

**2021**  
**MICROBIOLOGY**  
**[HONOURS]**  
**Paper : I**

Full Marks : 75

Time : 4 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***Answer all the questions.****Write the answers to questions of each Group in separate books.****GROUP-A****(Overview of Microbiology and Diversity of Microbes)****(Marks: 50)**

1. Answer any **two** of the following:  $1 \times 2 = 2$
- What is the natural source of alginic acid?
  - What is heterothallism?
  - State the differences between capsule and slime layer.
  - Name two human pathogenic fungi.

*[Turn over]*

2. Answer any **five** of the following:  $2 \times 5 = 10$
- What is diploidization?
  - What is the agricultural importance of algae?
  - What molecular evidence supports the theory of endosymbiogenesis?
  - What features should have the thermophiles to overcome high temperature?
  - What is the function of gas vesicles in bacteria?
  - Why is 16SSrRNA sequence a valuable index of relatedness of major groups of organisms?
  - Mycoplasma caused diseases cannot be treated with penicillin, Why?
3. Answer any **three** of the following :  $6 \times 3 = 18$
- Differentiate between Eubacteria and Archaeobacteria.
    - What is 'One-step growth curve' of viruses?  $3 + 3 = 6$
  - Discuss the role of microbes in maintaining ecological balance.
    - How does Ribozyme exemplifies the concept of 'RNA World'?  $3 + 3 = 6$
  - What is retrograde evolution? Discuss with proper example.

- ii) Differentiate between the life cycles of  $T_4$  &  $\lambda$  phages.  $3+3=6$
- d) i) What is phage typing? What is its importance?
- ii) Give three major evidences in favour of the 'Theory of endosymbiogenesis'.  
 $(2+1)+3=6$
- e) i) Differentiate between Gram positive and Gram negative Eubacteria.
- ii) Which type of viruses have life cycle based on reverse transcription? Why? Give one such example.  $3+3=6$

4. Answer any **two** of the following:  $10 \times 2 = 20$

- a) Why is Archaea considered as primitive prokaryotes? Point out the distinctive molecular characters by which they differ from Eubacteria. How do halophilic archaeobacteria survive and grow in high salt habitat?
- b) Why are SSU rRNA genes suitable for phylogenetic analysis? What information does RDP-II provide? What value do molecular clocks have in phylogenetic analysis?

- c) How can you determine the total number of  $T_4$  present in sewage sample? Mention the molecular basis of classification of viruses by Baltimore and Temin and the classes suggested by them with example of each class.
- d) Write short notes on:
- i) Theory of chemical evolution
- ii) Viroids
- iii) Prion
- iv) Methanogenesis

#### **GROUP-B**

#### **(Microbial Cell and Cell Component)**

**(Marks : 25)**

5. Answer any **three** of the following:  $1 \times 3 = 3$

- i) What are episomes?
- ii) Write the name of two D-amino acids found in bacterial cell wall.
- iii) In which structure of prokaryotic cells hopanoids are found?
- iv) What is kinetosome?
- v) What is negative taxis?

6. Answer any **three** of the following:  $2 \times 3 = 6$

- i) What are cytoplasmic inclusions? Write the function of gas vesicles in bacteria.
- ii) Write the difference between flagella of bacteria and eukaryotes.
- iii) What is 'O'-antigen and where it is found?
- iv) What is heterocyst? Write its significance.
- v) Write the name of eukaryotic cell organelles that are involved in secretion of protein out of the cell.

7. Answer any **one** of the following:  $6 \times 1 = 6$

- i) Which part of peptidoglycan is constant in all bacteria? Write the structural diversity of peptidoglycan. Write the relationship of cell wall structure to the Gram stain.  $1 + 3 + 2$
- ii) What do you mean by bacterial perennation? What are the factors those trigger bacterial perennation? Describe the steps of any one of the way of perennation.  $1 + 2 + 3$

8. Answer any **one** of the following :  $10 \times 1 = 10$

- i) What do you mean by cytoskeleton? Write the basic components of cytoskeleton of eukaryotic cells. Write the role of various

skeletal proteins that take part in bacterial shape determination. Write the name of structural protein that takes part in chromosome movement.  $1 + 4 + 4 + 1$

ii) Short note on the following :  $2 \frac{1}{2} \times 4 = 10$

- a) Nucleosome
- b) Plasmids
- c) Outer membrane of Gram negative bacteria
- d) Magnetosome

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