ADDIS ABABA CITY GOVERNMENT EDUCATION BUREAU

GRADE 12 BIOLOGY MODEL EXAMINATION.

NUMBER OF QUESTIONS: 100 **TIME ALLOWED: 2: HOURS**

GENERAL DIRECTION

THIS BOOKLET CONTAINS **BIOLOGY** MODEL EXAMINATION. THIS EXAMINATION CONSISTS OF A TOTAL OF **100 MULTIPLE CHOICE QUESTIONS**. CAREFULLY SELECT THE BEST ANSWER AND WRITE THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS ON BOTH THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY.

PLEASE DO NOT WRITE UNNECESSARY MARKS ON THE ANSWER SHEET.

YOU ARE ALLOWED TO WORK ON THE EXAMINATION FOR **2 HOURS.** WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, PUT YOUR PEN DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT DURING THE EXAMINATION WILL RESULT IN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

PLEASE MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU BEGIN WORKING ON THE EXAMINATION.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Which of the following renowned Ethiopian biologists is known for developing and growing locally adapted native seeds without the use of commercial fertilizers or chemicals?
   (A) Professor Tilahun Yilma
   (B) Professor Gebisa Ejeta
   (C) Professor Sebsebe Demissew
   (D) Dr. Melaku Worede

2. What is the **limit of resolution** for a standard optical light microscope compared to an electron microscope?
   (A) Light microscope: 0.1 mm; Electron microscope: 200 nm
   (B) Light microscope: 200 nm; Electron microscope: 0.3 nm
   (C) Light microscope: 2000 nm; Electron microscope: 2,000,000 nm
   (D) Light microscope: 0.3 nm; Electron microscope: 200 nm

3. A plant cell is unable to regulate the movement of materials into and out of its interior. As a result, waste enters the cell and vital nutrients leak out. Which of the following might structures is failing to function?
   (A) Cell wall
   (B) Cell membrane
   (C) Endoplasmic reticulum
   (D) Vacuole

4. In a model of osmosis, two solutions are separated by a semi-permeable membrane and labeled **Side A** and **Side B**. Over time, the fluid level (and weight) of Side B begins to rise. Based on this observation, which of the following statements is true?
   (A) Solution A is hypotonic to solution B
   (B) Solution A is isotonic to solution B
   (C) Solution A is hypertonic to solution B
   (D) It is impossible to determine

5. A laboratory investigation was conducted using three distinct food samples. The samples were treated as follows:
   Test Tube 1: Biuret reagent was added.
   Test Tube 2: Benedict's solution was added (and heated).
   Test Tube 3: Iodine solution was added.
   All three test tubes showed a positive result. Which of the following correctly matches the test tube, the organic compound it contains, and the observable positive result?
   (A) Test tube 1, protein, Orangey or red precipitate appears
   (B) Test tube 2, reducing sugar, A purple (mauve) color appears
   (C) Test tube 3, starch, A blue-black color appears
   (D) Test tube 2, protein, Orangey or red precipitate appears

6. How does bile assist the enzymes found in the small intestine to work most effectively?
   (A) It increases the acidity of the food coming from the stomach.
   (B) It neutralizes stomach acid to create an alkaline environment.
   (C) It breaks down lipid in to fatty acid and glycerol
   (D) It cools the temperature of the semi-digested food.

7. In the human respiratory system, the actual site of gas exchange is the:
   (A) Trachea
   (B) Bronchi
   (C) Alveoli
   (D) Larynx

8. During the process of inhalation (breathing in), what specific changes occur in the thorax to allow air to enter the lungs?
   (A) The diaphragm relaxes and becomes dome-shaped
   (B) The internal intercostal muscles contract to pull the ribs downward.
   (C) The volume of the chest decreases, forcing air into the lungs
   (D) The external intercostal muscles contract, pulling the ribs up

9. How does a high-altitude environment initially affect a person's breathing compared to being at sea level?
   (A) The higher concentration of oxygen causes the breathing rate to slow down
   (B) The lower concentration of oxygen in the air causes a person to breathe faster
   (C) The increased atmospheric pressure makes it easier for oxygen to diffuse into the blood
   (D) Altitude has no measurable impact on the depth or rate of ventilation

