



BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – M.Sc.(MB)-2023

Course Name – Microbial Biotechnology

Course Code - MMBE304

(Semester III)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Which microorganism is commonly used in the fermentative production of beer?
 - a) Lactobacillus
 - b) Escherichia coli
 - c) Saccharomyces cerevisiae
 - d) Streptococcus
- (ii) What is the primary function of malt adjuncts in beer production?
 - a) To enhance color and aroma
 - b) To filter the beer
 - c) To provide additional fermentable sugars
 - d) To increase alcohol content
- (iii) In beer production, what is the purpose of wort boiling?
 - a) Enhance color
 - b) Decrease alcohol content
 - c) Sterilize and extract flavors from hops
 - d) Increase sweetness
- (iv) Select the reason why *Aspergillus oryzae* is preferred over *Bacillus subtilis* in the industrial production of amylase.
 - a) *Aspergillus oryzae* produces higher yields
 - b) *Bacillus subtilis* has slower growth rates
 - c) *Aspergillus oryzae* has more stable enzyme activity at extreme pH
 - d) *Bacillus subtilis* requires a more complex growth medium
- (v) Select the importance of inoculum preparation in microbial enzyme production.
 - a) It minimizes contamination risk during recovery
 - b) It optimizes microbial growth for efficient enzyme production
 - c) It regulates the pH of the fermentation broth
 - d) It reduces the cost of enzyme purification
- (vi) Select from the following that is NOT a biotechnological product.
 - a) A. Antibiotics
 - b) B. Smartphones
 - c) C. Biofuels
 - d) D. Vaccines
- (vii) Select type of microorganism that is commonly used in the production of enzymes
 - a) A. Mammals
 - b) B. Bacteria
 - c) C. Birds
 - d) D. Fungi
- (viii) Select the term "bioproducts" refer to in the context of biotechnology

a) A. Biological offspring

b) B. Products made from renewable resources

c) C. Genetically modified organisms

d) D. Radioactive materials

(ix) Differentiate the role of carbon and nitrogen sources in the formulation of the production medium for microbial enzymes.

a) A. Nitrogen sources improve enzyme yield, while carbon sources provide energy

b) B. Carbon sources regulate pH, nitrogen sources enhance product stability

c) C. Both carbon and nitrogen sources enhance microbial growth equally

d) D. Carbon sources determine enzyme specificity, nitrogen sources impact yield

(x) Compare different recovery methods for enzymes after microbial fermentation.

a) A. Centrifugation removes microbial cells while filtration retains enzymes

b) B. Crystallization offers higher enzyme purity than liquid-liquid extraction

c) C. Filtration is slower but offers higher recovery than centrifugation

d) D. Chromatography yields higher enzyme purity but is costlier than filtration

(xi) Identify the first step in the wine making process after the fruit has been selected

a) Crushing

b) Fermentation

c) Bottling

d) Aging

(xii) Vitamin B12 production primarily involves important metal, select them from the following.

a) Iron

b) Zinc

c) Cobalt

d) Magnesium

(xiii) Complex media containing sugars and nitrogen sources support the growth of microorganism for vitamin B12 production, identify the microorganism.

a) *Saccharomyces cerevisiae*

b) *Clostridium botulinum*

c) *Propionibacterium freudenreichii*

d) *Fusarium oxysporum*

(xiv) Choose the method commonly used for the recovery of penicillin from the fermentation broth.

a) Centrifugation

b) Precipitation and extraction

c) Chromatography

d) Filtration

(xv) Choose the main application of tetracyclines in medicine.

a) Treatment of fungal infections

b) Treatment of viral infections

c) Antibiotic for bacterial infections

d) Pain management

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Differentiate between chlortetracycline, oxy-tetracycline, and tetracycline. (3)
3. Discuss the role of microalgae in the production of biofuels. (3)
4. Identify the microorganisms involved in the fermentative production of tetracyclines. (3)
5. Assess the benefits of using microbial enzymes in the detergent industry compared to synthetic chemical alternatives. (3)
6. Explain the importance of regulatory compliance in microbial biotechnology research. (3)

OR

Compare the inoculum preparation techniques used for the production of amylases and proteases. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Evaluate the impact of microbial biotechnology on sustainable agriculture. Provide examples of microbial products used in agriculture and their benefits. (5)

8. Discuss the applications of extremophiles in biotechnology. Provide examples of extremophiles and their unique adaptations for industrial processes. (5)
9. Analyze the impact of biotechnology on the production of biofuels. Provide examples of microbial processes used to produce biofuels and their advantages over conventional fuel sources. (5)
10. Discuss the fundamental principles of fermentation. (5)
11. Discuss the significance of recovery processes in the commercial production of benzyl penicillin. (5)
12. Design a microbial vaccine production strategy using recombinant technology, detailing the choice of microorganism, antigen expression, and recovery. (5)

OR

Formulate a step-by-step process for insulin production using genetically modified bacteria, (5) highlighting the role of recombinant DNA technology.

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