ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2019
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR MEDICAL LABORATORY TECHNOLOGY

Date : October 13, 2019
Total Marks : 100
Writing Time : 150 minutes (2.5 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 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 SECTIONS**, namely SECTION A & SECTION B:
   - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
     Part II - 4 Short Answer Questions

     All questions under SECTION A are COMPULSORY.
   - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. 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.
5. 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 the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **8 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions (30 marks)

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. All of the following are fat soluble vitamins EXCEPT
   a) Vitamin A
   b) Vitamin D
   c) Vitamin E
   d) Vitamin C

2. Which of these functions is the least important for proteins?
   a) Become blood osmotic proteins.
   b) Convert to enzymes.
   c) Utilization for energy.
   d) Component of structures.

3. From the following, which does not require Phosphate group of compounds?
   a) Bone matrix
   b) ATP
   c) DNA
   d) All of the above.

4. Which of the following pairs of ion is most important for maintenance of osmosis?
   a) K^++Na^+
   b) Na^+ + Fe^+
   c) K^++ Cu^+
   d) Na^++Mn^+

5. All the following are correct for bilirubin EXCEPT
   a) It is a yellow pigment produced by liver.
   b) It is increased in patients with liver diseases.
   c) It is measured using Jendrassic Groff Method.
   d) It is released by the breakdown of WBCs.

6. Molarity of the solution is defined as
   a) the number of moles of a substance per liter of solution.
   b) the number of moles of solute per kilogram of solvent.
   c) number of grams of substance per liter of solution.
   d) number of grams of solute per kilogram of solvent.

7. The purpose of EDTA in the blood collection is
   a) to prevent clotting of blood in the vial.
   b) to prevent bacterial action.
   c) to prevent chemical reaction.
   d) to inhibit glycolytic enzyme to reduce glucose degradation.

8. Moderate anemia has hemoglobin concentration of
   a) 8-12gm%
   b) 5-8gm%
   c) 4-10gm%
   d) <5gm%

9. Which of the following anemia is not a *microcytic hypochromic*?
   a) Iron deficiency anemia
   b) Thalassemia
   c) Anemia of chronic disease
   d) Megaloblastic anemia

10. The formula used to calculate *Absolute Reticulocyte count* is
    a) Reticulocyte% x HCT.
    b) Reticulocyte% x Hb.
    c) Reticulocyte% x Total red blood cell count (TRBC).
    d) Reticulocyte% x Reticulocyte production index (RPI).

11. What is the major metabolically available storage form of iron in the body?
    a) Hemosiderin
    b) Ferritin
    c) Transferin
    d) Haemoglobin

12. The ability of the test to identify affected individuals correctly is
    a) sensitivity of the test.
    b) specificity of the test.
    c) positive predictive value.
    d) negative predictive value.

13. A measure of the dispersion of a set of data from its mean is
    a) standard deviation.
    b) coefficient of variation.
    c) variance.
    d) bias.

14. Assessment of laboratory performance by an outside agency focusing on performance assessment and improvement is
    a) external quality assessment scheme.
    b) proficiency testing.
    c) internal audit.
    d) performance survey.

15. All the following cause random errors in analytical process, EXCEPT
    a) Electric fluctuation.
    b) Inappropriate pipetting.
    c) Change in laboratory personnel.
    d) Expiring of reagents.

16. Lyophilized serum is advantageous as quality control material because
    a) it is in liquid form which is ready made to be used.
    b) it can be stored at room temperature.
    c) it is stable for longer period.
    d) it is not affected by the light.

17. Calibration is defined as the process of
    a) measurement of carry-over of the analyser.
    b) setting the equipments to generate results in reportable range.
    c) setting the wavelength and measurement units.
    d) analyzing quality control material to validate daily results.

18. Kinetic method of measurement involves
    a) recording of absorbance at the certain interval of time during the reactions.
    b) recording of absorbance at the fixed time when the reaction is about to be completed.
    c) recording of absorbance at the fixed time when the reaction is completed.
    d) recording of absorbance at the beginning of the reaction.

