For Each multiple choice question, answer not only the question, but also figure out what the question must be for the other answers to be right.

Science Of Life

1. Which of the following is not a characteristic of all living organism:
    a. Energy Processing
    b. Evolutionary Adaptation
    c. Growth and Development
    d. Order
    e. Photosynthesis
    f. Regulation / Homeostasis
    g. Reproduction
    h. Response to Environment

2. Multicellular organisms like plants and animals are made up of:
    a. Eukaryotic Cells
    b. Prokaryotic Cells

3. Number the levels of the hierarchy of Biological Organization starting with atoms
    __**1**___ Atoms
    _____ Biosphere
    _____ Cells
    _____ Community
    _____ Ecosystem
    _____ Molecules
    _____ Organ
    _____ Organ System
    _____ Organelles
    _____ Organism
    _____ Population
    _____ Tissues

4. Briefly define the terms as used in the scientific Method: Observation, Hypothesis, Prediction, Experiment, Theory

Chemistry, Biological Molecules

5. What are the special properties of water that make it relevant to life?

6. In glucose, a Carbon and Oxygen atom unequally share a hydrogen atom. This is an example of a :
    a. Hydrogen Bond
    b. Ionic Bond

c. Non-Polar Covalent Bond
d. Polar Covalent Bond

7. Among the common biological molecule, _____ contains monosaccharides like Glucose and Fructose and Polysaccharides like Starch and Glycogen
    a. Carbohydrates
    b. Lipids
    c. Nucleic Acids
    d. Proteins

8. These biological molecules are used for long-term energy storage and are the main components of cell membranes:
    A. Carbohydrates
    B. Lipids
    C. Nucleic Acids
    D. Proteins

Cell Structure and Function, Membrane Function

9. These cell do not have their nucleus encased in a membrane:
    A. Eukaryotes
    B. Prokaryotes

10. Match the cell organelle with the function

_____ Chloroplasts A.
_____ Cytoskeleton
_____ Extracellular Matrix
_____ Golgi Apparatus
_____ Lysosome
_____ Mitochondrion
_____ Nucleolus
_____ Nucleus
_____ Plasma Membrane
_____ Ribosomes
_____ Rough Endoplasmic Recticulum
_____ Smooth Endoplasmic Recticulum
_____ Vacules

A. contains most of the cell's DNA and controls the cell's activities by directing protein synthesis by making messenger RNA (mRNA).
B. the site of ribosomal RNA (rRNA) synthesis.
C. are involved in the cell's protein synthesis, either free in the cytoplasm or bound to the Rough Endoplasmic Recticulum

D. produces enzymes important in the synthesis of lipids, helps process drugs, alcohol, and other potentially harmful substances, and may store calcium ions.
E. Makes proteins for membranes and proteins for export from the cell
F. Finishes, sorts, and ships cell products
G. a membranous sac containing digestive enzymes which help digest food particles engulfed by a cell
H. large vesicles that have a variety of functions in the general maintanence of the cell
I. A Phospholipid bilayer that forms a barrier between the cell and the outside world. Regulates movement of things into and out of the cell
J. carry out cellular respiration in nearly all eukaryotic cells, converts the chemical energy in foods to chemical energy in ATP (adenosine triphosphate).
K. photosynthesizing organelles of all photosynthesizing eukaryotes, conversion of light energy from the sun to the chemical energy of sugar molecules.
L. a network of protein fibers, which functions in structural support and motility.
M. helps hold cells together in tissues and protects, supports the plasma membrane

11. These types of cell junctions prevent leakage of extracellular fluid across a layer of epithelial cells:
    A. Anchoring Junctions
    B. Gap Junctions
    C. Tight Junctions

12. Why is the Plasma Membrane Known as a "Fluid Mosaic"?

13. If water diffuses from the surrounding solution into the cell, that solution is said to be:
    A. Hypertonic
    B. Hypotonic
    C. Isotonic

