

CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND MARK ON THE CIRCLE CORRESPONDING TO YOUR ANSWER ON THE ANSWER SHEET. TIME ALLOWED: 2:00 HOURS

1. Which of the following is NOT in agreement with the scientific method?
 - A. Putting forward testable hypothesis
 - B. Carrying out experiments in duplicates
 - C. Putting forward personal value judgment
 - D. Analyzing result and drawing conclusion
2. In an experiment designed to study the effect of fertilizer on the growth of plants, which of the following should the experimenter vary?
 - A. Seed number
 - B. water quality
 - C. Amount of fertilizer
 - D. seed size
3. What is the specific name of biologist who do research that tries to find evidence of life on other planets in the solar system?
 - A. Neurobiologist
 - B. Astrobiologist
 - C. Paleontologist
 - D. Biogeographers
4. How does simple microscope differ from a compound microscope?
 - A. A simple microscope has no lens.
 - B. A simple microscope has got two lenses.
 - C. A simple microscope uses mirror as lens.
 - D. A simple microscope has only one lens.
5. What is ultimate source of all scientific knowledge?
 - A. Observation
 - B. Guessing
 - C. Trial and error
 - D. Observation and experimentation
6. Of the following four cells whose surface area to volume ratio is given, which cell can more efficiently transport its needs of materials across the cell surface?
 - A. 24 : 8 ratio
 - B. 54 : 27 ratio
 - C. 96 : 64 ratio
 - D. 150 : 125 ratio
7. Choose that come last step in the scientific method?
 - A. Proposing the research hypothesis
 - B. Formulation of scientific theory
 - C. Conducting experiments
 - D. Making predictions
8. If the size of a cell increases, which one of the following gets smaller?
 - A. The volume of the cell
 - B. Surface area to volume ratio of the cell
 - C. The surface area of the cell
 - D. Volume to surface area ratio of the cell
9. Which of the following types of microscope is most suitable for a detailed study of the surface structure of an object?
 - A. Field microscope
 - B. Scanning electron microscope
 - C. optical microscope
 - D. dissecting microscope
10. Which of the following techniques is used to separate DNA fragments according to their size on a gel?
 - A. Southern blotting
 - B. Radioactive labeling
 - C. Electrophoresis
 - D. Polymerase chain reaction
11. Which one of the following eukaryotic cell organelles was a free living cell before eukaryotic cells evolved?
 - A. Nucleus
 - B. Ribosome
 - C. Chloroplast
 - D. Nucleolus

12. Which of the following classes of molecules CANNOT pass easily across the cell membrane by simple diffusion?
 - A. Small non-polar molecules
 - B. Non-polar molecules
 - C. lipid soluble molecules
 - D. polar molecules
13. Which of the following factors determines the rate at which organelles settle out of cell homogenate if spun in a centrifuge?
 - A. Mass of the organelle
 - B. Location of the organelle in the cell
 - C. Function of the organelle in the cell
 - D. Thickness of the membrane.
14. In which of the following solutions does RBC undergo haemolysis?
 - A. In hypotonic solution
 - B. In hypertonic solution
 - C. In isotonic solution
 - D. In isoosmotic solution
15. If a cell fails to clear its cellular debris, which one of its organelles is most likely NOT functioning?
 - A. Nucleus
 - B. Mitochondria
 - C. Endoplasmic reticulum
 - D. Lysosome
16. If a suspension of a mixture of cellular organelles is spun in a centrifuge, which organelle settles to the bottom first?
 - A. Mitochondria
 - B. Chloroplast
 - C. Ribosome
 - D. Endoplasmic reticulum
17. Which of the following requires expenditure of ATP?
 - A. Osmosis
 - B. Facilitated diffusion
 - C. Simple diffusion
 - D. endocytosis
18. Which of the following properties of water makes sweat an effective body cooler?
 - A. Its high specific heat
 - B. Its low density when frozen
 - C. Its high surface tension
 - D. Its high heat of vaporization
19. The formula of the compound formed when three molecules of glucose are bonded together is
 - A. $C_{18}H_{32}O_{16}$
 - B. $C_{18}H_{36}O_{18}$
 - C. $C_{18}H_{34}O_{17}$
 - D. $C_{18}H_{42}O_{18}$
20. A peptide bond is formed when NH_2 group combines with
 - A. $COOH$ group
 - B. hydrogen group
 - C. CH_2 group
 - D. another NH_2 group
21. Which of the following steps in the cellular respiration can take place in the absence of oxygen?
 - A. Electron transport
 - B. Krebs cycle
 - C. glycolysis
 - D. link reaction
22. Which process produces mRNA during protein synthesis?
 - A. Translation
 - B. Replication
 - C. Mutation
 - D. Transcription
23. Of the following functions which one do triglycerides accomplish in cells?
 - A. Increase density of tissues and cells.
 - B. Yield limited amount of ATP for cells
 - C. Increase thermal insulation of cells
 - D. facilitate entry of excess water into cells
24. Which of the following food types would most likely give a negative result upon addition of iodine solution?
 - A. Bread
 - B. Butter
 - C. Biscuits
 - D. Potato
25. In cell division, what is the phase that comes following the metaphase called?
 - A. Extraphase
 - B. Prophase
 - C. Anaphase
 - D. Telophase
26. What is the circumstance that causes the health condition known as sickle-cell anaemia?
 - A. DNA denaturation
 - B. RNA mutation and decay
 - C. Hemoglobin mutation
 - D. Phosphate mutagenesis
27. Which of the following is the correct constitution of the sex chromosome of a normal woman ?
 - A. XY
 - B. XX
 - C. XO
 - D. XXY
28. Which two nitrogenous bases belong to the purines?

