtles from the island can no longer breed with turtles from the continent. What has happened?

(A) Convergent evolution
(B) Hardy-Weinberg equilibrium
(C) Mutation
(D) Allopatric speciation
(E) Extinction

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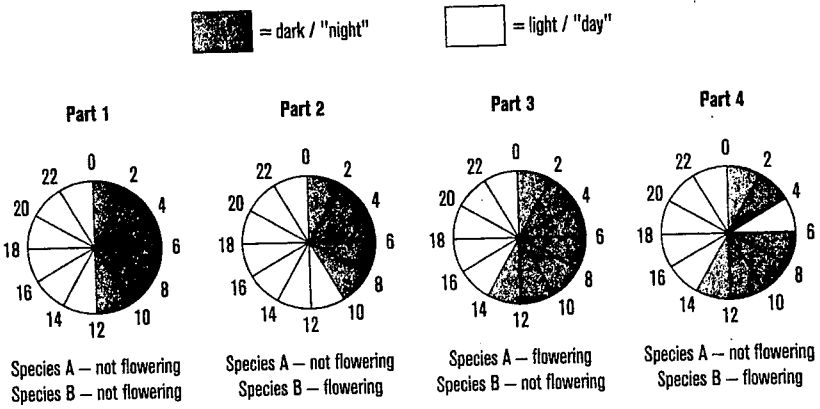
Questions 46–49 refer to the following experiment in which plant species A and B were exposed to dark and light environments for various lengths of time. The shaded areas represent "night" and the unshaded areas represent "day".

In this experiment, plants that flower only when exposed to 12 or more hours of daylight are called "long-day" plants. Plants that flower only when exposed to less than 12 hours of daylight are called "short-day" plants. Plants whose flowering patterns are not dependent on day length are called "day-neutral" plants.



46. The dependence of flowering on the duration of light and dark periods is called

(A) gravitropism
(B) thigmoperiodism
(C) phototropism
(D) photoperiodism
(E) thigmotropism

47. Which of the following statements is correct?

(A) Plant A is a long-day plant.
(B) Plant B is a short-day plant.
(C) Plant A is a day-neutral plant.
(D) Plant A is a short-day plant.
(E) Plant B is a day-neutral plant.

48. Which of the following statements is NOT supported by the data?

(A) Plant A flowers when exposed to 14 hours of darkness.
(B) Neither plant will flower when exposed to 12 hours of light and 12 hours of darkness.
(C) Plant A will not flower if there is an interruption of exposure to darkness, even if the total hours of darkness in a full day is greater than 12 hours.
(D) Plant B will not flower if there is an interruption of exposure to darkness that causes "night" to be less than 14 hours long.
(E) Plant B flowers when exposed to 14 hours of light.

