

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2018
EXAMINATION CATEGORY: TECHNICAL**

PAPER II: GENERAL SUBJECT KNOWLEDGE PAPER FOR BIOSCIENCE

Date	: 6 October 2018
Total Marks	: 100
Examination Time	: 90 minutes (1.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of 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 Section and Part in 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 are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
11. This paper has **8 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 chemical element is central in the chlorophyll molecule
 - a) Carbon
 - b) Nitrogen
 - c) Magnesium
 - d) Hydrogen
2. Number of moles of NaOH present in 2 litre of 0.5 M NaOH is:
 - a) 1.5
 - b) 1.0
 - c) 1.5
 - d) 2.5
3. In nature, cleistogamous flowers are:
 - a) Wind-pollinated
 - b) Self-pollinated
 - c) Bird-pollinated
 - d) Insect-pollinated
4. The maximum possible number of H-bonds in which a water molecule can participate is:
 - a) 1
 - b) 2
 - c) 3
 - d) 4
5. Disease associated with secretion of toxin is:
 - a) Tetanus
 - b) AIDS
 - c) TB
 - d) Food poisoning
6. Which of the following is not related to sex chromosome X or Y?
 - a) Klinefelter syndrome
 - b) Turner syndrome
 - c) Down syndrome
 - d) Haemophilia and colour blindness

7. The molecule which does not exhibit dipole moment is:
- NH₃
 - H₂O
 - CCl₄
 - CHCl₃
8. Cyanobacteria are useful biofertilisers in the fields of:
- Maize
 - Rice
 - Wheat
 - Potato
9. Which one of the following is an example of *ex situ* conservation?
- National park
 - Sacred groove
 - Seed bank
 - Wildlife sanctuary
10. Glass is considered to be a:
- Micro-crystalline solid
 - Super cooled liquid
 - Gel
 - Polymeric mixture
11. Henry's law is not applicable to:
- O₂
 - N₂
 - NH₃
 - HCl
12. A mixture which boils off like a single pure compound is called:
- Azeotrope
 - Eutectic
 - Ideal solution
 - Saturated solution
13. Insectivorous plants live in a soil that is usually deficient in:
- Phosphorus
 - Potassium
 - Nitrate
 - Magnesium
14. Potassium, nitrogen, calcium, and magnesium deficiency causes:
- Chlorosis
 - Leaf curl
 - Red rust
 - Late blight of potato

15. The solubility of a gas increases with increase of:
- Temperature
 - Pressure
 - Volume of the gas
 - None of the above
16. Which of the following is a bacterium Involved in denitrification?
- Nitrococcus
 - Nitrosoonus
 - Pseudomonas
 - Azotobacter
17. Chloroplast dimorphism is a characteristic feature of:
- Plants with Calvin cycle
 - C₄ plants
 - All plants
 - Only in algae
18. In plants, the guard cells differ from other epidermal cells in having:
- Mitochondria
 - Endoplasmic Reticulum
 - Cytoskeleton
 - Chloroplasts
19. Wind pollination is common in:
- Legumes
 - Lilies
 - Orchids
 - Grasses
20. The Pigment involved in photomorphogenetic movement is:
- Cytochrome
 - Phytochrome
 - Chromatin
 - Vernalin
21. Haemoglobin is having maximum affinity with:
- Carbon monoxide
 - Carbon dioxide
 - Oxygen
 - Ammonia
22. The role of catalyst in a chemical reaction is to change:
- Heat of reaction
 - Product of reaction
 - Equilibrium constant
 - Activation energy

23. The role of pacemaker in heart is to:
- Accelerate blood circulation
 - Initiate heart beat
 - Stimulate blood pressure
 - Inhibit backflow of blood
24. When the pH of a solution is increased from 3 to 6 its H^+ ion concentration will be:
- Reduced to half
 - Doubled
 - Reduced by 1000 times
 - Increased by 1000 times
25. Ammonia is converted into urea in:
- Kidney
 - lungs
 - Liver
 - Spleen
26. NH_3 dissolves in H_2O to give NH_4OH . In this reaction water acts as:
- A base
 - An acid
 - A salt
 - A conjugate base
27. Which of the following hormones stimulates the secretion of milk from female?
- Luteinising Hormone
 - Prolactin
 - Oxytocin
 - Progesterone
28. Which part of human brain is concerned with the regulation of body temperature?
- Medulla Oblongata
 - Cerebellum
 - Cerebrum
 - Hypothalamus
29. Leaf abscission is caused by:
- ABA
 - Cytokinin
 - Auxin
 - Gibberellins
30. Largest muscle in the human body is:
- Sartorius
 - Gluteus
 - Stapedius
 - Masseter