10. A person undergoing a blood test finds that their red blood cells lack both A and B antigens. Based on this finding, which of the following statements is true?
   (A) The person belongs to Blood Group AB
   (B) The person can safely receive a transfusion from a Group A donor
   (C) The person's blood plasma contains both anti-A and anti-B antibodies.
   (D) The person is considered a universal recipient

11. The right ventricle has a thinner muscular wall compared to the left ventricle. What is the primary functional reason for this structural difference?
   (A) The right ventricle stores blood rather than pumping it
   (B) The right ventricle only pumps blood to the nearby lungs, requiring less pressure
   (C) The right ventricle carries deoxygenated blood, which is less dense
   (D) The right ventricle lacks the electrical stimulation needed for high pressure

12. Which of the following scenarios best illustrates the concept of **artificial active immunity**?
    (A) Person recovering from a cold and becoming immune to that specific strain naturally
    (B) Using an antiseptic on a cut to prevent bacteria from entering the bloodstream
    (C) A child receiving a weakened strain of polio through injection to prevent future infection
    (D) Individual receiving emergency rabies shot containing antibodies after a dog bite

13. Which of the following is the primary method of transmission for a human to develop an adult tapeworm infection (Taeniasis)?
    (A) Walking barefoot on soil contaminated with larvae
    (B) Drinking water contaminated with tapeworm eggs
    (C) Being bitten by an infected mosquito vector
    (D) Eating undercooked meat containing larval cysts

14. What is a major social impact of HIV/AIDS that complicates prevention and control efforts in Ethiopia?
    (A) The rapid expansion of digital communication.
    (B) The elimination of traditional religious practices
    (C) Social stigma and discrimination against People living with HIV
    (D) An increase in the literacy rate across rural provinces.

15. Consider the following statements regarding the rules for writing scientific names:
    I. The genus name is written first and begins with a capital letter
    II. The species name begins with a capital letter
    III. When printed, the entire scientific name should be in italics
    IV. The genus name can be abbreviated to a single capital letter after its first use
    Which of the following represents the **correct** set of rules?
    (A) I, II, and III
    (B) I, III, and IV
    (C) II, III, and IV
    (D) I, II, and IV

16. An animal with a soft body, a muscular foot, and a visceral mass protected by a shell belongs to which phylum?
    (A) Arthropoda
    (B) Echinodermata
    (C) Mollusca
    (D) Chordata

17. A biologist observes an organism that is microscopic and single-celled. To decide whether to classify it in Kingdom Monera or Kingdom Protista, which of the following must be determined?
   (A) Whether the genetic material is enclosed within a separate nucleus
   (B) Whether the organism can move using a muscular foot.
   (C) Whether the organism is capable of causing diseases in humans
   (D) Whether the organism lives in a marine or terrestrial environment

18. In a coral reef ecosystem, energy flows through various organisms based on their feeding relationships. Consider a specific marine food chain observed by researchers:

   Algae → Parrotfish→ Grouper → Barracuda

   Which one of the following statements regarding this food chain is **incorrect**?
   (A) Algae occupy the first trophic level as it converts solar energy into chemical energy
   (B) Algae population holds the highest amount of stored energy compared to all other levels
   (C) The Parrotfish functions as a carnivore that regulates the Grouper population
   (D) The Barracuda has the least amount of available energy due to loss at each level

19. Which one of the following is an adaptation is used to reduce water loss in plants?
   (A) Having a single layered epidermis in leaves
   (B) Thin broad leaves
   (C) Large and wide stomata
   (D) Leaves covered with waxy cuticle

20. Temperature, rock types, soil drainage and pH levels are critical components that influence an ecosystem. These are examples of:
   (A) Biotic factors
   (B) Abiotic factors
   (C) Biological factors
   (D) Adaptive factors

21. A biologist is organizing a museum exhibit and wants to categorize four research scientists (A, B, C, and D) based on the specific groups of organisms they study

