

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022
EXAMINATION CATEGORY: TECHNICAL

PAPER II: GENERAL SUBJECT KNOWLEDGE PAPER FOR BIO SCIENCE

Date	: October 8, 2022
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 **11 printed pages**, including this instruction page.

GOOD LUCK!

Part I

Multiple Choice Questions [70 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 71 (a). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Which crop utilises solar energy most efficiently?
 - a) Potato
 - b) Sugarcane
 - c) Rice
 - d) Sunflower
2. A red blood cell was kept in a certain solution for few minutes and it got burst. The said solution was:
 - a) Isotonic
 - b) Hypertonic
 - c) Hypotonic
 - d) All of the above
3. The type of isomerism exhibited by the compounds $\text{CH}_3\text{-O-C}_3\text{H}_7$ and $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5$ is:
 - a) Optical isomerism
 - b) Chain isomerism
 - c) Tautomerism
 - d) Metamerism
4. Hexose monophosphate pathway takes place in:
 - a) Endoplasmic reticulum
 - b) Cytoplasm
 - c) Cristae
 - d) Mitochondrial matrix
5. Chlorophyll in chloroplasts is located in:
 - a) Grana
 - b) Stroma
 - c) Pyrenoid
 - d) None of the above
6. About 1000 ml of air is always known to remain inside the human lungs. It is described as
 - a) inspiratory reserve volume.
 - b) expiratory reserve volume.
 - c) residual volume.
 - d) tidal volume.
7. Which of the following organs in human can be called a sort of 'blood bank'?
 - a) Heart
 - b) Spleen
 - c) Lungs
 - d) Liver

8. 4.0 g of NaOH is dissolved in 100 ml solution. The normality of the solution is:
- 0.1 N
 - 1.0 N
 - 4.0 N
 - 0.5 N
9. The isotope of an element was discovered by:
- Soddy
 - Curie
 - Thomson
 - Chadwick
10. Which of the following blood vessels in the circulatory system of frog has more oxygenated blood?
- Pulmocutaneous artery
 - Pulmocutaneous vein
 - Pulmonary artery
 - Precaval veins
11. Patients suffering from cholera are given a saline drip because
- Na^+ ions help in stopping nerve impulse and hence sensation of pain.
 - NaCl is an important component of energy supply.
 - Na^+ ions help in the retention of water in the body tissues.
 - NaCl furnishes most of the fuel required for cellular activity.
12. The existence of a substance in more than one physical form is known as:
- Isotropy
 - Allotropy
 - Amorphism
 - None of the above
13. Which one of the solids in the list is a good conductor of electricity?
- NaCl
 - Diamond
 - Dry ice
 - Graphite
14. When ice melts into water, entropy
- becomes zero.
 - increases.
 - decreases.
 - remains the same.
15. The process by which new allele of a gene is produced is termed as
- natural selection.
 - gene flow.
 - genetic drift.
 - mutation.

16. Blue litmus turns red in a solution of pH
- below 7
 - at 7
 - above 7
 - at all pH.
17. The placental barrier between the maternal and foetal blood is minimum in:
- Goat
 - Pig
 - Cow
 - Man
18. Genetic diversity in agricultural crops is threatened by
- introduction of high yielding varieties.
 - extensive use of fertilizers.
 - extensive intercropping.
 - intensive use of biopesticides.
19. Desired improved varieties of economically useful crops are raised by:
- Migration
 - Biofertilisers
 - Hybridisation
 - Natural selection
20. The terminator gene technology causes
- failure of seed setting after one generation.
 - breakage of seed dormancy.
 - early flowering in plants.
 - None of the above
21. The element which catches fire in air at 30° C and is stored under water is:
- Calcium
 - Sodium
 - White Phosphorus
 - Red Phosphorus
22. IUPAC name of C_2H_5CN is:
- Ethyl cyanide
 - Propane nitrile
 - Acetonitrile
 - Ethane nitrile
23. In human body, an organ capable of extensive regeneration is:
- Heart
 - kidney
 - Liver
 - Spleen

