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The Princeton Review AP Biology Practice Test 2

BIOLOGY

Three hours are allotted for this examination: 1 hour and 20 minutes for Section I, which consists of multiple-choice questions, and 1 hour and 40 minutes for Section II, which consists of essay questions.

SECTION I

Time—1 hour and 20 minutes
Number of questions—100
Percent of total grade—60

Section I of this examination contains 100 multiple-choice questions, followed by 15 multiple-choice questions regarding your preparation for this exam. Please be careful to fill in only the ovals that are preceded by numbers 1 through 115 on your answer sheet.

General Instructions

INDICATE ALL YOUR ANSWERS TO QUESTIONS IN SECTION I ON THE SEPARATE ANSWER SHEET ENCLOSED. No credit will be given for anything written in this examination booklet, but you may use the booklet for notes or scratchwork. After you have decided which of the suggested answers is best, COMPLETELY fill in the corresponding oval on the answer sheet. Give only one answer to each question. If you change an answer, be sure that the previous mark is erased completely.

Example:

Chicago is a

(A) state
(B) city
(C) country
(D) continent
(E) village

Sample Answer

Use your time effectively, working as rapidly as you can without losing accuracy. Do not spend too much time on questions that are difficult. Go on to other questions and come back to the difficult ones later if you have time. It is not expected that everyone will be able to answer all the multiple-choice questions.

BIOLOGY

SECTION I

Time—1 hour and 20 minutes

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then fill in the corresponding oval on the answer sheet.

1. In general, animal cells differ from plant cells in that animal cells have
   (A) an endoplasmic reticulum and membrane-bound organelles
   (B) a cell wall made of cellulose
   (C) lysosomes
   (D) large vacuoles that store water
   (E) centrioles within centrosomes

2. In order for plants to conquer land, they had to evolve all of the following adaptations EXCEPT
   (A) flagellated sperm cells that swim to fertilize an egg
   (B) a waxy cuticle layer on their outer surfaces
   (C) specialized structures that permit gas exchange
   (D) specialized organs that anchor the plant on land
   (E) vascular tissues that allow for the transport of needed nutrients and water

3. In a diploid organism with the genotype AaBbCCDDEE, how many genetically distinct kinds of gametes would be produced?
   (A) 4
   (B) 8
   (C) 16
   (D) 32
   (E) 64

4. A cell from the leaf of the aquatic plant *Elodea* was soaked in a 15 percent sugar solution, and its contents soon separated from the cell wall and formed a mass in the center of the cell. All of the following statements are true about this event EXCEPT
   (A) The vacuole lost water and became smaller.
   (B) The space between the cell wall and the cell membrane expanded.
   (C) The large vacuole contained a solution with much lower osmotic pressure than that of the sugar solution.
   (D) The concentration of solutes in the extracellular environment is hypertonic with respect to the cell's interior.
   (E) The sugar solution passed freely through the cell wall but not the cell membrane.

5. Under favorable conditions, bacteria divide every 20 minutes. If a single bacterium replicated according to this condition, how many bacterial cells would one expect to find at the end of three hours?
   (A) 32
   (B) 64
   (C) 128
   (D) 256
   (E) 512

6. A chemical agent is found to denature all enzymes in the synaptic cleft. What effect will this agent have on acetylcholine?
   (A) Acetylcholine will not be released from the presynaptic membrane
   (B) Acetylcholine will not bind to receptor proteins on the postsynaptic membrane.
   (C) Acetylcholine will not diffuse across the cleft to the postsynaptic membrane.
   (D) Acetylcholine will be inactivated by the chemical agent.
   (E) Acetylcholine will not be degraded in the synaptic cleft.

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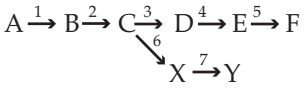
7. The base composition of DNA varies from one species to another. Which of the following ratios would you expect to remain constant in the DNA?
   (A) Cytosine : Adenine
   (B) Pyrimidine : Purine
   (C) Adenine : Guanine
   (D) Guanine : Deoxyribose
   (E) Thymine : Guanine

8. The use of radioactive iodine as a tracer element in the study of human metabolic rate has shown that iodine
   (A) alters gene expression
   (B) regulates calcium metabolism
   (C) binds to a specific receptor on the cell membrane of a thyroid gland cell
   (D) is a hormone that lowers glucose levels in the blood
   (E) is a lipid-soluble hormone that diffuses across a membrane

