AP EXams1990 AP BIOLOGY

Answers: Last Page

Three hours are allotted for this examination: 1 hour and 30 minutes for Section I, which consists of multiple-choice questions; and 1 hour and 30 minutes for Section II, which consists of essay questions. Section I is printed in this examination booklet; Section II, in a separate booklet.

SECTION I

Time- 1 hour and 30 minutes

Number of questions – 120

Percent of total grade – 60

This examination contains 120 multiple-choice questions. Following this examination there are 12 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 132 on your answer sheet.

General Instructions

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE INSTRUCTED TO DO SO.

INDICATE ALL YOURR 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 scratch work. After you have decided which of the suggested answers is best, COMPLETEY 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.

Many candidates wonder whether or not to guess the answers to questions about which they are not certain. In this section of the examination, as a correction for haphazard guessing, one-forth of the number or questions you answer incorrectly will be subtracted from the number of questions you answer correctly. If, however, you are not sure of the correct answer but have some knowledge of the question and are able to eliminate one or more of the answer choices as wrong, your chance of getting the right answer is improved, and it may be to your advantage to answer such a question.

Use your time effectively, working as rapidly as you can without losing accuracy. Do not spend too much time on questions that are too 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 30 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. The bones of a human arm are homologous to structures in all of the following EXCEPT a

    A. whale flipper
    B. bat wing
    C. butterfly wing
    D. bird wing
    E. frog forelimb

2. Competition for food would probably be most severe between two

    A. closely related species in different niches
    B. closely related species in similar niches
    C. unrelated species in different communities
    D. unrelated species in the same community occupying different niches
    E. ecological equivalents in different niches

3. The graph below represents the relationship between the cadmium level in the drinking water of mice and the blood pressure of the mice.

    All of the following are accurate statements about the relationship shown in the graph EXCEPT:

    A. Both high and low concentrations of cadmium are associated with low blood pressure
    B. An intermediate level of cadmium produces the highest blood pressure
    C. The lower the cadmium concentration in the water, the higher the blood pressure
    D. Up to a certain point, blood pressure increases as cadmium intake increases
    E. After a certain point, blood pressure decreases as cadmium intake increases.

4. In angiosperms, the endosperm functions in

    A. pollen formation

B. fruit formation

C. seed coat formation

D. nourishment of the embryo

E. direction of the growth of the pollen tube

5. *A* represents the dominant allele and *a* represents the recessive allele of a pair. If, in 1,000 offspring, 500 are *aa* and 500 are of some other genotype, which of the following are most probably the genotypes of the two parents?

   A. *Aa* and *Aa*

   B. *Aa* and *aa*

   C. *AA* and *Aa*

   D. *AA* and *aa*

   E. *aa* and *aa*

6. A microscopic, unicellular organism that has a cell wall impregnated with silicon and is important as plankton in a food chain belongs to which of the following groups?

   A. Mosses

   B. Diatoms

   C. Cyanobacteria (blue-green algae)

   D. Ferns

   E. Brown algae

7. The organelle that is a major producer of ATP and is found in both heterotrophs and autotrophs is the

   A. chloroplast

   B. nucleus

   C. ribosome

   D. Golgi apparatus

   E. Mitochondrion

8. All of the following are density-dependent factors that limit animal populations EXCEPT

   A. weather

B. predation

C. birthrate

D. food competition

E. mortality

9. Which of the following is an example of a hydrogen bond?

A. The peptide bond between amino acids in a protein

B. The bond between an oxygen atom and a hydrogen atom in the carboxyl group of a fatty acid

C. Thee bond between Na+ and Cl- in salt

D. The attraction between a hydrogen of one water molecule and the oxygen of another water molecule

E. The bond between carbon and hydrogen in methane

10. Which of the following is LEAST involved in respiratory gas exchange in the frog?

A. Lining of the mouth

B. Lungs

C. Skin

D. Large intestine

E. Blood

11. The nitrogenous base, adenine, is found in which three of the following

A. Proteins, chlorophyll, and vitamin A

B. Protein, ATP, and DNA

C. ATP, DNA, and RNA

D. Chlorophyll, ATP, and DNA

E. Proteins, carbohydrates, and ATP

12. Which of the following features of angiosperms has probably contributed most to their evolutionary success relative to all other land plants groups?