24. Bacterium *Pseudomonas* is useful as it can
- fix atmospheric nitrogen.
 - transfer gene from one plant to another plant.
 - decompose a variety of organic compounds.
 - produce several antibiotics.
25. Which one of the following is not a biofertiliser?
- Agrobacterium*
 - Nostoc*
 - Rhizobium*
 - Mycorrhiza
26. The isomers have the same
- chemical properties.
 - molecular formula.
 - physical properties.
 - structural formula.
27. The material used in solar cells contains:
- Cs
 - Si
 - Sn
 - Ti
28. On the basis of requirement of light intensity, plants are recognised as
- Dicotyledonous or monocotyledonous.
 - Hydroponics or aeroponics.
 - Xerophytes or bryophyte.
 - Sciophytes or heliophytes.
29. Graham's law is correlated with:
- Diffusion
 - Osmoregulation
 - Osmosis
 - Absorption
30. Which one of the following is used as an antitranspirant?
- Cobalt chloride
 - Naphthol acetic acid
 - Calcium carbonate
 - Phenyl mercuric acetate
31. Identify the plant parts whose transverse section shows a clear and prominent pith.
- Dicot and monocot stems
 - Dicot stem and monocot root
 - Dicot and mono roots
 - Dicot stem and dicot root

32. On heating one end of a piece of a metal, the other end becomes hot because of
- resistance of a metal.
 - mobility of atoms in the metal.
 - energised electrons moving to the other end.
 - minor perturbation in the energy of atoms.
33. The tiny air sacs present in human lungs is called:
- Alveoli
 - Bronchus
 - Bronchioles
 - All of the above
34. C-14 has a half-life of 5760 years. 100 mg of a sample of C-14 is reduced to 25 mg in
- 12780 years.
 - 1440 years.
 - 2890 years.
 - 11520 years.
35. An indicator for iodine titration is:
- phenolphthalein
 - Cellulose
 - Starch
 - Galactose
36. In some plants, anthers and stigma grow and mature at the same time. This phenomenon is called:
- Homogamy
 - Allogamy
 - Fusion
 - Syngamy
37. The outermost layer of maize endosperm is known as:
- Perisperm
 - Endothecium
 - Aleurone
 - Tapetum
38. Alkaline hydrolysis of an ester is called:
- Neutralization
 - Esterification
 - Polymerization
 - Saponification
39. Which one of the following is not true about the polymers?
- Polymers do not carry any charge
 - Polymers have low molecular weight
 - Polymers scatter light
 - None of the above

40. Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called _____.
- Autogamy
 - Karyogamy
 - Geitonogamy
 - Xenogamy
41. What is the function of germ pore?
- Release of male gametes
 - Emergence of radical
 - Absorption of water for seed germination
 - Initiation of pollen tube
42. Which accessory genital gland occurs only in mammalian male?
- Prostate gland
 - Perineal gland
 - Cowper's gland
 - Bartholin gland
43. Haeckel's theory of recapitulation means that
- Ontogeny repeats phylogeny.
 - Progeny of an organism resembles its parents.
 - All organisms begin their life from one cell.
 - Regeneration
44. "The ratio of the concentration of a solute between two liquid phases is constant at a given temperature." This statement is called:
- Kirchoff's law
 - Henry's law
 - Distribution law
 - Raoult's law
45. The pigment involved in photomorphogenetic movement is:
- Cytochrome
 - Phytochrome
 - Chromatin
 - Vernalin
46. The flowers of *Oxalis* open during the day and close at night. Such type of movement is:
- Photnastic
 - Nyctinasty
 - Photonasty
 - Seismonastic
47. Volume of water needed to mix with 10 ml of 10 N HNO_3 to get 0.1 N HNO_3 is:
- 10 ml
 - 990 ml
 - 1000 ml
 - 1010 ml

48. Which of the following is considered to be the best chemical method of fixing atmospheric nitrogen?
- Fisher method
 - Haber-Bosch method
 - Decan method
 - Parnas-Meyerhoff method
49. In leaves of C₄ plants, malic acid synthesis during carbon dioxide fixation occurs in:
- Epidermal cells
 - Guard cells
 - Mesophyll cells
 - Bundle sheath cells
50. Which of the following help in blood coagulation?
- Leucocytes
 - Monocytes
 - Lymphocytes
 - Thrombocytes
51. A mixture which boils off like a single pure compound is called:
- Eutectic
 - Azeotrope
 - Ideal solution
 - Saturated solution
52. Evolutionary history of an organism is known as:
- Ancestry
 - Palaeontology
 - Ontology
 - Phylogeny
53. Which one of the following theories was propose by Weismann?
- Theory of natural selection
 - Law of inheritance
 - Theory of germplasm
 - Theory of inheritance of acquired characters
54. The modern man differs from the apes in:
- Protruding eyes
 - Spare body hair
 - Wearing of clothes
 - Arms shorter than legs
55. The scientific name of Java man is _____.
- Homo habilis*
 - Homo sapiens neanderthalensis*
 - Homo erectus erectus*
 - Australopithecus boisei*