   Scientist A: Studies the structure, function of animals

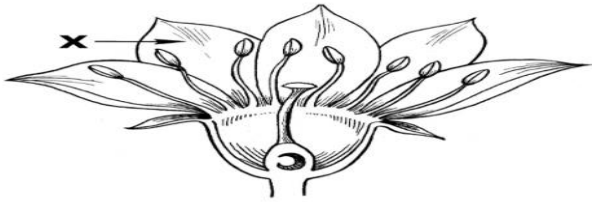
   Scientist B: Focuses on the scientific study of plants, their physiology and genetics

   Scientist C: Investigates the complex world of insects

Based on these descriptions, Scientists A, B, C can be classified under which biology sub-fields, respectively?
   (A) Zoology, Botany, Entomology
   (B) Botany, Zoology, Entomology
   (C) Zoology, Entomology, Ornithology
   (D) Entomology, Zoology , Botany

22. Which scientist is credited with providing the experimental support for the concept of infectious disease and pinpointing the causal agents for tuberculosis and cholera?
    (A) Robert Koch
    (B) Antonie van Leeuwenhoek
    (C) Galen
    (D) Wilmut

23. Answer the following based on the following image. In this picture" X" represents:
    (A) Sepal
    (B) Stigma
    (C) Stemen
    (D) Petal



24. Which statement best describe the positioning and role of the **endodermis** in a plant stem?
    (A) It is the outermost layer of the cortex that protects the epidermis
    (B) It is the innermost layer of the cortex that separates the cortex from the vascular bundles
    (C) It is a loosely arranged layer of cells located within the vascular bundles
    (D) It is the central core of the stem used primarily for water transport

25. A gardener notices that after planting maize, the seed remains at its original depth even after the first leaves appear. In contrast, nearby bean seeds have carried their cotyledons above ground. Which of the following is true about these types of germination?
    (A) Maize germination is epigeal
    (B) In maize, the hypocotyl elongates rapidly
    (C) Bean germination is epigeal
    (D) In bean seed radicle transforms into the primary leaf

26. A farmer applies a metabolic poison to a plant that stops all ATP production (cellular energy) in the roots and leaves. Based on the mechanisms of transport, what is the most likely result?
    (A) Both water and food transport will stop immediately because both are passive processes
    (B) Water transport will stop, but the translocation of food will continue normally.
    (C) Water transport through the xylem will continue, but food transport in the phloem will stop
    (D) The plant will switch to using diffusion to move food through the dead cells of the xylem

27. A germinating seedling is placed in a clinostat that rotates slowly and continuously in a horizontal position. After several days, what is the expected growth pattern of the root and the shoot?
    (A) Both the root and shoot grow downward toward the force of gravity
    (B) Both the root and shoot grow upward away from the force of gravity
    (C) The root grows downward and the shoot grows upward
    (D) Both the root and shoot continue to grow horizontally in a straight line

28. A phospholipid molecule contains a hydrophilic (water-loving) region. Which specific part of the molecule makes up this polar region?
    (A) The fatty acid chain
    (B) The glycerol molecule
    (C) The phosphate group
    (D) The hydrocarbon tail

29. Which property of water allows it to act as a temperature buffer in living organisms, preventing rapid internal temperature changes?
    (A) Low density as ice
    (B) High specific heat capacity
    (C) Surface tension
    (D) Low latent heat of vaporization

30. A patient presents with an enlarged thyroid gland (goiter). This condition is most directly linked to a deficiency in:
    (A) Iron
    (B) Calcium
    (C) Iodine
    (D) Chloride

31. Which one of the following takes place during **Anaphase** that ensures each daughter cell receives an identical set of genes (chromosomes)?
    (A) Homologous chromosomes pair up
    (B) Sister chromatids are pulled apart opposite poles
    (C) The nuclear envelope reforms around the chromatin
    (D) Genetic recombination occurs through crossing over

