ROYAL CIVIL SERVICE COMMISSION
CIVIL SERVICE COMMON EXAMINATION (CSCE) 2009
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER FOR: MICROBIOLOGY

Date: 8th November 2009
Total Marks: 100
Examination Time: 2.5 hours
Reading Time: Min 5 minutes

General Directions:

1. **This question paper contains 6 pages. You will be given 15 minutes to read the questions before you write the answers.**
2. **All answers should be written on the separate answer sheets provided.**

SECTION A

PART A. MULTIPLE CHOICE QUESTIONS

Directions:

In this part there are thirty multiple choice questions, each carrying 1 mark.
Each question is followed by four suggested answers. Write the correct answer as **a, b, c** or **d** against the respective question number in your answer sheet.

Bacteriology, Virology and Parasitology

1. The basic difference between Gram positive and Gram negative bacteria by Gram's reaction is
    a. Their cell wall
    b. Lipopolysaccharides
    c. Metabolism
    d. Biochemical reaction

2. Which of the following bacteria causes scarlet fever
    a. *Staphylococcus aureus*
    b. *Pseudomonas aeruginosa*
    c. *Streptococcus pyogenes*
    d. All of the above

3. Following are serious complications related to post *Streptococcal* infections
    a. Diabetes and blood pressure
    b. RHD and Glomerulus nephritis
    c. Cushing's syndrome
    d. None of the above

4. Which of the following bacteria are most efficient in neutralizing the gastric acidity
    a. *Escherichia coli*
    b. *Salmonella typhiA*
    c. *Helicobacter pylori*
    d. *Acinetobacter baumannii*

5. Penicillins and β-lactam antibiotics inhibit bacterial growth by
    a. Inhibiting DNA replication
    b. Inhibiting cell wall sysnthesis
    c. Increased export of antibiotics
    d. All of the above

6. Which of the following are spore forming bacteria
    a. *Escherichia coli*
    b. *Klebsiella pneumoniae*
    c. *Bacillus anthracis*
    d. All of the above

7. A high neutrophil count indicates probable infection by
    a. Bacteria
    b. Fungi
    c. Parasites
    d. Viruses

8. The recent immunization of HiB vaccine in child in our country is against
    a. *Streptococcus penumoniae*
    b. *Mycobacterium tuberculosis*
    c. *Neisseria meningitidis*
    d. *Haemophilus influenzae*

9. Which of the following virus are called rhabdo virus
    a. Polio virus
    b. Measles virus
    c. Rota virus
    d. Rabies virus

10. The recent pandemic of influenza or swine origin flu is caused by the following
    a. Paramyxo virus
    b. Orthomyxo virus
    c. Parvo virus
    d. Picarno virus

11. Which of the following virus causes the so called avain flu
    a. H5N1
    b. H1N1
    c. Influenza virus type B
    d. All of the above

12. HIV virus has the following genome
    a. RNA virus
    b. DNA virus
    c. tRNA virus
    d. None of the above

13. The scientific name of round worm is
    a. *Ancylostoma duodenale*
    b. *Ascaris lumbricoides*
    c. *Fasiolo hepatica*
    d. None of the above

14. Elephantiasis is severe lymphatic disease caused by the following parasite
    a. LD bodies
    b. African sleeping sickness worms
    c. Filarial worms
    d. Guinea worms

Bio-informatics

15. The following method is used to determine the evolutionary relationship of organisms
    a. Monogamy tree
    b. Phylogenetic tree
    c. Organogram
    d. Paternity tree

16. In blast database, Blastn is used to search for
    a. Protein sequences
    b. Aminoacid sequences
    c. Nucleotide sequences
    d. All of above

17. Multiple sequence alignment is used to
    a. Predict nucleotide similarity
    b. Predict bacterial identity
    c. Predict protein sequence
    d. None of the above

18. For epidemiological purpose, which of the following genetic tools would you prefer
    a. Bacterial DNA Genotyping
    b. Antibiogram typing
    c. Species identification
    d. Genus identification

