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ROYAL GOVERNMENT OF BHUTAN
ROYAL CIVIL SERVICE COMMISSION



BHUTAN CIVIL SERVICE EXAMINATION 2024

MAIN EXAMINATION

OCTOBER 4, 2024

CATEGORY: TECHNICAL (BIOSCIENCE)

PAPER II: GENERAL SUBJECT KNOWLEDGE

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2024
EXAMINATION CATEGORY: TECHNICAL

PAPER II: GENERAL SUBJECT KNOWLEDGE PAPER FOR BIO SCIENCE

Date	: October 4, 2024
Total Marks	: 100
Writing Time	: 90 minutes (1.5 hours)
Reading Time	: 15 Minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of the Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO Parts: Part I & Part II**
Part I consists of 70 multiple choice questions of 1 (one) mark each, and
Part II consists of 10 short answer questions of 3 (three) marks each.
4. All questions are COMPULSORY.
5. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
6. **All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.**
7. Begin each Part on a fresh page of the Answer Booklet.
8. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
9. Use of any other paper including paper for rough work is not permitted.
10. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
11. This paper has **13 printed pages**, including this instruction page.

GOOD LUCK

PART I

MULTIPLE CHOICE QUESTIONS

(70 MARKS)

Choose the correct answer and write down the letter corresponding to the correct answer chosen in the Answer Booklet against the question number. E.g. 71 (A). Each question carries ONE mark. Answering questions with more than one choice will not be evaluated.

1. In flowering plants, pith is a central part of the ground tissues generally made up of:
A Parenchyma
B Collenchyma
C Chlorenchyma
D Sclerenchyma
2. Which tissue gives rise to secondary growth?
A Apical meristem
B Adventitious root
C Germinating seed
D Vascular cambium
3. The purplish red pigment rhodopsin contained in the rods type of photoreceptor cells of human eye is a derivative of:
A Vitamin B1
B Vitamin C
C Vitamin A
D Vitamin D
4. The fertilisation in which male gametes are carried through pollen tube is known as:
A Syngamy
B Siphonogamy
C Poromay
D Chalazogamy
5. Vernalisation stimulates flowering in:
A Zamikand
B Turmeric
C Carrot
D Ginger
6. Hormone replacing the requirement of vernalisation is:
A Ethylene
B Giberrellins
C Auxin
D Cytokinin

7. In malaria, the product released by mosquitoes into blood that causes chill and fever is called:
- A Haematin
 - B Schuffner's dots
 - C Haematoxin
 - D Haemazoin
8. Which part of our body secretes the hormone secretin?
- A Ileum
 - B Duodenum
 - C Stomach
 - D Oesophagus
9. Which of the following liquids would possess the highest vapour pressure at room temperature?
- A Acetic acid (b.p. 118 °C)
 - B Chlorobenzene (b.p. 132 °C)
 - C Nitrobenzene (b.p. 212 °C)
 - D Methyl alcohol (b.p. 65 °C)
10. Wings of insects and birds are:
- A Analogous
 - B Homologous
 - C Vestigial
 - D Atavism
11. Which of the following enzymes digests protein in stomach?
- A Trypsin
 - B Pepsin
 - C Erepsin
 - D None of the above
12. Which one of the following in birds indicates their reptilian ancestry?
- A Scales on their hind limbs
 - B Four –chambered heart
 - C Two special chambers crop and gizzards in their digestive tract
 - D Egg with a calcareous shell
13. Man-made crop *Triticale* is a hybrid between:
- A Wheat and Rye
 - B Rice and Barley
 - C Maize and Wheat
 - D Rice and Maize

14. The following is used to get desired breed of plants:
- A Tissue culture
 - B Genetic engineering
 - C Inbreeding
 - D None of the above
15. How many gramme of CH_3OH should be added to water to prepare 150 ml solution of 2.0 M CH_3OH ?
- A 32.0 g
 - B 9.6 g
 - C 16.0 g
 - D 9.0 g
16. Which one of the following is a systematic insecticide?
- A Malathion
 - B Endrin
 - C Parathion
 - D Furadan
17. Disease associated with secretion of toxin is:
- A TB
 - B AIDS
 - C Tetanus I
 - D Food poisoning
18. Cyanobacteria are useful biofertilisers in the field of:
- A Wheat
 - B Maize
 - C Rice
 - D Sugarcane
19. Grapheme is a good conductor of electricity because:
- A It is an allotrope of carbon
 - B It has unpaired electrons
 - C It has sheet structure
 - D None of the above
20. A free-living aerobic and non-photosynthetic nitrogen-fixing bacterium is:
- A Anabaena
 - B Azotobacter
 - C Rhizobium
 - D Clostridium