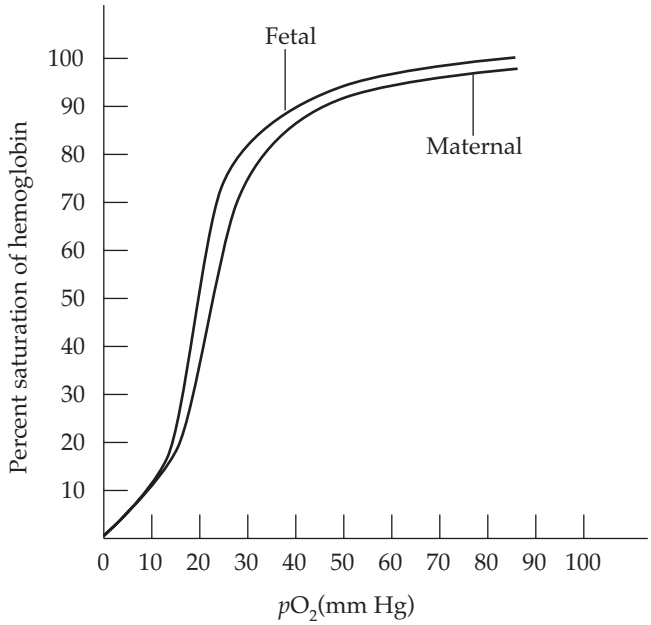
9. In reptile eggs, the extraembryonic membrane that functions in excretion and respiration is the
   (A) amnion
   (B) chorion
   (C) allantois
   (D) yolk sac
   (E) placenta

10. Consider the following enzyme pathway:



An increase in substance F leads to the inhibition of enzyme 3. All of the following are results of the process EXCEPT
   (A) an increase in substance X
   (B) increased activity of enzyme 6
   (C) decreased activity of enzyme 4
   (D) increased activity of enzyme 5
   (E) a decrease in substance D

11. The liver is a vital organ that performs all of the following functions EXCEPT
   (A) storing amino acids that were absorbed in the capillaries of the small intestine
   (B) detoxifying harmful substances such as alcohol or certain drugs
   (C) synthesizing bile salts that emulsify lipids
   (D) breaking down peptides into amino acids
   (E) storing fatty acids that were absorbed by the lacteals of the lymphatic vessels



12. The graph above shows the oxygen dissociation curves of maternal hemoglobin and fetal hemoglobin. Based on the graph, it can be concluded that
   (A) fetal hemoglobin surrenders O_2 more readily than maternal hemoglobin
   (B) the dissociation curve of fetal hemoglobin is to the right of maternal hemoglobin
   (C) fetal hemoglobin has a higher affinity for O_2 than does maternal hemoglobin
   (D) fetal and maternal hemoglobin differ in structure
   (E) fetal hemoglobin is converted to maternal hemoglobin

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13. In minks, the gene for brown fur (B) is dominant over the gene for silver fur (b). Which set of genotypes represents a cross that could produce offspring with silver fur from parents that both have brown fur?

(A) BB × BB
(B) BB × Bb
(C) Bb × Bb
(D) Bb × bb
(E) bb × bb

14. Hemoglobin is a molecule that binds to both O_2 and CO_2. There is an allosteric relationship between the concentrations of O_2 and CO_2. Hemoglobin's affinity for O_2

(A) decreases as blood pH decreases
(B) increases as H^+ concentration increases
(C) increases in exercising muscle tissue
(D) decreases as CO_2 concentration decreases
(E) increases as HCO_3^- increases

15. Nitrogen from the atmosphere must be incorporated into living organisms to make proteins. Which of the following plants is a vehicle for organisms that add nitrates into the soil?

(A) Rice
(B) Lima bean
(C) Rose
(D) Venus flytrap
(E) Corn

16. In snapdragon plants that display intermediate dominance, the allele C^R produces red flowers and C^W produces white flowers. If a homozygous red-flowered snapdragon is crossed with a homozygous white-flowered snapdragon, the percent ratio of the offspring will be

(A) 100% red
(B) 100% pink
(C) 50% red and 50% white
(D) 50% red and 50% pink
(E) 25% red, 50% pink, and 25% white

17. All viruses contain at least these two principal components:

(A) DNA and proteins
(B) nucleic acid and a capsid
(C) DNA and cell membrane
(D) RNA and cell wall
(E) nucleic acid and cell membrane

18. One characteristic that flagellates, ciliates, sporozoans, and green algae have in common is that they

(A) undergo alteration of generation
(B) form spores
(C) use flagella for motility
(D) are autotrophic
(E) are microscopic, single-celled, eukaryotes

19. The scientific name for the fruit fly is *Drosophila melanogaster*. The word *Drosophila* refers to the classification group known as

(A) species
(B) genus
(C) class
(D) family
(E) phylum

20. In humans, fertilization normally occurs in the

(A) ovary
(B) fallopian tube
(C) uterus
(D) placenta
(E) vagina

21. The development of an egg without fertilization is known as

(A) meiosis
(B) parthenogenesis
(C) embryogenesis
(D) vegetative propagation
(E) regeneration

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22. All of the following are examples of hydrolysis EXCEPT

(A) conversion of fats to fatty acids and glycerol
(B) conversion of proteins to amino acids
(C) conversion of starch to simple sugars
(D) conversion of pyruvic acid to acetyl CoA
(E) conversion of proteins to dipeptides

23. In cells, which of the following can catalyze reactions involving hydrogen peroxide, provide cellular energy, and make proteins, in that order?

