

B.Sc. BIOTECHNOLOGY
First Semester
Microbiology-I
(BBT-02)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20

Part-B (Descriptive)=50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer the following questions (any five):

2 × 5=10

- a) Bacteria are prokaryotic organisms. What does this mean?
- b) Who developed gram staining technique to differentiate bacteria? What is the mordant used in the gram staining procedure?
- c) What are the two basic types of electron microscope?
- d) Define *any one* of the following
 - i. Spontaneous generation
 - ii. Selective media
 - iii. Differential media
- e) Define *any one* of the following
 - i. Photoautotrophs
 - ii. Chemoautotrophs
 - iii. Lyophilization
- f) Answer *any one* question
 - i. Draw a neat labelled diagram of bacterial cell.
 - ii. Draw a bacterial growth curve indicating the four phases of growth.

g) Answer *any one* question

- i. Name any two microbial culture collection centres in India.
- ii. List two ways in which bacteria can reproduce.

2. Answer the following questions (any five):

3 × 5 = 15

a) Answer *any one* question of the following

- i. Describe Koch's postulates.
- ii. How did Louis Pasteur contradict the spontaneous generation theory?

b) Answer *any one* question of the following

- i. Describe the scope of microbiology in genetic engineering & biotechnology.
- ii. Describe the scope of microbiology in agriculture.
- iii. Describe the role of microbes in food & dairy industries.
- iv. Describe the role of microbes in medical field of microbiology.

c) Answer *any one* question of the following

- i. Briefly describe how fluorescence microscope works.
- ii. Why phase contrast microscope is useful to observe living cells?
- iii. Describe the applications of electron microscopy.

d) Answer *any one* question of the following

- i. Describe the Gram stain procedure and explain how it works.
- ii. Describe the differences between Gram positive and Gram negative bacteria.

e) Answer *any one* question of the following

- i. What do you mean by colony forming unit (CFU) of microorganism? Why bacterial plate count results expressed as colony forming unit?
- ii. Describe synchronous culture and its applications.

f) Answer *any one* question of the following

- i. Explain isolation of bacteria by streak plate technique.
- ii. Explain isolation of bacteria pour plate technique.

g) Answer any one question of the following

- i. How will you estimate bacterial number by turbidity method?
- ii. What's the difference between the total count and the viable count of bacteria?

3. Answer the following questions (any five):

5 × 5=25

- a) Discuss the contributions of Pasteur and Koch to the germ theory of disease.
- b) Answer *any one* question
 - i. What is pure culture? Write a commonly used method for isolation of pure culture of bacterium.
 - ii. What instruments and conditions are required to obtain a pure culture? What is the advantage of using solid medium? Why have so few organisms been isolated in pure culture?
- c) Answer *any one* question
 - i. Explain the different methods bacterial growth measurements.
 - ii. Discuss the different modes of uptake of nutrients by microorganisms with suitable examples.
- d) Answer *any one* question of the following
 - i. What are the minimal nutritional requirements for bacterial growth? Distinguish between autotrophs and heterotrophs.
 - ii. Describe the environmental factors that affect bacterial growth.
- e) Answer *any one* question
 - i. Explain the biological applications and importance of scanning and transmission electron microscopy.
 - ii. Compare the limitations and uses of the scanning electron microscope to those of the transmission electron microscope.
- f) Answer *any one* question
 - i. What are the main criteria used in the classification of bacteria? Explain the salient features of numerical taxonomy.
 - ii. What are the *Archaea*? Briefly describe the major ways in which they differ from Bacteria and eucaryotes.
- g) Answer *any one* question
 - i. Describe the differences between batch and continuous microbial cultures. Write advantages and uses of continuous culture.
 - ii. What is Lyophilization? Explain the methods for short and long term maintenance and preservation of microbial cultures.

