1. The most efficient oxygenation of blood is found in a:
   a. Bass
   b. Frog
   c. Snake
   d. Robin
   e. Turtle

2. The main abiotic source of carbon in the environment for the carbom cycle comes from:
   a. Carbon dioxide in the air
   b. Carbon dioxide in the water
   c. Carbon monoxide in the air
   d. Carbon monoxide in the water
   e. Carbonates in the air and water

3. The optimum pH and body site for amylase activity is:
   a. 2, stomach
   b. 5, small intestine
   c. 7, oral cavity
   d. 8, stomach
   e. 10, small intestine

4. In the process of photosynthesis, free oxygen is liberated from:
   a. Carbohydrates
   b. Carbon dioxide
   c. Carbon monoxide
   d. Chlorophyll
   e. Water

5. Hydrolysis of lipid molecules yields:
   a. Amino acids and water
   b. Amino acids and glucose
   c. Fatty acids and glycerol
   d. Glucose and glycerol
   e. Glycerol and water

6. Prokaryotic cells lack:
   a. A cell membrane
   b. Cytoplasm
   c. A DNA molecule
   d. A nuclear membrane
   e. Ribosomes

7. The useful energy flowing through a food chain is available mostly to the:
   a. Herbivores
   b. Primary consumers
   c. Producers
   d. Secondary consumers
   e. Tertiary consumers

8. Enzymes affect biochemical reactions by:
   a. Blocking the end product formation
   b. Destroying all substances produced in the reactions
   c. Raising the temperature of the reaction’s environment
   d. Reversing their direction
   e. Accelerating the reaction rates

9. Simple squamous tissue is a type of which of the following kinds of tissue?
   a. Connective
   b. Epithelial
   c. Muscle
   d. Nerve
   e. Vascular

10. The ten-inch human-body tube accepting swallowed food is the:
    a. Esophagus
    b. Larynx
    c. Nasal cavity
    d. Pharynx
    e. Trachea

11. The majority of ATP molecules derived from nutrient metabolism are generated by (the):
    a. Anaerobic fermentation and glycolysis
    b. Fermentation and electron transport chain
    c. Glycolysis and substrate phosphorylation
    d. Krebs cycle and electron transport chain
    e. Substrate phosphorylation

12. Mitosis functions in many organism life cycle events except:
    a. Body cell replacement
    b. Development
    c. Gametogenesis
    d. Growth
    e. Wound healing

13. The Mendelian law that describes the behavior or two or more gene pairs is the law of:
    a. Codominance
    b. Dominance
    c. Independent assortment
    d. Segregation of genes
    e. Recombination

14. The scientific name *Escherichia coli* refers to this bacterium’s:
    a. Class and family
    b. Family and order
    c. Genus and species
    d. Kingdom and phylum
    e. Order and phylum

15. Two parents are heterozygous and display respective blood types A and B. If they mate, the probability of producing and offspring with blood type O is:
    a. 0%
    b. 25%
    c. 50%
    d. 75%
    e. 100%

16. An organism with genotype AaBb can produce a variety of different sex cell genotypes equaling:
    a. 1
    b. 2
    c. 4
    d. 8
    e. 16

17. Fill in the missing blanks for the photosynthetic reaction: Water + (1) → Carbohydrate + (2)
    a. (1) carbon dioxide, (2) oxygen
    b. (1) chlorophyll, (2) oxygen
    c. (1) light, (2) carbon dioxide
    d. (1) oxygen, (2) water
    e. (1) sugar, (2) light

18. Two pink flowers (Rr), of the species Japanese four-o’clock plant, mate. Assuming incomplete dominance, the chance of obtaining a red-colored offspring is:
    a. 0%
    b. 25%
    c. 50%
    d. 75%
    e. 100%

19. The human condition of colorblindness is:
    a. Caused by a recessive allele
    b. Equally common in both sexes
    c. Expressed by a heterozygous genotype in females
    d. Inherited by males from their fathers
    e. Produced by a homozygous genotype in males

20. All are common forms of energy used in metabolism except:
    a. Chemical
    b. Heat
    c. Kinetic
    d. Light
    e. Nuclear
21. A DNA strand in a double helix has a base sequence of ATACGT. The base sequence of its DNA complement is:
   a. ACGUAU
   b. ATACGT
   c. TATGCA
   d. TGCATA
   e. UAUGCA