- A. Adenine and thymine
B. Adenine and guanine
C. Guanine and cytosine
D. Thymine and Uracil
29. Which of the following is NOT true about C4 plants such as teff?
A. CO₂ is harvested during the night time.
B. The bundle sheath cells contain chloroplast.
C. Light-dependent reaction occurs in mesophyll cells.
D. Chloroplast of bundle sheath cells lack thylakoids.
30. What is the purpose of the infoldings of the inner-membrane of the mitochondrion?
A. Increasing the photosynthetic capacity of the cell
B. Speeding up the loss of CO₂ during fermentation.
C. Speeding up the process of glycolysis.
D. Increasing the surface area for ATP production.
31. In scientific method, what is the importance of a background research for a given problem?
A. To formulate a hypothesis
B. To prepare report of the result
C. To make a prediction.
D. To make a conclusion
32. What is the process called when two bacteria directly contact cell to cell and exchange their genetic information?
A. Conjugation
B. Co-transformation
C. Transformation
D. Transduction
33. In which of the following ways do retroviruses differ from other RNA viruses?
A. Their genetic material is DNA.
B. They copy RNA to DNA molecules.
C. Their genetic material is RNA.
D. They copy RNA from DNA molecule.
34. Which of the following is the best collective name for all bacteria with spherical shapes?
A. Cocci
B. Bacilli
C. Spirochaetes
D. Streptococcus
35. During seasons of reproduction, the males of some species of birds produce colorful feathers to attract females. What do ethologists call this method of communication in animals?
A. Visual
B. Chemical
C. Auditory
D. Touch
36. Which of the following laboratory equipments is used to separate the organelles of the cell according to their density?
A. Incubator
B. Measuring cylinder
C. Centrifuge
D. filter paper with fine pores.
37. In DNA cloning technology, which of the following molecules serves as a vector of gene of interest to be transferred to bacterial host?
A. Bacterial DNA
B. Plasmid DNA
C. Nuclear DNA
D. Mitochondrial DNA
38. When do populations of living organisms show exponential growth?
A. When the resources are plentiful
B. Whenever they enter a new environment
C. When they face strong competition from other species.
D. When the carrying capacity of the environment is reached.
39. What could be the main reason behind the currently observed slow or stable rate of population growth in the industrialized countries?
A. Good family planning
B. Increasing death rate
C. Poor health conditions
D. high rate of child death

40. Behaviour that is repeated on a daily basis is referred to as:
 A. Lunar B. Circadian C. Circannual D. seasonal
41. Which one of the following functions best at higher optimum pH than all the rest?
 A. Pepsin B. salivary amylase C. Trypsin D. Enzymes in stomach
42. If a cell has a size of 0.04mm. What is its size in μm ?
 A. 40 μm B. 0.004 μm C. 0.0004 μm D. 0.4 μm
43. In Ethiopia, which one of the following vertebrates groups has the largest number of genera?
 A. Mammals B. Birds C. Reptiles D. Amphibians
44. During protein synthesis, where in the cell does transcription take place?
 A. Ribosome B. Nucleus C. Endoplasmic reticulum D. Golgi apparatus
45. Which of the following is true about saturated fatty acids?
 A. They have single bonds between carbon atoms
 B. They are the same as polyunsaturated fatty acids
 C. They are the same as monounsaturated fatty acids
 D. They have double bonds between the carbon atoms
46. Which of the following is true about mutations that occur in normal body cells?
 A. They never lead to cancerous cells. C. They never pass to the next generation
 B. They never damage the affected cells D. There is no way that they kill the affected cell
47. Which of the following substances has a shape which is similar to that of the substrate of an enzyme?
 A. The reaction product C. A competitive inhibitor
 B. A cofactor D. An allosteric inhibitor
48. Which of the following is NOT the correct characteristic of tropical rainforests?
 A. Low biodiversity C. Heavy precipitation
 B. High temperature D. Trees of different heights
49. For what purpose do molecular biologists use the technology known as polymerase chain reaction or PCR?
 A. To insert DNA into plasmids C. To insert plasmid into bacteria
 B. To multiply copies of DNA molecules D. To produce DNA from RNA
50. Suppose when you first enter a room you notice an unpleasant smell which you eventually forget about its presence, what is this behavior called?
 A. Latent learning C. Habituation
 B. Insight learning D. operant conditioning
51. Which of the following is an evolutionary requirement for two sub-populations of a species to evolve into independent species?
 A. Free exchange of genes C. Geographic isolation
 B. Free migration between populations D. Absence of natural selection
52. What does a restriction enzyme do?
 A. Restricts transcription C. Cuts DNA at specific sites
 B. Prevents DNA from replicating D. Hydrolyses the DNA molecule
53. What is the ultimate source of all scientific knowledge?
 A. Observation C. Trial and error
 B. Guessing D. Observation and experimentation
54. The optimum temperature of enzymes found in thermophilic bacteria is:
 A. Lower than for enzymes in the human body.