32. Which of the following stages of the cell cycle is **incorrectly** matched with its primary function?
    (A) **G1 Phase:** Accumulation of energy reserves and DNA building blocks
    (B) **S Phase**: Replicating DNA to form sister chromatids
    (C) **G2 Phase:** Synthesis of proteins required for chromosome manipulation
    (D) **M Phase:** Physical separation of the cytoplasmic components

33. A student observes two distinct types of cell division under a microscope.
Process 1: A single division results in two diploid daughter cells
Process 2: Two successive divisions result in four haploid daughter cells
Which statement correctly describes these two processes?
(A) Process 1 represents mitosis, while Process 2 represents meiosis
(B) Process 1 produces genetic variation through crossing over
(C) Process 2 is used by the body to repair worn-out or damaged cells
(D) Both Process 1 and Process 2 are variations of mitosis

34. A patient experiences a sharp ache because tooth decay has penetrated the innermost chamber containing blood vessels and nerves. Which specific part of the tooth is undergoing inflammation and causing this sensation?
(A) Pulp cavity
(B) Enamel
(C) Crown
(D) Dentine

35. What is the primary function of the thymus gland within the lymphatic and immune systems?
(A) It filters pathogens and debris from the lymph
(B) It serves as the site where T-lymphocytes mature
(C) It engulfs damaged cells and cellular wastes
(D) It stores and concentrates excess bile

36. In which part of nephron does K^+ and H^+ ions are selectively secreted into the filtrate, while Na^+, Cl^-, and $HCO3^-$ ions are reabsorbed to maintain blood pH and electrolyte balance?
(A) Bowmans capsule
(B) Distal convoluted tubule
(C) Proximal convoluted tubule
(D) Loop of Henle

37. Which of the following statements is **incorrect** regarding the characteristics of lymphocytes?
(A) They circulate continuously between the bloodstream and the lymphatic system
(B) T cells, B cells, and natural killer cells are the primary types of lymphocytes
(C) Lymphocytes use phagocytosis to engulf and digest pathogens and cellular debris
(D) Some Lymphocytes are produced and complete their full maturation in the bone marrow

38. Why is nutrient recycling essential for the long term survival of an ecosystem? Because:
(A) It allows energy to be captured from the sun and reused multiple times by consumers
(B) It prevents the accumulation of toxic organic waste in the atmosphere
(C) The total amount of matter and essential elements on Earth is finite and limited
(D) Decomposers require a constant supply of inorganic minerals to perform cellular

39. Which of the following organisms are producers in the aquatic ecosystem?
    (A) Fungi
    (B) Grasshopper
    (C) Zooplankton
    (D) Phytoplankton

40. Which stage of the nitrogen cycle involves the conversion of ammonium into nitrate?
    (A) Nitrification
    (B) Depolymerization
    (C) Ammonification
    (D) Denitrification

41. Which two of the following natural structures serve as models for biomimicry in house construction?
    (A) Swallow nests and spider webs
    (B) Termite mounds and mosquito proboscis
    (C) Swallow nests and termite mounds
    (D) Shellfish exoskeletons and elephant trunks

42. Which of the three Rs principles focuses on minimizing animal suffering by using less invasive techniques, providing better medical care, and improving living conditions during experiments?
    (A) Refinement
    (B) Production
    (C) Replacement
    (D) Reduction

43. During embryonic development, the process in which the three germ layers undergo differentiation into specific tissue types is called:
    (A) Zygote
    (B) Gastrulation
    (C) Organogenesis
    (D) Blastulation

44. Which of the following reproductive characteristics distinguishes rats from both birds and crocodiles?
    (A) The production of amniotic fluid to protect the developing embryo from attack
    (B) The presence of a leathery or hard-shelled egg that can withstand terrestrial environments
    (C) The provision of parental care to increase the offspring's chances of survival
    (D) The presence of mammary glands used by the mother to provide milk to the young

45. How does the substance Cantharidin, secreted by blister beetles, assist in medical treatment?
    (A) It acts as a protein blocker that can prevent viral cell reproduction and treat tumors
    (B) It is a powerful pain reliever for migraines
    (C) It improves blood circulation and decreases joint inflammation
    (D) It is used as a permanent pigment for food and cosmetics