A. Phloem

B. Cutinized aerial surfaces

C. Flowers and fruits

D. True leaves and roots

E. Xylem

13. Only female gametes are produced in which of the following structures?

A. Antheridia

B. Stamens

C. Protonemata

D. Flowers

E. Archegonia

14. Which of the following is most often associated with the elaborate courtship rituals conducted by many birds?

A. Species recognition

B. Migration

C. Feeding responses

D. Altruism

E. Kin selection

15. The primary value of a specific type of backcross known as a test cross is to

A. determine whether a trait is really hereditary

B. permit detection of recessive genes

C. reveal cases of blending inheritance

D. reveal remote ancestors

E. reveal sex-linked inheritance

16. Which of the following would result if the sodium-potassium pump of a neuron were inoperative?

A. The movement of chloride ions would produce an action potential

B. An impulse would travel from the axon to the dendrites of the neuron

C. The rate of transmission of the impulse would greatly increase

D. The rate of ATP synthesis would increase.

E. The action potential would not occur.

17. All of the following cell components are found in prokaryotic cells EXCEPT

A. DNA
B. Ribosomes
C. Cell membrane
D. Nuclear envelope
E. Enzymes

18. Structures found in the cells of both angiosperms and mammals are

A. cell walls and cell membranes
B. centrioles and lysosomes
C. chloroplasts and ribosomes
D. cell membranes and chromosomes
E. contractile vacuoles and leucoplasts

19. Compounds that are foreign to an organism and that elicit an immune response in the organism are called

A. antigens
B. interferons
C. teratogens
D. antibodies
E. histamines

20. A plant that has a stem with scattered vascular bundles, leaves with parallel venation, and seeds with a single cotyledon is probably a

A. pine
B. moss
C. corn plant
D. bean plant
E. liverwort

21. In humans primary oocytes are located in the

A. cervix
B. uterus

C. corpus luteum

D. oviduct

E. ovary

22. Which of the following are found in viruses?

A. Chloroplasts

B. Ribosomes

C. Mitochondria

D. Nucleic acids

E. Golgi bodies

23. All of the following processes occur in the nephron EXCEPT

A. tubular secretion

B. glomerular filtration

C. erythrocyte formation

D. cellular respiration

E. selective reabsorption

24. Which of the following statements about xylem and phloem is correct?

A. Both are produced as secondary growth by vascular cambium.

B. Both have companion cells.

C. Both are found in bryophytes.

D. Both conduct glucose in the plant.

E. Both actively move fluids up and down stems.

25. All of the following statements about the placenta are correct EXCEPT

A. It permits interchange of CO_2 and O_2 between maternal and fetal blood.

B. It forms from tissues of both the embryo and the uterus.

C. It permits the mixing of maternal and fetal blood

D. It functions as an endocrine gland.

E. (E) It provides the embryo with a way to dispose of its nitrogenous waste products.

26. A diploid cell has three pairs of homologous chromosome designated J/J2, K1/K2 and L1/L2. Which of the following represents a probable chromosome complement in a haploid cell formed by meiosis?

a. J1 and K1

b. J1 and K1

c. J1, K1, and

d. J1, J1, K2, and K2

e. J1, J2, K1, K2, L1, and L2

27. A severe dose of x-ray radiation results in conditions such as anemia, atypical sperm production, and a depressed immune system because the cells affected

a. are fully differentiated

b. are the largest cells in the body

c. are the most actively dividing cells in the body

d. contain more protein than any other cells in the body

e. contains pigments that reflect radiation

28. Which of the following is the most effective in lowering the body temperature of a mammal?

a. erection of fur

b. involuntary contraction of skeletal muscles

c. increased epinephrine secretion

d. increase flow of blood to the skin

e. increased metabolic rate

29. All members of which of the following groups have the greatest number of characteristics in common?

a. Class

b. Order

c. Family

d. Genus

e. Phylum

30. An organism that is eukaryotic, multicellular, heterotrophic, and lacks cell walls belongs to which of the following?

a. monera
b. protista
c. fungi
d. plantae
e. animalia

31. Which of the following is true about secondary consumers in an ecosystem?

a. they eat only plants
b. they are eaten by primary consumers
c. they are smaller and weaker than are primary consumers
d. they are fewer in number than are primary consumers
e. they contain the greatest total biomass in the system