19. Normal flora would typically have what type of relationship with its host?
    a) Mutualism
    b) Commensalism
    c) Parasitism
    d) Antagonism

20. Choose the INCORRECT Koch's Postulates:
    a) Bacteria are present in a diseased animal but not in healthy animals.
    b) Bacteria can be isolated from the diseased animal and grown in pure culture.
    c) Inoculation of another healthy animal with cultured bacteria causes the same disease.
    d) The same bacteria can again be isolated from the inoculated diseased animal.

21. Which of the following is best to sterilize heat labile solutions?
    a) Incineration
    b) Autoclave
    c) Boiling water
    d) Pasteurization

22. Which of the following does not kill endospores?
    a) Autoclave
    b) Incineration
    c) Hot air sterilization
    d) Free flowing steam

23. Which is not an immune cell?
    a) Lymphocyte
    b) Erythrocyte
    c) Monocyte
    d) Neutrophil

24. One would expect microbes to be found in each of the following areas, EXCEPT
    a) Large intestine
    b) Oral cavity
    c) Blood
    d) Urine

25. Which type of biological safety cabinet must be used when handling risk group-2 organisms?
    a) Class I biological safety cabinet.
    b) Class III biological safety cabinet.
    c) Class II biological safety cabinet.
    d) Clean bench (Laminar flow).

26. Which of the following statement is FALSE regarding benign tumors?
    a) They never metastasise.
    b) Usually do not require treatment.
    c) They are always harmless.
    d) They grow slowly.

27. Primarily Role of Cytotechnician in the Cytopathology laboratory is
    a) diagnostic interpretation.
    b) specimen processing.
    c) screening abnormalities.
    d) specimen processing and screening cytological abnormalities.

28. All the following are correct description of exofoliative cytology, EXCEPT
    a) Does not need biopsy for sampling.
    b) Use PAP staining technique for examination.
    c) Body fluids can be used for examination.
    d) Important only for detecting benign tumor.

29. All of these factors described are characteristics of fixation, EXCEPT
    a) Arrests autolysis.
    b) Activates bacterial decomposition.
    c) Minimises loss of soluble cytoplasmic components.
    d) Stabilises tissue for further processing and treatment.

30. The most common of all histological stains is hematoxylin and eosin (H&E). If a tissue is stained using H&E, the cell nucleus would appear dark blue/purple because
    a) the nucleus is an acidophilic organelle which reacts strongly with eosin.
    b) the nucleus is an acidophilic organelle which reacts strongly with hematoxylin.
    c) the nucleus is a basophilic organelle which reacts strongly with hematoxylin.
    d) the nucleus is a basophilic organelle which reacts strongly with eosin.

PART II – Short Answer Questions (20 marks)

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

1. Describe principle, procedure and interpretation of Zielneson staining technique for mycobacterium tuberculosis.
2. Write down the normal reference ranges for the following test parameters:
   a) Glucose fasting
   b) Creatinine
   c) Urea
   d) AST
   e) ALT
   f) ALP
   g) Bilirubin
   h) Total Protein
3. Name at least four important anticoagulants used in the clinical laboratory and write their functions with actions.
4. Write down the differences between serum grouping and cell grouping.

SECTION B: Case Study (50 marks)

Choose either CASE I or CASE II from this section. Each case study carries 50 marks.