(A) Peroxisomes, mitochondria, and ribosomes
(B) Peroxisomes, mitochondria, and lysosomes
(C) Peroxisomes, mitochondria, and Golgi apparatus
(D) Lysosomes, chloroplasts, and ribosomes
(E) Smooth endoplasmic reticulum, mitochondria, and ribosomes

24. All of the following play an important role in regulating respiration in humans EXCEPT

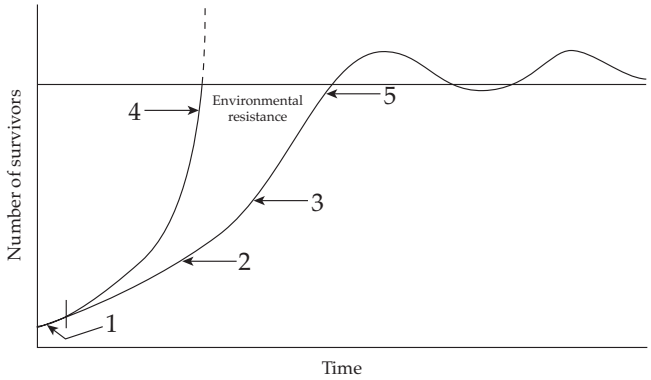
(A) an increase in the amount of CO_2 in the blood
(B) a decrease in the amount of O_2 in the blood
(C) a decrease in the plasma pH level
(D) strenuous exercise
(E) an increase in H^+ levels

25. The primary site of glucose reabsorption is the

(A) glomerulus
(B) proximal convoluted tubule
(C) loop of Henle
(D) collecting duct
(E) distal convoluted tubule

Questions 26 and 27 refer to the graph.

The graph below shows the growth curve of a bacterial culture.



26. Which of the following represents the carrying capacity of the environment?

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

27. Which of the following shows the exponential growth curve of the population?

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

28. All of the following statements are true EXCEPT:

(A) Thyroxine increases the rate of metabolism.
(B) Insulin decreases storage of glycogen.
(C) Vasopressin stimulates water reabsorption in the kidney.
(D) Epinephrine increases blood sugar levels and heart rate.
(E) Growth hormone stimulates muscle growth.

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29. Metafemale syndrome, a disorder in which a female has an extra X chromosome, is the result of nondisjunction. The failure in oogenesis that could produce this would occur in

(A) Prophase I
(B) Metaphase I
(C) Metaphase II
(D) Telophase I
(E) Anaphase II

30. In plants, the tendency of climbing vines to twine their tendrils around a trellis is called

(A) thigmotropism
(B) hydrotropism
(C) phototropism
(D) geotropism
(E) chemotropism

31. Females with Turner's syndrome have a high incidence of hemophilia, a recessive, X-linked trait. Based on this information, it can be inferred that females with this condition

(A) have an extra X chromosome
(B) have an extra Y chromosome
(C) lack an X chromosome
(D) have red blood cells that clump
(E) have an abundance of platelets

32. When a retrovirus inserted its DNA into the middle of a bacterial gene, it altered the normal reading frame by one base pair. This type of mutation is called

(A) duplication
(B) translocation
(C) inversion
(D) frameshift mutation
(E) lethal mutation

33. High levels of estrogen from maturing follicles inhibit the release of gonadotropin releasing hormone (GnRH). Which of the following endocrine glands produces GnRH?

(A) Anterior pituitary
(B) Posterior pituitary
(C) Hypothalamus
(D) Pineal gland
(E) Ovary

34. At times, freshwater communities undergo changes in which the availability of nutrients increases to the extent that an overabundance of green algae suffocates the community. This trend toward excess nutrients in freshwater bodies is called

(A) succession
(B) eutrophication
(C) evolution
(D) greenhouse effect
(E) lake turnover

35. The principle inorganic compound found in living things is

(A) carbon
(B) oxygen
(C) water
(D) glucose
(E) carbon dioxide

36. Kangaroo rats are better able to concentrate urine than humans are. It would be expected that, compared to the nephrons of human kidneys, the nephrons of kangaroo-rat kidneys would have

(A) thicker walls, which are impermeable to water
(B) shorter loops of Henle
(C) longer loops of Henle
(D) shorter collecting ducts
(E) longer proximal convoluted tubules

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37. All of the following are modes of asexual reproduction EXCEPT

(A) sporulation
(B) fission
(C) budding
(D) cloning
(E) meiosis

38. The moist skin of earthworms, the lenticels of plants, and the spiracles of grasshoppers are all associated with the process of

(A) excretion
(B) respiration
(C) circulation
(D) digestion
(E) reproduction

39. Locomotion in annelids is accomplished through the interaction of muscles and

(A) an exoskeleton
(B) paired setae
(C) tracheids
(D) jointed appendages
(E) pseudopods

40. All of the following are examples of connective tissue EXCEPT

(A) ligaments
(B) muscle
(C) blood
(D) cartilage
(E) bone

41. In most plants, germination is triggered by the presence of

(A) water, oxygen, and soil
(B) light, water, and soil
(C) carbon dioxide, water, and soil
(D) oxygen, water, and temperature
(E) carbon dioxide and light

42. Which of the following statements best describes a pyramid of energy?

(A) A net gain occurs as energy is transferred from one organism to another.
(B) The total energy in plants is less than that in herbivores.
(C) The first trophic level is at the top of a pyramid.
(D) The total mass of carnivores is more than the total mass of plants.
(E) Each smaller trophic level possesses less available energy than the previous level.

