RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2017

FIRST YEAR [BATCH 2017-20]

Date : 12/12/2017 **MICROBIOLOGY (Honours)**

Time : 11.00 am – 3.00 pm Paper : I Full Marks : 100

(Use a separate Answer Book for each group)

Group – A

Answer **any six** of the following: [6×10]

1. a) Why is endospore formation not a method of reproduction? 2
   b) Write down the structural peculiarities of Archebacterial cell wall. 2
   c) During repetition of swan-neck flask experiment by L. Pasteur, sometimes, a negative result was obtained i.e., boiled infusion contained in the flask became spoiled. Who proved the causes of this spoilage giving a final blow to the "Theory of Abiogenesis" and how? 2
   d) What are type specimens? 2
   e) What are synonyms? 2

2. a) Mention the role of bacterial capsule in relation to its pathogenecity. 2
   b) How would you differentiate capsule from slime layer? 2
   c) How is an ascus formed in the phylum-Ascomycota after fertilization leading to formation of ascospores? 3
   d) Why did Carl Woese choose small submit rRNA to classify living kingdom?
   State the major characteristic features considered by Whittaker to classify the living organism. 2+1

3. a) Write down the functions of the small and large subunit of prokaryotic ribosomes. 1+1
   b) What is the genome size of *Escherichia coli* in terms of base pair? How does the huge genome remain compact within the small bacterial cell? 1+2
   c) What are the purposes of staining of bacterial cells? 2
   d) What is mordant? Explain its function with respect to Alizarin. 1+2

4. a) In some cases Koch's postulations may not hold good to establish a relationship between a disease and its causal organism. Cite two such examples. 2
   b) Why is penicillin active on growing cells only? 3
   c) Explain the theory and principle of bacterial endospore staining. 3
   d) Is it logical to include blue green algae within the Prokaryotes? Justify. 2

5. a) What is a fruiting-body? Name the different kinds of fruiting bodies under Ascomycota with suitable examples. 1+3
   b) Write the chemical structure of glycan part of peptidoglycan. 3
   c) Mention the name of one dye of Tri-phenyl methane series used in staining of bacteria and how does it work? 1+2

6. a) What is meant by "new yeast" in the context of spoilage of alcohol manufactured by the distillers in France? 2

   b) Name the stages of reproduction in the life cycle of malaria parasite, *Plasmodium vivax* and mention the name of the hosts where these stages are completed. 2

   c) What is Ti-plasmid? Do you agree Ti-plasmid and T-DNA are same? Explain. 2

   d) "It is not safe to assume that organisms with very similiar G+C contents also have similiar DNA base sequences" — Explain. 2½

   e) What are oligonucleotide signature sequences? 1½

7. a) What is a sclerotium? Write its importance in the field of medicine. 1½+1½

   b) Mention the economic importance of fungi with respect to industrial use. 2

   c) What do you mean by 'Numerical Aperture' of a microscope? 2

   d) With the help of a suitable diagram, explain how the microscope magnifies the object when viewed. 3

8. a) Who is called the "Father of soil Microbiology"? Write his contribution in this area. 1+2

   b) Write down the structure and function of PHB in bacterial cell. 2+2

   c) How is carbol fuchsin stain retained by the acid-fast bacteria? 3

9. a) State the reasons behind the separation of Oomycotes from the Phylum-Zygomycota. 2

   b) How does *Entamoeba histolytica* overcome the adverse environmental conditions for sustenance of its existence. 1

   c) What is the function of auxospore? 2

   d) What is Chromatic Aberration? How is it corrected? 2+2

   e) Mention the scientific name of an alga from which agar-agar is obtained. 1

10. a) Name the stages of the life cycle of rust fungus and mention the sites where these stages are completed. 2½

    b) What is meant by "variolation"? 1½

    c) Define chromophore and auxochrome with suitable examples. 2+2

    d) You want to study different stages of cell division in a living cell. Which microscope will you use? Mention its working principle. 1+1

11. a) What is a heterocyst? State its importance in increasing soil fertility. 1½+1½

    b) Write down the stored food of Chlorophyceae. 2

    c) "DNA-DNA hybridization is used to study only closely related microorganisms" — explain with suitable example. 3

    d) What do you mean by Addansonian classifications. 2

12. a) What is trichome? 2

    b) What are the intergenic families of repetitive sequences? How is it useful in molecular taxonomy? 2+2

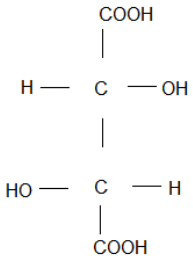
c) What is differential staining? How does bacterial cell wall composition help to retain crystal violet-iodine complex during Gram staining? 2+2

Group – B

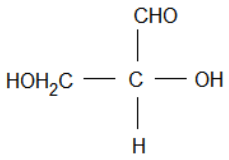
Answer **any four** of the following: [4×10]

13. a) What is chirotopicity and stereogenecity? 2
    b) What happen when amino acids are treated with phenylisothiocyanate. 2
    c) Convert (i) Glycine to methylamine, (ii) Alanine to 2-keto-propionic acid. 1+1
    d) Write short notes on ion exchange chromatography. 2
    e) Give R/S nomenclature: 2

(i)



(ii)



14. a) Write the structure of 1,4, dimethylcyclohexane and find out the most stable conformation with proper justification. 2
    b) Prove that meso form is more stable than active form. 3
    c) Why Dansyl method is advantageous over Sanger method for N terminal determination of protein? 2
    d) Formaldehyde is used to minimize the pKa2 of the glycine titration with NaOH – Justify. 2
    e) Write the structure of S-methionine. 1

15. a) Why proline gives yellow colour not violet? Give mechanistic interpretation. 3
    b) State four important characteristics of peptide bond in the protein structure. 2
    c) Secondary structure of protein is all about H-bonding – be it α-helical style or β-sheeted pattern – elaborate. 2
    d) What distinguishes tertiary from quaternary structure in proteins? Do all proteins have quaternary structures? 2+1

16. a) Why α-helix of a helical protein is completely lost when dissolved in water containing urea? 3
    b) Name the methods used to determine the structure of proteins. 1½
    c) Haemoglobin and porin are typical examples of globular proteins – how their structures contribute to their cellular locations and functions? 2½
    d) Ramachandran plot helps understand protein folding pattern and the associated restrictions – comment. 3

17. a) What do you mean by C-value? What is C-value paradox? 2+2
    b) What is Twist number? What will be the approximate Twist number of a relaxed covalently closed circular DNA double helix of length 200 bp? 2+2
    c) What do you mean by sugar puckering of DNA? 2

18. a) Which tautomeric form of Guanine is predominant in living system? Whom does it base pair with? 2+2

b) What are the difference among the A-DNA, B-DNA and Z-DNA? 2

c) What is Propeller Twist of DNA base pairing? Explain with diagram. 2

d) How many type of covalent bonds are found in a chain of RNA? 2

19. a) Define "Henderson-Hasselbalch" equation . State about titrable and true acidily. 3+1

b) What are polyprotic acids? Give examples. 2

c) How many milliliters of 0.05 N HCl are required to neutralize exactly 8.0 gm of NaOH? 4

20. a) What are coupled reactions? Explain with example. 2

b) Briefly describe the importance of hydrogen bonding in biological system. 4

c) What is standard free energy?

Give the mathematical representation of the relation among the free energy, enthalpy and entropy. 1+1

d) What is the pH of a 10^{-8} M solution of HCl? 2

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