ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2020
EXAMINATION CATEGORY: TECHNICAL

PAPER II: GENERAL SUBJECT KNOWLEDGE PAPER FOR MEDICAL SCIENCE

Date : February 26, 2021
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 **12 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. An example for enucleated cell in plants is
   a) Parenchyma cell
   b) Tracheid
   c) Meristematic cell
   d) A mature sieve tube cell

2. Which of the following conditions need not be present for photosynthesis to proceed?
   a) Water
   b) Light
   c) Oxygen
   d) Chlorophyll

3. In most of the mammals, the testes remain enclosed in an extra abdominal sac, the scrotum, where the temperature is lower than that in the abdomen. What will happen if the temperature of the scrotum is artificially maintained to the level of abdominal temperature?
   a) Germinal epithelium will carry out normal spermatogenesis.
   b) Germinal epithelium will produce a large quantity of androgen secretion.
   c) Germinal epithelium will produce more sperms.
   d) Germinal epithelium will degenerate, resulting in sterility.

4. The rate limiting step in photosynthesis is
   a) Oxygen evolution
   b) Dark reaction
   c) Light reaction
   d) Carbon dioxide diffusion to photosynthetic site

5. A person who is on a long hunger strike and is surviving only on water will have
   a) less amino acid in his urine.
   b) less urea in his urine.
   c) more glucose in his blood.
   d) more sodium in his urine.

6. If Henles loop were absent from mammalian nephron, which of the following is to be expected?
   a) There will be no urine formation.
   b) There will be hardly any change in the quality and quantity of urine formed.
   c) The urine will be more concentrated.
   d) The urine will be more dilute.

7. Standing on tip toe is an example of
   a) Elevation
   b) Flexion
   c) Extension
   d) Retraction

8. Which muscle is immune to fatigue?
   a) Unstriped
   b) Striped
   c) Voluntary
   d) Cardiac

9. If mammalian ovum fails to get fertilized, which one of the following is unlikely?
   a) Corpus luteum will degenerate.
   b) Progesterone secretion rapidly declines.
   c) Estrogen secretion further decreases.
   d) Primary follicle starts developing.

10. By anticlinal division, organ increases in
    a) Circumference
    b) Area
    c) Volume
    d) Length

11. Which one of the following does not cause water absorption by the plant roots?
    a) High Turgor Pressure of a plant cell.
    b) Transpiration pull force.
    c) Osmotic pressure of the soil water.
    d) Non osmotic pressure of the root hairs.

12. Choose the water soluble vitamins from the following:
    a) Vitamin A
    b) Vitamin D
    c) Vitamin C
    d) Vitamin E

13. Choose the trace element which is required for body immune system:
    a) Manganese
    b) Copper
    c) Zinc
    d) Magnesium

14. A recent study on health hazard of cigarette smoking has found that, continuous smoking reduces life span by 10 years. Choose the most appropriate habit to be adopted to quit smoking?
    a) Ignore when you see the smokers.
    b) Delay smoking when you feel urged.
    c) Go out for exercise and involve in some work when you get urged.
    d) Stay at home without going anywhere.

15. Choose the correct function of vacuoles:
    a) Rigidity and protection of cells.
    b) Takes part in cell division.
    c) Acts as storage unit for food and water in the cells.
    d) Function as power house of the cells.

16. The nitrogenous base present in pyrimidine are
    a) Adenine & guanine
    b) Adenine and thymine
    c) Gunine and uracil
    d) Cytosine and thymine

17. Choose the bad cholesterol from the following:
    a) Chylomicron
    b) Very low density lipoprotein
    c) Low density Lipoprotein
    d) High density Lipoprotein

18. All of the following are haemoparasitic infection EXCEPT
    a) Dermatophytosis
    b) Malaria
    c) Kalazar
    d) Filariasis