43. If a forest of fir, birch, and white spruce trees was devastated by fire, which of the following would most likely happen?

(A) Only animal life would continue to inhabit the region.
(B) Secondary succession would begin to occur.
(C) Only tough grasses would appear.
(D) The number of species would stabilize as the ecosystem matures.
(E) This forest would no longer support living things.

44. Which of the following processes occur in the cytoplasm of an eukaryotic cell?

I. DNA replication
II. Transcription
III. Translation

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

45. Crossing-over during meiosis permits scientists to determine

(A) the chance for variation in zygotes
(B) the rate of mutations
(C) the distance between genes on a chromosome
(D) which traits are dominant or recessive
(E) which traits are masked

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46. Which of the following statements describes an activity that is part of the nitrogen cycle?

(A) Legume plants release water into the atmosphere through the process of transpiration.
(B) Green plants assimilate nitrogen in the form of ammonia.
(C) Soil bacteria convert ammonia into minerals usable by autotrophs.
(D) Bacteria return nitrogen that is locked up in urea to the nitrogen cycle.
(E) Legume plants only assimilate nitrogen through the activity of small microorganisms.

47. The results of the process of cloning are most similar to the results of the process of

(A) gametogenesis
(B) fertilization
(C) pollination
(D) meiosis
(E) mitosis

48. Three distinct bird species, flicker, woodpecker, and elf owl, all inhabit a large cactus, *Cereus giganteus*, in the desert of Arizona. Since competition among these birds rarely occurs, the most likely explanation for this phenomenon is that these birds

(A) have a short supply of resources
(B) have different ecological niches
(C) do not live together long
(D) are unable to breed
(E) do not share the same habitat

49. Lampreys attach to the skin of lake trout and absorb nutrients from its body. This relationship is an example of

(A) commensalism
(B) parasitism
(C) mutualism
(D) gravitropism
(E) thigmotropism

50. The nucleotide sequence of a DNA molecule is 5'-C-A-T-3'. A mRNA molecule with a complementary codon is transcribed from the DNA in the process of protein synthesis a tRNA pairs with a mRNA codon. What is the nucleotide sequence of the tRNA anticodon?

(A) 5'-G-T-A-3'
(B) 5'-G-U-A-3'
(C) 5'-C-A-U-3'
(D) 5-'U-A-C-3'
(E) 5'-G-U-G-3'

51. Viruses are considered an exception to the cell theory because they

(A) are not independent organisms
(B) have only a few genes
(C) move about via their tails
(D) have evolved from ancestral protists
(E) are multinucleated

52. All of the following organs in the digestive system secrete digestive enzymes EXCEPT the

(A) mouth
(B) stomach
(C) gall bladder
(D) small intestine
(E) pancreas

53. Memory loss would most likely be due to a malfunction of which part of the brain?

(A) Medulla
(B) Cerebellum
(C) Cerebrum
(D) Pons
(E) Hypothalamus

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54. In nonplacental mammals, the embryo obtains its food from the

(A) ovary
(B) uterus
(C) oviduct
(D) yolk sac
(E) allantois

55. The sequence of amino acids in hemoglobin molecules of humans is more similar to the hemoglobin of chimpanzees than it is to the hemoglobin of dogs. This similarity suggests that

(A) humans and dogs are more closely related than humans and chimpanzees
(B) humans and chimpanzees are more closely related than humans and dogs
(C) humans are related to chimpanzees but not to dogs
(D) humans and chimpanzees are closely analogous
(E) the hemoglobin molecule of all three organisms did not have intervening sequences

56. According to the heterotroph hypothesis, which event had to occur before oxygen filled the atmosphere?

(A) Heterotrophs had to remove carbon dioxide from the air.
(B) Autotrophs, which make their own food, had to evolve.
(C) Heterotrophs had to evolve.
(D) Autotrophs had to convert atmospheric nitrogen to nitrate.
(E) Heterotrophs had to carry out their metabolic activity in the presence of oxygen.

57. Which structure in an earthworm has a function similar to that of the alveoli of a human?

(A) Malphigian tubules
(B) Nephridia
(C) Chitinous exoskeleton
(D) Gills
(E) Skin

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Directions: Each group of questions consists of five lettered headings followed by a list of numbered phrases or sentences. For each numbered phrase or sentence, select the one heading that is most closely related to it and fill in the corresponding oval on the answer sheet. Each heading may be used once, more than once, or not at all in each group.