46. A type of learning which is based on past experience and reasoning to solve problems. Humans have used this learning to solve problems ranging from starting a fire to traveling to the moon. This type of learning is:
    (A) Classical conditioning
    (B) Insight learning
    (C) Instinctive behaviours
    (D) Sensitization

47. When the body temperature rises above the normal range, the control center activates an effector to reverse the situation. Which of the following is a correct physiological response?
    A. Vasoconstriction and shivering to produce heat
    B. Vasodilation and activation of sweat glands to allow heat evaporation
    C. Deactivation of sweat glands and skeletal muscle contraction
    D. A positive feedback loop that further increases the temperature

48. Which property of enzymes refers to their inability to pass through a semipermeable membrane (dialysis) due to their high molecular weight?
    (A) Precipitation
    (B) Molecular weight
    (C) Colloidal nature
    (D) Precipitation

49. Which one of the following interactions is primarily responsible for stabilizing the secondary structure of a protein?
    (A) Hydrogen bonding
    (B) Ionic bonding
    (C) Disulfide Bridge
    (D) Hydrophobic interaction

50. Which of the following regulatory mechanisms involves the enzyme-catalyzed addition or removal of a functional group (such as a phosphate) to covalently alter a protein's activity between an active and an inactive state?
    (A) Covalent modification
    (B) Allosteric regulation
    (C) Competitive inhibition
    (D) Feedback inhibition

51. In the process of glycolysis enzyme that catalyzes rearrangement of **Glucose 6 phosphate** to **Fructose 6 phosphate** without the addition or removal of atoms is categorized in which class of enzyme?
    (A) Transferase
    (B) Isomerases
    (C) Lyases
    (D) Ligases

52. A competitive inhibitor reduces the rate of an enzyme-catalyzed reaction by specifically binding to the:
    (A) Allosteric site
    (B) Regulatory site
    (C) Both active and allosteric site
    (D) Active site

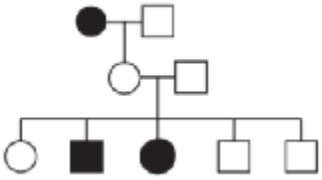
53. During DNA duplication if DNA fail to replicate because of **DNA supercoiling** at the region ahead of the replication fork. Which enzyme is most likely failing to function correctly?
    (A) DNA Helicases
    (B) Topoisomerase
    (C) DNA polymerase
    (D) DNA ligase

54. A DNA strand has the sequence 3'-CGA TTA GGG-5'. What is the complementary mRNA sequence that would bond to this strand?
    (A) 3'-GCT AAT CCC-5'
    (B) 5'-GCT AAT CCC-3'
    (C) 5'-GCU AAU CCC-3'
    (D) 5'-GCU AAU CCG-3'

55. A plant with round seeds is test-crossed. Which one of the following is **NEVER** a possible result of this specific cross? (Assume: Round seed (R) is dominant over wrinkled seed (r))
    (A) 100% Round seeds
    (B) 100% Wrinkled seeds
    (C) 50% Round and 50% Wrinkled seeds
    (D) 1:1 Genotypic ratio

56. An Rh-negative woman marries a man who is heterozygous Rh-positive. What is the probability that they will have an Rh-negative child?
    (A) 0%
    (B) 25%
    (C) 50%
    (D) 100%

57. In the pedigree below, squares represent males and circles represent females. Individuals who express a particular trait are represented by shaded figures.



