ROYAL CIVIL SERVICE COMMISSION

BHUTAN CIVIL SERVICE EXAMIANTION (BCSE) 2010

EXAMINATION CATEGORY: <u>TECHNCIAL</u>

PAPER III: SUBJECT SPECILAIZATION PAPER for <u>Medical Technology/ Biomedical science</u>

Date   : **24th November 2010**

Total marks   : **100**

Examination Time   : **2.5 Hours**

Reading Time   : **15 Minutes**

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INSTRUCTIONS

1. Write your Roll Number clearly on the answer booklet in the space provided.

2. The first 15 minutes is being provided to check the number of pages, printing errors, clarity doubts and to read the instructions. You are **NOT PERMITTED TO WRITE** during this time.

3. Use either Blue or Black ink or ball point pen for the written part and H.B. Pencil for the sketches and drawings

4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper.

5. This Question Booklet consists of eight **(8)** pages. It is divided into two sections – namely **SECTION A and SECTION B.**

6. **SECTION A** consists of two parts. Part I and Part II.
   Part I consists of 30 multiple choice questions carrying one **(1)** mark each and is **compulsory**. The answer of your choice should be clearly written **in whole** along with the question number and option number on your answer booklet.
   Part II consists of four (4) short answer questions of five **(5)** marks each and all questions are **compulsory**.

7. **SECTION B** consists of two **Case studies**. Choose only **ONE** case study and answer the question under your choice. Each case study carrier fifty **(50)** marks in total.

PART A: MULTUPLE CHOICE QUESTIONS (COMPULSORY)

1. Which amino acids is negatively charged
   a. Arginine
   b. Asparagine
   c. Asparate
   d. Alanine

2. DNA double helix is held together by which bond
   a. Covalent bond
   b. Electrovalent bond
   c. Hydrogen bond
   d. All the above

3. What is the renal threshold of glucose
   a. 100 mg/dl
   b. 140 mg/dl
   c. 160 mg/dl
   d. 180 mg/dl

4. The minimum hours you would advice patient to fast for fasting blood sugar test
   a. 6 hours
   b. 8 hours
   c. 10 hours
   d. 12 hours

5. What is the normal range of hemoglobin for infant
   a. 8-12 g/dl
   b. 10-15 g/dl
   c. 11-16 g/dl
   d. 14-18 g/dl

6. Elevated level of Hematocrit is seen in
   a. Pregnancy
   b. Severe diarrhea
   c. Anemia
   d. Malnutrition

7. Which of the following you would find in urine microscopic examination if the patient is glomerulonephitis
   a. **Granualar casts**
   b. RBC
   c. Bacteria
   d. None of the above

8. Cytology examination of urine is done to detect urinary tract
   a. Cancer
   b. Inflammation
   c. Infection
   d. **All the above**

9. What is the ideal thickness of tissue section you would prepare for histopathological examination
   a. < 1 mm
   b. 1- 3 mm
   c. **3 -5 mm**
   d. 5 -10 mm

10. What is the next step after tissue sectioning for histopathological examination
    a. Dehydration
    b. Rehydration
    c. **De-waxing**
    d. Staining

11. What is the role of hematoxylin in hematoxylin and Eosin (H&E) staining method
    a. **Stain cell nuclei**
    b. Stain cell cytoplasm
    c. Stain cell membrane
    d. Stain cell wall

12. Which of the following microorganism can be seen in stool microscopic examination
    a. **Gardia cyst**
    b. Salmonella
    c. Rotavirus
    d. All above

13. The principle of hematolgy auto-analyzer for complete blood count (CBC) is based on
    a. **Size**
    b. Shape
    c. Concentration
    d. All the above

14. What is the role of Copper Sulphate in Benedict solution in determining sugar in urine
    a. Oxidation
    b. Reduction
    c. Displacement
    d. Dissociation

15. Which blood component you would advise for the transfusion if the patient is diagnosed as dengue hemorrhagic fever
    a. Whole blood
    b. RBC
    c. Plasma
    d. Platelets

16. If you perform lipid profile test for obesity patient, which biochemical parameter will be seen elevated
    a. Cholesterol
    b. Triglyceride
    c. Low density lipoprotein (LDL)
    d. All the above

17. The cause of painful joints and capillaries in gout patient is because of
    a. Excessive accumulation of uric acid
    b. Crystal formation of uric acid
    c. Irritation by uric acid
    d. Breakdown of joint and capillaries by uric acid

18. How would you physically distinguish the diarrhea caused by amoeba and bacteria in stool sample collected
    a. Form
    b. Odour
    c. Colour
    d. Content

19. Shooting diarrhea seen in cholera patient is caused by
    a. Vibro Cholera
    b. Vibro Cholera toxin
    c. Virbro Cholera byproduct
    d. All the above

20. Which of the following bacteria you would expect to isolate and report to physician for rheumatic heart disease (RHD) patient
    a. Streptococcus pneumonia
    b. Streptococcus pyogenes
    c. Streptococcus neoformans
    d. Staphylococcus aureus

21. Which media would you use to carry out antibiotic susceptibility testing of *Streptococcus pneumonia*
   a. Nutrient Agar
   b. Blood Agar
   c. Chocolate Agar
   d. MacConkey Agra

22. What is the role of Gram iodine in Gram staining method
   a. Decolorizer
   b. Mordant
   c. Washing
   d. None of the Above

23. Which of the anti-tuberculosis drugs will be resistant against *Mycobacterium tuberculosis* if TB patient is multi-drug resistance TB (MDR-TB)
   a. Streptomycin and Rifampicin
   b. Rifampicin and Isoniazid (INH)
   c. Isoniazid and Ethambutol
   d. Streptomycin and Ethambutol

