KATHMANDU UNIVERSITY
End Semester Examination
January, 2024-25

Marks Scored:

Level : B.Tech.
Year : IV

Course : BIOT 401
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 31 JAN 2025

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and mark [X] in the most appropriate option from each set of choices

1. The organism used for the production of lactic acid is
   [ ] *L. delbruckii* [ ] *L. lactis* [ ] *L. casei* [ ] L. *acidophilus*

2. The factor that does NOT influence the choice of an organism for industrial use is
   [ ] Nutritional characteristics [ ] Genetic stability
   [ ] Geographical location [ ] Optimum temperature

3. Glutamate production from *C. Glutamicum* is an example of
   [ ] Natural variant [ ] Induced mutant
   [ ] Recombinant [ ] Recombinant strain

4. Which of the following storage methods uses a protective medium like milk or serum?
   [ ] Lyophilization [ ] Agar slopes
   [ ] Continuous culture [ ] Liquid nitrogen storage

5. What type of screening method was used to discover penicillin?
   [ ] Molecular probe screening [ ] Enzyme inhibition assays
   [ ] Waksman platform [ ] Receptor ligand binding assays

6. Which of the following methods can minimize the re-isolation of the same microbial strain?
   [ ] Antibiotic pretreatment [ ] Numerical taxonomic databases
   [ ] Continuous enrichment culture [ ] Freeze-drying

7. The organism is primarily used for the industrial production of glutamic acid is
   [ ] *Bacillus subtilis* [ ] *Corynebacterium glutamicum*
   [ ] *Saccharomyces cerevisiae* [ ] *Penicillium notatum*

8. Which is NOT true about liquid enrichment culture?
   [ ] Frequently carried out in culture flask
   [ ] The selective force changes during culture
   [ ] Repeated subculture will favor the growth of undesired microbes.
   [ ] The time of subculture is critical

9. The method used to isolate auxotrophic mutants based on their inability to grow on minimal media is
   [ ] Gradient plate technique [ ] Sandwich technique
   [ ] Replica plating [ ] Solid-state fermentation

10. The type of feedback control observed in branched metabolic pathways where weak control is exerted by individual end products
[ ] Sequential [ ] Cumulative [ ] Cooperative [ ] Isoenzyme

11. During citric acid production, the metal used as an antagonist of the enzyme aconitase is
[ ] Fe [ ] Cu [ ] Mg [ ] Mn

12. Which of the following is a key regulatory protein in glutamate overproduction via mechanosensitive channels?
[ ] OdhI [ ] Aspartokinase
[ ] PRPP [ ] Homoserine dehydrogenase

13. Which nitrogen source is commonly used in large-scale industrial fermentation?
[ ] Pure amino acids [ ] Corn steep liquor
[ ] Gelatin hydrolysate [ ] Yeast extract

14. The primary purpose of adding precursors like phenylacetic acid to the fermentation medium is to
[ ] Enhance growth rate [ ] Directly incorporate into the product
[ ] Act as a buffer [ ] Induce sporulation

15. The primary yeast used in wine production is
[ ] *Saccharomyces cerevisiae* [ ] *Saccharomyces rouxi*
[ ] *Acetobacter aceti* [ ] *Gluconobacter oxydane*

16. Which acid is commonly added during must treatment in wine production?
[ ] Citric acid [ ] Lactic acid [ ] Tartaric acid [ ] Malic acid

17. The purpose of sulfiting in wine production is
[ ] Enhance the flavor of the wine [ ] Inhibit undesirable microorganisms
[ ] Increase sugar content in the must [ ] Improve the color of the wine

18. The optimum pH for lactic acid fermentation using Lactobacillus sp. is
[ ] 4-5 [ ] 6-7 [ ] 2-3 [ ] 7-8

19. Which microorganism is primarily used during the koji fermentation in soy sauce production?
[ ] *Aspergillus niger* [ ] *Saccharomyces cerevisiae*
[ ] *Aspergillus oryzae* [ ] *Pediococcus soyae*

20. What is the approximate pH range of the moromi mixture during lactic fermentation?
[ ] 6.5-7.0 [ ] 5.5-6.0 [ ]4.8-5.0 [ ] 3.0-3.5

SECTION "B"

[10 Q. × 1 = 10 marks]

Fill in the blanks

21. The salt concentration in the moromi mash during soy sauce fermentation is _____

22. The technique of _____ involves freezing a culture followed by its drying under vacuum.

23. The _____ process is beneficial for selecting microorganisms with high affinity for limiting substrates.

24. During ethanol fermentation, higher pH values lead to the formation of _____

25. The ratio of soybean: wheat for preparing Japanese shoyu is _____

26. Addition of sulfite in wine is done at a final concentration of _____.

27. During soya sauce fermentation the optimum temperature for protease production is _____.

28. Auxotrophic mutants of _____ have been used for the production of lysine.

29. The _____ reaction is one of the main causes of damage to culture media during heat sterilization.

30. Typical elemental formula of industrial microbial cells is approximately _____

KATHMANDU UNIVERSITY
End Semester Examination
January, 2024 25

Level : B.Tech.
Year : IV
Time : 2 hrs. 30mins.

31 JAN 2025

Course : BIOT 401
Semester : I
F. M. : 55

SECTION "C"
[3 Q. × 8 = 24 marks]

Attempt ANY THREE questions.

1. Explain the blueprints of various hypothetical mutants that do not produce feedback inhibitors or repressors with suitable diagram.

2. Explain the permeability hypothesis for the production of Glutamic acid by *C.glutamicum*.

3. Explain the different steps involved in wine production.

4. List the criteria for the choice of an industrial strain. Explain the various screening techniques for the isolation of industrial strains.

SECTION "D"
[31 marks]

Attempt ANY SIX questions. ***(Q.N. 5 is compulsory)***

5. Write short notes on [3+3=6]
   a. Auxotrophic mutants
   b. Natural variants

6. Why strain improvement is necessary in industrial biotechnology? Draw a flowchart of strain improvement process [5]

7. Explain the gradient plate techniques for the isolation of analogue resistant mutants [5]

8. Explain protoplast fusion techniques with a diagram [5]

9. List the various steps involved in the production of Tempeh. [5]

10. Explain the various biochemical basis to increase the production of citric acid from *A. niger*. [5]

11. Explain the various sources of carbon used in large scale industrial fermenation [5]