32. The replacement of glumatic acid by valine at a specific position in the beta chains of hemoglobin leads to sickle cell anemia. This change represents which of the following mutational events?

a. DNA base pair substitution
b. DNA base pair deletion
c. DNA base pair addition
d. Chromosomal deletion
e. Frame shift mutation

33. Cytokinesis is the portion of the cell cycle during which

a. the growth of cells is momentarily arrested in G2 stage
b. the amount of DNA per chromosome doubles
c. centromeres uncouple and chromatids separate
d. a cell plate is formed in plant cells
e. the nuclear membrane breaks down

34. If plant cells are immersed in distilled water, the resulting movement of water into cells is called:

a. conduction
b. active transport

c. transpiration

d. osmosis

e. facilitated diffusion

35. In the nitrogen cycle, the transformation of gaseous nitrogen into nitrogen-containing compounds is performed primarily by:

a. fungi

b. bacteria

c. green plants

d. herbivores

e. carnivores

36. In corn, the trait for tall plants (T) is dominant to the trait for dwarf plants (t) and the trait for colored kernels (C) is dominant to the trait for white kernels (c). In a particular cross of corn plants, the probability of an offspring being tall is 1/2 and the probability of a kernel is being colored 3/4. Which of the following most probably represents the parental genotypes?

a. TtCc X ttCc

b. TtCc X TtCc

c. TtCc X ttcc

d. TTCc X ttCc

e. TTCc X TtCC

37. ABCDEF…→ ABDEF…

A rearrangement in linear sequence of genes as shown in the diagram above is known as:

a. duplication

b. deletion

c. inversion

d. polyploidy

e. translocation

38. Which of the following factors is most important in the movement of water up a tall tree?

a. guttation

b. capillary in the phloem

c. air pressure

d. leaf transpiration

e. active transport in the xylem

39. During the carbon cycle, which of the following carbon compounds would be utilized as an energy source by heterotrophs?

a. calcium carbonate

b. carbonic acid

c. organic molecules

d. carbon dioxide

e. carbon monoxide

40. GTAGTAGGT

What would be the sequence of bases of an mRNA molecule that was transcribed from the sequence of DNA bases shown above?

a. GTAGTAGGT

b. CAUCAUCCA

c. UCGUCGUUC

d. AUGAUGAAU

e. CATCATCCA

41. Which of the following tissue types gives rise to all other plant tissue?

a. Parenchyma

b. Sclerenchyma

c. Collenchyma

d. Xylem

e. Phloem

42. Animals produce most of their nitrogen-containing wastes during

A. protein catabolism

B. carbohydrate catabolism

C. lipid catabolism

D. glycogen synthesis

E. production of chemiosmotic gradients

43. The end products of the light-dependent reactions of photosynthesis are

A. ADP, H_20, $NADPH_2$

B. ADP, PGAL, RuBP (RuDP)

C. ATP, CO_2, H_20

D. ATP, $NADPH_2$, O_2

E. CO_2, H^+, PGAL

44. A form of vitamin D-resistant rickets, known as hypophosphatemia, is inherited as an X-linked dominant trait. If a male with hypophosphatemia marries a normal female, which of the following predictions concerning their potential progeny would be true?

A. All of their sons would inherit the disease.

B. All of their daughters would inherit the disease.

C. About 50% of their sons would inherit the disease.

D. About 50% of their daughters would inherit the disease.

E. None of their daughters would inherit the disease.

45. S. L. Miller's classic experiment demonstrated that a discharge of sparks through a mixture of gases could result in the formation of a large variety of organic compounds. All of the following gases were used in this experiment EXCEPT

A. hydrogen

B. methane

C. ammonia

D. oxygen

E. water vapor

46. Which of the following is the primary role of the lysosome?

A. ATP synthesis

B. Intracellular digestion

C. Lipid transport

D. Carbohydrate storage

E. Protein synthesis

47. Which of the following enzymes is responsible for CO_2 fixation in C_3 plants?

A. Succinate dehydrogenase

B. RuBP (RuDP) carboxylase

C. Hexojinase

D. Amylase

E. DNA polymerase

48. Which of the following is true about the blood of a normal newborn infant?

A. It carries oxygen for the first time.

B. It fails to produce hemoglobin.

C. It carries nitrogenous wastes for the first time.

D. It ceases to flow to the lungs.

E. It ceases to pass from one atrium directly to the other atrium.

49. Which of the following is most directly influenced by antiduretic hormone (ADH)?

A. The rate of glomerular filtration

B. Countercurrent exchange in the loop of Henle

C. Reabsorption of water from the collecting duct

D. Reabsorption of sodium ions from the distal convoluted tubule

E. Secretion of potassium and hydrogen ions into the proximal convoluted tubule.

50. Some varieties of *Neisseria gonorrhoeae* are now resistant to penicillin. These varieties of bacteria most probably developed as a result of

