RAMAKRISHNA MISSION VIDYAMANDIRA

(A Residential Autonomous College under University of Calcutta)

First Year

First-Semester Examination, December 2010

Date : 15-12-2010 **MICROBIOLOGY (Honours)** Full Marks : 75

Time : 11am – 2pm **Paper - I**

(Use separate answer script for each group)

Group – A

Answer Question No. 1 and any three from the rest :

1. Answer **any five** questions in brief : [2×5]
   a) What is Kelp? Write its importance.
   b) Write the scientific names of fission and budding yeast.
   c) What is chemotherapy?
   d) What is meant by resolving power of a microscope?
   e) What is 'S'-layer?
   f) How would you define episome?
   g) Why is steam heating required in endospore staining?

2. a) What is germ theory of disease? What was the contribution of Robert Koch in formulating this theory? [1+1]
   b) What is T_m value and how it is utilized in determining the co-relation between two organisms? [2+2]
   c) What is a dendrogram? [2]
   d) Write two exceptions of Koch's postulates. [2]

3. a) How do ascospores differ from basidiospores? [2]
   b) What is a fruiting body? [2]
   c) How an *E. coli* cell of 0·2 μm length can accommodate about 1 mm long DNA within it? [2]
   d) What are the different types of membrane proteins? State their properties. [1+3]

4. a) What are pseudomurein and teichoic acid? Write their functions. [3+2]
   b) State the differences between prokaryotic and eukaryotic chromosomes. [3]
   c) Draw the structure of a unit of peptidoglycan. [2]

5. a) What is bar diagram? What do you mean by frequency density? [3]
   b) The data presented below refers to running speed (cm/s) of male *Tidarren* spiders before and after ampulation of pedipalp :

Spider	Speed before	Speed after
1	1·25	2·40
2	2·94	3·50
3	2·38	4·49
4	3·09	3·17
5	3·41	5·26
6	3·00	3·22
7	2·31	2·32
8	2·93	3·31

   Calculate from the above data the—
   i) mean change in running speed
   ii) standard deviation
   iii) variance [7]

6. c) Briefly explain the mechanism of staining of tuberculosis bacilli. [4]
   b) What is the nature and use of gas vacuole as an inclusion body within bacterial cell? [2+1]
   c) Trinitrobenzene and picric acid both have the same chromophore group ($-NO_2$), but one is a chromogen while the other is a dye— Explain. [3]

Group – B

Answer the following questions : (<u>any five</u>) [7×5 = 35]

1. a) What is polyprotic acid? Give two examples of polyprotic acids showing dissociation. [1+2 = 3]
   b) A pH of 4 is 10-times more acidic than a pH of 5 — justify. [2]
   c) The surface tension of mercury is 484×10^{-3} NM^{-1}. If the depression caused by Hg is 3·63cm and density is $13{\cdot}6 \times 10^3$ Kg/m^3, calculate the radius of the tube. [2]

2. a) What do you mean by stereoselective and stereospecific reactions? [3]
   b) Write down the R/S configurational nomenclature for L-alanine and D-cysteine. [1+1 = 2]
   c) Define : Plane of symmetry and Axis of symmetry with proper example. [1+1 = 2]

3. a) Write down the differences between B-DNA and Z-DNA. [4]
   b) Write down the name of a biologically active tripeptide. [1]
   c) What is the advantage of using Dabsylchloride over Dansyl chloride in the determination of N-terminal end of a peptide? [2]

4. a) A solution containing Ala, Lys and Asp at pH-7 is subjected to cation exchange chromatography. Write down the order of elution of amino acids. [2]
   b) What are the basic differences between haemoglobin and myoglobin? [2]
   c) What are the forces that stabilize the structure of protein? [3]

5. a) Graphically represent the following titration : Alanine at pH6 with NaOH solution in the presence and absence of formaldehyde. [3]
   b) Write down the alkaline denaturation of duplex DNA. [2]
   c) What is isoelectric focusing? [2]

6. a) Name the symmetry of elements present in—
      i) Trans 1, 3-dimethyl cyclobutane
      ii) Mesotartaric acid [1+1 = 2]
   b) Give an example of a molecule containing asymmetric centres but optically inactive. [1]
   c) How does an epimer differs from an anomer? Illustrate with suitable example. [2]
   d) What do you mean by Butane-Gauche interaction? [2]

7. a) Define 'buffer capacity'. [1]
   b) Calculate the ratio of concentrations of lactate and lactic acid in a buffer system, the pH of which is 4·50 [pK_a of lactic acid = 3·86] [2]
   c) What happens when **(any two)**—
      i) Glycine molecule is heated at high temperature.
      ii) Amino acid is treated with phenyl isothiocyanate.
      iii) Lysine is treated with nitrous acid. [2+2]