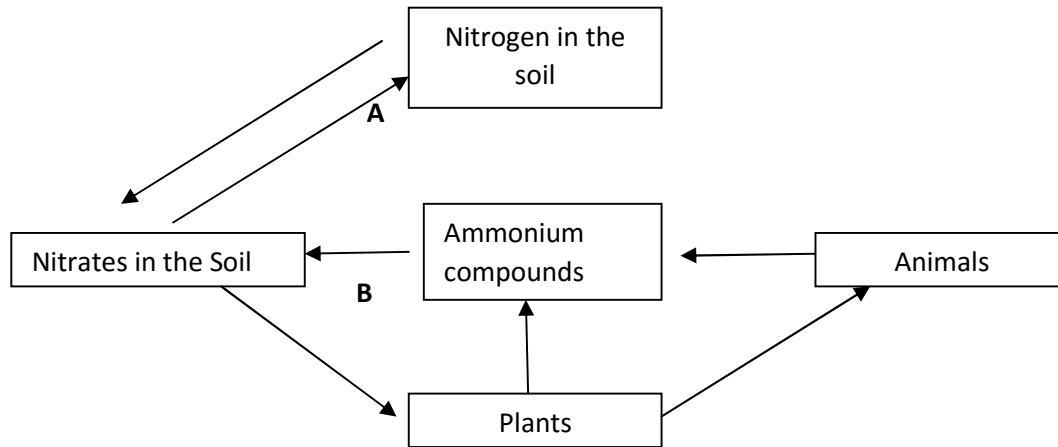
- B. Higher than enzymes in the human body.
 C. The same as enzymes found in human body.
 D. Lower than enzymes found in warm blooded animals.
55. To which of the following groups do those bacteriophages that integrate their DNA into the chromosome of their bacterial host belong?
 A. Virulent viruses
 B. Lytic viruses
 C. Lysogenic viruses
 D. Non-paraitic viruses
56. Which of the following theories explains evolutionary changes of living things in terms of changes in their allele frequencies?
 A. Darwin's natural selection
 B. Inheritance of acquired characteristics
 C. spontaneous generation
 D. Neo-Darwinism
57. Which of the following is NOT true about the called SRY?
 A. It is found on the Y-chromosome.
 B. It determines maleness
 C. Testes develop in its presence.
 D. Females have two copies of this gene.
58. If a DNA contains 10% thymine, what is the percentage of cytosine in the DNA ?
 A. 10% B. 30% C. 40% D. 90%
59. If a substance that weighs 2000 grams and has a half-life of 100 years is left with only 250 grams, for how long has the radioactive decaying activity been undergoing?
 A. 200 years B. 250 years C. 300 years D. 500 years
60. If the rate of an enzyme catalyzed reaction remains constant even when more substrate is added to the reaction, which of the following might be the reason?
 A. Saturation of the enzyme
 B. Inactivation of the enzyme
 C. Inhibition of enzyme-substrate complex formation
 D. Loss of substrate specificity by the enzyme
61. Which of the properties of water allows mosquito larvae to hang themselves down into the water from the water surface?
 A. Its high specific heat capacity
 B. Its high surface tension
 C. Its high latent heat of vaporization
 D. Its low density in solid state.
62. Which of the following happens in both cyclic and non-cyclic photophosphorylation?
 A. ATP is formed
 B. Oxygen is generated
 C. NADP is reduced
 D. Water molecule splits
63. What is the purpose of the infoldings of the inner-membrane of the mitochondrion?
 A. Increasing the photosynthetic capacity
 B. Speeding up the loss of CO₂ during fermentation.
 C. Speeding up the process of glycolysis.
 D. Increasing the surface area for ATP production.
64. What is the ecological succession in which plant communities establish after an area has been completely demolished by fire?
 A. Tree succession C. secondary succession