Questions 58–61 refer to human hormones

(A) Cortisol
(B) Oxytocin
(C) Progesterone
(D) Hypothalamus
(E) Parathyroid hormone

58. Regulates bone growth

59. Elevates blood sugar

60. Maintains uterine endometrium

61. Secretes hormones that travel to the anterior pituitary

Questions 62–65 refer to types of learning

(A) Insight learning
(B) Operant conditioning
(C) Imprinting
(D) Classical conditioning
(E) Circadian rhythm

62. Bees that regularly feed on blue flowers settle on blue paper even though it lacks food

63. Hatched goslings become attached to the first moving object they see

64. A child learns not to touch a hot stove

65. Opening and closing of stomates, independent of light and darkness

Questions 66–68 refer to embryonic tissues

(A) Mesoderm
(B) Ectoderm
(C) Endoderm
(D) Coelom
(E) Amnion

66. Germ layer that gives rise to the skin

67. Germ layer that gives rise to the epithelial lining of the gastrointestinal tract and its outgrowths

68. Germ layer that gives rise to cartilage, bone, and other connective tissues

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Questions 69–71 refer to different biomes

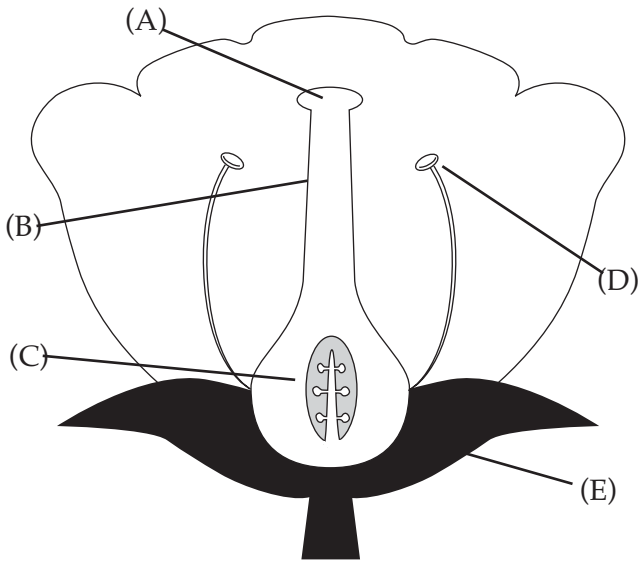
(A) Taiga
(B) Tundra
(C) Temperate forest
(D) Grassland
(E) Tropical rain forest

69. Contains soil that has the highest rate of leaching of nutrients

70. Characterized by low temperatures and a short growing season

71. Animal life includes black bears, moose, and wolves

Questions 72–75 refer to flower anatomy



72. Embryo sporophyte develops within this structure

73. Structure that has a similar function to that of the human testes

74. Sticky, pollen-trapping structure

75. Meiosis occurs within this structure to produce microspores

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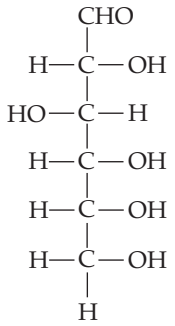
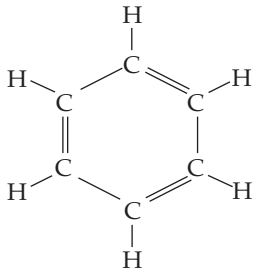
Questions 76–79 refer to important organic molecules

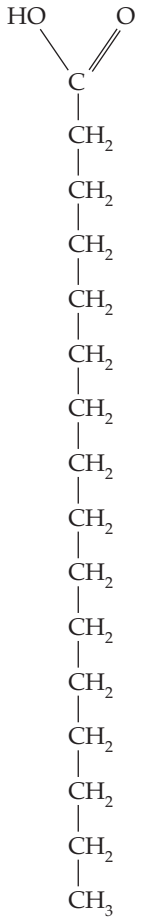
(A)



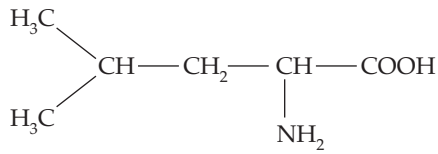
(B)



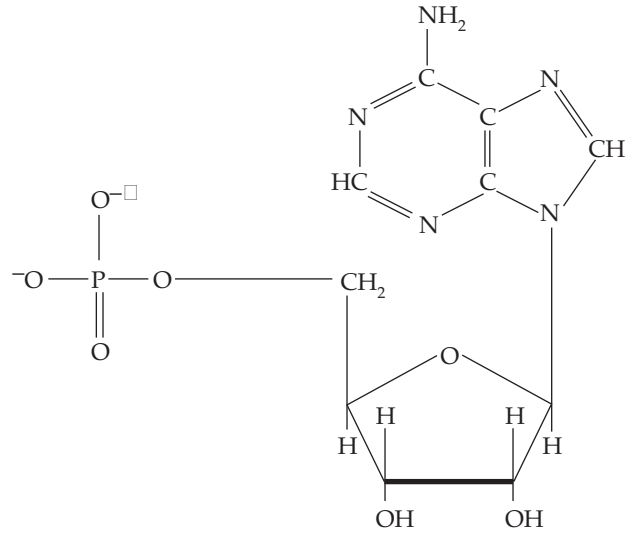
(C)



(D)



(E)