14. Ions like Na+ and K+ passively cross the cell membrane through protein with water-filled channels in their center. This type of passive transport is:
    A. Diffusion across the plasma membrane
    B. Diffusion through ion channels
    C. Diffusion via transport proteins (Carrier-mediated Diffusion)

15. In this type of active transport, small molecules like glucose are moved against their concentration gradient. The energy comes from Na+ moving down its concentration gradient
    A. Primary Active Transport
    B. Secondary Active Transport
    C. Exocytosis/Endocytosis

Energy and Metabolism

16. A chemical reaction that releases energy is said to be:
    A. Endergonic
    B. Exergonic

17. Why do we refer to enzymes as “Protein Catalysts”?

18. This portion of cellular respiration occurs in the cytoplasm and involves the breakdown of glucose into 2 pyruvate molecules:
    A. Glycolysis
    B. Citric Acid Cycle
    C. Oxidative Phosphorylation

DNA, Biotechnology; Mitosis & Meiosis; Genetics

19. Because more than one codon encodes a particular amino acid, the genetic code is said to be:
    A. Nearly Universal
    B. Redundant
    C. Unambiguous

20. In this process an RNA copy of the original DNA is made:
    A. Duplication
    B. Transcription
    C. Translation

21. In this Biotechnology technique, multiple, identical copies of a gene-carrying piece of DNA are produced:
    A. DNA profiling
    B. Gene Cloning
    C. Gene Therapy
    D. Genetically Modifies Organism (GMOs)

22. During This type of cell division, the DNA is duplicated and the cell divides twice to produce 4 daughter cells, each with ½ the DNA of the parent cell:
    A. Meiosis
    B. Mitosis

23. During this phase of the cell cycle, duplication of chromosomes occurs:
    A. G_1 Phase
    B. G_2 Phase
    C. Miotic Phase
    D. S Phase

24. Draw a cell during Prophase, Metaphase Anaphase, and Telophase of the cell cycle.

25. _____ are different versions of a given gene
    A. Allele
    B. Diploid
    C. Gene
    D. Genotype
    E. Haploid
    F. Phenotype

26. An individual whose genotype consists of two different alleles for a given phenotype is said to be:
    A. Heterozygous
    B. Homozygous

27. Draw a Punnett Square for an F_2 cross between individuals who are heterozygous for two independent genes – AaBb X AaBb

28. When the effect of both alleles is equally visible in the phenotype of the heterozygote, this is known as:.
    A. Codominant
    B. Dominant
    C. Incomplete Dominance
    D. Recessive

Tissues; Muscle Skeletion

29. This tissue contracts to provide movement and heat
    A. Epithelial Tissue
    B. Connective Tissue
    C. Muscular Tissue
    D. Nervous Tissue

30. This tissue is a hard mineralized tissue found in the skeleton:
    A. Connective Tissue
    B. Cartilage
    C. Bone
    D. Blood & Lymph
    E. Adipose

31. This type is striated and contracts rhythmically on its own. It is found in the heart:
    A. Cardiac Muscle

B. Skeletal Muscle
C. Smooth Muscle

32. This part of a feedback system compares the monitored property if the desired value:
    A. Effector
    B. Error Signal
    C. Integrator (Comparator)
    D. Sensor
    E. Set Point

33. If in a feedback system, the output is the opposite of the initial input, the feedback system is a:
    A. Negative Feedback System
    B. Positive Feedback System

34. These bone cells use acids and enzymes to break down bone structure:
    A. Osteoblasts
    B. Osteoclasts

35. Put the number 1 before structures that are part of the Axial Skeleton and the number 2 before structures that are part of the Appendicular Skeleton
    _____ Cranial Bones
    _____ Facial Bones
    _____ Hyoid Bone
    _____ Lower Appendages
    _____ Pectoral Girdle
    _____ Pelvic Girdle
    _____ Ribs
    _____ Upper Appendages
    _____ Vertebrae

