ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2016
EXAMINATION CATEGORY: TECHNICAL

PAPER II: GENERAL SUBJECT KNOWLEDGE FOR BIOSCIENCE GROUP

Date	: 1 October 2016
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, printing error, clarify doubts and to read instructions in Question Paper. You are NOT permitted to write during this time.
3. This paper consists of **TWO parts: – namely Part I and 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 Part, Section and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating correct Part, Section and Question Number will NOT be evaluated and no marks would be awarded.
7. Begin each 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. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
10. The Question paper has **12 pages** including this Instruction Page.

GOOD LUCK!

PART I: MULTIPLE CHOICE QUESTIONS

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

1. Phenomenon which converts light energy into chemical energy is called
   a. photorespiration
   b. photosynthesis
   c. chemosynthesis
   d. global warming

2. Which of the following maintains the shape of cell?
   a. Osmosis
   b. Osmotic pressure
   c. Turgor pressure
   d. Wall pressure

3. Maximum percentage of which element occurs in plant ash?
   a. Nitrogen
   b. Calcium
   c. Magnesium
   d. Potassium

4. Which of the following help in blood coagulation?
   a. Monocytes
   b. Thrombocytes
   c. Leucocytes
   d. Lymphocytes

5. The ability of plant cells to regenerate the complete plants is known as
   a. tissue culture
   b. cell cloning
   c. totipotency
   d. pleuropotency

6. About 70 % of total global carbon is found in
   a. forests
   b. oceans
   c. agro-ecosystems
   d. grasslands

7. A free-living aerobic and non-photosynthetic nitrogen-fixing bacteria is
   a. *rhizomium*
   b. *anabaena*

c. *azotobacter*
d. *clostridium*

8. Gene mutations occur at the time of
   a. cell division
   b. RNA transcription
   c. DNA replication
   d. None of the above

9. The one that is a good conductor of electricity in the following list of solids is
   a. diamond
   b. graphite
   c. NaCl
   d. dry ice

10. The role of a catalyst in a chemical reaction is to change
   a. equilibrium
   b. activation energy
   c. heat of reaction
   d. product of reactions

11. Which of the following vitamins is water soluble?
   a. Vitamin-A
   b. Vitamin-B
   c. Vitamin-E
   d. Vitamin-K

12. Which type of carbohydrate is cane sugar?
   a. Monosaccharide
   b. Disaccharide
   c. Polysaccharide
   d. ketohexose

13. The lining of intestine and kidneys in human is
   a. ciliated
   b. brush-bordered
   c. keratinised
   d. None of the above

14. Which of the following alcohols is used as a beverage?
   a. butanol
   b. ethanol
   c. propanol
   d. methanol

15. During inflammation, which of the following is secreted by connective tissue?
    a. heparin
    b. histamine
    c. serotonin
    d. glucagon

16. Which tissue in plant gives rise to secondary growth?
    a. apical meristem
    b. adventious roots
    c. vascular cambium
    d. None of the above

17. Carbon dioxide is transported in blood in the form of
    a. haemoglobian
    b. oxhaemoglobin
    c. bicarbonate
    d. carbonate

18. Which of the following has highest pH?
    a. CH_3COOK
    b. Na_2CO_3
    c. NH_4Cl
    d. $NaNO_3$

19. An evolutionary process giving rise to new species adapting to new habitat and ways of life is called
    a. adaptation
    b. adaptive radiation
    c. convergent evolution
    d. microevolution

20. Which of the following scientist's names is correctly matched with the theory put forth by him?
    a. Louis Pasteur – Inheritance of acquired characters
    b. Weismann – Theory of continuity of germplasm
    c. Hugo deVries – Natural selection
    d. Mendel – Theory of pangenesis

21. Which part of ovary in mammals acts as an endocrine gland after ovulation?
    a. vitelline membrane
    b. stroma
    c. graafian follicle
    d. germinal epithelium

22. Hot spots of biodiversity are
    a. where maximum number of fauna are found
    b. where maximum number of flora are found
    c. where maximum diversity is found
    d. where maximum natural resources are found

23. Disease associated with secretion of toxin is called
    a. tetanus
    b. food poisoning
    c. AIDS
    d. tuberculosis

24. The process by which new allele of gene is produced is termed
    a. gene manipulation
    b. genetic drift
    c. mutation
    d. gene recombination