A. natural selection

B. hybrid vigor

C. coevolution

D. adaptive radiation

E. convergent evolution

51. The difference in cricket calls among sympatric species of crickets are examples of

A. habitat isolation

B. temporal isolation

C. physiological isolation

D. behavioral isolation

E. geographical isolation

52. The enzyme that is found in retroviruses and that is required for the synthesis of DNA from RNA is

A. DNA polymerase III
B. RNA polymerase
C. Restriction endonuclease
D. Reverse transcriptase
E. Dehydrogenase

53. Sieve cells differ from trachids in that only sieve cells are

A. considered living cells
B. involved in transporting water and ions
C. found in vascular plants
D. found in the outer cortex of the stem
E. found in the center of the stem

54. The reaction $Hb(O_2)_4$ –$Hb+4O_2$ (Hb = hemoglobin) is fostered by all of the following EXCEPT

A. increased carbon dioxide in the blood
B. increased oxygen in the blood
C. increased acidity of the blood
D. increased temperature
E. strenuous exercise

55. All of the following statements concerning cellular respiration are true EXCEPT

A. In the citric acid cycle, two molecules of CO_2 and one molecule of $FADH_2$ are produced for each acetyl-CoA that enters the cycle.
B. ATP is converted to ADP during two of the reactions of glycolysis
C. When aerobes respire anaerobically, they may build up an oxygen debt that may be paid eventually by intake of oxygen
D. The metabolic breakdown of glucose yields more energy during fermentation than during aerobic respiration
E. The conversion of glucose to pyruvic acid can occur in the absence of oxygen

56. Which of the following describes the correct sequences of stages during embryogensis?

A. Cleavage, blastula formation, gastrulation
B. Cleavage, gastrulation, blastula formation

C. Blastula formation, gastrulation, cleavage

D. Blastula formation, cleavage, gastrulation

E. Gastrulation, cleavage, blastula formation

57. Which of the following processes effectively makes nitrogen unavailable for plant use?

A. The reduction of gaseous nitrogen to ammonia

B. The reduction of nitrate to gaseous nitrogen

C. The oxidation of nitrate to nitrate

D. The oxidation of ammonia to nitrate

E. The breakdown of proteins into amino acids

58. In DNA replication, DNA polymerase catalyzes the reaction in which

a. The double helix unwinds

b. The sugar-phosphate bonds of each strand are broken

c. A phosphate group is added to the 3'-carbon or 5'-carbon of ribose

d. A nucleotide with a base complementary o the base on the template stand is added to the new DNA strand

e. The two nucleotide strands come together and intertwine to form a double helix

59. Mosses are characterized by which of the following?

a. A dominant gametophyte with dependant sporophyte

b. A dominant gametophyte with independent sporophyte

c. A dominant sporophyte with independent gametophyte

d. A dominant sporophyte with large dependent gametophyte

e. A dominant sporophyte with gametophyte reduced to a few cells

60. In order for a bacterium to produce a eukaryotic protein, which of the following must first be isolated from a eukaryotic cell prior to cloning?

a. The protein's primary RNA transcript from the nucleus

b. The protein's mRNA from the cytoplasm

c. The protein from the rough endoplasmic reticulum

d. The introns from the segment of DNA that codes for the protein

e. The segments of DNA that control transcription for this protein

61. In a population that is in Hardy-Weinberg equilibrium, the frequency of a recessive allele for a certain hereditary trait is 0.20. What percentage of the individuals in the next generation would be expected to show the dominant trait?

a. 8%
b. 16%
c. 32%
d. 64%
e. 96%

62. All of the following are common to all monocots and dicots EXCEPT
a. Protein synthesis
b. Aerobic respiration
c. ATP formation
d. The electron-transport system
e. C_4 photosynthesis

63. The result of meiosis in angiosperms is the production of
a. Gametes
b. A haploid sporophyte
c. A diploid sporophyte
d. A diploid gametophyte
e. Haploid megaspores and microspores