49. The plants used in this experiment are all

(A) gymnosperms
(B) angiosperms
(C) bryophytes
(D) tricots
(E) non-vascular

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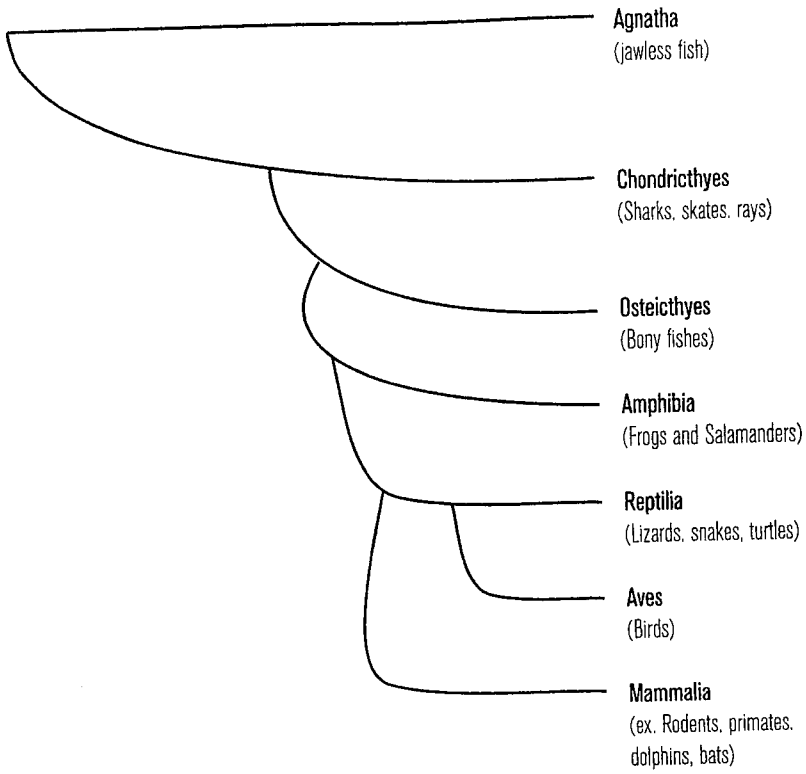
Questions 50–52 refer to evolutionary relationships between members of Subphylum Vertebrata.



50. The above diagram is called a

(A) Punnett diagram
(B) phylogram
(C) karyotype
(D) diversity chain
(E) phylogenetic tree

51. Sharks and dolphins both have a dorsal fin. In this instance, the dorsal fin is an example of a(n)

(A) vestigial structure
(B) analogous structure
(C) homologous trait
(D) molecular clock
(E) defense structure

52. Of the following choices, which pair is most closely related?

(A) Agnatha and Mammalia
(B) Reptilia and Osteicthyes
(C) Agnatha and Osteicthyes
(D) Amphibia and Chondricthyes
(E) Reptilia and Aves

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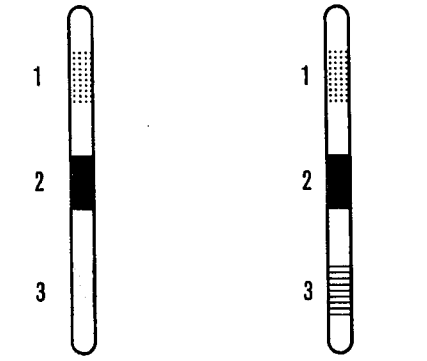
Questions 53–56 refer to the chromosomes depicted below.



Chromosome 1 from the male gamete

Chromosome 1 from the female gamete

	Dominant	Recessive
1. Flower Color	Red	White
2. Height	Tall	Short
3. Seed Type	Wrinkled	Smooth

53. How many traits are coded for in the above chromosomes?

(A) 1
(B) 2
(C) 3
(D) 6
(E) 7

54. The two gametes that contain these chromosomes unite during fertilization and become part of the same zygote. What would be the individual's phenotype?

(A) Red flower, tall, smooth seeds
(B) Red flower, short, smooth seeds
(C) White flower, short, wrinkled seeds
(D) Red flower, tall, wrinkled seeds
(E) White flower, tall, wrinkled seeds

55. If the offspring resulting from the union of these original gametes were to be self-crossed, what is the likelihood of each trait appearing in this second generation?

(A) 100% white, 100% tall, 75% wrinkled, 25% smooth
(B) 100% white, 100% tall, 50% wrinkled, 50% smooth
(C) 100% white, 100% tall, 25% wrinkled, 75% smooth
(D) 50% red, 50% white, 50% tall, 50% short, 75% wrinkled, 25% smooth
(E) 50% red, 50% white, 50% tall, 50% short, 75% wrinkled, 25% smooth

56. What is the process by which these gametes were formed?

(A) Mitosis
(B) Synapsis
(C) Meiosis
(D) Fertilization
(E) Genesis

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Questions 57–60 refer to the following description of kangaroo rats.

Kangaroo rats are adapted to life in hot, dry climates and have very efficient kidneys to conserve water. The following table compares kangaroo rats to humans with respect to their gain and loss of water. (Data from Schmidt-Nielsen, K. 1990. *Animal Physiology: Adaptation and Environment,* 4th ed. Cambridge University Press, Cambridge.)