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(The figures in the margin indicate full marks for the questions)

Duration: 20 minutes

Marks – 20

PART A- Objective Type

I. Choose the correct answer:

1×20=20

1. Who first described microorganisms such as bacteria?
 - A) Robert Koch
 - B) Louis Pasteur
 - C) Fannie Hesse
 - D) Anton von Leeuwenhoek

2. Which of the following scientists provided evidence in favor of the concept of spontaneous generation?
 - A) Louis Pasteur
 - B) John Needham
 - C) Francesco Redi
 - E) Lazzaro Spallanzani

3. Which scientists resolved the problems of bacterial spore contamination by developing a method of killing spores called tyndallisation?
 - A) Robert Koch
 - B) Lazzaro Spallanzani
 - C) Arthur Nicolaier
 - D) John Tyndall

4. The first scientist to provide scientific evidence that contradicted the spontaneous generation of microbes was
 - A) Francesco Redi
 - B) Aristotle
 - C) Lazzaro Spallanzani
 - D) John Needham

5. Which of the following identified the causative agents of such deadly diseases as anthrax and tuberculosis?
- A) John Snow
 - B) Robert Koch
 - C) Joseph Lister
 - D) Ignaz Semmelweis
6. Which of the following types of optics would provide the greatest contrast and best reveal the sub-cellular structural detail for observing the bacterial cell?
- A) Bright field
 - B) Dark field
 - C) Phase contrast
7. Which of the following microscope uses an ultraviolet light source?
- A) Phase contrast microscope
 - B) Darkfield microscope
 - C) Fluorescent microscope
 - D) Electron microscope
8. Which of the following are made up of prokaryotic cells?
- A) Bacteria and fungi
 - B) Archaea and fungi
 - C) Protozoa and animals
 - D) Bacteria and archaea
9. The main feature of prokaryotic organism is
- A) Absence of locomotion
 - B) Absence of nuclear envelope
 - C) Absence of nuclear material
 - D) Absence of protein synthesis
10. Which of the following is an INCORRECT pairing?
- A) protozoa: multicellular
 - B) fungi: cell walls
 - C) algae: aquatic and marine habitats
 - D) viruses: acellular
11. Christian Gram solved what important problem facing microbiologists?
- A) How to kill Gram+ and Gram- microbes.
 - B) How to view microbes and distinguish between two main types.
 - C) How to prevent the spread of infectious disease
 - D) How to make microbes more attractive through the use of colorful dyes.
12. In Gram Staining, Gram's iodine is act as-----
- A) Counter stain
 - B) primary stain
 - C) Secondary stain
 - D) Mordant

13. Lipopolysaccharide (LPS) is associated with ____ .
- A) The outer membrane of Gram positive bacteria.
 - B) The outer membrane of Gram negative bacteria.
 - C) The cytoplasmic membrane of Gram positive bacteria.
 - D) The cytoplasmic membrane of Gram negative bacteria.
14. Bacteria and fungi multiply best
- A) below 16°C
 - B) between 16-38°C
 - C) above 38°C
 - D) none of these
15. The period between inoculation of bacteria in a culture medium and beginning of multiplication is known as
- A) stationary phase
 - B) log phase
 - C) lag phase
 - D) decline phase
16. The organism which obtain their energy from chemicals are designated as
- A) Prototrophs
 - B) Chemotrophs
 - C) Organotrophs
 - D) Autotrophs
17. Which of the following procedures can be used to isolate a pure culture of a bacterium from a mixture?
- A) streak plating
 - B) dilution plating
 - C) enrichment culture
 - D) All the above can be used to isolate a pure culture of a bacterium from a mixture.
18. Addition of blood to a culture medium only allows the hemolytic bacteria that grow on the plate to be picked out. This is an example of a ____ .
- A) differential media.
 - B) liquid media
 - C) chemically defined media.
 - D) Selective media.
19. The bacterial culture prepared by pure culture method is
- A) Inoculum
 - B) Suspension
 - C) Dilution
 - D) None of above
20. Lyophilization means
- A) Sterilization
 - B) Freeze-drying
 - C) Burning to ashes
 - D) Exposure to formation