76. Subunits of nucleic acids

77. A building block of phospholipids

78. An important energy source central to many metabolic processes

79. A building block of proteins

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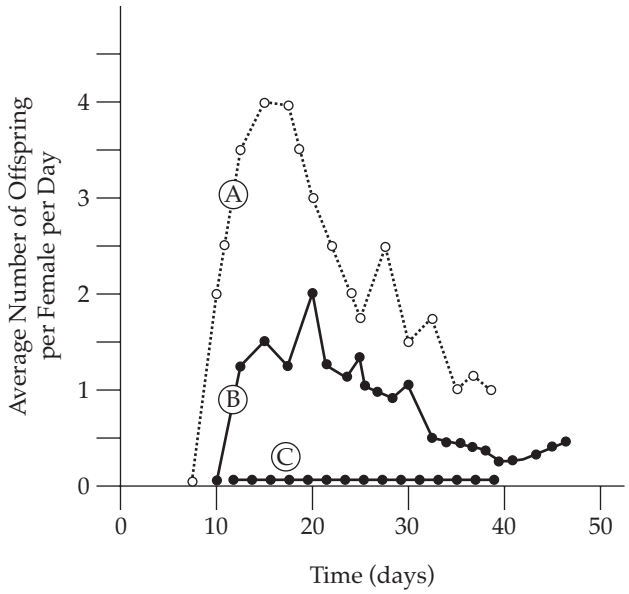
Questions 80–82 refer to the following experiment.

A group of 100 female *Daphnia*, small crustaceans known as water fleas, were placed in one of three culture jars of different sizes to determine their reproductive rate. The graph below shows the average number of offspring produced per female each day in each jar of pond water.



Key: Ⓐ Water fleas in a 1-liter jar of pond water
Ⓑ Water fleas in a 0.5-liter jar of pond water
Ⓒ Water fleas in a 0.25-liter jar of pond water

80. What is the total number of offspring produced in the 0.5-liter jar on the twentieth day, assuming all survive?

(A) 2
(B) 4
(C) 50
(D) 200
(E) 400

81. Based on the graph, what is the limiting factor in the reproductive rate of the female water fleas?

(A) Vapor pressure
(B) Food
(C) Temperature
(D) Density
(E) Competition

82. Which of the following statements is true concerning the results of the experiment?

(A) The water fleas in the 1-liter jar have a lower reproductive rate than the water fleas in the 0.5-liter jar.
(B) The reproductive rate of the water fleas in jars A and B are similar.
(C) The reproductive rate in the 0.25-liter jar changes because of a change in habitat.
(D) The water fleas in the 0.25-liter jar are infertile.
(E) The reproductive rate for the water fleas steadily decreases after 20 days.

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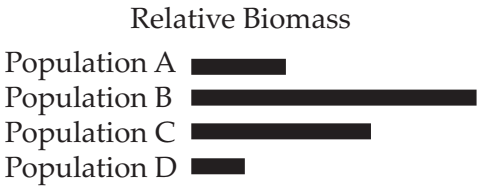
Questions 83–85 refer to the bar graph, which shows the relative biomass of four different populations of a particular food pyramid.



83. The largest amount of energy is available to
    (A) population A
    (B) population B
    (C) population C
    (D) population D
    (E) It cannot be determined

84. Which of the following would be the most likely result if there was an increase in the number of organisms in population C?
    (A) The biomass of population D will remain the same.
    (B) The biomass of population B will decrease.
    (C) The biomass of population C will steadily increase.
    (D) The food source available to population C would increase.
    (E) There would be an intense competition among the members of population C for the food source.

85. On average, there is a 90 percent reduction of productivity for each trophic level. Based on this information, 10,000 pounds of grass should be able to support how many pounds of crickets?
    (A) 90 pounds
    (B) 500 pounds
    (C) 1,000 pounds
    (D) 2,000 pounds
    (E) 9,000 pounds

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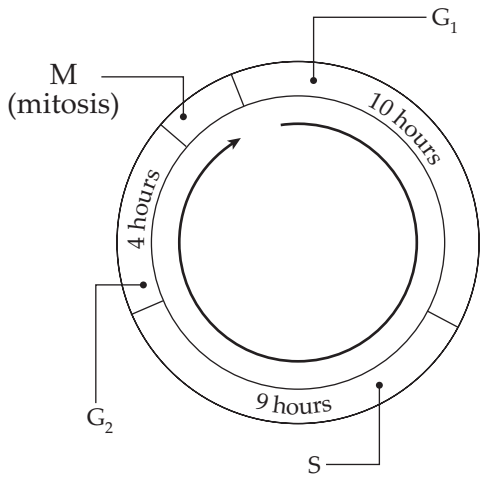
Questions 86–89 refer to the following illustration and information.

The cell cycle is a series of events in the life of a dividing eukaryotic cell. It consists of four stages: G_1, S, G_2, and M. The duration of the cell cycle varies from one species to another, and from one cell type to another. The G_1 phase varies the most. For example, embryonic cells can pass through the G_1 phase so quickly that it hardly exists, whereas neurons are arrested in the cell cycle and do not divide.