- D. Whales and humans had a common ancestry.
76. In a cross between round green pea of RRyy genotype and wrinkled yellow pea of rrYY genotype, what is the expected genotype of the F1?
 A. RRyy B. rrYY C. RRYy D. RrYy
77. In which of the activities of the honey bee colony are worker bees involved?
 A. Laying eggs C. reproductive functions
 B. Serving as queens D. Taking care of the larvae
78. Which of the following types of chromosome mutation gives rise to an extra chromosome?
 A. Inversion C. Deletion
 B. Translocation D. Non-disjunction
79. In which of the following solutions does an animal cell undergo haemolysis?
 A. In hypotonic solution C. In hypertonic solution
 B. In isotonic solution D. in both hypotonic and hypertonic solution
80. If someone suddenly removes his/her hand from a very hot object, which of the following types of behavior is manifested?
 A. Reflex action C. Learned behavior
 B. Imprinting D. Sensitization
81. If a codon on a messenger RNA is UUU, what is the complementary anticodon on the transfer RNA?
 A. UUU B. GGG C. TTT D. AAA
82. Which of the following substances is NOT formed when glucose is fermented by yeasts?
 A. Alcohol B. ATP C. Lactic acid D. Carbon dioxide
83. Which of the following is responsible for the bending of a young plant towards a unidirectional source of light?
 A. Reduced photosynthesis on dark side
 B. Slower growth rate on the dark side
 C. Increased auxin concentration on dark side
 D. Increased rate of cell division on the light side
84. Which of the following is a learned behavior?
 A. Suckling of the newborn at mother's breasts.
 B. Salivation by conditioned dogs at the sound of a bell.
 C. Withdrawal of hands suddenly from hot objects.
 D. Blinking the eyes when something gets into them.
85. Which of the following is consistent with the understanding of human evolution?
 A. Bipedalism was never important in human evolution
 B. Larger brain size had no contribution to the evolution of the human species.
 C. Human ancestry had no relation whatsoever with that of the chimpanzees.
 D. Fossils of Lucy and Ardi provided evidence for human origin.
86. Which component of soil fertility is improved when farmers grow legumes in crop rotation?
 A. Phosphorus B. Nitrogen C. Sulfur D. Carbon
87. Before making crosses, which part of the flower did Mendel remove to avoid self pollination?
 A. Stigma B. Ovule C. Ovary D. Stamens
88. The group of Ethiopian wolf which does NOT contribute to territory marking with their urine containing pheromones is:
 A. Adult males B. Adult females C. Sub-adult male D. Sub-adult females

89. Which of the following processes occurs during carbon cycle?

- A. CO_2 is released to the air during decomposition
- B. CO_2 is removed from the air during respiration
- C. CO_2 is released to the air during photosynthesis
- D. CO_2 is removed from the air during burning of fossils

90. This item is based on the following nitrogen cycle.



What are 'A' and 'B' on the above diagram of nitrogen cycle?

- A. Putrefying and denitrifying bacteria, respectively
- B. Nitrifying and denitrifying bacteria, respectively.
- C. Nitrifying and putrefying bacteria, respectively.
- D. Denitrifying and putrefying bacteria, respectively.

91. Which molecule in the cell is the constituent of the gene?

- A. Nucleic acid
- B. Protein
- C. Lipid
- D. Carbohydrate

92. If an animal has genotype GgRr without linkage between the two genes what gametes can the animal produce?

- A. GR,Gr,gR,gr
- B. GG, Gr,RR,rr
- C. Gg,Rr,GG,GR
- D. Gg,Rr

93. Which of the following is removed from eukaryotic mRNA during post transcriptional modification?

- A. Intron
- B. Transcriptase
- C. Promoter
- D. Exon

94. Which of the following is NOT an example of point mutation?

- A. Substitution
- B. Deletion
- C. Addition
- D. Translocation

95. If due to incomplete dominance, the F1 plants from a cross of red flowered and white flowered parents are pink, which of the following ratios are expected in the F2 generation?

- A. 1red:2pink:1white
- B. 2red:1pink:1white
- C. 1red:1pink:1white
- D. 3red:1pink:1white

96. The two scientists who developed the biochemical theory of the origin of life were:

- A. Ritche and Arrhenius
- B. Haldane and Oparin
- C. Redi and Pasteur
- D. Aritotle and van Helmont

97. In a reflex action, to which of the following does the impulse reach last?

- A. Coordinator B. Receptors C. Efferent neuron D. Effectors
98. The functional group of fatty acids is:
A. Hydroxyl B. Carboxylic C. Amine D. phosphate
99. Gene silencing is the function of one of the following molecules.
A. dsRNA B. mRNA C. siRNA D. tRNA
100. Which class of enzymes joins two molecules together by formation of new bonds?
A. Ligase B. Isomerase C. Lyases D. Hydrolases