22. RNA is made by the process of:
   a. Duplication
   b. Fermentation
   c. Replication
   d. Transcription
   e. Translation

23. Select the light with the shortest wavelength absorbed during photosynthesis:
   a. Blue
   b. Green
   c. Orange
   d. Red
   e. Yellow

24. Genes control body chemistry by ultimately specifying the structure of:
   a. Carbohydrates
   b. Lipids
   c. Phospholipids
   d. Proteins
   e. Water

25. The gene that turns structural genes off and on in an operon is the:
   a. Cistron
   b. Operator
   c. Promotor
   d. Regulator
   e. Repressor

26. The Variable portion of a DNA nucleotide is at its
   a. Base
   b. Deoxyribose
   c. Phosphate group
   d. Ribose
   e. Sugar

27. Select the cell type containing the highest concentration of mitochondria.
   a. Erythrocyte
   b. Leukocyte
   c. Muscle
   d. Neuron
   e. Skin

28. Viral replication, in which the host cell bursts following each cycle, is termed:
   a. Conjugation
   b. Lysogenic
   c. Lytic
   d. Transduction
   e. Transformation

29. The smallest, most specific category of classification is the:
   a. Class
   b. Family
   c. Genus
   d. Phylum
   e. Species

30. The largest, most general category of classification is the:
   a. Class
   b. Genus
   c. Kingdom
   d. Phylum
   e. Species

31. The function of phloem is to:
   a. Cover and protect
   b. Convert nutrients from the soil
   c. Strengthen and support
   d. Store reserve materials
   e. Transport organic solutes

32. Which one of the following five components of a reflex arc carries out the organism’s response?
   a. Effector
   b. Motor neuron
   c. Receptor
   d. Sensory neuron
   e. Spinal cord

33. In the binomial Quercus alba, the first term represents the organism’s
   a. Class
   b. Genus
   c. Order
   d. Phylum
   e. Species

34. The largest number of known species is represented by the phylum:
   a. Arthropoda
   b. Annelida
   c. Echinodermata
   d. Platychelminthes
   e. Porifera

35. A human birth defect produced by a dominant allele of a gene is:
   a. Albinism
   b. Diabetes mellitus
   c. Hemophilia
   d. High cholesterol
   e. Low melanin levels

36. The root system of plants can function for all of the following except:
   a. Absorption
   b. Anchorage
   c. Storage
   d. Transpiration
   e. Transport

37. What type of leaf structures and environmental conditions promote gas exchange in plants?
   a. Cortex, heat
   b. Cortex, cold
   c. Mesophyll, high humidity
   d. Stomata, heat
   e. Stomata, normal temperatures

38. The falling off of a leaf from the branch of a deciduous tree is termed:
   a. Absorption
   b. Abscission
   c. Evaporation
   d. Perennial
   e. Transpiration

39. Phloem conducts:
   a. Ions
   b. Glucose
   c. Glycogen
   d. Minerals
   e. Sucrose

40. The skin performs all of the following human body functions except:
   a. Identification of an individual
   b. Protection
   c. Sensation
   d. Storage
   e. Temperature regulation