Water Gain	Kangaroo Rat	Human
Ingested by eating and drinking	10%	90%
Derived from metabolism	90%	10%

Water Loss	Kangaroo Rat	Human
Urine	23%	60%
Feces	4%	4%
Evaporation	73%	36%

57. Most of the water lost by humans is a result of

(A) drinking
(B) evaporation
(C) excretion of solid wastes
(D) urination
(E) metabolism

58. What might be the explanation for the low percentage of water that the kangaroo rat loses through urine?

(A) Because the kangaroo rat does not often drink or eat, it does not produce much urine.
(B) Urine might allow a predator to track and kill a kangaroo rat.
(C) Most of the water that is lost through urine is reabsorbed by the kangaroo rat's kidneys.
(D) Water lost by evaporation is less vital to the survival of the organism.
(E) Urine in the bladder might freeze during extremely cold temperatures and kill the organism.

59. The kangaroo rat is a mammal. What might be some of the adaptations that help it to conserve water?

I. Nocturnal lifestyle
II. Exceptionally long loops of Henle in the kidney
III. A waxy exoskeleton
IV. An amniotic egg

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

60. In what biome would you expect the kangaroo rat to live?

(A) Tropical rainforest
(B) Temperate deciduous forest
(C) Marine
(D) Desert
(E) Arctic tundra

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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 population is in Hardy-Weinberg equilibrium. The frequency of the dominant allele in the population is $p = 0.6$. What is the frequency of the recessive allele?

(A) 36%
(B) 0.4
(C) 16%
(D) 0.6
(E) 48%

62. A deer has a tapeworm residing in its digestive system. The tapeworm feeds on the food that the deer ingests. This is an example of

(A) coevolution
(B) commensalism
(C) mutualism
(D) parasitism
(E) positive symbiosis

63. A baby bird hatches from an egg and first sees a human girl. The bird then treats the girl as its mother. This is an example of

(A) conditioning
(B) habituation
(C) imprinting
(D) associative learning
(E) unlearning

64. The smallest unit in which evolution can occur is a(n)

(A) population
(B) gene
(C) cell
(D) community
(E) individual

65. The components of the blood that control clotting are

(A) white blood cells
(B) hemoglobin molecules
(C) platelets
(D) plasma
(E) red blood cells

66. Carbon dioxide is released into the atmosphere by all of the following processes EXCEPT

(A) animal respiration
(B) combustion of fossil fuels
(C) decomposition of dead material by microbes
(D) photosynthesis
(E) burning of forests

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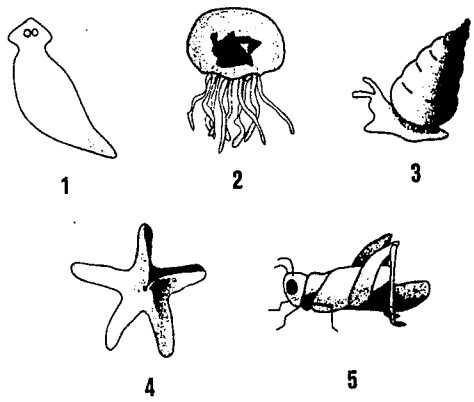
Questions 67–70 refer to the following drawings of members of kingdom Animalia.