31. The term “mutation” was introduced by:
- Darwin
 - Hugo DeVries
 - Muller
 - Morgan
32. Which one of the following is the weakest base?
- NaOH
 - KOH
 - Zn(OH)₂
 - Ca(OH)₂
33. Which of the following has the highest pH?
- CH₃COOK
 - Na₂CO₃
 - NH₄Cl
 - NaNO₃
34. 17.0 g of NH₃ is present in 500.0 ml volume. Its active mass is:
- 1.0 ML⁻¹
 - 0.5 ML⁻¹
 - 1.5 ML⁻¹
 - 2.0 ML⁻¹
35. When a mutation is limited to the substitution of one nucleotide for another it is called:
- Translocation
 - Point mutation
 - Base inversion
 - Frameshift
36. Which of the following is the non-essential metal found in plant tissue analysis?
- Potassium
 - Boron
 - Sodium
 - Nitrogen
37. An apparatus used for the measurement of quantity of electricity is known as:
- Calorimeter
 - Calcimeter
 - Coulometer
 - Colorimeter
38. Which of the following is the chemical composition of Chlorophyll *a*:
- C₅₅H₇₂O₅N₄Mg
 - C₅₅H₇₀O₆N₄Mg
 - C₄₀H₅₆
 - C₄₀H₅₆O₂

- 39 In human, the cardiac cycle in a normal subject is about:
- a) 0.5 second
 - b) 0.8 second
 - c) 1.0 second
 - d) 1.2 second
- 40 Which of the following enzymes digests protein in stomach?
- a) Trypsin
 - b) Pepsin
 - c) Erepsin
 - d) Amylases
- 41 Uric acid is the chief nitrogenous component of excretory product of:
- a) Man
 - b) Cockroach
 - c) Frog
 - d) Earthworm
- 42 When ice melts into water , entropy:
- a) Becomes zero
 - b) Increases
 - c) Decreases
 - d) Remains the same
- 43 In human body , an organ capable of extensive regeneration is:
- a) Kidney
 - b) Liver
 - c) Spleen
 - d) Thymus
- 44 Evolutionary history of an organism is known as:
- a) Phylogeny
 - b) Ancestry
 - c) Palaeontology
 - d) Ontogeny
- 45 Which of the following is a protozoan disease? :
- a) Malaria
 - b) Amoebiasis
 - c) Sleeping sickness
 - d) All of the above
- 46 Which among the following is endothermic reaction?
- a) Combustion of methane
 - b) Decomposition of H_2O
 - c) Hydration of ethanol
 - d) None of the above

- 47 Which one of the following diseases is spread by housefly?
- a) Dengue fever
 - b) Encephalitis
 - c) Typhoid
 - d) Filariasis
- 48 Bell metal is an alloy of:
- a) Sn and Cu
 - b) Al and Sn
 - c) Zn and Pb
 - d) Zn and Cu
- 49 Quinine is obtained from:
- a) Leaves of *Cinchona*
 - b) Bark of *Cinchona*
 - c) Wood of *Cinchona*
 - d) Root of *Cinchona*
- 50 There are certain bacteria which are strongly attracted by the presence of free oxygen, and such movement toward the source of supply is termed:
- a) Phototaxis
 - b) Thermotaxis
 - c) Chemotaxis
 - d) None of these
- 51 The mutations caused either due to intracellular factors or due to background cosmic radiation is called:
- a) Induced mutations
 - b) Spontaneous mutations
 - c) Physical mutagens
 - d) Chemical mutagens
- 52 Which hormone causes dilation of blood vessels, increased oxygen consumption and gluconeogenesis?
- a) Glycogen
 - b) ACTA
 - c) Insulin
 - d) Adrenaline
- 53 Green manure plants used for improving soil fertility by farmers mainly belong to:
- a) Compositae
 - b) Solanaceae
 - c) Leguminosae
 - d) Poaceae

