SECTION C — (3 × 10 = 30)

Answer any THREE questions.

16. Explain the various factors affecting microbial growth and death kinetics, and how these factors are manipulated in industrial processes to optimize product yields.

17. Explain the importance of air sterilization in bioreactor design and operation. Provide an in-depth discussion of the methods and technologies used for maintaining aseptic conditions in large-scale bioprocessing.

18. Explain the principles of heat-sensitive materials sterilization and the impact of different sterilization methods on the quality and safety of bioprocesses Discuss the validation process for sterilization procedures.

19. Provide a comprehensive overview of the principles and applications of various extraction methods, and discuss their advantages, limitations, and relevance in different bioprocessing contexts.

20. Explain the production process of bacteriocins from lactic acid bacteria, and discuss the challenges and strategies in scaling up production for industrial applications.

(For candidates admitted from 2016–2021 Batch)

B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

Part III — Biotechnology — Major

MICROBIAL BIOTECHNOLOGY

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20)

Answer ALL the questions.

1. Why is aseptic technique crucial during microbial isolation?

2. Describe the significance of the lag phase in microbial growth kinetics.

3. How is the steady-state maintained in continuous fermentation?

4. Describe the concept of "media optimization' in industrial fermentation.

5. Define a complex medium in microbial culture and provide an example.

6. Name two common scaling criteria used in bioprocess engineering.

7. What is the main purpose of sonication in cell disruption?

8. Define ammonium sulfate precipitation in bioprocessing.

9. What is the primary role of microorganisms in the fermentation of foods and beverages?

10. Name a microorganism commonly used in the production of sauerkraut.

SECTION B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b).

11. (a) Discuss the steps involved in the isolation of a novel microbial strain for industrial applications. Highlight the importance of purity and characterization during this process.

Or

(b) Compare and contrast classical and recombinant DNA techniques for strain improvement in microorganisms, providing examples of each.

12. (a) Elaborate on the factors that influence the selection of the appropriate type of fermentor for a specific fermentation process.

Or

(b) Explain the concept of heat transfer in bioreactor design and how it is managed in various types of fermentors.

13. (a) Discuss the challenges and strategies involved in scaling up and scaling down bioprocesses. Highlight the importance of maintaining consistency and product quality during scale-up and the flexibility required for scale-down studies.

Or

(b) Discuss the key considerations in media formulation for a specific bioprocess, highlighting the importance of selecting suitable carbon and nitrogen sources, with examples.

14. (a) Describe the fundamentals of liquid-liquid extraction and how it is used for separating intracellular components from cells. Discuss the importance of optimizing extraction conditions for high yields.

Or

(b) Explain the principles of reverse osmosis and ultrafiltration in bioseparation, highlighting their differences and common applications in concentrating and purifying biomolecules.

15. (a) Discuss the challenges and opportunities associated with utilizing food waste materials for the production of biofuels, biopolymers, and other high-value products. Highlight the importance of sustainable waste management in the food industry.

Or

(b) Explain in detail with examples, how the conversion of food waste into useful products can contribute to a circular economy in the food industry.