56. In tissue culture, which one of the following pairs of substances is used to induce shoot formation and root formation respectively during organogenesis?
- Auxins and Cytokinins
 - Cytokinins and auxins
 - Ethylene and abscisic acid
 - Hydrogen peroxide and chlorine
57. Which term is used to describe the component isolated from a plant for *in vitro* culture?
- Callus
 - Embryoid
 - Explant
 - None of the above
58. Aflatoxin is produced by:
- Bacterium
 - Fungus
 - Virus
 - Mosquitoes
59. In AIDS, which of these cells are most affected?
- B-cells
 - T-cells
 - Monocytes
 - Neutrophils
60. Which of the following liquids would possess the highest vapour pressure at room temperature?
- Acetic acid (b.p. 118° C)
 - Chlorobenzene (b.p. 132° C)
 - Methyl alcohol (b.p. 65° C)
 - Nitrobenzene (b.p. 212° C)
61. A chemical substance produced by a microorganism for inhibiting the growth of another is:
- Antibody
 - Antibiotic
 - Antiallergic
 - Aflatoxin
62. Improvement of human race through hereditary qualities is called:
- Euthenics
 - Human hereditary
 - Human demography
 - Eugenics
63. The drug useful to increase cardiovascular effects in human being is:
- Cocaine
 - Benzodiazepine
 - Barbiturate
 - Insulin

64. Volume of 0.6 M NaOH required to neutralise 30 cm³ of 0.4 M HCl is:
- 10 cm³
 - 20 cm³
 - 30 cm³
 - 40 cm³
65. Morphine, which is used as analgesic is obtained from:
- Cinchona officinalis*
 - Papaver somniferum*
 - Taxus brevifolia*
 - Berberis nilghiriensis*
66. Which one of the following is surrounded by a callose wall?
- Male gamete
 - Egg
 - Pollen
 - Microspore mother cell
67. Which part of our body secretes the hormone secretin?
- Ileum
 - Stomach
 - Duodenum
 - Oesophagus
68. Uric acid is the chief nitrogenous component of the excretory product of:
- Earthworm
 - Frog
 - Man
 - Cockroach
69. Vitamin-D is synthesized in skin by the action of sunlight on:
- Cholesterol
 - 7-hydroxy cholesterol
 - Cephalin cholesterol
 - All of the above
70. The minerals involved in water-splitting reaction during photosynthesis are
- copper and chlorine.
 - magnesium and chlorine.
 - manganese and chlorine.
 - potassium and chlorine.

Part II

Short Answer Questions [30 marks]

Answer ALL 10 short answer questions. Each question carries 3 marks.

1. What is the utility of carotenoids to plant? (3 marks)
2. Why is bile juice important in digestion of food when it has no digestive enzymes? (3 marks)
3. Define hybridisation in crop improvement. What are the types of hybridisation? (3 marks)
4. Calculate the molality of one litre of 93% H_2SO_4 solution (w/v). The density of the solution is 1.84 g per ml. (3 marks)
5. From which chemical compound are all steroid hormones derived. Name the steroid hormones secreted by Leydig's cells of testes and adrenal cortex. (3 marks)
6. How does the progeny formed from asexual reproduction differ from that formed by sexual reproduction? (3 marks)
7. When and why leghaemoglobin pigment develops in leguminous plants? Where is it located? (3 marks)
8. Why is transpiration considered to be a necessary evil in plants? (3 marks)
9. Amylase is secreted by two different glands. (a) Name the glands. (b) What is the difference between two amylases? (3 marks)
10. What are biofertilisers? Legumes fertilise the soil but cereals do not. Why? (3 marks)

TASHI DELEK