67. Which of the pictured organisms exhibit radial symmetry?

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

68. Organism 1 is a member of phylum

(A) Nematoda
(B) Cnidaria
(C) Arthropoda
(D) Mollusca
(E) Platyhelminthes

69. Which of the above organisms has a foot, radula, and mantle?

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

70. Which of the above organisms is most closely related to phylum Chordata?

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

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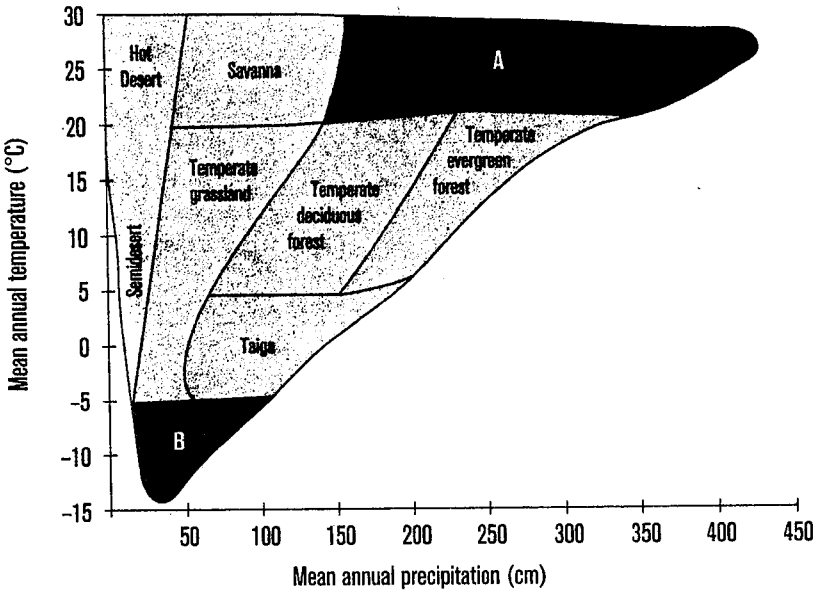
Questions 71–73 refer to the effects of temperature and precipitation on the placement and productivity of biomes.



71. A region in South America has a mean annual precipitation of 50 cm and a mean annual temperature of 10°C. The area is likely a

(A) desert
(B) taiga
(C) temperate deciduous forest
(D) tundra
(E) temperate grassland

72. In which biome would you find prairie dogs, bison, and antelope?

(A) Desert
(B) Taiga
(C) Temperate deciduous forest
(D) Tundra
(E) Temperate grassland

73. Two of the biomes in Figure 1 are labeled A and B, respectively. What are these biomes?

(A) A is tropical rainforest; B is desert.
(B) A is savanna; B is tropical rainforest.
(C) A is tundra; B is tropical rainforest.
(D) A is tropical rainforest; B is tundra.
(E) A is desert; B is tundra.

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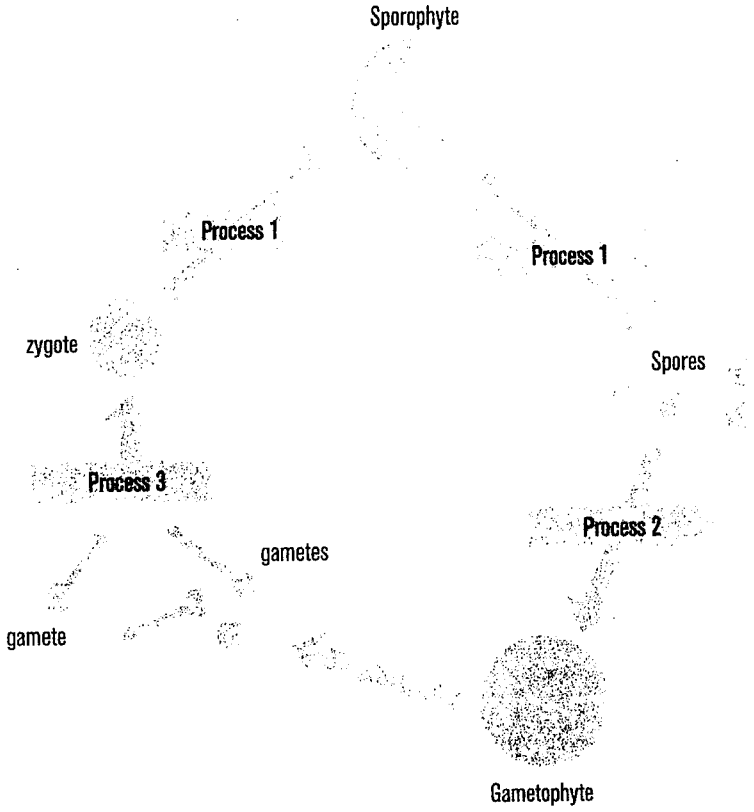
Questions 74–76 refer to the life cycle of a plant.



