RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2012

FIRST YEAR

Date : 14/12/2012

MICROBIOLOGY (Honours)

Time : 11 am – 2 pm

Paper : I

Full Marks : 75

[Use separate script for each group]

Group – A

1. Answer **any five** questions from the following
    a) What do you mean by pseudopeptidoglycan?   2
    b) What is carboxysome?   2
    c) What do you mean by resolving power of a microscope?   2
    d) What is the function of heterocyst?   2
    e) What are metachromatic granules?   2
    f) Name one parasitic algae and the resulting disease.   2
    g) What is episome?   2

2. Answer **any three** questions:
    a) i) Write a brief account on spontaneous generation theory?   2
        ii) Why is small subunit RNA of ribosome used for phylogenetic classification of living kingdom?   2
        iii) Write down the difference between the cell wall and membrane lipid components of archaea and bacteria.   3
        iv) Comment on the limitations of Koch's postulates.   3

    b) i) What is hopanoid? Write down its importance.   2
        ii) Compare and contrast between fimbriae and pili.   3
        iii) Why is Ca^{+2} and Dipicolinic acid accumulation important during endospore formation in bacteria?   2
        iv) Prokaryotes grow faster than eukaryotes-Justify.   2
        v) Define Ti plasmid.   1

    c) i) What are diatoms?   2
        ii) What do you mean by "fungi imperfecti"?   2
        iii) Write down the differences between Gram positive and Gram negative cell wall.   3
        iv) What is the difference between fission yeast and budding yeast?   3

    d) i) What is dispersion?   2
        ii) What is standard deviation?   2
        iii) The mean weight of 100 carp fishes of a pond is 49.46 kg. The mean weight of 200 carp fishes is 52.32 kg. Find the combined mean weight of all the carp fishes.   2
        iv) Compute the standard deviation and coefficient of variation of the following distribution of body weights (grams) of a sample of animals: 2+2

Class interval	101-105	106-110	111-115	116-120	121-125
Frequency	6	22	40	25	7

    e) i) Which type of staining is called indirect staining and why?   2
        ii) Why are most Gram negative bacterial cells resistant against penicillin?   2
        iii) Write a brief account on the principle behind acid fast staining?   3
        iv) Comment on the use of $CuSO_4$ in Anthony's method of capsule staining.   3

f) i) What do you mean by chromatic aberration?   2

     ii) Write down the differences between TEM and SEM?   3

     iii) Comment on the working principle of electron microscope.   2

     iv) Why is phase plate used in phase contrast microscopy?   3

Group – B

Answer **<u>any five</u>** questions from the following

3. a) What do you mean by pseudochirality? Give examples.   2

    b) Draw the Flying Wedge configuration of S-Proline.   1

    c) How many stereoisomers are possible for tetronic acid?   2

    d) What in Butane Gauche interaction?   2

4. a) What are the structural features of fibrous proteins? Name a fibrous protein.   2+1

    b) Write the structure of nucleotides which are present in RNA.   2

    c) What is T_m? How would you determine T_m experimentally?   2

5. a) Define surface tension and viscosity.   2

    b) If it takes 50 ml of 0.5 M KOH solution to completely neutralize 125 ml of sulphuric acid (H_2SO_4) solution, what is the concentration of the H_2SO_4 solution?   2

    c) What do you mean by common ion effect? Explain with proper example.   2

    d) Define polyprotic acids.   1

6. a) Draw and explain the titration curve of alanine.   2

    b) Why is haemoglobin a globular protein? What are the major structural differences between deoxyhaemoglobin and oxyhaemoglobin?   1+2+2

7. a) Briefly explain the effect of pH on enzyme catalysed reaction.   3

    b) Find the pH of a solution that contains 0.0034M lactic acid ($Ka = 1.4 \times 10^{-4}$) and 0.056M propionic acid ($Ka = 1.4 \times 10^{-5}$).   2

    c) How many millilitres of 5M H_2SO_4 are required to make 1500 ml of 0.002M H_2SO_4 solution?   2

8. a) Alanine is optically active but glycine is not — Explain.   2

    b) Oxygen association curves of Hb and Mb are different — Explain.   2

    c) Write down the structure of the product obtained by treating Histidine with Ninhydrin.   3

9. a) What do you mean by DNA complexity?   2

    b) With suitable graph, define $Cot_{1/2}$.   2

    c) How is DNA complexity related to $Cot_{1/2}$ for the DNA?   3

10. a) Designate R/S – notation of L-serine.   2

    b) Name the symmetry of elements present in – Trans 1,3-dimethyl cyclobutane and *meso* tantaric acid.   2

    c) Draw potential energy diagram of 1-chloropropane for rotation around C_1–C_2 bond, showing the conformers having the maximum and minimum energy.   3

11. a) What is C-value?   2

    b) Deduce the equation relating C-value to Genome size.   3

    c) What is C-value paradox?   2

12. a) Write short notes on Ampholytes.   3

    b) Mutarotation of glucose is facile in the presence of 2-hydroxy pyridine – Explain.   2

    c) Describe a suitable method of separation of a mixture of glutamic acid and glutamine.   2

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