

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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## M. Sc. (Biotechnology) (Fourth Semester)

### EXAMINATION, July, 2022

### (Elective)

### INDUSTRIAL BIOTECHNOLOGY

Paper Code					
MBT	4	0	0	3	(A)

Questions Booklet  
Series

A

Time : 1:30 Hours ]

[ Maximum Marks : 100

#### Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 60 questions. Examinee is required to answer any 50 questions in the OMR Answer-Sheet provided and not in the question booklet. If more than 50 questions are attempted by student, then the first attempted 50 questions will be considered for evaluation. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

#### परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 60 प्रश्न हैं। परीक्षार्थी को किन्हीं 50 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। यदि छात्र द्वारा 50 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 50 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

***(Only for Rough Work)***

1. In ethanol fermentation, from 10 grams of glucose, the theoretical ethanol yield will be :
  - (A) 51.1 gram/gram
  - (B) 0.511 gram/gram
  - (C) 5.11 gram/gram
  - (D) 0.48 gram/gram
2. Which type of chromatography depends on the principle of size of particles ?
  - (A) Affinity chromatography
  - (B) Gel-filtration chromatography
  - (C) Ion- exchange chromatography
  - (D) Multimodal chromatography
3. Which of the following is not included in immobilization process ?
  - (A) Absorption
  - (B) Adsorption
  - (C) Entrapment
  - (D) Affinity
4. Which type of fermentation is used for large-scale manufacturing of enzymes ?
  - (A) Solid-state fermentation
  - (B) Submerged fermentation
  - (C) Solid-Gas state fermentation
  - (D) Gas-state fermentation
5. Which phase has the condition of specific growth rate " $\mu \approx \mu_{\max}$ " ?
  - (A) Lag phase
  - (B) Log phase
  - (C) Stationary phase
  - (D) Death phase
6. The lag phase constitute of \_\_\_\_\_.
  - (A) No change in number, but an increase in mass
  - (B) Change in number but decrease in mass
  - (C) No change in number and decrease in mass
  - (D) Constant number and mass

7. Ethanol fermentation occurs in :
- (A) Aerobic condition
  - (B) Anaerobic condition
  - (C) Gaseous state
  - (D) Solid State
8. Alcoholic fermentation is carried by yeast known as \_\_\_\_\_.
- (A) *Lactobacillus*
  - (B) *Bacillus*
  - (C) *Saccharomyces cerevisiae*
  - (D) *Escherichia coli*
9. Amylase hydrolyses starch into :
- (A) Dextrin
  - (B) Glucose
  - (C) Maltose
  - (D) All of the above
10. A fed-batch fermentation process includes :
- (A) Single feed input and multiple product output
  - (B) Multiple product output and no feed input
  - (C) Multiple feed input and single product output
  - (D) Multiple feed input and multiple product output
11. The sequence of events in a biotechnical process to produce a product will be :
- (A) Upstream, Downstream and Fermentation
  - (B) Fermentation, Upstream and Downstream
  - (C) Upstream, Fermentation and Downstream
  - (D) Downstream, Fermentation and Upstream
12. The nature of microbial growth curve is :
- (A) Sigmoid
  - (B) Straight line
  - (C) Hyperbola
  - (D) Parabola

13. Microorganisms produces secondary metabolites in :
- (A) Lag Phase
  - (B) Exponential Phase
  - (C) Stationary phase
  - (D) Log phase
14. Confinement of enzyme to a phase (matrix/support) different from the one for substrates and products is known as :
- (A) Enzymatic reaction
  - (B) Enzyme inhibition
  - (C) Enzyme denaturation
  - (D) Enzyme immobilization
15. In enzyme immobilization, glutaraldehyde acts as :
- (A) Denaturizing agent
  - (B) Adsorbing agent
  - (C) Encapsulating agent
  - (D) Crosslinking agent
16. The enzyme involved in conversion of conversion of glucose to fructose is :
- (A) Fructose isomerase
  - (B) Glucose oxidase
  - (C) Glucose isomerase
  - (D) Glucose reductase
17. Penicillin acylase (PAH) catalyzes :
- (A) The conversion of penicillin to 6-amino-penicillanate and phenylacetate (PA)
  - (B) The conversion of penicillin to 5-nitro-penicillanate and phenylacetate (PA)
  - (C) The synthesis of penicillin from 6-amino-penicillanate and phenylacetate (PA)
  - (D) The synthesis of penicillin from 5-nitro-penicillanate and phenylacetate (PA)
18. Starch can be biotransformed into :
- (A) Glucose
  - (B) Maltose
  - (C) Ethanol
  - (D) All of the above

19. Cellulose and hemicellulose are :
- (A) Homopolymeric sugar and Heteropolymeric sugar
  - (B) Heteropolymeric sugar and Homopolymeric sugar
  - (C) Oligo-polymeric sugar and Homopolymeric sugar
  - (D) Mono-polymeric sugar and oligo-polymeric sugar
20. If a bacterium produced intracellular enzyme then its downstream processing will involve :
- (A) Centrifugation, concentration and purification
  - (B) Cell disruption, centrifugation, concentration and purification
  - (C) Fermentation, centrifugation, concentration and purification
  - (D) Filtration, centrifugation, concentration and purification
21. Invertase is derived from :
- (A) *Aspergillus niger*
  - (B) *Saccharomyces cerevisiae*
  - (C) *Mucor*
  - (D) *Bacillus bulgaris*
22. In which of the following the microorganisms grow on the surface of the medium ?
- (A) Submerged fermentation
  - (B) Fed-fermentation
  - (C) Solid state fermentation
  - (D) Batch fermentation
23. In which of the following the microorganisms grow inside the medium ?
- (A) Submerged fermentation
  - (B) Surface fermentation
  - (C) Solid state fermentation
  - (D) Batch fermentation
24. Which of the following are criterias for the choice of an organism ?
- (A) The organism must be genetically stable
  - (B) The organism must be able to produce a high yield of product
  - (C) The organism must be able to grow in an easily available nutrient medium
  - (D) All of the above