19. Bhutan has the highest number of death due to alcoholic liver disease and liver cancer. Recent studies on the locally brewed alcohol 'Ara' found that there is a high amount of chemical toxic to the liver which causes cancer. Choose the chemical that was found in Ara that causes liver cancer.
    a) Aflatoxin
    b) Methanol
    c) Aldehyde
    d) Ethanol

20. All the following vitamins are involve in body immune system EXCEPT
    a) Vitamin A
    b) Vitamin K
    c) Vitamin B Complex
    d) Vitamin C

21. All of the following are the impact of intensive farming called Green Revolution EXCEPT
    a) Water scarcity
    b) Loss of habitat
    c) Increase in soil fertility
    d) Loss of genetic diversity

22. In proof reading during DNA replication
    a) wrong nucleotides are inserted.
    b) wrong nucleotides are taken out.
    c) wrong nucleotides are removed and correct ones are inserted.
    d) mutations are prevented.

23. Which plant will lose its economic value if its fruits are produced by induced parthenocarpy?
    a) Grape
    b) Banana
    c) Pomegranate
    d) Orange

24. Mountain sickness is caused due to
    a) insufficient hemoglobin in RBCs.
    b) inadequate immune system.
    c) height phobia.
    d) sudden change in atmospheric pressure and oxygen level.

25. In the renal tubules, the permeability of DCT and collecting duct is controlled by
    a) Aldosterone
    b) Vasopressin
    c) Rennin
    d) Renin

26. In a skip generation inheritance of color blindness, the trait from a colour blind father is passed on to
    a) Daughter
    b) Son
    c) Grandson
    d) Granddaughter

27. The end product of ornithine cycle is
    a) CO_2 and urea.
    b) Creatinine that excreted through urine.
    c) Urea that is excreted through urine.
    d) Ammonia that is excreted through urine.

28. What will happen if ligaments are broken?
    a) Bones will move freely.
    b) No movement at joint.
    c) Bone will become unfixed.
    d) Bone will become fixed.

29. Which of the following is true regarding the Calvin cycle and light dependent reaction of the photosynthesis?
    a) The light dependent reaction use ATP from the Calvin cycle and the Calvin cycle uses energy from absorbed sunlight.
    b) During the light dependent reactions, carbon dioxide is fixed to produce sugars that form glucose.
    c) The Calvin cycle converts water molecules into oxygen gas as a byproduct of its reaction.
    d) The light dependent reactions take place in the thylakoid membrane and the Calvin cycle takes place in the stroma.

30. During an injury, if nasal septum gets demaged, which cartilage is perfused for its recovery?
    a) Elastic cartilage
    b) Hyaline cartilage
    c) Calcified cartilage
    d) Fibrous cartilage

31. Most of the biological energy is supplied by mitochondria through
    a) breaking of proteins.
    b) reduction of $NADP^+$
    c) breaking sugars.
    d) oxidising TCA substrates.

32. The net pressure gradient that causes the fluid to filter out of the glomeruli in the capsule is
    a) 20 mmHg
    b) 50 mmHg
    c) 75mmHg
    d) 30mmHg

33. Which of the following nucleotide sequences contains 4 pyrimidine bases?
    a) AGCCTTCAGC
    b) GATCAATGC
    c) GCUAGACAA
    d) UAGCGGUAA

34. Which biomolecule is responsible for insulation and long term energy storage?
    a) Protein
    b) Nucleic Acid
    c) Lipid
    d) Carbohydrates

35. Blood group of a person with no antigens present in their blood cells is
    a) O^-
    b) O+
    c) AB+
    d) A+

36. The hormone erythropoietin stimulates red blood cell production in red bone marrow. Where is erythropoietin produced in the body?
    a) Liver
    b) Kidney
    c) Spleen
    d) Thyroid

37. Which of the following is responsible for connecting muscle to the bone?
    a) Tendon
    b) Hyaline cartilage
    c) Ligament
    d) Elastic cartilage

38. Identify the method used that does not preserve heat in the body:
    a) Shivering
    b) Curled up
    c) Vasodilation
    d) Vasoconstriction