36. What is the Sliding Filament Hypothesis and how does it relate to muscle contraction?

37. Number the steps in muscle contraction in the correct order
    _____ Acetyl Choline triggers an Action Potential in th Muscle cell
    _____ Action Potential in muscle cell releases Calcium from Sarcoplasmic Recticulum
    _____ Calcium binds to Troponin which moves Tropomyosin out of the way
    _____ Motor Neuron releases Acetyl Choline
    _____ Myosin + ADP + Phosphate bind to Actin
    _____ Myosin pulls Actin, releasing ATP and Phosphate
    _____ Myosin binds ATP releasing Actin

_____ Myosin cuts ATP to ADP and Phosphate and resets

Digestion, Nutrition

38. These Molecules are broken down into amino acids during digestion:
    A. Carbohydrates
    B. Lipids
    C. Minerals
    D. Proteins
    E. Vitamins

39. During this type of gut motility, food is mixed in the gut:
    A. Peristalsis
    B. Segmentation

40. This layer of the gut wall is the outermost layer, It attaches the gut to the lining of the body cavity:
    A. Mucosa
    B. Submucosa
    C. Muscularis
    D. Serosa

41. Match the digestive organ with the function
    A. Esophagus
    B. Gall Bladder
    C. Large Intestine
    D. Liver
    E. Mouth, Tongue and Teeth
    F. Pancreas
    G. Pharynx
    H. Salivary Glands
    I. Small Intestine
    J. Stomach
    K. Tonsils

_____ Grinds food and shapes it for the digestive tract
_____ Protects the body from bacteria entering the digestive tract
_____ produces mucus to lubricate food and releases an enzyme for carbohydrates
_____ Gateway between digestive tract and respiratory tract
_____ Conducts food to stomach using peristalsis
_____ Stores food. Secretes acid to begin digestion of proteins
_____ Site of most digestion and almost all absorption of nutrients
_____ Stores waste material, recovers water, and site of large numbers of bacteria

_____ Produces bile. Processes carbohydrates and proteins following absorption in the gut
_____ Stores bile until needed for digestion
_____ Produces enzymes that digest proteins, carbohydrates, and lipids. Produces bicarbonate to neutralize stomach acids.

42. Briefly describe the digestion and absorption of Proteins, Carbohydrates, and Lipids

Nervous System; Sensory Systems

43. These neurons compose part of the peripheral nervous system and carry information from the central nervous system to effector organs (muscles and glands):
    A. Interneurons
    B. Motor Neurons
    C. Sensory Neurons

44. This part of the neuron is the "input" to the neuron:
    A. Axon
    B. Axon Hillock
    C. Axon Terminals
    D. Cell Body
    E. Dendrites

45. If the membrane potential of a neuron becomes more negative, this is called a:
    A. Action Potential
    B. Depolarization
    C. Equilibrium potential
    D. Hyperpolarization
    E. Membrane Potential
    F. Resting Potential

46. Draw an Action Potential. Show the behavior of the two main ion channels during the action potential

47. What do I mean when I say an action potential propagates?

48. In this type of synapse ions (current) flow directly from one neuron to another

49. Place the steps of a chemical synapse in order
    _____ Action potential propagate to presynaptic terminal
    _____ Calcium triggers synaptic vesicles to open, releasing transmiiter
    _____ Current flows into postsynaptic cell either hyperpolarizing it
    _____ Depolarization of presynaptic terminal opens Calcium channels

__**8**__ If the membrane potential of the postsynaptic cell reaches threshold, an action potential is generated
_____ Receptor is ion channel that opens
_____ Transmitter diffuses to postsynaptic membrane
_____ Transmitter binds to receptor in postsynaptic membrane

50. This portion of the nervous system triggers the "Fight or Flight" response
    A. Central Nervous System
    B. Peripheral Nervous System
    C. Parasympathetic Nervous System
    D. Sympathetic Nervous System

51. This lobe of the cerebral cortex involves planning:
    A. Frontal
    B. Occipital
    C. Parietal
    D. Temporal

52. Brain parts
    A. Amygdala
    B. Broca's Area
    C. Cerebellum
    D. Corpus callosum
    E. Hypothalamus
    F. Medulla Oblongata
    G. Midbrain
    H. Pons
    I. Thalamus
    J. Wernicke's Area