Immunology

19. Which of the following immunity is non-specific
    a. Innate immunity
    b. Acquired immunity
    c. Both
    d. None of them

20. Toll like receptors (TLR) belongs to
    a. Innate immunity
    b. Acquired immunity
    c. B-cells
    d. T-cells

21. Immune cells like T-cells recognize foreign antigens through
    a. Recognition of auto-antigens
    b. Differentiation of self and non-self antigens
    c. Recognition of antibodies
    d. None of the above

Bacterial Genetics

22. The process of synthesis of proteins from amino acid is called
    a. Transcription
    b. Replication
    c. Translation
    d. None of above

23. Post translational glycoxylation is a process of addition of the following after translation
    a. Proteins
    b. Carbohydrates
    c. Ploy A tail
    d. None of the above

24. In conventional PCR, the following enzyme is employed
    a. Ribosome
    b. DNA polymerase
    c. RNA dependent DNA polymerase
    d. Reverse transcriptase

25. In post PCR DNA visualization, Ethidium bromide, an intercalating dye, is used to
    a. RNA single strand
    b. Stain the DNA double helix
    c. Protein Sequences
    d. All of the above

Biochemistry

26. The following enzyme is an indicator of liver damage during toxic viral hepatitis
    a. Alanine transaminase (ALT)
    b. Lactate dehydrogenase (LDH)
    c. Creatine kinase (CK)
    d. Glucokinase

27. Enzymes with different physical properties but catalyzing the same characteristic reactions are known as
    a. Catalysts
    b. Isoenzymes
    c. Proteins
    d. Co-factors

28. The process of synthesis of Glycogen from Glucose is called
    a. Gluconeogenesis
    b. Glycogenesis
    c. Glycogenolysis
    d. None of the above

29. The primary structure of proteins are composed of an arrangement of
    a. Nucleic acids
    b. Amino acids
    c. Monosaccharides
    d. Lipoproteins

30. Which of the following is conjugated protein
    a. Albumin
    b. Globulin
    c. Haemoglobin
    d. All of the above

PART B. WRITE SHORT ANSWERS (20 marks)

General Direction:
In this part there are four short answer questions carrying 5 marks each. All the questions must be answered.

1. Explain bacterial growth curve? Illustrate with a labeled diagram/graphs/charts where necessary. (5)

2. What is the composition of the recently introduced pentavalent vaccine in our country? What are the diseases against which they confer protection? (5)

3. What are fastidious microorganisms? Explain by giving two examples of a fastidious organism. (5)

4. Explain how do you demonstrate the antimicrobial susceptibility of an organism in the routine laboratory? Name the preferred method and explain (5)

SECTION B (50 marks)

General Direction:
In this section there are two questions related to a case study. Answer **ANY** one question.

1. A microorganism that is non-lactose fermenter (NLF) on MacConkey agar was isolated from sputum of a 72 year-old man admitted in the Medical ward. The man had previous history of admission in the hospital and received various antibiotics during the visits. The direct microscopy of the sputum showed 15 WBCs/HPF and more than 10 epithelial cells/HPF. Subsequent antimicrobial susceptibility result showed that the isolated organism was highly resistant to most of the antibiotics currently prescribed by the physician.
   Answer the following:
   a. What do you mean by non-lactose fermenter (NLF)? Name two non-fermentative bacteria.
   b. How do you demonstrate that the bacterium was resistant to antibiotics?
   c. What is minimal inhibitory concentration (MIC)? Explain with an example
   d. From the above information, what do you think could have led the bacteria to develop resistance to most of the antibiotics?
   e. Describe in your own ways how bacteria develop resistance to antibiotics?

2. For example, you believe that the extract of *Cordyceps sinensis* has an antiviral activity against H1N1 swine origin flu and hypothesize that it acts by inhibiting certain viral enzyme, the neuraminidase. Design your own experiment to prove your hypothesis. Remember to use bioinformatics (dry lab) and wet lab where necessary and assume that you have the best of the facility to perform the experiments.