    Which of the following patterns of inheritance best explains the transmission of the trait?
    (A) Sex-linked dominant
    (B) Autosomal recessive
    (C) Sex-linked recessive
    (D) Autosomal dominant

58. While studying a tissue sample, a biologist identifies branched cells and the presence of intercalated discs. Which type of muscle tissue is being observed?
    (A) Cardiac muscles
    (B) Skeletal muscles
    (C) Smooth muscles
    (D) Mixed muscles

59. Which one of the following ions binds with troponin to allow actin and myosin to interact during muscle contraction?
    (A) Sodium
    (B) Calcium
    (C) Potassium
    (D) Chlorine

60. Which one of the following type of bone cells are used to break down bones and help them to form into correct shapes?
    (A) Osteoblasts
    (B) Osteocytes
    (C) Osteoclasts
    (D) Osteoprogenitor

61. Which one of the following types of join allows for movement primarily in one plane, similar to the bending and straightening action of the elbow and knee?
    (A) Hinge joints
    (B) Condyloid joints
    (C) Pivot joints
    (D) Saddle joint

62. Which of the following pairs **incorrectly** matches a male reproductive structure with tits function?
    A. Seminiferous tubules → produce immature sperm cells
    B. Epididymis → matures and stores sperm cells
    C. Seminal vesicle → secretes mucus-rich fluids
    D. prostate gland → secretes an alkaline buffer

63. During the process of spermatogenesis, certain tall somatic cells located in the seminiferous tubules provide essential nourishment to developing sperm. What are these cells called?
    (A) Primary spermatocytes
    (B) Secondary spermatocytes
    (C) Primordial germ cells
    (D) Sertoli cells

64. During days 12–14 of the cycle, estrogen provides positive feedback to the hypothalamus and pituitary. What is the immediate physiological result of this feedback?
    (A) The immediate onset of menstrual bleeding
    (B) A surge in LH leading to the release of an egg
    (C) The inhibition of FSH to prevents the growth of follicle
    (D) The degeneration of the ovary to corpus luteum

65. Which one of the following is categorized as a barrier method of contraception?
    (A) Pills
    (B) Diaphragm
    (C) Contraceptive implant
    (D) Contraceptive injection

66. While conducting a mark-recapture study on birds, a biologist catches and marks 150 birds. One week later, 120 birds are caught, and 30 of them are found to be marked. Based on this data, what is the estimated total population of birds?
    (A) 300
    (B) 1,200
    (C) 600
    (D) 450

67. Which of the following conditions is a fundamental requirement for a population to exhibit an exponential growth model?
    (A) An ideal environment with unlimited resources
    (B) A negative per capita rate of increase ($r<0$)
    (C) A population size that has reached its carrying capacity
    (D) The presence of limited resources and high competition

68. A demographer observes a population where the percentage of individuals in the 0-14 age group is significantly higher than those in the above 60 group, resulting in a broad-based, narrow-topped pyramid. What does this shape primarily indicate about the country's development?
    (A) It is a developed nation with a stationary population and high life expectancy
    (B) It is an elderly population that is shrinking due to low crude birth rates
    (C) It is a stable population where mortality and fertility rates are nearly equal
    (D) It is a developing nation with high fertility rates and lower life expectancy

69. Which of the following is classified as a mechanical measure of soil and water conservation?
    (A) Planting tree seedlings on farmlands
    (B) Constructing check dams and terraces
    (C) The Green Legacy initiative
    (D) Enclosing degraded land from animals

70. In a food chain consisting of: **Algae→ Small Fish→ Large Fish → Fish → Eagle**, which organism would you expect to have the highest concentration of DDT, and why?
    (A) Small Fish, because toxins(DDT) is lost as they move up the trophic levels
    (B) Fish Eagle, because toxins(DDT) accumulate as they move up the trophic levels
    (C) Algae, because they are the first to absorb the toxin(DDT) from the water
    (D) Large Fish, because they have more fatty tissue to store the toxins(DDT) than birds

71. How does a conscious citizen contribute to sustainable development according to biology?
    (A) By consuming more non-renewable resources to increase the economy
    (B) By ignoring environmental conditions to focus on industrial growth
    (C) By developing bio based technologies that reduce waste products
    (D) By preventing the use of all biotechnology in agriculture

72. Which of the following pairs of bacteria functions as a bioinsecticide by producing protein against insects?
    (A) Thiobacillus ferrooxidas and Thiobacillus thiooxidans
    (B) Bacillus thuringiensis and Bacillus popilliae
    (C) Beauveria bassiana and Metarhizium anisoppliae
    (D) Lepitosprillum ferooxidans and Thiobacillus organoparus