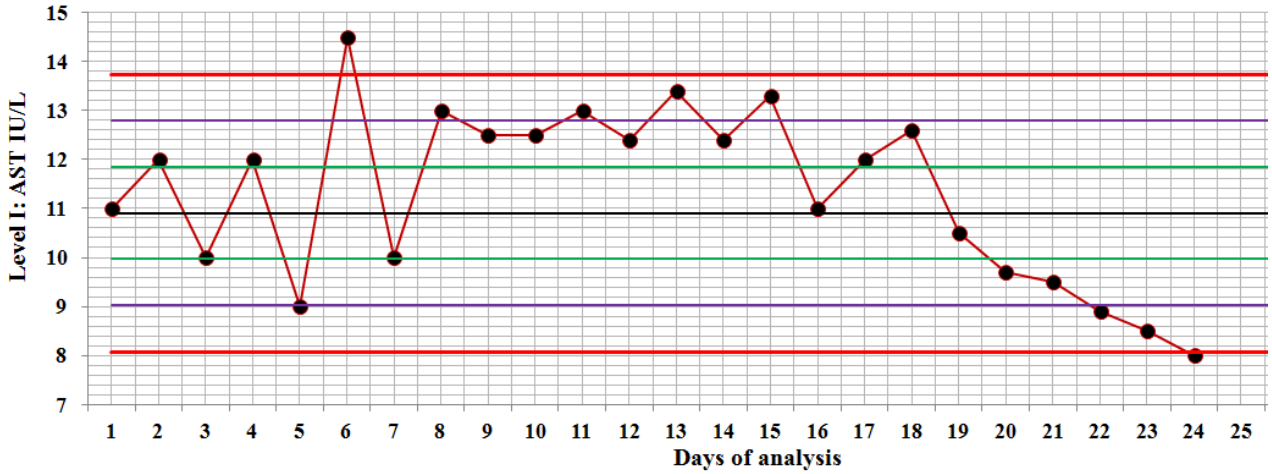
CASE I

One of the laboratories at the district hospital established Internal Quality control for Aspartate Aminase (AST) level I using the control results for 11 consecutive days as shown in the table. Assayed lyophilized serum control was used for this establishment. The control results of 11 days were trimmed at ±2SD or by using CLIA CV. Daily IQC results were plotted on LJ chart, precision was determined using Coefficient of variation and accuracy by using the manufacture's mean. Westgard's Multi-QC rules were used for detection of the errors. The package insert of the control lot has the mean of 12 IU/L.

1. Complete the table and calculate the following parameters using the data given in the table. Correct steps of calculation and **unit should be shown for each parameter wherever necessary without which marks will not be awarded:**
   a) Mean
   b) Standard Deviation (SD)
   c) Coefficient of variation (CV)
   d) Mean±2SD
   e) Mean±3SD
   f) Bias

Days	Xi (g/dl)	Xi-X	$(Xi-\bar{X})^2$
1	9		
2	11		
3	12		
4	11		
5	12		
6	11		
7	10		
8	12		
9	11		
10	11		
11	10		

Following L-J chart has been generated using the quality control level I plotted up to 24 days. Answer the following questions:



2. Name the control rule violated on:
   a) 6th day of the analysis.
   b) 8th – 15th day of the analysis
   c) 18th – 24th day of the analysis

3. List down at least 3 causes of the above control rule violation and ways of rectifying the errors caused.

4. Lyophilized human serum is the most recommended control material in Bhutan. State the reasons for choosing the lyophilized human serum.

Case II

25-year-old man visited Phuentsholing General Hospital with the following complaints:

- Severe abdominal pain.
- Persistent vomiting.
- Bleeding from your gums or nose.
- Blood in your urine, stools or vomit.
- Bleeding under the skin, which might look like bruising.
- Difficult or rapid breathing.

Doctor looking at the clinical signs and symptoms suspected dengue hemorrhagic fever or severe dengue**.**

1. Describe the laboratory diagnosis of dengue hemorrhagic fever. Description should include the following points:
   a) Causative agents
   b) Pathogenesis
   c) Mode of transmission
   d) Specimens for diagnosis of dengue
   e) Methods of diagnosis

2. Describe the Test principle, procedure and interpretation of the Rapid test kits currently used in Bhutan.

3. List down the dengue preventive and precautionary messages you would like to spread to the people living in endemic areas and travellers.

TASHI DELEK