21. Which one of the following is a good electrolyte in aqueous solution?
- A Metallic solid
 - B Covalent solid
 - C Ionic solid
 - D Molecular solid
22. The pH of a solution is increased from 3 to 6. So, its H⁺ ion concentration will be:
- A Reduced to half
 - B Doubled
 - C Increased by 100 times
 - D Reduced by 1000 times
23. Which one of the following provides most evident proof of evolution?
- A Fossils
 - B Morphology
 - C Embryo
 - D Vestigial organs
24. Theory of continuity of germplasm was propounded by:
- A Mendel
 - B Lamarck
 - C Weismann
 - D Haeckel
25. The species listed in Red Data Book are:
- A Threatened
 - B Endangered
 - C Rare
 - D All of the above
26. All of the following are included under *in situ* conservation except:
- A Botanical garden
 - B Biosphere reserve
 - C National park
 - D Sanctuary
27. Which one of the following is an example of *ex situ* conservation? :
- A Wildlife sanctuary
 - B Seed bank
 - C Sacred groves
 - D National park

28. Resonance structure of molecule does not have:
- A Identical arrangement of atoms
 - B Nearly the same energy content
 - C The same number of paired electrons
 - D Identical bonding
29. Formic acid is prepared by heating oxalic acid with:
- A Glycol
 - B Glycine
 - C Glycerol
 - D Acetic anhydride
30. The excretory material of bony fish is:
- A Urea
 - B Protein
 - C Amino acid
 - D Ammonia
31. The principal nitrogenous excretory compound in human is synthesised:
- A In kidney but eliminated mostly through liver
 - B In kidney as well as eliminated by kidneys
 - C In liver and also eliminated by the same through bile
 - D In the liver, but eliminated mostly through kidneys
32. Which tissue acts as the first line of protection for our body from any physical or chemical damage?
- A Adipose tissue
 - B Epithelial tissue
 - C Muscular tissue
 - D Areolar tissue
33. 10 g of NaCl is dissolved in 10^6 g of the solution. Its concentration is:
- A 0,1 ppm
 - B 1.0 ppm
 - C 10 ppm
 - D 100 ppm
34. Which is common to kidney and skeleton in mammals?
- A Cortex
 - B Pelvis
 - C Radius
 - D Medulla

35. In honey, the percentage of maltose and other sugar is:
A 8.5
B 9.5
C 10.5
D 11.5.
36. Which one of these diseases in animals is caused by *Babesia bigemina*?
A Rinderpest
B Tick fever
C Anthrax
D Diarrhoea
37. Which hormone affects opening and closing of stomata?
A Ethylene
B GA
C Abscisic acid
D Zeatin
38. Graham's law is correlated with:
A Diffusion
B Osmoregulation
C Osmosis
D Absorption
39. Plasmolysis is the result of:
A Endosmosis
B Exosmosis
C Reverse osmosis
D None of the above
40. Exarch and polyarch xylem strands are found in:
A Monocot stem
B Dicot stem
C Monocot root
D Dicot root
41. IUPAC name for C_2H_5CN is:
A Ethyl cyanide
B Acetonitrile
C Propane nitrile
D Ethane nitrile

42. An aqueous solution of glucose is 10% in strength. The volume in which 1 g mole of it is dissolved will be:
- A 1.0 litre
 - B 1.8 litre
 - C 8.0 litre
 - D 0.8 litre
43. Gibberellin was first extracted from:
- A *Aspergillus*
 - B *Gelidium*
 - C *Gracelaria*
 - D *Gibberella fujikuroi*
44. Removal of Ringwood of tissue outside the vascular cambium from the tree trunk kills it because:
- A Water cannot move up
 - B Shoot becomes starved
 - C Annual rings are not produced
 - D Food does not travel down and root becomes starved
45. The cells without nuclei are present in:
- A Companion cell
 - B Members of sieve tube
 - C Vascular cambium
 - D Root hairs
46. The term 'mutation' was introduced by:
- A Hugo deVries
 - B Darwin
 - C Muller
 - D Morgan
47. When a mutation is limited to the substitution of one nucleotide for another it is called:
- A Translocation
 - B Frameshift
 - C Base inversion
 - D Point mutation
48. The basis of paper chromatography is:
- A Absorption
 - B Adsorption
 - C Partition
 - D Hydration

