RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, JANUARY 2015

FIRST YEAR

Date : 05/01/2015 **MICROBIOLOGY (Honours)**

Time : 11 am – 3 pm **Paper :** I Full Marks : 100

[Use a separate Answer Book for each group]

Group – A

1. Answer the following questions : [5×2]
   a) What is meant by signature sequence?
   b) What is fructification? Give an example.
   c) State the infective stages of *Entamoeba* and *Plasmodium*.
   d) What is porin? State its function.
   e) State the location and function of mesosome.

Answer **any three** questions from **Q.No. 2 - 7** : [3×10]

2. a) In which situations, Koch's postulates are not applicable? [2]
   b) State the differences between the Ascocarp and Basidiocarp. [2]
   c) Why did Carl Woese choose ribosome for the phylogenetic classification of organisms? [2]
   d) Why are the majority of the membrane associated lipids asymmetric in nature? [2]
   e) State the functions of fimbriae. [2]

3. a) What is clay theory? State its importance. [2]
   b) Distinguish between nucleus and genophore. [2]
   c) Discuss the salient features of the fluid mosaic model of cell membrane. How did it remove the demerits of unit membrane? [2+1]
   d) State the special adaptations of archeal cell membrane which help them to survive in extreme environmental condition. [3]

4. a) Distinguish between the asexual reproductive spores of Zygomycota and Oomycota. [2]
   b) Mention the major stages in the life cycle of *Plasmodium vivax* in human and also mention the major feature of each stage. [2+2]
   c) What is meant by germ theory of disease? [2]
   d) What is paraphyses? Write its function. [2]

5. a) Why is heterocyst important? [2]
   b) What is meant by similarity coefficient? [2]
   c) What are anamorph and teleomorph? State their importance in the life cycle of a fungus. [2+2]
   d) What is hormogone? State its function. [2]

6. a) What is tyndalization? [2]
   b) Name two fungal alkaloids and their function. [2]
   c) What is dendrogram? State its importance. [2]
   d) What is Brauns' lipoprotien? [2]
   e) Write down the function of PHB. State its function. [2]

7. a) State two distinctive features of slime moulds. [2]
   b) Name a plant parasitic slime mould and the disease caused by it. [2]
   c) Describe the different stages of endospore formation in bacteria with suitable diagram. [3]
   d) State the composition of glycocalyx and its function in bacteria. [3]

Group – B

8. Answer the following questions : [5×2]
   a) What do you mean by '*anti*' and '*syn*' mucleotides?
   b) What are the general tests for proteins?
   c) What is meant by conjugated protein? Give one example.
   d) Myoglobin and porin have distinctly different types of amino acids around their surfaces— name a few and state why?
   e) What is the number of hydrogen bonds present between—
      (i) Adenine and Thymine, (ii) Guanine and Cytosine

Answer **any three** questions from **Q.No. 9 - 14** : [3×10]

9. a) Explain the term 'supercoiling' with respect to DNA in vivo. [5]
   b) Name the forces which make the DNA to be double stranded? [2]
   c) What are the differences between Z-DNA and B-DNA. [3]

10. In X-ray studies of crystalline peptides, Linus Pauling and Robert Corey found that the C–N bond in the peptide link is intermediate in length (1·32Å) between a typical C–N single bond (1·49Å) and a C=N double bond (1·27Å). They also found that peptide bond is planar (all four atoms attached to the C–N group are located in the same plane) and that the two α-carbon atoms attached to the C–N are always *trans* to each other (on opposite side of the peptide bond).
   a) What does the length of the C–N bond in the peptide linkage indicate about its strength and its bond order (i.e whether it is single, double or triple)? [2]
   b) What do the observations of Pauling and Corey tell us about the ease of rotation about the C–N peptide bond? [2]
   c) Enumerate the nature of the forces that stabilize the structure of any protein. [3]
   d) State three distinguishing structural features of fibrous proteins and globular proteins. [3]

11. a) What are the symmetry elements present in cyclopentane? [2]
   b) Give an example of chiral molecule with nonstereogenic centre. [1]
   c) What are the drawbacks present in DL nomenclature? [2]
   d) *cis*-2-aminocyclohexanol on treatment with nitrous acid gives single product whereas its trans isomer gives a mixture of products— justify the statement. [3]
   e) How many stereoisomers are present in riboric acid? [2]

12. a) Write down the structure of trans-4-t-butyl cyclohexyl tosylate. [1]
   b) What is Butane-Gauche interaction? Explain with example. [3]
   c) What is the basic difference between conformation and configuration? [2]
   d) What do you understand by pH scale? [1]
   e) Briefly describe Formol titration of glycine with NaOH and why is it difficult to titrate of glycine with NaOH without formaldehyde? [3]

13. a) Discuss the importance of hydrophobic interaction in biological system. [2]
   b) State the definition of coefficient of viscosity. [2]
   c) Draw a graph for the effect of temperature on surface tension. [2]
   d) The surface tension of mercury is 484×10^{-3} Nm^{-1}. If the depression caused by Hg is 3·63 cm and density is $13{\cdot}6\times10^{3}$ Kg/m^{3}, calculate the radius of the tube. (Given, g = 9·8 metre/sec^{2}) [2]
   e) What are cohesive force and adhesive force? State with examples. [2]

14. a) What are the drawbacks of Sanger's method for determination of N-terminal of a peptide? [2]
   b) Which group is specific for Biuret reaction? [1]
   c) What is an α-helix? [2]
   d) How would you synthesize gly-phe-ala chemically? [3]
   e) What is isoelectric focusing? [2]

Group – C

15. Answer the following questions : [3×2]
    a) Distinguish between chromophore and chromogen with a suitable examples.
    b) What is meant by the limit of resolution of a microscope.
    c) How is bacterial endospores stained?

Answer **any two** questions from **Q.No. 16 - 19** : [2×7]

16. Compute mean, median, S.D. and Variance and coefficient of variance of the following data— [7]

Class Interval	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74	75 – 79	80 – 84
Frequency	2	4	2	6	8	10	12	20	16

17. a) What is quartile deviation? [1]
    b) How it varies from standard deviation? [1]
    c) What is meant by coefficient of quartile deviation? [1]
    d) Find the Quartile deviation of the following distribution : [4]

Class Interval	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70
Frequency	10	22	28	20	12	8

18. Define the following terms with example :
    a) Simple Staining [1]
    b) Double Staining [2]
    c) Differential Staining [2]
    d) Mordants [1]
    e) Negative Staining [1]

19. a) What is meant by Gram Variability? Where and why it is seen? [1+1]
    b) Briefly illustrate the process of staining a fungal spore. [2]
    c) Why certain bacteria are called "acid fast"? Give example. [1]
    d) Briefly state the method of staining bacterial flagella. [2]

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