86. During which phase do chromosomes replicate?
    (A) G_1
    (B) S
    (C) G_2
    (D) M
    (E) Cytokinesis

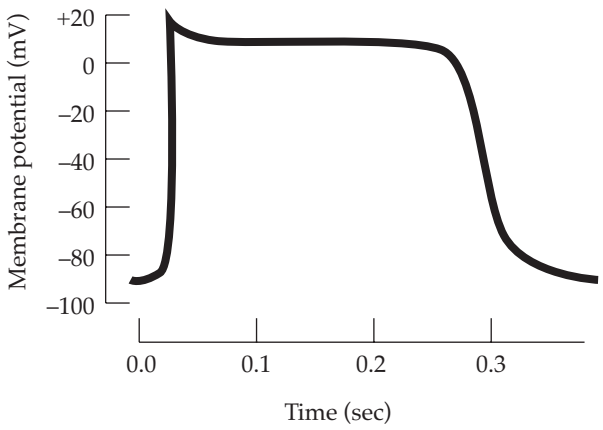
87. In mammalian cells, the first sign of prophase is the
    (A) appearance of chromosomes
    (B) separation of chromatids
    (C) disappearance of the nuclear membrane
    (D) replication of chromosomes
    (E) crossing over of homologous chromosomes

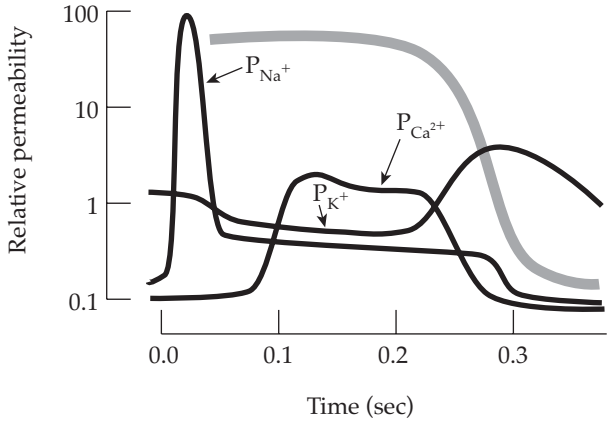
88. Mitosis occurs in all of the following types of cells EXCEPT
    (A) epidermal cells
    (B) hair cells
    (C) red blood cells
    (D) pancreatic cells
    (E) kidney cells

89. Since neurons are destined never to divide again, what conclusion can be made?
    (A) These cells will go through cell division.
    (B) These cells will be permanently arrested in the G_1 phase.
    (C) These cells will be permanently arrested in the G_2 phase.
    (D) These cells will quickly enter the S-phase.
    (E) The duration of the cell cycle will be long.

GO ON TO THE NEXT PAGE

Questions 90–93 refer to the graphs, which show the permeability of ions during an action potential in a ventricular contractile cardiac fiber. The action potential of cardiac muscle fibers resembles that of skeletal muscles.





90. Based on the graph, the resting membrane potential of the muscle fibers is close to
    (A) –90 mV
    (B) –70 mV
    (C) 0 mV
    (D) +70 mV
    (E) +90 mV

91. Which of the following statements is true concerning the initial phase of depolarization?
    (A) Voltage-gated K^+ channels open in the plasma membrane.
    (B) The concentration of Ca^{2+} ions within the plasma membrane becomes more negative.
    (C) The membrane potential stays close to –40 mV.
    (D) There is a rapid inflow of Ca^{2+} ions along the electrochemical gradient.
    (E) The permeability of the sarcolemma to Na^+ ions increases.

92. In cardiac fibers, the duration of an action potential is approximately
    (A) 0.10 secs
    (B) 0.20 secs
    (C) 0.25 secs
    (D) 0.30 secs
    (E) 0.35 secs

93. One major difference between the action potential of cardiac muscle fibers and the action potential of skeletal muscle fibers is that in cardiac muscle fibers
    (A) the membrane is permeable to Na^+, not K^+
    (B) voltage-gated K+ channels open during depolarization, not repolarization
    (C) depolarization is prolonged compared to that in skeletal muscle fibers
    (D) the refractory period is shorter than that of skeletal muscle fibers
    (E) the speed of the contraction is faster than that of skeletal muscle fibers

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Questions 94–97 refer to the data below concerning the general animal body plan of five organisms.

	Acoelomate	Pseudocoelomate	Coelomate	Protostomes	Deuterostomes	Radical Symmetry	Bilateral Symmetry
Organism 1						+	+
Organism 2	+						
Organism 3		+					+
Organism 4			+	+		+	
Organism 5			+		+		+

Note: + indicates a feature presence in an organism.

94. The body plan associated with nematodes is Organism
    (A) 1
    (B) 2
    (C) 3
    (D) 4
    (E) 5

95. The body plan associated with flatworms is Organism
    (A) 1
    (B) 2
    (C) 3
    (D) 4
    (E) 5

96. Into what phylum should Organism 5 be placed?
    (A) Platyhelminthes
    (B) Nematoda
    (C) Molluska
    (D) Annelida
    (E) Chordata

97. All of the following organisms exhibit bilateral symmetry EXCEPT
    (A) hydra
    (B) mollusks
    (C) arthropods
    (D) earthworms
    (E) fish