64. The cytoplasmic channels between plant cells which are most similar to gap junctions between animals cells are called
a. Middle lamellas
b. Tonoplasts
c. Plasmodesmata
d. Tight junctions
e. Desmosomes

65. Dichlorophenolindophenol (DPIP) is a blue dye that is decolorized when it is reduced. After being mixed with DPIP, which of the following would show the greatest change of color?
a. Isolated chloroplasts in the light
b. Isolated chloroplasts in the dark
c. Chlorophyll extract in the dark

d. Boiled chloroplasts in the light

e. Boiled chloroplasts in the dark

66. All of the following are plant-growth regulators EXCEPT

a. Ethylene

b. Indoleacetic acid

c. Abscisic acid

d. Cytokinins

e. Anthocyanin

67. The working of the *lac operon* is important for which of the following reasons?

a. It represents a principal means by which genes are regulated in prokaryotes

b. It represents a principal means by which genes are regulated in eukaryotes

c. It illustrates the complexities of rRNA transcription

d. It provided the first clues to how DNA replication is controlled during the cell cycle

e. The understanding of it led to the development of an economical means for the biological production of lactose

68. Which of the following statements about plasmids is correct?

a. They are synthesized in the endoplasmic reticulum

b. The are found only in eukaryotic cells

c. They are composed of RNA

d. They are larger in size than bacterial chromosomes

e. They are self-replicating

69. Examination of a typical dicotyledon seed reveals that it

a. Is made mostly of meristematic tissue used for the storage of food

b. Can be stimulated to germinate by an application of Abscisic acid

c. Forms from the union of a microspore mother cell with a megaspore mother cell

d. Shows the presence of a well-developed coeloptile

e. Contains a first-foliage pulumule formed at the apical meristem

70. DNA replication can be described as

a. Semi conservative

b. Conservative

c. Degenerative

d. Dispersive

e. Radical

71. The relative location of four genes on a chromosome can be mapped from the following data on crossover frequencies.

Genes	Frequency of crossover
B and D	5%
C and A	15%
A and B	30%
C and B	45%
C and D	50%

Which of the following represents the relative positions of these four genes on the chromosome?

a. ABCD

b. ADCB

c. CABD

d. CBAD

e. DBCA

72. In fruit flies, vermilion eyes are a sex-linked recessive characteristic. If a vermilion-eyed female is crossed with a wild-type male, what proportion of the male offspring should have vermilion eyes?

a. 0%

b. 25%

c. 50%

d. 75%

e. 100%

73. Which of the following statements best describes the effect of a genetic drift on the gene frequencies of a population?

a. Genes enter a population through immigration, thus changing gene frequencies

b. Genes leave a population through emigration, thus changing gene frequencies

c. Chance alone can cause significant changes in gene frequencies of small populations

d. Mutations over time cause gene frequencies to change

e. Selection against one allele causes gene frequencies to change

74. Which of the following most directly controls the flowering response in short-day plants?

a. Length of the light period
b. Length of the dark period
c. Relative amount of blue light available during the light period
d. Intensity of light during the light period
e. Air temperature during the dark period

Questions 75-76 refer to the diagram below of a mammalian eye

75. Structures 1 and 2 function to

a. Change the shape of the cornea
b. Change the wavelengths of light entering the eye
c. Focus an image on the retina
d. Transmit neural impulses from the eye to the brain
e. Determine the color of the eye

76. Which of the following structures contains the light-sensitive pigments?

a. 3
b. 4
c. 5
d. 6
e. 7

Questions 77-78

A. Glucose
B. Glycerol
C. Glycogen
D. Glucagon
E. Guanine

77. Essential for the synthesis of neutral fats
78. A storage form of carbohydrate in muscle

Questions 79-80

A. Iron
B. Zinc
C. Magnesium
D. Calcium
E. Sulfur

79. A constituent of the chlorophyll molecule
80. Required in ionic form for the activity of many enzymes, the maintenance of bone, and the contraction of muscle fibers

Questions 81-84

A. Cleavage
B. Organogenesis
C. Gastrulation
D. Neurulation
E. Fertilization

81. This process establishes the primary germ layers
82. Two haploid cells fuse to form a diploid cell
83. The number of cells increases, but there is no increase in total cell mass and there is little or no differentiation
84. Cells migrate over the dorsal lip of the blastopore.

