# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

**P.O. Box 972-60200 – Meru-Kenya**
**Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,**
**Website: info@must.ac.ke Email: info@must.ac.ke**


**University Examinations 2024/2025**

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICAL MICROBIOLOGY

**HMM 3411: INDUSTRIAL MICROBIOLOGY**

**DATE: JANUARY 2024** **TIME: 3 HOURS**

**INSTRUCTIONS:**
Answer ***All*** *questions*
*Ensure that all your answers are properly numbered*
*Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark*
*Part II: Short Answer Questions – Answer questions following each other on the answer booklet*
*Part III: Long Answer Questions – Answer each question on the answer booklet*

## SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. Different methods of strain improvement are
   a) Protoplast fusion
   b) Recombinant DNA technique
   c) Genetic recombination
   d) All of these
2. The purification and recovery of the production after fermentation is called
   a) Upstream processing
   b) Downstream processing
   c) Surface fermentation

d) None of these

3. Which of the following is a substrate for biogas production?
   a) Municipal and residential waste
   b) E-waste
   c) Metallic waste
   d) Gaseous effluents
4. Dental plaque is one of the best known examples of a biofilm. What Gram-positive cocci is known to be involved with the formation of dental plaques?
   a) Bacillus cereus
   b) Streptococcus mutans
   c) Actinomyces neuii
   d) Neisseria subf/ava
5. The technology used for production of monoclonal antibodies is?
   a) Mass culture technology
   b) Tissue culture technology
   c) Hybridoma technology
   d) None of the above
6. Which of the following methods is commonly used for long-term preservation of bacterial cultures?
   a) Freezing
   b) Lyophilization (freeze-drying)
   c) Incubation at room temperature
   d) Heat sterilization
7. Which of the following microorganisms can survive extreme conditions due to its spore-forming ability?
   a) Escherichia coli
   b) Bacillus anthracis
   c) Saccharomyces cerevisiae
   d) Lactobacillus plantarum

8. Which microorganism is primarily used in the production of yogurt?
   a) Saccharomyces cerevisiae
   b) Lactobacillus bulgaricus
   c) Bacillus subtilis
   d) Escherichia coli
9. In industrial fermentation, what is a "batch process"?
   a) Continuous addition of substrates
   b) Fermentation in multiple stages
   c) All ingredients are added at once and fermented together
   d) Fermentation occurs in a series of connected tanks
10. What is the primary goal of downstream processing?
   a) Cultivating microorganisms
   b) Purifying and isolating products
   c) Enhancing microbial growth
   d) Fermenting substrates
11. What type of bioreactor is commonly used for biogas production?
   a) Batch reactor
   b) Continuous stirred-tank reactor (CSTR)
   c) Plug flow reactor
   d) All of the above
12. What is the typical temperature range for mesophilic anaerobic digestion?
   a) 10-200C
   b) 30-400C
   c) 50-600 C
   d) 70-800C
13. What is a monoclonal antibody?
   a) An antibody produced by multiple B cells
   b) An antibody produced from a single clone of B cells
   c) An antibody that binds to multiple antigens

d) An antibody derived from anima! sources

14. What is the primary method used to purify monoclonal antibodies?
    a) Affinity chromatography
    b) Ion exchange chromatography
    c) Gel filtration chromatography
    d) All of the above
15. What is the primary method used to purify monoclonal antibodies?
    a) Affinity chromatography
    b) Ion exchange chromatography
    c) Gel filtration chromatography
    d) All of the above
16. Which of the following environments can support biofilm formation?
    a) Aquatic environments
    b) Natural surfaces
    c) Medical devices
    d) All of the above
17. Which of the following medical conditions can be associated with biofilms?
    a) Influenza
    b) Typhoid fever
    c) Cystic fibrosis lung infections
    d) Asthma attacks
18. What is strain selection?
    a) The process of modifying the genetic material of an organism
    b) Choosing a specific microorganism for a particular application
    c) A method for producing vaccines
    d) A technique for microbial fermentation
19. What is the purpose of using a selective medium during strain selection?
    a) To inhibit the growth of unwanted organisms
    b) To enhance the growth of all microorganisms

c) To increase the diversity of microbial populations

d) To promote rapid fermentation

20. What is the process of removing the grape skins from the juice called in red wine oroduction?

a) Pressing

b) Crushing

c) Maceration

d) Fermentation

**SECTION B: SHORT ANSWER ALL QUESTIONS (40 MARKS)**

1. Outline any factors that affect biogas production in a biogas plant (4 marks)
2. Outline given characteristics that are desirable for yeast strains used in ethyl alcohol production (4 marks)
3. Describe the steps involved in biofilm formation (4 marks)
4. Explain any advantages associated with microbial biotransformation (4 marks)
5. Explain how you would select for hybridoma cells from a mixture of B cells and myeloma cells (4 marks)
6. Describe the process of acidogenesis in biogas production and name any two principle acids produced (4 marks)
7. Explain the freeze-thaw method used to break cells in order to release intracellular products (4 marks)
8. Outline the disadvantages of immobilized enzyme based bioreactors (4 marks)
9. Write short notes on preservation of microorganisms by drying (4 marks)
10. Differentiate between continuous fermentation process and batch fermentation process for production of microorganisms (4 marks)

**SECTION C: LONG ANSWER TWO QUESTIONS (40 MARKS)**

1. a) Describe the industrial production of lactic acid (10 marks)

   b) Discuss solid state fermentation (10 marks)

2.Discuss the physical and chemical methods used to lyse cells in downstream processing (20 marks)

3. Discuss the advantages accrued from production and utilization of biogas over other energy sources (20 marks)