49. A mixture which boils off like a single pure compound is called:
- A Eutectic
 - B Azeotrope
 - C Ideal solution
 - D Saturated solution
50. 'Descent with modification' is the main theme of:
- A Genetics and interpretation
 - B Biogenesis
 - C Recapitulation
 - D Evolution
51. The theory of use and disuse organ was proposed by:
- A Darwin
 - B Lamarck
 - C deVries
 - D Hooker
52. The low density of ice as compared to water is due to:
- A Induced dipole-induced dipole interactions
 - B Dipole-induced dipole interactions
 - C Hydrogen bonding interactions
 - D Dipole-dipole interactions
53. The hybridization of carbon atom in benzene is:
- A sp
 - B sp^2
 - C sp^3
 - D dsp^2
54. Which one is used as a biofertiliser?
- A *Nostoc*
 - B *Volvox*
 - C *Funaria*
 - D *Rhizopus*
55. 'Mammalian thymus' is mainly concerned with:
- A Regulation of body temperature
 - B Regulation of body growth
 - C Immunological function
 - D Secretion of thyrotropin

56. Which one of the following diseases is spread by housefly?

- A Malaria
- B Pneumonia
- C Tuberculosis
- D Typhoid

57. Which of the following causes prostate cancer?

- A Chromium
- B Chromium oxide
- C Vinyl chloride
- D Aflatoxins

58. The metallic lustre exhibited by sodium is explained by:

- A Diffusion of sodium ions
- B Excitation of free protons
- C Oscillation of loose electrons
- D Existence of body centred cubic lattice

59. Which one contains both polar and non-polar bonds?

- A NH_4Cl
- B HCN
- C H_2O_2
- D CH_4

60. Which one of the following help in blood coagulation?

- A Leucocytes
- B Monocytes
- C Lymphocytes
- D Thrombocytes

61. Sympathetic nerve accelerates heart beat due to:

- A Insulin
- B Adrenalin
- C Glucagon
- D None of the above

62. The 'Eyes' of the potato tuber are:

- A Root buds
- B Flower buds
- C Shoot buds
- D Axillary buds

63. What is the function of germ pore?
- A Emergence of radical
 - B Adsorption of water for seed germination
 - C Initiation of pollen tube
 - D Release of male gametes
64. Volume of water needed to mix with 10 ml of 10 N HNO_3 to get 0.1 N HNO_3 is:
- A 900 ml
 - B 1000 ml
 - C 100 ml
 - D 20 ml
65. Which will show maximum depression in freezing point when concentration is 0.1 M?
- A NaCl
 - B Urea
 - C Glucose
 - D K_2SO_4
66. Phenomenon which converts light energy into chemical energy is:
- A Respiration
 - B Transpiration
 - C Photosynthesis
 - D Photons
67. Which of the following elements are essential for photolysis of water?
- A Ca and Cl
 - B Cu and Fe
 - C Mn and Cl
 - D Zn and I
68. For yielding one molecule of glucose, the Calvin cycle turns:
- A Two times
 - B Four times
 - C Six times
 - D Eight times
69. When two species of different genealogy come to resemble each other as a results of adaptation, the phenomenon is termed:
- A Co-evolution
 - B Convergent evolution
 - C Divergent evolution
 - D Microevolution

70. In C_3 plants, the first stable product of photosynthesis during the dark reaction is:
- A Malic acid
 - B Oxaloacetic acid
 - C Phosphoglyceraldehyde
 - D 3-phosphoglyceric acid

PART II

SHORT ANSWER QUESTIONS

(30 MARKS)

ANSWER ALL THE FOLLOWING 10 SHORT ANSWER QUESTIONS (3 MARKS EACH)

1. What is vegetative propagation? Give two suitable examples. (3 marks)
2. What is siphonogamy? Differentiate between parthenogenesis and parthenocarpy. (3 marks)
3. Saturated solutions of Na_2SO_4 and $\text{Al}_2(\text{SO}_4)_3$ are mixed and allowed to crystallise. Write the name and formula of the crystals formed. (3 marks)
4. Name the hormones involved in regulation of spermatogenesis. (3 marks)
5. Given the chemical equation: $\text{C}_{12}\text{H}_{22}\text{O}_{11} + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{12}\text{O}_6$, what is the order of the reaction? Justify your answer. Also name the reactants and the products in the equation. (3 marks)
6. Why does chlorophyll appear red in reflected light and green in transmitted light? (3 marks)
7. How is intracellular CO_2 increased in C_4 plants during daytime? (3 marks)
8. 0.2 M solution of monobasic acid is dissociated to 0.95%. Calculate its dissociation constant. (3 marks)
9. Name the cells that secrete mucus. What functions are carried out by mucus? (3 marks)
10. Why is photosynthesis called a process of transformation of photonic energy into chemical energy? (3 marks)

TASHI DELEK