73. Glyphosate-resistant crops are genetically engineered to allow farmers to:
    (A) cultivate crops that produce their own pesticide chemical
    (B) increase the diversity of different crop species grown in a single field
    (C) apply herbicide to a field without damaging the primary crop
    (D) eliminate the need for any herbicide application on the plants

74. Grade 12 students performing a Gram stain procedure identified that a specimen they are studying is Gram-negative. Which of the following characteristics is **wrong** about the structure of this bacterium?
    (A) A cell wall composed of two distinct major layers
    (B) High concentrations of Lipopolysaccharides (LPS)
    (C) A significantly reduced or absent periplasmic space
    (D) The presence of porin proteins to facilitate transport

75. In the classification of fungi, the family known as **Zygomycota** is characterized by the production of:
    (A) sporoniospore on the surface of a club-shaped sporangia
    (B) ascospores within a sac-like structure called an ascus
    (C) basidiospores on the surface of a club-shaped basidium
    (D) flagellated zoospores that swim through aquatic habitats

76. Which of the following groups of protozoa utilizes **conjugation** as a method of genetic exchange?
    (A) Ciliates
    (B) Sporozoans
    (C) Amebae
    (D) Filagellates

77. In the viral replication process, some bacteriophages integrate their DNA into the host cell chromosome and remain dormant for many generations. This cycle is known as the:
    (A) lytic cycle
    (B) lysogenic cycle
    (C) productive cycle
    (D) Chronic release

78. Which one of the following techniques is **not** correctly matched with temperature used and its time of exposure?
    (A) Hot air oven, 150°C, 2.5 seconds
    (B) Autoclaves, 121°C, 15 minutes
    (C) Tyndallisation, 100°C for 20 minutes
    (D) Boiling 100°C for 10 minutes

79. Which of the following statement is **wrong** about anabolism? Anabolism:
    (A) is the constructive phase of metabolism
    (B) is an endergonic reaction
    (C) is the process whereby simpler substances are joined together to form complex macromolecules
    (D) releases energy as a result of the build-up of molecules

80. During the non-cyclic photophosphorylation stage of photosynthesis, what is the specific role of the water molecule?
    A. To combine with CO_2 to form the unstable 6-carbon intermediate
    B. To act as the final electron acceptor in the electron transport chain
    C. To catalyze the reduction of NADP+ into NADPH in the stroma
    D. To provide electrons to replace those lost by Photosystem II

81. All of the following can happen in both photophosphorylation and oxidative phosphorylation **except**:
    A. Generation of ATP using chemiosmosis
    B. Use of ATP synthase enzyme to generate ATP
    C. Phosphorylation of ADP to produce ATP
    D. Conversion of light energy to chemical energy (ATP)

82. In the Calvin cycle, when three molecules of carbon dioxide (CO2) are fixed through three turns of the cycle, which of the following statements accurately describes the resulting products?
    (A) A total of five molecules of 3-phosphoglycerate (3-PGA) are produced during the fixation stage
    (B) Three molecules of ATP are consumed to reduce 3-phosphoglycerate (3-PGA) into glyceraldehyde-3-phosphate (G3P)
    (C) Six molecules of NADPH are required to reduce the 1, 3-bisphosphoglycerate into glyceraldehyde-3-phosphate (G3P)
    (D) The process results in the immediate net synthesis of one six-carbon glucose molecule

83. What is the primary function of the Electron Transport Chain (ETC) in the inner mitochondrial membrane?
    (A) To oxidize ATP into ADP to release energy for the cell
    (B) To synthesize glucose from carbon dioxide and water
    (C) To create a proton gradient using energy from electron transfers
    (D) To produce 4 molecules of CO_2 for every turn of the cycle

84. Which one of the following best represents the products of one turn of the Krebs cycle for one Acetyl CoA?
    (A) 2 ATP, 2 NADH, and 2 Pyruvate
    (B) 3 NADH, 1 FADH, 1 ATP, and 2 CO_2
    (C) 6 NADH, 2 FADH, 2 ATP, and 4 CO_2
    (D) 1 Glucose, 6 Oxygen molecules and 6 CO_2