74. What is the name of the process labeled 3?

(A) Meiosis
(B) Mitosis
(C) Fertilization
(D) Asexual reproduction
(E) Duplication

75. Which of the following elements of the plant life cycle is incorrectly matched with a description of its chromosomes?

(A) Spores – diploid
(B) Gametophyte – haploid
(C) Zygote – diploid
(D) Gametes – haploid
(E) Sporophyte – diploid

76. The type of life cycle depicted is common in plants and is called

(A) alternation of generations
(B) parthenogenesis
(C) budding
(D) pedogenesis
(E) dominance of the diploid

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Questions 77–80 refer to a food web involving grasses, rabbits, foxes, and mountain lions.

Organism	Diet	Total Biomass
Grasses	—	150,000 kg
Rabbits	Grasses	48,000 kg
Foxes	Rabbits	5,000 kg
Mountain Lions	Rabbits/Foxes	600 kg

77. In this food web, the grasses are

(A) primary consumers
(B) primary producers
(C) secondary consumers
(D) top carnivore
(E) secondary producer

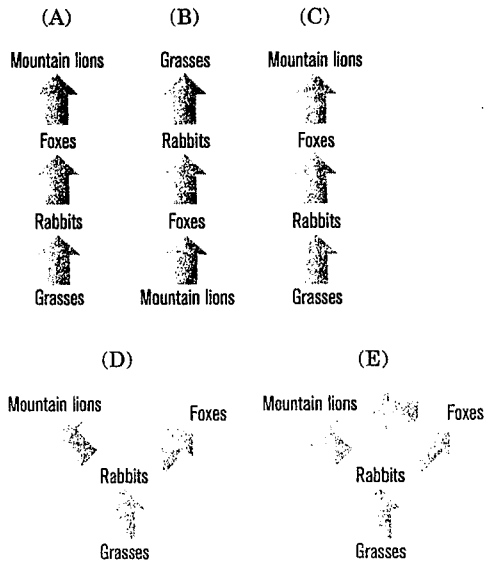
78. What is the original source of the energy in this food web?

(A) Soil
(B) Carbon and nitrogen
(C) Sun
(D) Water
(E) Atmosphere

79. Which of the following organisms are carnivores?

(A) Foxes and rabbits only
(B) Foxes only
(C) Mountain lions only
(D) Foxes, rabbits, and mountain lions only
(E) Foxes and mountain lions only

80. Which diagram best represents the food web described in the table?



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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. Which of the following statements is NOT correct?

Cell Organelles	Cell A	Cell B
Vacuole	Yes	No
Cell wall	Yes	Yes
Nucleus	Yes	No
Flagella	No	Yes
Golgi complex	Yes	No
Chloroplasts	Yes	No

(A) Cell A is a eukaryote.
(B) Cell B is a prokaryote.
(C) Cell A is a plant.
(D) Cell B is evolutionarily less advanced than Cell A.
(E) Cell B would have mitochondria, and Cell A would not.

82. An enzyme-aided reaction occurs in a solution. If the solution is already saturated with substrates, what could be done to speed the reaction's progress?

(A) Reduce the temperature of the solution to 0°C.
(B) Add more substrate to the solution.
(C) Increase the temperature of the solution to 120°C.
(D) Add an allosteric inhibitor to the solution.
(E) Add more enzymes to the solution.

83. Which of the following occurs in both aerobic and anaerobic respiration?

(A) Fermentation
(B) The Krebs cycle
(C) Glycolysis
(D) The Electron transport chain
(E) Transcription

84. A volcanic eruption separates one population of birds into two isolated populations. Many generations pass. Two individuals, one from each of the two isolated populations, are brought together in the hope that they will mate with one another. What would NOT be considered evidence that the two populations had evolved into different species?