Questions 85-87 refer to the diagram of the plasma membrane below.

85. Hydrophilic portion of lipid molecule.
86. Cell-recognition component.
87. Carriers or permeases involved in cell transport.

Questions 88-90 refer to the diagram below.

88. This structure is a dendrite of a sensory neuron.
89. This structure is an axon of an interneuron (association neuron).

90. Concentrations of synaptic vesicles containing neurotransmitters are located at this site.

Questions 91-94.

A. Tropical rain forest
B. Taiga
C. Artic tundra
D. Temperate grassland
E. Desert

91. Permafrost; temperatures range from approximately -50° C to +25° C; a growing season of 60 days or less.

92. Over 10 inches of precipitation per year; long, cold winters and short summers; dominant vegetation is evergreen trees.

93. Lack of water common in summer; seasonal temperature variations; maintained by periodic fires.

94. Less than 10 inches of precipitation per year; extremes of hot and cold throughout the year; large daily temperature variations.

Questions 95-96.

The illustrations below represent homologous pairs of chromosomes as they appear in various stages of mitosis and meiosis (2n=2).

95. At which stage do the chromosomes have the LEAST amount of DNA per cell?

96. Which diagram represents anaphase of meiosis I?

Directions: Each group of questions below concerns an experimental or laboratory situation or data. In each case, first study the description of the situation or data. Then choose the one best answer to each question following it and fill in the corresponding oval on the answer sheet.

Questions 97-100 refer to the following experiment, which is designed to test the effects of several chemicals on the contractibility of skeletal muscle.

A frog femur with the gastrocnemius muscle attached is installed in a bone clamp as indicated in the accompanying figure. The sciatic nerve leading to the muscle is attached to a battery via electrical leads. A small weight is suspended from the free end of the Achilles tendon.

The entire preparation is rinsed in one of the five different solutions listed below. A brief stimulus is then applied to the sciatic nerve by closing the circuit to the battery. Three muscle responses are possible, depending on the solution with which the preparation has been rinsed: (1) the muscle will twitch once normally; (2) the muscle will go into sustained contraction until it is completely fatigued; and (3) the muscle will remain flaccid and not twitch at all.

Substance Added to Ringer's Rinsing Solution	**Mechanism of Action**
None	Provides an isotonic saline environment for the muscle
EDTA	Binds free calcium ions
Botulin	Blocks the release of acetylcholine from presynaptic junctions
Malathion	Inhibits the enzyme acetylcholine
Curare	Binds to the acetylcholine receptor site in the synapse or myoneural junction

97. Which of the following substances allows action potentials to reach the sarcoplasmic membrane and the transverse tubule system but prevents muscle contraction?

A. Ringer's solution

B. EDTA

C. Botulin

D. Malathion

E. Curare

98. Competitors of acetylcholine include which of the following?

I. Botulin

II. EDTA

III. Curare

A. I only

B. II only

C. III only

D. I and II only

E. I, II, and III

99. Which substance produces a sustained contraction (tetany) after a brief electrical stimulation of the sciatic nerve?

A. Ringer's solution

B. EDTA

C. Botulin

D. Malathion

E. Curare

100. Which substance allows a single muscle twitch after a brief electrical stimulation of the sciatic nerve?

A. Ringer's solution

B. EDTA

C. Botulin

D. Malathion

E. Curare

Questions 101-102

Frogs of three different species are weighed and the amount of oxygen consumed by each species is determined by placing them in a respirometer for 1 hour. The results of this experiment are listed below.

Species	Average Weight (in grams)	Total Cubic Centimeters of Oxygen Consumed in 1 Hour
1	15	0.75
2	11	0.55
3	21	1.05

101. From the information in the table, it is most reasonable to conclude that

A. Since all frogs respire through their skin, smaller frogs with smaller surface areas will consume less oxygen per gram of body weight than larger frogs with larger surface areas.