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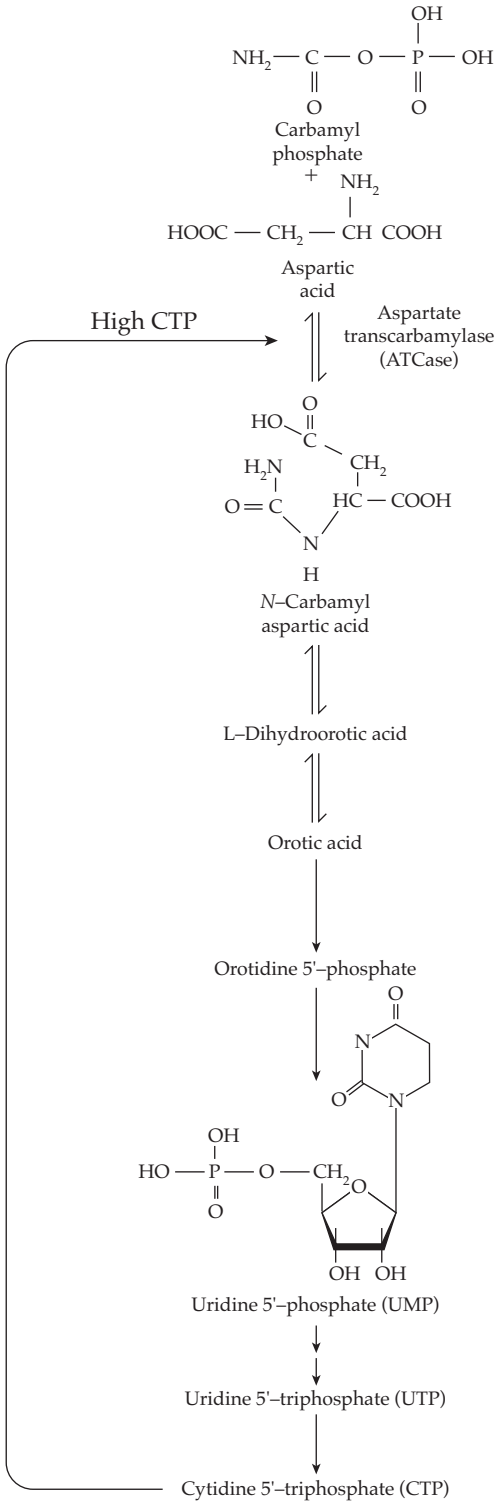
Questions 98–100 refer to the synthetic pathway of a pyrimidine, cytidine 5′ triphosphate, CTP. This pathway begins with the condensation of two small molecules by the enzyme, aspartate transcarbamylase (ATCase).



Regulation of CTP biosynthesis

98. Which of the following is true when the level of CTP is low in a cell?
    (A) CTP is converted to ATCase
    (B) the metabolic traffic down the pathway increases
    (C) ATCase is inhibited, which slows down CTP synthesis
    (D) the final product of the pathway is reduced
    (E) CTP blocks the production of N-carbamyl aspartic acid

99. This enzymatic phenomenon is an example of
    (A) transcription
    (B) feedback inhibition
    (C) dehydration synthesis
    (D) photosynthesis
    (E) hydrolysis

100. The biosynthesis of cytidine 5′-triphosphate requires
    (A) a ribose sugar, a phosphate group, and a nitrogen base
    (B) a deoxyribose sugar, a phosphate group, and a nitrogen base
    (C) a ribose sugar, phosphate groups, and a nitrogen base
    (D) a deoxyribose sugar, phosphate groups, and a nitrogen base
    (E) a ribose sugar, phosphates, ATP, and a nitrogen base

STOP

IF YOU FINISH BEFORE TIME IS CALLED,
YOU MAY CHECK YOUR WORK
ON THIS SECTION.

DO NOT GO ON
UNTIL YOU ARE TOLD TO DO SO.

NO TEST MATERIAL ON THIS PAGE

BIOLOGY

SECTION II

Planning time—10 minutes

Writing time—1 hour and 30 minutes

You will have 10 minutes to read the exam questions. Spend this time reading through all of the questions, noting possible problem-solving approaches and otherwise planning your answers. It's fine to make notes on the green question insert, but be sure to write your answers and anything else that might be worth partial credit in the pink answer booklet—the graders will not see the green insert. After 10 minutes you will be told to break the seal on the pink Free-Response booklet and begin writing your answers in that booklet.

Answer all questions. Number your answer as the question is numbered below.

Answers must be in essay form. Outline form is NOT acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write.

1. Chlorophyll is one of a class of pigments that absorbs light energy in photosynthesis.
   a. **Relate** the structure of chlorophyll to its function.
   b. **Design** an experiment to investigate the influence of sunlight on the activity of chlorophyll.
   c. **Describe** what information concerning the structure of chlorophyll could be inferred from your experiment.

2. Select **two** of the following three pairs of hormones and discuss the concept of negative feedback.
   a. Thyroid-stimulating hormone (TSH) and thyroxine
   b. Parathyroid hormone and calcitonin
   c. ACTH and cortisol

3. **Describe** the chemical nature of genes. **Discuss** the replication process of DNA in eukaryotic organisms. Name two types of gene mutations that could occur during replication.

4. Over the course of early evolution, organisms had to develop various methods to regulate internal fluids and excrete wastes. **Discuss** the problems faced by **three** organisms and how these problems were solved. In your discussion include structural adaptations and their functional significance.

END OF EXAMINATION