25. Which one of the following does not contain volume?
    a. normality
    b. molarity
    c. molality
    d. formality

26. Number of chromosomes in Down's syndrome is
    a. 45
    b. 46
    c. 47
    d. 48

27. Solid NaCl is a bad conductor of electricity, since
    a. Solid NaCl is covalent
    b. In solid NaCl there are no ions
    c. In solid NaCl there are no electrons
    d. In solid NaCl ions are not mobile

28. Length of petiole increases due to division of
    a. apical meristem
    b. lateral meristem
    c. intercalary meristem
    d. All of the above

29. A cell swells up when kept in
    a. hypertonic solution
    b. hypotonic solution

c. isotonic solution
d. None of the above

30. The soil water available to plants for absorption is
    a. hygroscopic water
    b. gravitational water
    c. capillary water
    d. chemically bound water

31. The role of pacemaker in heart is to
    a. accelerate blood circulation
    b. stimulate blood pressure
    c. inhibit backflow of blood
    d. initiate heart beat

32. The pigment involved in photomorphogenetic movement is
    a. cytochrome
    b. chromatin
    c. phytochrome
    d. vernalin

33. The deteriorative processes in plants that naturally terminate their functional life are collectively called
    a. abscission
    b. plasmolysis
    c. senescence
    d. wilting

34. Kupffer's cells are present in
    a. small intestine
    b. liver
    c. pancreas
    d. thyroid gland

35. Which type of movement is present in *Mimosa pudica*?
    a. chmonastic
    b. seismonastic
    c. nyctinastic
    d. phototropic

36. Vitamin-D is synthesized in skin by the action of sunlight on
    a. cephain cholesterol
    b. cholesterol
    c. 7-hydroxy cholesterol
    d. All of the above

37. What is the molarity of an aqueous solution of ethanoic acid (CH3COOH), molar mass = 60, which contains 6.0 g of ethanoic acid in 500 ml of the solution?
    a. $0.1\ mol^{-1}$
    b. $0.2\ mol^{-1}$
    c. $0.3\ mol^{-1}$
    d. None of the above

38. Diamond and graphite are
    a. polymers
    b. allotropes
    c. isomers
    d. isotopes

39. Sodium bicarbonate is commonly used in cooking as
    a. alum
    b. baking Powder
    c. baking soda
    d. yeast

40. Humidity in atmosphere decreases rate of
    a. growth
    b. glycolysis
    c. transpiration
    d. photosynthesis

41. Which of the following genes is responsible for biological nitrogen fixation?
    a. Yeast alanine *tRNA synthetase*
    b. *Nif gene*
    c. *RNA synthetase*
    d. *Nitrogenase*

42. Plasmolysis is the result of
    a. endosmosis
    b. exosmosis
    c. reverse osmosis
    d. diffusion

43. Most accepted theory for ascent of sap is
    a. pulsation theory
    b. transpiration pull theory
    c. capillary theory
    d. root pressure theory

44. In which of the following is putrefying bacteria present**?**
    a. colon
    b. stomach
    c. intestine
    d. kidney

45. In plants, the guard cells differ from other epidermal cells in having
    a. mitochonddria
    b. chloroplasts
    c. cytoskeleton
    d. endoplasmic recticulum

46. Which one is known as Oil of Vitriol?
    a. H_2SO_3
    b. $H_2S_2O_7$
    c. H_2SO_4
    d. HNO_3

47. When you chop onions, your eyes can burn because a chemical reaction produces
    a. acetic acid
    b. hydrochloric acid
    c. nitric acid
    d. sulphuric acid

48. "Brown heart" in root crops characterised by dark spot on the thickest parts of the root or splitting at centre is caused due to the deficiency of
    a. iron
    b. manganese
    c. boron
    d. sulphur

49. Which part of human brain is concerned with the regulation of body temperature
    a. cerebrum
    b. cerebellum
    c. hypothalamus
    d. medulla oblongata

50. Lignifications is associated with
    a. chlorenchyma
    b. parenchyma
    c. phloem
    d. xylem

51. The Black rust of disease of wheat is caused by
    a. xanthomonas graminis
    b. puccinia graminis
    c. puccinia recondite
    d. None of the above