41. The biceps brachii produce movements by pulling on:
   a. Bones
   b. Joints
   c. Muscles
   d. Nerves
   e. Skin

42. Which of the following can be said to be a semiconservative process?
   a. Conjugation
   b. DNA replication
   c. RNA transcription
   d. Translation
   e. Translocation
43. Neurons that conduct signals away from the central nervous system are classified as:
   a. Afferent
   b. Associative
   c. Internuncial
   d. Motor
   e. Sensory
44. The innermost layer of the eye is the:
   a. Choroid coat
   b. Cornea
   c. Pupil
   d. Retina
   e. Sclera
45. Which of the following is not a polymer?
   a. DNA
   b. Glycogen
   c. Glucose
   d. RNA
   e. Starch
46. Select the nonpathogenic bacterium:
   a. Clostridium
   b. Escherichia
   c. Salmonella
   d. Staphylococcus
   e. Treponema
47. The largest number of chambers is found in the heart of an:
   a. Amphibian
   b. Bird
   c. Fish
   d. Reptile
   e. Shark
48. Which law explains the inhalation and exhalation of air in terms of pressure changes?
   a. Archimedes’s Law
   b. Aristotle’s Law
   c. Boyle’s Law
   d. Dalton’s Law
   e. Mendel’s Law
49. Evolution is a process exhibited by:
   a. Cell
   b. Tissue
   c. Organ
   d. Organ system
   e. Population
50. Graded variations in a species’ trait over a geographic distribution is a(n)
   a. Cline
   b. Genus
   c. Inbreeding
   d. Mutation
   e. Polymorphism
51. Paramecium caudatum is best classified into the kingdom:
   a. Animalia
   b. Fungi
   c. Monera
   d. Plantae
   e. Protista
52. Which of the following is a single bacterial cell?
   a. Diplobacillus
   b. Gonococcus
   c. Staphylococcus
   d. Streptococcus
   e. Streptomyces
53. Bacteria that can effectively carry out metabolism in the presence or absence of oxygen are described as:
   a. Aerobic
   b. Anaerobic
   c. Facultative anaerobes
   d. Fermentative microbes
   e. Glycolytic
54. Each is an important assumption for maintenance of a Hardy-Weinberg equilibrium in a population except:
   a. Asexual reproduction
   b. Random mating among members
   c. Large population size
   d. Lack of emigration or immigration
   e. Absence of new mutations
55. All the roles and associations of a species in its community comprise its:
   a. Cycle
   b. Ecosystem
   c. Habitat
   d. Niche
   e. Population
56. The free-swimming coelenterate larva is the:
   a. Coral
   b. Hydra
   c. Medusa
   d. Planula
   e. Polyp
57. Plant-eaters can digest plant cell walls due to their utilization of which enzyme?
   a. Amylase
   b. Cellulase
   c. Chymotrypsin
   d. Pepsin
   e. Trypsin
58. A coelom is a(n):
   a. Body cavity bounded by mesoderm, in which the viscera are suspended
   b. Digestive tract, which is endodermal in origin
   c. Outer skin that is ectodermal in origin
   d. Specialized region of the higher forebrain
   e. One of the four mammalian heart chambers
59. Which of the following types of organisms occupies the trophic level of least biomass?
   a. Herbivores
   b. Plants
   c. Primary consumers
   d. Secondary consumers
   e. Tertiary consumers
60. The invertebrate phylum phylogenetically closest to the chordates is:
   a. Annelida
   b. Arthropoda
   c. Cnidaria
   d. Echinodermata
   e. Mollusca
61. An insect metamorphic life cycle occurs in which of the following sequences?
   a. Adult-pupa-larva-egg
   b. Egg-larva-pupa-adult
   c. Larva-adult-egg-pupa
   d. Pupa-egg-larva-adult
   e. Pupa-adult-larva-egg
62. Highest pressure of circulation blood is found in:
   a. Arteriole
   b. Artery
   c. Capillary
   d. Vein
   e. Venule
63. Which of the following is part of a human’s axial skeleton
   a. Clavicle
   b. Fibula
   c. Humerus
   d. Rib
   e. Scapula
64. Glial cells:
   a. Conduct signals
   b. Contribute to movement
   c. Cover the skin
   d. Support neurons
   e. Transport oxygen
65. Select the disease caused by a protozoa
   a. Chicken pox
   b. Common cold
   c. Malaria
   d. Measles
   e. Smallpox

66. Which of the following has a vitamin as a building block?
   a. Apoenzyme
   b. Coenzyme
   c. Holoenzyme
   d. Mineral
   e. Protein

67. The filtering of inhaled debris that travels through the upper respiratory tract occurs through the action of:
   a. Cilia
   b. Goblet cells
   c. Leydig cells
   d. Phagocytes
   e. Villi

68. Substances in the blood are transported across the nephron tubules by mechanisms in the process of:
   a. Bulk flow
   b. Filtration
   c. Osmosis
   d. Reabsorption
   e. Secretion

69. A person receives the results of a hematocrit during a series of blood tests. A hematocrit is the:
   a. Abundance of white blood cells in the blood
   b. Concentration of sugar in the blood
   c. Level of circulating antibodies
   d. Percentage of blood cellular material by volume
   e. Typing of the blood by the ABO scheme

70. An insect is captured and studied in a laboratory. This insect has a pair of short, rigid wings, and a pair of thin veined wings. It also has chewing mouthparts. The insect will most likely be classified as a member of which of the following orders?
   a. Diptera
   b. Hemiptera
   c. Homoptera
   d. Lepidoptera
   e. Orthoptera

Questions 71-74 refer to the macromolecules diagrams below.