85. In the absence of oxygen, why is **fermentation** necessary for a cell?
    (A) To regenerate NAD^+ so that glycolysis can continue
    (B) To produce large amounts of ATP for the cell
    (C) To convert ethanol back into NADH
    (D) To allow the electron transport chain to function without oxygen

86. The Eternity of Life theory was supported by some scientists because they believed:
    (A) The Universe is constantly expanding
    (B) Life is an inherent property of an unchanging Universe
    (C) Life was created by a supernatural force at a specific point in time
    (D) Life originated from resistant spores arriving from another planet

87. Which of the following is a key postulate of Neo-Darwinism that was not part of Darwin's original theory?
(A) New need
(B) Natural selection
(C) Struggle for existence
(D) Genetic variability

88. There are two main categories of fossils when considering the overall preservation method. Which one of the following is not category 1 fossil?
(A) Bones
(B) Body impressions
(C) Footprints
(D) Hair

89. In a forest with light-colored trees, light moths are camouflaged and survive better than dark moths, which are easily seen and eaten by birds. Over time, the moth population shifts to favor the light-colored trait because it offers a survival advantage in this specific environment. This shift toward one extreme characteristic is an example of:
(A) Stabilizing selection
(B) Directional selection
(C) Disruptive selection
(D) Artificial selection

90. A single nucleotide polymorphism changes one nucleotide in a gene sequence. As a result, the gene gains a stop codon 500 base pairs too soon and when the protein is translated, it cut short. Which of the following types of mutations did the point mutation cause?
(A) Silent
(B) Missense
(C) Nonsense
(D) Insertion

91. Which one of the following is **not** among assumptions of Hardy-Weinberg equilibrium?
(A) No mutation
(B) No natural selection
(C) No random mating
(D) No migration

92. Which part of the neuron is responsible for receiving signals from sensory receptors or other neurons?
(A) Dendrites
(B) Axon
(C) Cell body (Soma)
(D) Myelin sheath

93. During depolarization, which of the following events occurs?
(A) Potassium channels open and K^+ rushes out
(B) Sodium channels open and Na^+ rushes into the cell
(C) Calcium channels open and Ca^{2+} rushes into the cell
(D) The inside of the cell becomes more negative than the resting state

94. Which one of the following is **not** among the functions of brainstem?
   (A) Regulating heartbeat, breathing and blood pressure
   (B) Coordinating head movements in response to visual and auditory stimuli
   (C) Coordinating reflex actions of vomiting, coughing, sneezing, and swallowing
   (D) Maintaining balance and posture of the body

95. Imagine you are outside on a sunny day and having trouble reading your textbook. In bright light, what happens to your pupil?
   (A) The pupil is pulled open wide (it dilates).
   (B) The circular muscles of the iris contract
   (C) The radial muscles contact
   (D) The pupil cannot regulate the size of pupil

96. Glucagon is secreted by which cells of the pancreas?
   (A) Alpha (α) cells
   (B) Beta (β) cells
   (C) Delta (δ) cells
   (D) Acini cells

97. The functional unit of the kidney responsible for filtering blood and forming urine is the:
   (A) Neuron
   (B) Alveoli
   (C) Nephron
   (D) Renal

98. Insulin is a hormone known to regulate blood sugar levels. However, one of the following is **not** an action of insulin. Which is it?
   (A) Increase conversion of glucose into glycogen and deposition of it in the body
   (B) Increase the rate of oxidation of glucose in the tissues
   (C) Stimulates the rate of conversion of glucose into fat
   (D) Activates hepatic gluconeogenesis

99. Which one of the following greenhouse gases is emitted from the use of fertilizer and animal waste?
   (A) CH4 (B) N2O (C) SF6 (D) HFCs

100. Which of the following is NOT a direct consequence of man-made climate change, but rather a secondary or indirect effect?
   (A) Rising sea level
   (B) Rising maximum temperatures
   (C) Thawing of permafrost
   (D) Increasing spread of pests