- 54 Which one of the following disaccharides is present in milk?
- Maltose
 - Ketose
 - Sucrose
 - Lactose
- 55 The process by which plant nutrients or contaminants are dissolved and carried away by water into a lower layer of soil is:
- Surface run off
 - Leaching
 - Eutrophication
 - Erosion
- 56 The desired varieties of economically useful crops are raised by:
- Mutation
 - Hybridisation
 - Vernalisation
 - Natural selection
- 57 Male mosquitoes take their food from:
- The human blood
 - The stagnant water
 - The sap of plant
 - None of the above
- 58 A contemporary of Charles Darwin who came to the same conclusion in the matter of organic evolution was:
- Thomas Fluxley
 - Alfred Russel Wallace
 - Jean Baptist Lamarck
 - Franklin Benjamin
- 59 Chemical decomposition of an organic compound by water is called as:
- Hydrogenation
 - Hydrolysis
 - Hydration
 - All of the above
- 60 The decomposition of rocks, soils and their minerals through direct contact with the Earth's atmosphere is called:
- Erosion
 - Desertification
 - Weathering
 - Degradation

- 61 The Black rust of disease of wheat is caused by :
- Xanthomonas graminis
 - Puccinia recondita
 - Puccinia graminis
 - None of the above
- 62 The theory of use and disuse of organ was proposed by :
- Hooker
 - De Vries
 - Lamarck
 - Darwin
- 63 The reaction of H_2O_2 with PbS is an example of:
- Addition
 - Reduction
 - Oxidation
 - Acidic nature of H_2O_2
- 64 If mammalian ovum fails to get fertilised, which one of the following is unlikely?
- Corpus luteum will disintegrate
 - Estrogen secretion further decreases
 - Primary follicle starts developing
 - Progesterone secretion rapidly declines
- 65 Skin is an accessory organ of respiration in:
- Human
 - Rabbit
 - Frog
 - Lizard
- 66 Edible part in mango is:
- Endocarp
 - Receptacle
 - Epicarp
 - Mesocarp
- 67 Root hair absorbs water from soil through:
- Turgor pressure
 - Ion exchange
 - Osmosis
 - Imbibition
- 68 The pH of the digestive juices within the human small intestine is between 7.5 to 8.5 which is considered to be slightly:
- Neutral
 - Acidic

- c) Basic
 - d) None of the above
- 69 Vegetative propagation in ginger is carried out by means of:
- a) Tuber
 - b) Roots
 - c) Bulb
 - d) Rhizome
- 70 Most accepted theory for ascent of sap in plant is:
- a) Capillary theory
 - b) Root pressure theory
 - c) Pulsation theory
 - d) Transpiration pull theory

PART II – Short Answer Questions (30 marks)

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

1. In a fully turgid plant cell, two pressures are involved, outward and inward.
 - a) What are they, and describe how the pressures are generated? (2 marks)
 - b) Normally in the plant cell two pressures, outward and inward; counter-balance each other and a state of equilibrium is maintained between them. Name one factor that influences the turgidity of a living cell. (1 mark)
2. The pH of 0.05 M aqueous solution of diethylamine ($C_2H_5)_2NH$) is 12. Calculate its K_b . (3 marks)
3. What are the three ideal characteristics you will select for culturing honey bees? (3 marks)
4. Briefly answer the following questions:
 - a) How is light from the sun transformed into chemical energy to be used by the living beings on earth? (2 marks)
 - b) Which is the cell organelle responsible for the absorption of light for the photosynthesis process in plants and algae? (1 mark)
5. What are the three phases into which a cell respiration is divided? (3 marks)
6. a) Why is blind spot insensitive to light, though it is a part of photosensitive layer? (1.5 marks)
 - b) Why is cerebral cortex highly convoluted? (1.5 marks)

7. What are psychotropic and psychedelic drugs? (3 marks)
8. If the history of growth of any organs of plant be followed three phases can be recognised in it. What are these three phases? (3 marks)
9. What are the three most important economic benefits that can be generated by very biodiverse ecosystems? (3 marks)
10. Explain antibiotic resistance observed in bacteria in the light of Darwinian selection theory. (3 marks)

TASHI DELEK