B. Frogs placed in a warm environment will respire more rapidly than frogs placed in a colder environment.

C. Each species of frog has its own unique rate of respiration.

D. The amount of oxygen consumed per gram of body weight for each species is the same.

E. The amount of oxygen consumed per gram of body weight by the largest frog is almost twice that by the smallest frog.

102. If each frog doubles its rate of oxygen consumption in 1 hour after an injection of thyroxine, it would be most reasonable to conclude that thyroxin

A. Acts as a general stimulus to respiratory metabolism.

B. Stimulates the release of hormone from the pituitary.

C. Doubles the amount of hormone released by the thyroid gland in each species.

D. Doubles the rate of breathing by doubling the rate of contraction of the diaphragm muscle.

E. Increases the permeability of the mitochondrial membrane to oxygen.

Questions 103-105 refer to the system depicted below.

103. Which of the following statements about the system is correct?

A. It is an important component of glycolysis, which cannot function without the system.

B. It takes place in organelle that has a double membrane.

C. It is unique to animal cells.

D. It is unique to bacteria.

E. It functions most efficiently in organisms growing under anaerobic conditions.

104. Which of the following is the most important consequence of the operation of the system?

A. Coenzymes are reduced.

B. Carbon dioxide is produced.

C. The pH of the mitochondrial matrix decreases.

D. Electron carriers in the mitochondrial membrane are irreversible oxidized.

E. An electrochemical (proton) gradient is formed.

105. A system similar to that depicted in the figure can also be found in the

A. Golgi apparatus

B. Lysosome

C. Rough endoplasmic reticulum

D. Chloroplast

E. Ribosome

Questions 106-108 refer to the food web below.

106. Which of the following organisms is most likely to be located at the apex of the pyramid of biomass?

A. Grass

B. Grasshoppers

C. Snake

D. Mouse

E. Hawk

107. All of the following statements about the diagram are correct EXCEPT:

A. The grasshopper is an herbivore.

B. Only two trophic levels are depicted.

C. The mouse and grasshopper are at the same trophic level.

D. The grass is a producer.

E. All of the organisms except grass are consumers, regardless of position.

108. The organic and inorganic materials in all the organisms in the diagram will eventually return to the environment by the action of

A. decomposers

B. producers

C. primary consumers

D. secondary consumers

E. top carnivores

Question 109-112 refer to the following pedigree that illustrates the inheritance of sickle cell anemia. Shading indicates the presence of sickle cell anemia.

109. The phenotype of individual C is best explained by the fact that this individual received an allele for sickle cell anemia from

A. an autosomal chromosome of each parent

B. the Y chromosome contributed by the father

C. the X chromosome contributed by the mother

D. the X chromosome contributed by the father

E. the Y chromosome contributed by the mother

110. What is the probability that the next child of parents A and B would have had sickle cell anemia?

A. 0%

B. 25%

C. 60%

D. 75%

E. 100%

111. The most reasonable explanation for the fact that the offspring of C and D do not have sickle cell anemia is that each received a

A. sickle allele from the mother

B. normal allele from the father

C. sickle allele from each parent

D. normal allele from each parent

E. pair of normal alleles from the father

112. Which of the following statements is correct about the four offspring of C an D?

A. Only the females are carriers of the sickle cell trait.

B. Only the males are carriers of the sickle cell trait.

C. Only the females are heterozygous for the sickle cell trait.

D. All are homozygous for the sickle cell trait.

E. All are carriers of the sickle cell trait.

Questions 113 – 114 refer to the data presented in the graph below of tobacco cells grown in tissue culture. The numbers on the curves indicate the concentrations of indoleacetic acid (IAA) in milligrams per liter.

113. The optimum concentrations of hormones for promoting maximum tobacco cell growth are

A. 27 mg/liter of IAA alone

B. 27 mg /liter of IAA and 2.56 mg /liter of kinetin

C. 27 mg/liter of IAA and .64 mg/liter of kinetin

D. 4 mg/liter of IAA and .64 mg/liter of kinetin

E. 1 mg/liter of IAA and .64 mg/liter of kinetin

114.The purpose of the experiment is primarily to determine the

A. effect of IAA on the growth of tobacco cells
B. the amount of hormone normally released by tobacco cells in tissue culture
C. response of tobacco cells in tissue culture to synthetic hormones
D. response of kinetin to various concentrations of IAA only
E. respone of tobacco cells in tissue culture to combinations of IAA and kinetin

Questions 115-117

In a laboratory experiment using spectrophotometry, an enzyme is combined with its substrate at time zero. The absorbance of the resulting solution is measured at time zero and at five-minute intervals. In this procedure, an increase in absorbance is related to the amount of product formed during the reaction. This experiment is conducted using three preparations shown in the table below,