39. Maximum surface area of circulatory system is seen in
    a) Heart
    b) Capillaries
    c) Arterioles
    d) Veins

40. If the base sequence of the strand of DNA is ATTCCGCTA, then its complementary strand in RNA would be
    a) AUUCCGCUA
    b) UTTGGCGTU
    c) UAAGGCGAU
    d) AUTTCGGTU

41. The primary ions involved in gaseous exchange in and out of lung is
    a) H^+ only
    b) HCO_3^- only
    c) H^+ & HCO_3^-
    d) PO_4 only

42. From the following, choose the incorrect characteristics of catalyst:
    a) It does not initiate chemical reaction but enhance the reaction.
    b) It acts as reactant in the chemical reaction.
    c) It remains unchanged in chemical composition.
    d) It does not alter the final position of chemical equilibrium.

43. The composition of wrathful and peaceful cymbal (*Roem and Cynyen*) used as Buddhist religious instruments are the alloy of
    a) Gold and Tin
    b) Lead and Tin
    c) Tin and copper
    d) Silver and lead

44. Which one of the following shows the increasing order of acidic strength?
    a) HCOOH < CH3COOH < C6H5COOH
    b) CH3COOH < HCOOH < C6H5COOH
    c) C6H5COOH < CH3COOH < HCOOH
    d) CH3COOH < C6H5COOH < HCOOH

45. During winter, the metallic pipe gets cracked and burst due to
    a) high water pressure in winter.
    b) contraction of the metallic pipe in winter.
    c) expansion of ice in the pipe.
    d) pipe becomes brittle during winter.

46. Food is cooked slowly in Bumthang due to the decrease in
    a) humidity and low temperature in high altitude.
    b) boiling point and increase in atmospheric pressure in high altitude.
    c) boiling point and decrease in atmospheric pressure at high altitude.
    d) vapor pressure at high altitude.

47. The volume of a gas equals a constant value multiplied by its temperature as measured on the Kelvin scale. The above statement is
    a) Boyle's Law
    b) Charles' Law
    c) Dalton's Law
    d) Faraday's Law

48. Looking mirror is formed by the reaction of the silver with
    a) Secondary alcohol
    b) Aldehyde
    c) Ketone
    d) Ester

49. The mole fraction of the solute in one molal aqueous solution is
    a) 0.027
    b) 0.018
    c) 0.007
    d) 0.036

50. Given that $Zn^{2}+/Zn$ = - 0.76V, $Mg^{2}+/Mg$ = - 2.37 V, then the correct statement about the reaction Zn + $MgCl_2$ would be
    a) Solid zinc dissolves
    b) Formation of zinc chloride
    c) Magnesium chloride precipitates out
    d) No reaction occurs

51. In a hydrogen – oxygen fuel cell, combustion of hydrogen occurs to
    a) produce heat.
    b) produce pure water.
    c) create potential difference between two electrodes.
    d) remove absorbed oxygen from the surface of electrodes.

52. Number of neutrons in a parent nucleus X which gives $_{7}N^{14}$ nucleus after two successive β – emissions would be
    a) 9
    b) 6
    c) 8
    d) 7

53. The unit of rate constant for second order reaction is
    a) mol L^{-1} sec^{-1}
    b) sec^{-1}
    c) mol^{-1} L^{-1} sec
    d) mol^{-1} L sec^{-1}

54. The isoelectric point of a protein is
    a) the pH at which the protein molecule has no net electrical charges on its surface.
    b) the pH at which a protein in solution has an equal number of positive and negative charges.
    c) the electric charge under isotonic conditions.
    d) the electric charge under isothermal conditions.

55. The pH of a solution is enhanced from 2 to 3. The concentration of H^{+} in the new solution
    a) is three times the original solution.
    b) is two times the original solution.
    c) decreases 10 times.
    d) increases 10 times.