(A) The individuals mate, and the offspring are deformed and die soon after birth.
(B) The individuals mate, and the offspring are sterile.
(C) The female does not recognize the male's courtship song and will not mate with him.
(D) The individuals produce fertile offspring, and the offspring do not resemble either parent.
(E) The individuals try to mate but are not physically compatible.

85. A tall plant is bred with another tall plant, and all 50 of the resulting offspring are tall. A short plant is then bred with another short plant, and all 50 of the offspring are short. The tall offspring are bred together, and all of the offspring are again tall. The short offspring are also crossbred, and all of the offspring are short. If one of the tall plants is then bred with one of the short plants, and the resulting offspring are all short, this demonstrates

(A) that the tall plants were heterozygous for tallness
(B) that the short plants were heterozygous for shortness
(C) the Law of Segregation
(D) that the allele for tallness is recessive in this plant
(E) codominance

86. The procedure of injecting healthy DNA into a person with a genetic problem is called

(A) recombination
(B) DNA fingerprinting
(C) gene therapy
(D) vaccination
(E) electrophoresis

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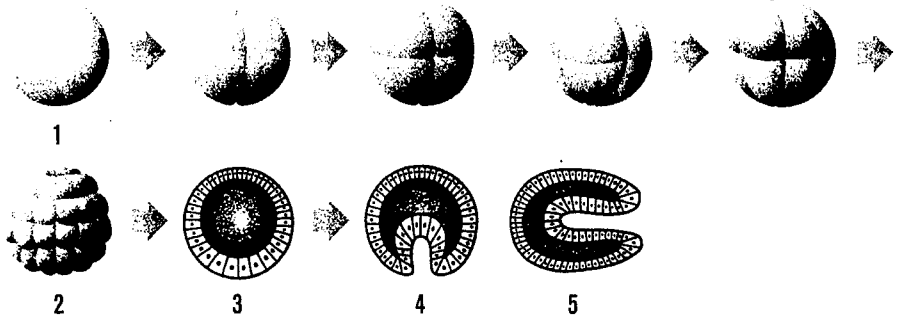
Questions 87–90 refer to the early development of a human fetus.



87. Structure 1 is

(A) haploid
(B) diploid
(C) a gamete
(D) a blastula
(E) an unfertilized egg

88. Which structure is the morula?

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

89. Cells in a developing zygote increase in number through

(A) respiration
(B) meiosis
(C) mitosis
(D) gametogenesis
(E) translation

90. Which embryonic tissue layers does Structure 5 possess?

(A) Endoderm only
(B) Endoderm and mesoderm only
(C) Endoderm and ectoderm only
(D) Mesoderm and ectoderm only
(E) Endoderm, mesoderm, and ectoderm

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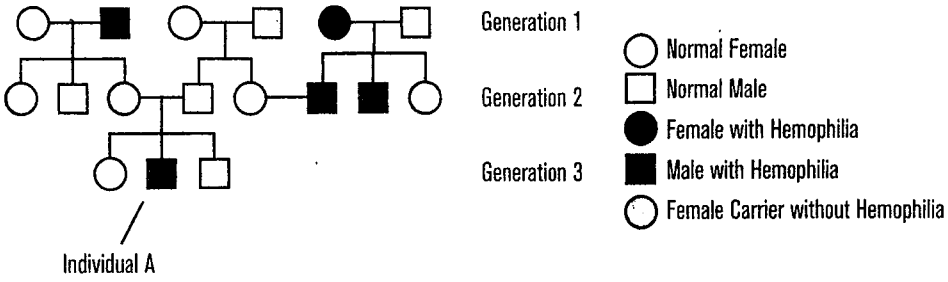
Questions 91–94 refer to the genetic disease called hemophilia, which affects the blood's ability to clot.