53. What do I mean when I say the somatosensory cortex and motor cortex is arranged topographically?

54. These senses include taste and smell:
    A. Mechanoreceptors
    B. Chemoreceptors
    C. Electromagnetic Receptors
    D. Thermoreceptors
    E. Pain receptors

55. These mechanoreceptors detect linear acceleration
    A. Saccule and Utricle
    B. Semicircular canals

56. How does the cochlea detect different frequencies of sound?

57. These photoreceptors are used during high acuity, color vision::
    A. Cones
    B. Rods

58. Outline the steps in phototransduction in the human photoreceptor

59. These taste receptors to acids (H^+ ions):
    A. Bitter
    B. Salty
    C. Sour
    D. Sweet
    E. Umami

Respiratory System; Circulatory System; Immune System

60. This is the amount of air you could still exhale after a normal exhalation:
    A. Expiratory Reserve Volume
    B. Forced Expiratory Volume
    C. Functional Residual Capacity
    D. Inspiratory Capacity
    E. Inspiratory Reserve Volume
    F. Residual Volume
    G. Tidal Volume
    H. Total Lung Capacity
    I. Vital Capacity

61. What is the partial pressure of a gas? Why do we use partial pressures when talking about gases?

62. Number the steps in inspiration in the correct order:
    _____ Air flows into lungs
    _____ Alveolar pressure drops
    _____ Chest cavity expands
    _____ Contract inspiratory muscles
    _____ Interpleural pressure drops
    _____ Lungs expand

63. Draw the Oxygen Dissociation Curve. Why is it S-shaped? Why is this physiologically important?

64. Most carbon dioxide is transported as:
   A. CO2 dissolved in blood
   B. Carbaminohemoglobin
   C. Bicarbonate ions (HCO_3^-)

65. Starting with the Vena Cava, trace the pathway of blood through the heart. Circle the names of chambers and vessels with oxygenated blood:
   _____ Aorta
   _____ Left Atrium
   _____ Left Ventricle
   _____ Pulmonary Artery
   _____ Pulmonary Vein
   _____ Right Atrium
   _____ Right Ventricle
   __**1**__ Vena Cava

66. This pressure is the value arterial pressure drops to during relaxation of the heart:
   A. Diastolic Pressure
   B. Systolic Pressure

67. These blood vessels are the site of exchange between the blood and the tissues:
   A. Arteriole
   B. Artery
   C. Capillary
   D. Vein & Venules

68. These components of blood are cells that are involved in the transport of oxygen. They are also known as Red Blood Cells:
   A. Erythrocytes
   B. Leukocytes
   C. Plasma
   D. Platelets

69. The skin and bacteria that grow on the skin, constitute:
   A. Adaptive Immune System
   B. External Defenses
   C. Innate Immune System

70. In this Innate Immune Response, cells that are invaded by viruses release chemicals that protect neighboring cells:
   A. Complement System
   B. Inflammation
   C. Interferons

D. Natural Killer Cells
E. Phagocytosis

71. When activated, these Adaptive Immune cells release antibodies into the blood to combat foreign materials:
    A. B cells
    B. Cytotoxic T Cells
    C. Helper T Cells

Evolution; Ecology

72. What are the observations/conclusions that underlie Darwin's theory of evolution by natural selection?

73. List four major pieces of evidence that evolution occurs

74. If a population is drastically reduced in numbers: that is an example of this mechanism of evolution
    A. Natural Selection
    B. Genetic drift
    C. Bottleneck and founder effect
    D. Gene flow
    E. Sexual selection

75. What defines a "Species"?

76. This biome contains forests of trees that drop their leaves in the winter
    A. Chaparrel
    B. Deciduous Forests
    C. Desert
    D. Grasslands (Prairies)
    E. Polar Ice
    F. Savannas
    G. Taiga
    H. Tropical Rain Forests
    I. Tropical Uplands
    J. Tundra

77. Give a dramatic example of human's effects on the global climate