

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

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

FIRST YEAR [BATCH 2015-18]

MICROBIOLOGY [Hons]

Date : 14/12/2015

Time : 11 am – 3 pm

Paper : I

Full Marks : 100

[Use a separate Answer Book for each Group]

Group – A

Unit – I

(Answer any four questions)

1. a) What is the basis of Woese's three kingdom classification? [2]
b) Write down three important functions of periplasm. [3]
c) How is Myxomycota different from true fungal members? [3]
d) Is there any benefit of having pentaglycine in the cellwall of certain bacteria? [2]
2. a) How did Robert Koch establish that *Bacillus anthracis* is the causal organisms of anthrax? [2]
b) Write down three important functions of lipo-polysaccharide in the outer membrane of bacterial cell wall. [3]
c) What is meant by similarity coefficient? [2]
d) What are the different types of teichoic acid in bacterial cell wall? State their function. [1+2]
3. a) Briefly describe the experiment of Pasteur denoting biogenesis. [3]
b) How can the integral membrane proteins from bacterial cell membrane be solubilized? [3]
c) What is Pasteurization? [2]
d) What is hopanoid? [2]
4. a) Write the differences between Chytridiomycota and Oomycota. [3]
b) Give three distinctions between flagella and pili. [3]
c) What is meant by variolation? [2]
d) What is episome? [2]
5. a) Schematically present the life cycle of *Schizosaccharomyces pombe*. [3]
b) Write down three important features of endospore in bacteria. [3]
c) Write two exceptions of Koch's postulates. [2]
d) Name the rotor and Stator protein of bacterial flagella. [2]
6. a) State the important features of bacterial chromosome. [3]
b) Write down one economic importance of Bacillariophyceae, Rhodophyceae and Phaeophyceae. [3]
c) Mention the parasitic features of *Giardia*. [2]
d) How does capsule protect bacteria from host defence? [2]
7. a) What is heterocious rust? Give an example. [2]
b) What is proto pyrenoid? [2]
c) What is mitosporic fungi? Name a fungus which produces ergotamine alkaloid. [3]
d) Distinguish between syngamy and conjugation giving example from algae. [3]

Unit – II

(Answer any one question)

8. a) Define the following terms : Chromogen, Auxochrome, Mordant [2+2+2]
b) State the principle and procedure of staining bacterial flagella. [2+2]

9. a) Why we cannot see specimens without staining in bright field microscopy? [2]
- b) How does a Phase plate help in phase contrast microscopy? [3]
- c) What is Gram staining? [2]
- d) Distinguish between double staining and differential staining method. [3]

Unit – III

(Answer **any one** question)

10. Calculate mean, median, mode, standard deviation and standard error of the following distribution

[2+2+2+2+2]

Scores	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74
Frequency	2	3	5	9	6	4	1

11. Answer **any five** questions :

[5×2]

- a) Name two different sources of secondary data.
- b) How can you convert class limits into class boundary?
- c) What is pie chart?
- d) What are primary and secondary data?
- e) State the uses of mean and standard deviation.
- f) What is meant by standard error? State its utility.
- g) What is coefficient of variation?
- h) Calculate the standard error of the mean, where SD = 13.05 and N = 566.

Group – B

Unit – I

(Compulsory Question)

12. a) (i) What do you mean by Viscosity? (1)
- (ii) State the S.I. Unit of Viscosity. (1)
- b) Briefly describe the importance of viscosity and surface tension in biological system. (1½+1½)
- c) What are the concentrations of HOAc and OAc⁻ in a 0.2 M “acetate” buffer, pH 5.0? (2)
- d) State and Derive surface energy? (1+2)

Unit – II

(Answer **any three** questions)

13. a) What are the symmetry elements present in chair conformation of cyclohexane? (2)
- b) Give an example of nonchiral molecule with stereogenic centre. (1)
- c) State the R/S nomenclature of (any one) : (2)
 - (i) CH₃CHIBr
 - (ii) 2-bromobutane
- d) Cis-2-aminocyclohexanol on treatment with nitrous acid gives single product whereas its trans isomers give mixture of products — justify the statement. (3)
- e) Write down the Fischer Projection formula of L-Phenylalanine. (2)
14. a) Write down the structure of trans-4-t-butyl cyclohexyl carboxylate. (1)
- b) Twist boat conformation is more stable conformation than boat for cyclohexane — justify. (2)
- c) What is isoelectric focussing? (2)
- d) State any method for detection of any amino acid. (2)
- e) Name any one of the biologically active octapeptide. (1)
- f) Fluorescamine method is useful for determination of N-terminal of peptide — Comment. (2)

15. a) Write down the structure of Boc-alanine. (1)
 b) What happens when:
 (i) Amino acid is treated with HI at 200°C.
 (ii) Chloroacetic acid is treated with trimethyl amine. (1½+1½)
 c) What do you mean by mobile phase and stationary phase in TLC? (2)
 d) How would you synthesize gly-ala-lys from ala-lys chemically? (2)
 e) Why is it difficult to titrate glycine with NaOH? (2)
16. a) Discuss the nature of the forces that stabilize the structure of any protein. (2½)
 b) Water soluble proteins fold into compact structures with non-polar cores—comment on their structure-function aspect citing appropriate examples. (2½)
 c) State the characteristic feature of intra-chain hydrogen bonding and inter-chain hydrogen bonding in the secondary structure of proteins. (2½)
 d) What are the characteristic differences between collagen and haemoglobin in respect to their structures? (2½)
17. a) Elaborate with examples the distinguishing features of fibrous proteins and globular proteins. (3)
 b) Enumerate the characteristic features of primary, secondary, tertiary and quaternary structures of proteins. (2)
 c) Ramachandran plots help understand protein structures — comment. (3)
 d) Which of the following peptides is more likely to take up an α -helical structure and why? (2)
 (i) LKAENDEAARAMSEA
 (ii) CRAGGFWDQPGTSN
18. a) State the differences between A, B, and Z-DNA. (3)
 b) How would you prove that a solution of nucleic acid is single or double stranded without using any chemical? (3)
 c) What do you mean by positive and negative supercoiling? (2+2)
19. a) Name the forces that stabilize a double stranded DNA. (3)
 b) What type of DNA is formed when,
 (i) Relative humidity is greater than 92%
 (ii) Relative humidity is around 75%. (1+1)
 c) (i) What is meant by the T_m of a DNA sample? (2)
 (ii) Define helix sense. (1½)
 (iii) Define twist. (1½)

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