Questions 75-78 refer to the diagram below.

75. organizes cell division
76. movement of the cell
77. internal transport
78. extraction of energy from nutrients

Questions 79-82 refer to stages of meiosis I.

Questions 83-86 refer to the listed descriptions of skeletal muscle contraction types.

83. fatigue
84. simple twitch
85. summation
86. tetanus

Questions 87-90 refer to various descriptions of:

87. Annelida
88. Arthropoda
89. Echinodermata
90. Mollusca
Questions 91-93 refer to the drawing below.

91. The root cortex
92. The root epidermis
93. Root Xylem

Questions 94-97 refer to the drawing below.

94. Gas exchange occurs here.
95. A waxy cuticle is thicker here.
96. A higher chloroplast density occurs here.
97. The highest humidity would be here.

Questions 98-101 refer to the diagram below.

98. A sudden change in an organism’s amount of extracellular fluid will be corrected by this organ.
99. A person eats three candy bars. Within minutes, this endocrine gland affects blood sugar homeostasis.
100. Substances that cause vasoconstriction change the diameter of the blood vessels in order to assist in increasing blood pressure.
101. Secrete aldosterone.

Questions 102-105 refer to the organelles of a cell and their functions

a. Site of mRNA translation
b. Contains a circular arrangement of 18 microtubules that surround 2 microtubules
c. Contains a circular arrangement of 27 microtubules
d. Site of rRNA synthesis
e. Contains a circular arrangement of nine microtubules surrounding two microtubules

102. centriole
103. cilium
104. nucleolus
105. ribosome

Questions 106-107 refer to the drawing below.

106. Producer biomass
107. Secondary consumer

Questions 108-110 refer to the diagram below.

108. The intracellular environment is best described as:
   a. Hypertonic
   b. Hypotonic
   c. Isotonic
   d. Osmotic
   e. Permeable

109. The extracellular environment will:
   a. Gain water
   b. Gain solute
   c. Lose water
   d. Lose solute
   e. Remain unchanged

110. Over time the cell will:
   a. Become more hypertonic intracellularly
   b. Enlarge and experience lysis
   c. Experience crenation
   d. Lose motility
   e. Lose solute
Questions 111-112 refer to the genetic grid below.

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<tr>
<td>Ab</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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</table>

111. In the genetic cross, what is the percentage of genetic recombinations that are heterozygous for both loci?
   a. 0
   b. 25
   c. 50
   d. 75
   e. 100

112. A genotype that is not produces among offspring from this cross:
   a. AABb
   b. AAbb
   c. AaBb
   d. Aabb
   e. aaBB

Questions 113-115 refer to the diagram below:

113. DNA nucleotide base #2 is cytosine. The RNA base of #6 is:
   a. Adenine
   b. Cytosine
   c. Guanine
   d. Thymine
   e. Uracil

114. RNA Base #7 is uracil. The DNA base at #3 is:
   a. Adenine
   b. Cytosine
   c. Guanine
   d. Thymine
   e. Uracil

115. The DNA-base sequence from 1-4 is CGCT. The RNA base sequence from 5 to 8 is:
   a. ACGG
   b. CGCT
   c. CGCU
   d. GCCG
   e. TCGC

Questions 116-118 refer to the drawing below

Somatic Cells

Capillary

Arrow indicates the direction of blood flow.

116. Region A
   a. Accepts carbon dioxide from cells
   b. Receives blood from an ateriole
   c. Receives nutrients from cells
   d. Has a lower blood pressure than the blood pressure at B
   e. Transports blood to an artery

117. Region B
   a. Accepts oxygen from cells
   b. Gives carbon dioxide to cells
   c. Has a higher blood pressure than the blood pressure at A
   d. Transports blood to a venule
   e. Unloads nutrients to cells

118. The best word to describe this blood vessel’s function is:
   a. Circulation
   b. Exchange
   c. Flow
   d. Pressurization
   e. Transport

Questions 119-120 refer to the graph below.

119. Point A on the graph reflects blood hemoglobin behavior at the:
   a. Heart
   b. Kidney
   c. Lung
   d. Tissue cell
   e. Vein

120. Point B on the graph reflects blood hemoglobin behavior at the:
   a. Artery
   b. Kidney
   c. Liver
   d. Lung
   e. Tissue cell