RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2011

FIRST YEAR

Date : 16/12/2011 **MICROBIOLOGY (Honours)**

Time : 11 am – 2 pm Paper : I Full Marks : 75

[Use separate Answer Books for each group]

Group – A

1. Answer **any five** questions : [2×5 = 10]
   a) What is pyrenoid?
   b) Why is poly-β-hydroxybutyrate important for bacterial cell?
   c) What do you mean by fruitbody?
   d) How does rRNA homology help in modern bacterial systematics?
   e) What is Tyndalization?
   f) What is the limit of resolution of a compound light microscope?
   g) What is the significance of calculating standard deviation in biological data?

2. Answer **any three** questions : [3×10 = 30]
   a) i) Describe with a ray diagram the working principle of a phase contrast microscope. [3]
      ii) What is the utility of oil immersion lens in microscopy? [2]
      iii) Differentiate between SEM and TEM [2]
      iv) "Basic dyes are often used in bacterial staining"— Justify. [2]
      v) What is mycolic acid? [1]

   b) i) Name one disease causing protozoa and mention the disease and also describe the life cycle of the mentioned protozoa. [2+4]
      ii) Write down the contribution of Robert Koch in the field of microbiology. [2]
      iii) Write the important differences between the Ascomycota and Basidiomycota. [2]

   c) i) Name a bacterium devoid of cell wall. [1]
      ii) How does a capsule protect the bacterial cell? [2]
      iii) What is a spheroplast? [1]
      iv) Name an endospore forming bacterium. [1]
      v) Describe the process of endospore formation. [4]
      vi) What is the role of pili in bacteria? [1]

   d) i) What is hopanoid? Write down its two important functions. [2+2]
      ii) What is periplasm? [2]
      iii) Write four important functions of LPS in bacteria. [4]

   e) i) What is histogram? [2]
      ii) What do you mean by coefficient of mean deviation? [2]
      iii) Find the mean and standard deviation of the following data. [6]

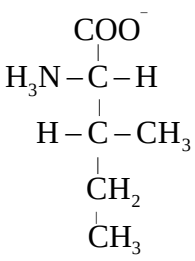
Number of bacteria	10	11	12	13	14	15	16
Number of colony	2	7	11	15	10	4	1

Group–B

Answer **any five** questions from the following:

1. a) What are polyprotic acids? Explain with proper example. [2+1]
   b) How many milliliters of 5M H_2SO_4 are required to make 1500ml. of a 0.002M H_2SO_4 solution? [2]
   c) Calculate the pH of a buffer containing 0.1 mole acetic acid and 0.1 mole acetate ion.
   [Ka = 1.8 x 10^{-5}, –log 10^{-5} = 5] [2]

2. a)



   How many chiral centres and optical isomers does it have? [2]
   b) Write short note on Butane Gauche interaction. [2]
   c) Mention the drawbacks of D, L nomenclature. [3]

3. a) Two amino acids are separated by thin layer chromatography and have R_f values 0.6 and 0.5. A laboratory technician is asked to perform the same separation with different buffer system. Will he obtain the same R_f values? Justify. [2]
   b) Super secondary structure is very important for protein stability — Justify. [2]
   c) Dansyl chloride treatment of a single polypeptide chain followed by its complete acid hydrolysis yields several dansylated amino acids. Explain. [2]
   d) Write down the structure of a biologically active tripeptide. [1]

4. a) Adenine – Thymine Watson – Crick base pairing. [2]
   b) Syn–Cytosine nucleoside. [2]
   c) What do you mean by C-value paradox? [2]
   d) Why is Melting Temperature (T_m) of $(G \equiv C)$ higher than (A=T)? [1]

5. a) Describe the preparations of 3 liters of 0.2M acetate buffer, pH 5.00, starting from solid sodium acetate trihydrate (MW 136) and *a* 1 *M* solution of acetic acid
   (Given, Ka for acetic acid is 1.70 x 10^{-5}) [3]
   b) Discuss the principle of "FORMOL" titration of glycine. [2]
   c) What happens when, peptide is treated with phenyl isothiocyanate? [2]

6. a) What do you mean by surface tension of water? Suggest a way to break it. [2+1]
   b) Define specific viscosity. Explain it's relation to relative viscosity. [1+2]
   c) What is the Helix Pitch for β-DNA? [1]

7. a) Point out the major differences between *A*, *B* and *Z*-DNAs. [3]
   b) Explain with suitable examples the role of H-bonding in stabilizing protein structure. Why are β-sheets pleated? [2+2]