

Anekant Education Society's
Tuljaram Chaturchand College
Baramati (Pune)

Msc First Year (Sem. I)

Paper code : MICRO4101

Paper : I

Title of Paper: Microbial Systematics and Diversity

Credits: 4

2 Marks Questions :

1. Enlist the culture independent molecular methods for identifying unculturable bacteria.
2. Give the classification of any bacterium.
3. Define Strain with examples.
4. Give 5 examples of kingdom Archaea.
5. What is Endosymbiosis?
6. What are stromatolites? What can they tell about the evolution of prokaryotes?
7. Enlists methods for phenetic and phylogenetic classification.
8. Why is the study of Ribosomal RNA especially useful in studying evolutionary relationships among organisms?
9. Enlist the criterias for classifying Bacteria.
10. What types of information are contained in Bergey's Manual of Determinative Bacteriology, compared to Bergey's Manual of Systematic Bacteriology?
11. Define the biological concept of species.
12. Define the phenetic concept of species.
13. Define the ecological concept of species.
14. Define the phylogenetic concept of species.
15. Define evolution.
16. What is alpha diversity and beta diversity?

17. Enlist the characteristics of monera kingdom of whittakers classification.
18. Enlist the characteristics of protista kingdom of whittakers classification with examples.
19. Enlist the characteristics of fungi kingdom of whittakers classification with examples.
20. Enlist the characteristics of archea domain of Woese's classification with examples.
21. Enlist the characteristics of bacteria domain of Woese's classification with examples.
22. Enlist the characteristics of eukarya domain of Woese's classification with examples.
23. Enlists methods for estimation of total number of species.
24. Enlists the strategies for culture of unculturable bacteria.
25. Enlist the methods of extracting total bacterial DNA from a habitat .
26. Enlist the culture independent molecular methods for identifying unculturable bacteria.

4 Marks Questions :

1. Define the significance of polyphasic approach to bacterial systematics.
2. Enlist and explain physiological characters used in systematics.
3. Write a short note on phylogenetic tree.
4. Describe importance of protein profiling in bacterial taxonomy.
5. Explain the significance of lipid profile in bacterial taxonomy.
6. Describe the role of extra chromosomal element transfer in bacterial taxonomy.
7. Give the importance of FAME profiling in bacterial taxonomy.
8. Draw and explain the flow sheet for DNA sequencing.

9. Elaborate the salient morphological features employed in bacterial taxonomy with suitable examples.

10. Given data is obtained from soil sample. The total number of colonies were counted to be 158×10^7 . Find out the Simpson index. [5]

Sr. No.	Types	No. of colonies
01	Umbonate	39
02	Flate raised	68
03	Convex	51

11. Give the flowsheet diagram for estimating total number of species from a selected environment.

12. From the given data calculate the Shannon diversity index for the river water sample. Total number of colonies is 184×10^7 .

Sr.No	Types of colonies	Number of colonies
1	Pinpoint colonies	50
2	Pigmented colonies	61
3	Colonies larger than 1mm	73

13. Role of flow-cytometry in bacterial taxonomy.

14. Describe the Gradient gel electrophoresis techniques.

15. Explain any one molecular technique used in identification of microbes.

16. Describe metagenomic library.

17. Explain any one method to identify unculturable bacteria.

18. Explain any two approaches to cultivate unculturable bacteria.

19. Write a short note on molecular evolution.

20. What is molecular clocks? Enlist various molecules used as molecular clocks in bacterial taxonomy.

21. Describe neutral evolution.

22. Define 'molecular clock'.

23. Explain the concept of phylogeny and molecular distances.

24. Give a short note on types of species.
25. Give definitions of species in prokaryotes.
26. Short note on 5 Kingdom classification.
27. Short note on 3 Domain classification.
28. Write a short note on co- evolution.
29. Discuss Woese theories about 3 domains.
30. Write a short note on next generation sequence

6 Marks Questions :

1. Discuss in brief 3 Domain classification system.
2. Define and explain phenetic approach of classification with suitable examples.
3. Justify : “16S r RNA is the most widely accepted molecular chronometer” in bacterial taxonomy.
4. Differentiate between species concept between Eukaryotes and Prokaryotes.
5. Short note on 5 Kingdom classification.
6. Write a short note on applications of FISH in bacterial Taxonomy.
7. Explain the phylogenetic approach of bacterial classification.
8. Describe the various techniques of DNA-DNA hybridization.
9. Explain why 16S rRNA is significant in systematic bacteriology.
10. Explain Carl Woe’s major contribution to microbial taxonomy.
11. Briefly explain the measures and indices of diversity.
12. Describe the various approaches to access the total number of species.
13. Briefly explain the factors affecting species diversion.

14. Justify : “Shanon index is better than the Simpson’s index for expressing bacterial diversity in an ecological sample.”
15. Describe the methodological strategy for identification of pure cultures.
16. Explain in brief the great plate count anomalies with suitable example.
17. Enlist & explain the various approaches to access the total number of bacteria in environment.
18. Explain the concept of ‘Unculturable’ bacterial diversity.
19. Explain the characteristics of bacteria in VBNC state. How does this state influence taxonomy?
20. Explain the strategies used for cultivating unculturable bacteria.
21. Explain the need and techniques of extracting total bacterial DNA from a habitat.
22. Methods to determine the extent of DNA Hybridization.
23. Outline the strategy for identification of pure culture with suitable flow sheet diagram.
24. Explain the culture independent molecular methods for identifying unculturable bacteria.
25. Explain the need of extracting total bacterial DNA from habitat.
26. What is metagenome analysis? Draw a flow-chart to carry out metagenome analysis.
27. Enlist and explain chronologically the methodological strategies for the identification of pure culture.
28. What is the significance of culture independent molecular methods? Describe the whole-genome shotgun technique.
29. Describe the newer approaches for exploring unculturable bacteria from environmental habitats.
30. Write a note on Neutral and Co-evolution .
31. Differentiate between the species concept of sexual and asexual organisms.
32. Differentiate between species concept in Eukaryotes and prokaryotes.
33. Write a short note on evolution of species.
34. What is co-evolution ? Explain co-evolution with respect to host –parasite evolution.
35. Comment on the level of selection .

36. Discuss the concept of evolutionary r and k selection.

12 Marks Questions:

1. Explain the difference between Phenetic Classification and Phylogenetic Classification, with reference to the objectives, methodology and application.
2. Explain 5 kingdom classification and 3 Domain classification in brief.
3. Explain and contrast between phenetic and phylogenetic approach to classification.
4. Explain methods of extracting total bacterial DNA from habitat and give short note on Metagenomic analysis.
5. Explain in brief species divergence and measurement of microbial diversity.
6. Explain the types and levels of selection. Write a short note on r and k selection.
7. Describe the types of species and concept of speciation (in sexual and asexual organisms).
8. Explain in brief types of evolution (neutral and co-evolution).
9. Enlist and explain chronologically the methodological strategies for the identification of pure culture.

10. What is the significance of culture independent molecular methods?
And Describe the molecular methods for identifying unculturable bacteria.
11. Explain in brief phylogenetic approach.
12. Describe in brief types of selection and write short note on r and k selection.
13. Describe in brief phenetic approach .
14. Give in brief the concept of unculturable bacterial diversity.
15. Explain the various measures and indices of microbial diversity and solve the given problem : From the given data calculate the Shannon diversity index for the river water sample. Total number of colonies is 184×10^7 .

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