52. The number of moles of KCl in 1000 ml of 3 molar solution is
    a. 2
    b. 3
    c. 4
    d. 5

53. Ascent of sap in plants was demonstrated by
    a. Lever auxanometer
    b. Girdling experiment
    c. Ganong's experiment
    d. Went experiment

54. Insectivorous plants eat the insects for
    a. phosphorus
    b. nitrogen
    c. copper
    d. chlorine

55. Which type of white blood cells are concerned with the release of histamine and the natural anticoagulant heparin?
    a. monocytes
    b. neutrophils
    c. basophils
    d. eosinophils

56. A cell when dipped in 0.5 M sucrose solution has no effect but when the same cell is dipped in 0.5 M NaCl solution, the cell will
    a. decrease in size
    b. increase in size
    c. be turgid
    d. get deplasmolysed

57. For nitrogen fixation useful pigment is
    a. haemoglobin
    b. leghaemoglobin
    c. nitrogenase
    d. myoglobin

58. The 'Eyes' of the potato tuber are
    a. axillary buds
    b. flower buds
    c. shoot buds
    d. root buds

59. The blue baby syndrome results from
    a. methaemoglobin
    e. haemoglobin
    b. excess of dissolved oxygen
    c. excess of chloride

60. 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

61. Law of limiting factors was given by
    a. Blackman
    b. Calvin
    c. Lavoisier
    d. Leibig

62. Vitamin-B12 is available to ruminants by
    a. animals
    b. plants
    c. microorganisms in caecum
    d. All of the above

63. Blood pressure instrument records
    a. systolic pressure
    b. diastolic pressure
    c. both (a) and (b)
    d. None of the above

64. For yielding one molecule of glucose, the Calvin cycle turns
    a. two times
    b. four times
    c. six times
    d. eight times

65. Which of the following enzymes digests protein in stomach?
    a. eripsin
    b. trypsin
    c. pepsin
    d. All of the above

66. Edible part in mango is
    a. endocarp
    b. mesocarp
    c. epicarp
    d. receptacle

67. An element playing important role in nitrogen fixation is
    a. copper
    b. molybdenum
    c. iron
    d. manganese

68. Which type of sugar is table sugar?
    a. fructose
    b. galactose
    c. sucrose
    d. glucose

69. Leaf abscission is caused by
    a. auxin
    b. ABA
    c. gibberellin
    d. cytokinin

70. A tomato gets its red colour from
    a. beta carotene
    b. lycopene
    c. fructose
    d. limonene

PART II: SHORT ANSWER QUESTIONS

This part consists of 10 Short Answer Questions. Answer all questions. Each question carries THREE marks.

1. Plants as primary producers, unlike animals, can independently manufacture their food through the process called photosynthesis.
    a. What are the reactants and products of photosynthesis? (2 marks)
    b. During the process of photosynthesis what other important process takes place simultaneously? (1 mark)

2. Atmospheric air contains 79% nitrogen. However, majority of plants obtain nitrogen from soil. Why? (3 marks)

3. What is the difference between hydroponics and aeroponics? Who first developed the hydroponics system? (3 marks)

4. What does the following chemical equation represent: $CO_2 + H_2O \rightarrow C_6H_{12}O_6$? This equation is incomplete. Provide a balanced equation. (3 marks)

5. What are the end products of aerobic and anaerobic respiration? What is Metabolism?

   (3 marks)

6. What is the basis for the classification of various types of white blood cells? (3 marks)

7. Given here are typical data for calculating soil bulk density where: Mass of core + wet soil = 250.0 g; Mass of core + dry soil = 224.28 g; Mass of core = 77.02 g; and Mass of oven-dry soil = 147.26 g. The volume of the core is 100 cm3

   a. Define soil bulk density. (1 mark)
   b. Calculate the dry bulk density using the above data? (1 mark)
   c. What is the water content of the soil? Express the answer as g H_2O g^{-1} of oven dry soil. (1 mark)

8. Why introduction of exotic species has an adverse effect on the native species? Give three reasons. (3 marks)

9. Briefly answer the following questions:

   a. Define gene pool. (1 mark)
   b. What is the expanded form of IUCN? (1mark)
   c. What is Red Data Book? (1 mark)

10. What is the difference between a food web and a food chain? Give an example in each case. (3 marks)