56. The electrical force between two charged objects is directly proportional to the product of the quantity of charge on the objects and inversely proportional to the square of the separation distance between the two objects. It is called
    a) Coulomb's law
    b) Faraday's law
    c) Law of conservation of charge
    d) Ohms Law

57. Choose the correct effect of conductance of a conductor:
    a) Directly proportional to the length of conductor.
    b) Directly proportional to the cross section of the conductor.
    c) Inversely proportional to the temperature.
    d) Inversely proportional to the density of electrons in the conductor.

58. The unit of an electric potential is
    a) Coulomb
    b) Watt
    c) Electron volt
    d) Ampere

59. All of the following are properties of convex lens EXCEPT
    a) One surface bulges outwards.
    b) Converges parallel rays to a focal point.
    c) Have negative focal lengths.
    d) Commonly used in cameras.

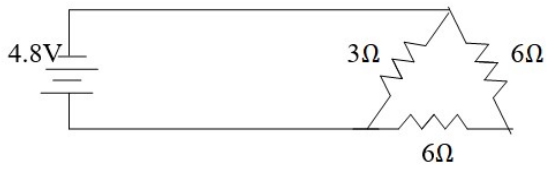
60. The electromagnetic radiation with shortest wavelength is
    a) X-rays
    b) Ultraviolet rays
    c) Radio waves
    d) Infra-red rays

61. Every particle attracts every other particle in the universe with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers. This is the law of
    a) Newton's First Law
    b) Newton's Second Law
    c) Newton's Third Law
    d) Newton's law of universal gravitation

62. A 2 kg mass and 1 kg mass are moving with equal kinetic energies. The ratio of the magnitudes of their linear momentum is
    a) 1 : 2
    b) 1 : 1
    c) 4 : 1
    d) 2 : 1

63. Which of the following pairs of physical quantities are dimensionally similar?
    a) Force and work
    b) Work and pressure
    c) Pressure and potential energy
    d) Work and potential energy

64. The total current in the circuit shown below is



    a) 8.31 A
    b) 6.82 A
    c) 4.92 A
    d) 2.00 A

65. A carbon resistor of 47 $K\Omega$ is to be marked with rings of different colours for identification. The correct sequence of colours will be
    a) yellow, violet, orange
    b) violet, orange, yellow
    c) orange, yellow, violet
    d) orange, violet, yellow

66. The best example of converting mechanical energy into electrical energy is
    a) Moving dynamo
    b) Moving of turbine by water
    c) Solar panel
    d) Wind mill

67. The type of pulleys used for lifting the water from the well is
    a) Fixed pulley
    b) Single movable pulley
    c) Compound pulley
    d) Combination of all

68. An image size as the same object size can be obtained by
    a) Plane mirror only
    b) Convex mirror only
    c) Concave mirror only
    d) Both plane and concave mirror

69. A well cut diamond appears bright due to
    a) Emission of bright light
    b) Total internal reflection
    c) Scattering of light
    d) Dispersion of light

70. A wire having a very high value of conductance is said to be
    a) A moderately good conductor
    b) A very good conductor
    c) An insulator
    d) A semiconductor

PART II

Short Answer Questions [30 marks]

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

1. Rising number of people with Non Communicable Diseases (NCDs) is an emerging public health problem that causes 70% of the Mortality in Bhutan. Write three most common NCDs prevailing in Bhutan and mention their preventive measures.

2. Explain scientifically how the following precautionary measures can prevent SARS-COV-2 infection?
    a) Physical Distance
    b) Wearing Mask
    c) Hand washing
    d) Maintain ventilation

3. Explain the Differences between Malaria and Dengue fever in terms of causative agents, transmission, brief pathophysiology and preventive measures.

4. Explain Glomerular Filtration with clear diagram.

5. Explain difference between XDR-TB and MDR-TB. Give three causes which lead to the increasing number of MDR-TB in Bhutan?

6. Draw a diagram to explain three Laws of refraction.

7. State Ohms Law with formula.

8. Name six noble gases and their common use?

9. Write down three chemical differences between Diamond and Graphite.

10. Explain Diabetes. Differentiate Type 1 and Type 2 Diabetes.