91. The inheritance pattern for this disease is

(A) simple dominant
(B) sex-linked dominant
(C) sex-linked recessive
(D) simple recessive
(E) none of the above

92. On which chromosome is this disease carried?

(A) The Y-chromosome
(B) The X-chromosome
(C) An autosome
(D) Chromosome 21
(E) Indeterminable

93. Which of the following statements is NOT true?

(A) If the father has hemophilia, all of his children have the disease or are carriers of the disease.
(B) If the mother has hemophilia, all of her children have the disease or are carriers.
(C) Males cannot carry an allele of the disease and still be phenotypically normal.
(D) Females who carry one allele for the disease are phenotypically normal.
(E) If both parents are phenotypically and genotypically normal, none of their children have hemophilia.

94. If Individual A has a daughter with a woman who does not have or carry hemophilia, what is the probability that their daughter will be a carrier of hemophilia?

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

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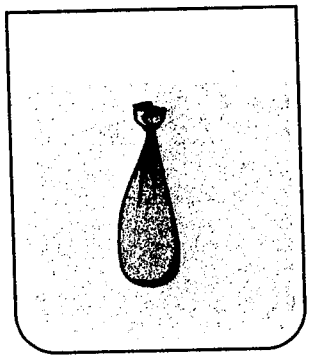
Questions 95–97 refer to a dialysis experiment, as discussed below.

Dialysis tubing is a semi-permeable membrane across which water and monosaccharides such as glucose and fructose can cross but across which disaccharides such as sucrose cannot cross.

Experiment 1: A section of dialysis tubing is filled with water and tied at the end to make a bag. The bag is submersed into a beaker containing a solution of 0.4 M fructose.

Experiment 2: A section of dialysis tubing is filled with a 0.5 M solution of sucrose and tied at the end to make a bag. The bag is submersed in beaker of water.



95. In Experiment 1, which molecules will cross the membrane?

(A) Glucose will diffuse into the bag.
(B) Fructose will diffuse into the bag.
(C) Sucrose will diffuse into the bag.
(D) Complex sugars will diffuse into the bag.
(E) Disaccharides will diffuse out of the bag.

96. The movement of fructose across the dialysis tubing membrane

(A) requires energy
(B) is an example of active transport
(C) is an example of facilitated diffusion
(D) requires exocytosis
(E) is an example of passive diffusion

97. Which of the following is true regarding Experiment 2?

(A) The bag is hypertonic relative to the water in the beaker.
(B) The bag is isotonic relative to the water in the beaker.
(C) The bag will lose fluid.
(D) Sucrose will diffuse out of the bag.
(E) The water in the beaker is hypertonic relative to the bag.

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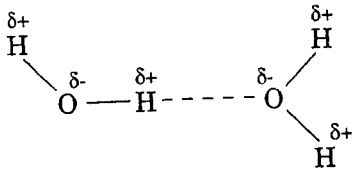
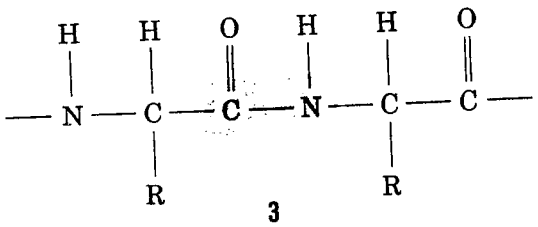
Questions 98–100 refer to different types of bonds between molecules.



1

$$H^{\bullet} + Y^{\bullet} = X^{+}\ :Y^{-}$$

2



3

$$H^{\bullet} + Y^{\bullet} = X{:}Y$$

4

98. Bond 1 is called a(n)

(A) dehydration bond
(B) phosphodiester bond
(C) covalent bond
(D) ionic bond
(E) hydrogen bond

99. Bond 3 is commonly found in

(A) proteins
(B) carbohydrates
(C) nucleotides
(D) water
(E) fats

100. Which of the bonds are ionic?

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

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.