24. How many immunity system does the human body have
   a. One
   b. Two
   c. Three
   d. Four

25. Which sample would you collect from polio cases to detect wild polio virus
   a. Blood
   b. Urine
   c. Stool
   d. CSF

26. Human Papilloma Virus (HPV) is associated with
   a. Breast cancer
   b. Cervical cancer
   c. Ovarian cancer
   d. All the above

27. Dengue virus has how many serotypes
   a. Two
   b. Four
   c. Six
   d. Eight

28. Which influenza strain caused pandemic HongKong flu in 1968-1969
    a. H1N1
    b. H1N2
    c. H2N2
    d. H3N2

29. The principle of rapid pregnancy test kit is based on
    a. Agglutination
    b. Flocculation
    c. Immuno-chromatographic
    d. Precipitation

30. What are the most common factors that affect the quality of laboratory result
    a. Pre-analytical factors
    b. Analytical factors
    c. Post analytical factors
    d. Clinical factors

PART B: WRITE SHORT ANSWERS (COMPULSORY)

1. Principle of sulphosalicylic acid method to determine protein in urine. **(5 Marks)**

2. Principle of glucose oxidase method to determine glucose concentration in blood. **(5 Marks)**

3. Principle of Ziehl Neelsen staining method. **(5 Marks)**

4. Principle of indirect Enzyme-link Immunosorbent assay (ELISA). **(5 Marks)**

SECTION B: CASE STUDIES (Choose only **ONE** case study)

1. **CASE STUDY ONE**

Mr James Bond (J.B), 28 years old business man visited emergency department of JDWNRH complaining of difficulty in breathing and chills. The patient had a history of intravenous herion abuse with an admission to the same hospital three years earlier because of a drug overdose. Doctor advised HIV and HBV tests and J.B. tested positive for anti-HIV antibody by ELISA. The sample was further subjected to PCR for viral RNA load and $CD4^+$ count. The viral RNA was 15,000 copies/mL of viral genome and $CD4^+$ cell count was $800/mm^3$ to $1500/mm^3$). There was no evidence of opportunistic infection at that time.

   a. What major risk factor did this patient have for acquiring HIV infection? (**10 Marks**)

   b. What are other risk factors for HIV infection? (**10 Marks**)

Patient was then administered HIV medications (two nucleoside reverse transcriptase inhibitors and one viral protease inhibitor) and became steady within few months. The cell count remained about $800/mm^3$ and viral load indicated less than 100copies/mL. However, over next 5 years, his $CD4^+$ T cell count gradually declined to $300/mm^3$ although patients has taken his medication regularly. The HIV medication regime was changed to different reverse transcriptase inhibitors three times, and a different protease inhibitors once, in attempt to stop the decline in his $CD4^+$ count. He felt well and work regularly.

   c. What caused the gradual decline in the $CD4^+$ T cell count? (**10 Marks**)

After 6 years from the time of initial diagnosis, J.B. began to lose weight. At the clinical visit 6 months ago, he complained of a sore throat and had white plaque lesion in his mouth. The CD4 count was $64/mm^3$ and viral load was more than 500,000 copies/mL

   d. What is the likely reason that the anti-HIV drugs given to this patient became ineffective after some time? (**10 Marks**)

Patient was then admitted to hospital with shallow respiration at the rate of 40 breaths per minutes and high fever (39^0C). He lost 10 kg of weight since his last visit. A chest radiograph showed a diffuse pneumonia. Intravenous antibiotic was administered for the presumed *Pneumocystic carinii* pneumonia. A sputum sample was also collected sent to lab and lab confirmed *Pneumocystic carinii.* Despite intensive case, the patient's pneumonia progressed and died few days later.

   e. Why are AIDS patients at high risk for developing opportunities infection such as *Pneumocystic carinii* pneumonia? (**10 Marks**)

2. **CASE STUDY TWO**

Ms Deki Wangmo 16 year old female student visited Dechencholing BHU complaining of fever with chest pain radiating towards the right shoulder. Patient had history of high fever for past two days. On examination of vitals, patient blood pressure was 120/80 mmHg, pulse 82 beat/minutes, temperature 98ºF. Patient was given Tab PCM 2 tabs stat and admitted in BHU for observation. One hour later blood pressure was rechecked and recorded 130/100 mm Hg and temperature was 98ºF. Patient was then referred to JDWNRH and examined by physician. The patient had high fever associated with myalgia, and projectile vomiting. Physician suspected bacterial meningitis and decided to do lumbar puncture (LP) for detail lab investigation and confirmation. Physician decided to wait for lab results for initiation of correct treatment.

a. List four common bacterial pathogens you expect to isolate from CSF of the patient **(8 Marks)**

b. Prepare a flow chart showing the activities or tests that you would undertake to identify pathogenic bacteria from CSF sample of the patient. **(12 Marks)**

c. Which test results would you like to communicate to physician immediately to help him to decide on initiation of initial treatment and why? **(10 Marks)**

After 48 hours, patient developed neck rigidity and physician wants to know the culture and antibiotic susceptibility test result if available. The culture result was reported negative but physician refuse to believe the culture result.

d. Which lab test results would you use to correlate and verify the false culture negative reported? **(5 Marks)**

e. List down possible error/causes in laboratory procedures that have led to false culture negative. **(5 Marks)**

f. List five viral pathogens that cause encephalitis. **(10 Marks)**