	Enzyme Preparation	0min	5min	10min	15min	20min
I.	3 mL of enzyme preparation 2mL of substrate pH 5.0	0.0	0.22	0.33	0.38	0.37
II.	3 mL of boiled enzyme preparation 2 mL of substrate pH 5.0	0.0	0.06	0.04	0.03	0.04
III.	3 mL of enzyme preparation 2 mL of substrate pH 6.0	0.0	0.32	0.37	0.36	0.38

115.The most likely reason for the failure of the absorbance to increase significantly after 10 minutes in preparation III is that

A. the reaction is thermodynamically impossible at pH 6.0
B. the enzyme is not active at this pH
C. a pH of 6.0 prevents the color development beyond an absorbance of 0.38
D. the enzyme is degraded more rapidly at pH 6.0 than it is at pH 5.0
E. most of the substrate was digested during the first 10 minutes

116.Which of the following statements is best supported by the data?

A. Increasing the pH to 7.0 would yield an absorbance of .30 after five minutes.

B. The enzyme demonstrates more activity at pH 6.0 than at pH 5.0.

C. The enzyme has no activity at pH 6.0.

D. A pH of 5.0 is the optimum for the activity of the enzyme.

E. The enzymatic activity is independent of pH.

117. Which of the following can best be concluded from the comparison of the results from preparation I with those of preparation II?

A. Heating the enzyme is required to increase the absorbance.

B. Boiling does not break down the substrate.

C. Most of the increase in the amount of product in preparation I was due to enzymatic degradation of the substrate.

D. Enzymatic reactions proceed at a faster rate after boiling the enzyme,

E. Products resulting from the breakdown of the enzyme are responsible for the absorbance increase in preparation II.

Question 118-120

Milkweed is a common field plant that produces a cardiac glycoside which, like digitalis, stimulates heart contractions. The synthesis of this compound ensures the survival of this plant species because the glycoside is toxic to most herbivores with a notable exception – the monarch butterfly.

Female monarchs lay their eggs on milkweed and the resulting larvae (caterpillars) feed on milkweed leaves. An enzyme produced by the caterpillars allows them to ingest and store the toxin without ill effects. After pupation, adult monarchs emerge with a conspicuous bright orange and black banding pattern and retain the toxin glycoside in their systems.

Viceroy butterflies are almost identical to monarchs in possessing the conspicuous banding pattern. However, viceroys cannot metabolize store the toxic glycoside.

118. Which of the following is the central concept of the situation described above?

A. Cryptic coloration

B. Defensive adaptation

C. Convergent evolution

D. Polymorphism

E. Adaptive radiation

119. The conspicuous banding displayed by monarch butterflies is an example of

A. polygenic inheritance

B. polymorphism

C. divergent evolution

D. cryptic coloration

E. warning coloration

120. The banding pattern of viceroy butterflies is an example of

A. mimicry

B. homology

C. polymorphism

D. mutualism

E. commensalism

S T O P

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. AFTER TIME HAS BEEN CALLED, PLEASE TURN THE PAGE AND ANSWER QUESTIONS 121-132.

1990 Biology AP Answers

1.C 21.E 41.A 61.E 81.C 101.D
2.B 22.D 42.A 62. E 82.E 102.A
3.C 23.C 43.D 63.E 83.A 103.B
4.D 24.A 44.B 64.C 84.C 104.E
5.B 25.C 45.D 65.A 85.D 105.D
6.B 26.C 46.B 66.E 86.A 106.E
7.E 27.C 47.B 67.A 87.C 107.B
8.A 28.D 48.E 68.E 88.A 108.A
9.D 29.D 49.C 69.E 89.D 109.A
10.D 30.E 50.A 70.A 90.B 110.B
11.C 31.D 51.D 71.C 91.C 111.B
12.C 32.A 52.D 72.E 92.B 112.E
13.E 33.D 53.A 73.C 93.D 113.C
14.A 34.D 54.B 74.B 94.E 114.E
15.B 35.B 55.D 75.C 95.E 115.E
16.E 36.A 56.A 76.E 96.C 116.B
17.D 37.C 57.B 77.B 97.B 117.C
18.D 38.D 58.D 78.C 98.C 118.B
19.A 39.C 59.A 79.C 99.D 119.E
20.C 40.B 60.B 80.D 100.A 120.A