25. The science of fermentation is called as :
- (A) Enzymology
  - (B) Fermentology
  - (C) Zymology
  - (D) Limnology
26. What is the basic function of the fermenter ?
- (A) To sterilize the medium
  - (B) To recover the product
  - (C) To provide optimum growth conditions to organisms and obtain the desired product
  - (D) To purify the product
27. Which of the following is used to prevent vortexing in fermenter ?
- (A) Baffles
  - (B) Sparger
  - (C) Impeller
  - (D) Cooling Jacket
28. Structural components which are involve in aeration and agitation in fermenter are :
- (A) Impeller
  - (B) Baffles
  - (C) Sparger
  - (D) All of the above
29. In cryopreservation, glycerol acts as a :
- (A) Solvent
  - (B) Cryo-protectant
  - (C) Solidifying agent
  - (D) Crystallization agent
30. Agar-Agar is used in growth media as :
- (A) Carbon source
  - (B) Nitrogen source
  - (C) Solidifying agent
  - (D) Micronutrient

31. Which of the following are approaches for strain improvement ?
- (A) Mutant selection
  - (B) Recombination
  - (C) Recombinant DNA Technology
  - (D) All of the above
32. The strain of fungi used for the large scale production of penicillin is \_\_\_\_\_.
- (A) *Penicillium chrysogenum*
  - (B) *Penicillium aurangiosum*
  - (C) *Streptomyces aureus*
  - (D) *Saccharomyces* sp.
33. Cellulose to glucose hydrolysis involves :
- (A) Exo-glucanase
  - (B) Endo-glucanase
  - (C)  $\beta$ -glucosidase
  - (D) All of the above
34. Which of the following is not a sterilization method ?
- (A) Autoclaving
  - (B) Filtration
  - (C) Centrifugation
  - (D) All of the above
35. In a fermenters we can control :
- (A) Media pH
  - (B) Temperature
  - (C) Dissolved oxygen
  - (D) All of the above
36. An organism's production potential can be increased through :
- (A) Strain improvement
  - (B) Process parameters optimization
  - (C) Both (A) and (B)
  - (D) None of the above
37. Glycolysis can occur in \_\_\_\_\_.
- (A) Anaerobic cells
  - (B) Aerobic cells
  - (C) Neither aerobic nor anaerobic cells
  - (D) Both aerobic and anaerobic cells
38. Sequence of events occurring in conversion of glucose to ethanol is :
- (A) Glucose, Pyruvate, Acetaldehyde, Ethanol
  - (B) Glucose, Phosphoenol pyruvate, Acetaldehyde, Ethanol
  - (C) Glucose, Acetaldehyde, Ethanol
  - (D) Glucose, Pyruvate, Citrate, Acetaldehyde, Ethanol



39. Industrially citric acid is produced by :
- (A) *Rhodotorula* sp.
  - (B) *Aspergillus niger*
  - (C) *Saccharomyces cerevisiae*
  - (D) *Pseudomonas* sp.
40. In lactic acid production, during homolactic fermentation glucose is utilized by :
- (A) EMP Pathway
  - (B) Kreb's cycle
  - (C) Glycogenesis
  - (D) HMP Shunt Pathway
41. Which of the following is/are secondary metabolite ?
- (A) Antibiotics and Vitamins
  - (B) Ethanol and Lactic acid
  - (C) Both (A) and (B)
  - (D) None of the above
42. Papain enzyme is obtained from :
- (A) Apple
  - (B) Pineapple
  - (C) Papaya
  - (D) Mango
43. Which of the following is a sweetener made from corn starch ?
- (A) Glucose
  - (B) Sucrose
  - (C) High fructose corn syrup (HFCS)
  - (D) High sucrose corn syrup (HSCS)
44. Which enzyme is involved in High fructose corn syrup (HFCS) production ?
- (A) Invertase
  - (B) Zymase
  - (C) Cellulase
  - (D) Glucose isomerase
45. Rearrangement of the fatty acids of a fat product, typically a mixture of triglyceride is called as :
- (A) Inter-esterification
  - (B) Trans-esterification
  - (C) Esterification
  - (D)  $\beta$ -oxidation

46. Which of the following is a carbohydrate ?
- (A) Cellulose
  - (B) Hemicellulose
  - (C) Starch
  - (D) All of the above
47. Agricultural wastes are preferred carbon source in :
- (A) Batch fermentation
  - (B) Submerged fermentation
  - (C) Solid state fermentation
  - (D) Continuous fermentation
48. Which of the following statements is not true for biosensors ?
- (A) Biosensors convert a biological signal into an electrical signal.
  - (B) Biosensors are used to determine the concentration of substances.
  - (C) Biosensors utilize the different ligand binding and the antibody-antigen reaction.
  - (D) Biosensor consists of a vessel, or series of vessels, used to perform a desired conversion by microbial/enzymatic means.
49. When the physical change produced in a biosensor is due to the movement of electrons produced in a redox reaction, the biosensor is referred to as \_\_\_\_\_.
- (A) calorimetric biosensor
  - (B) potentiometric biosensor
  - (C) amperometric biosensor
  - (D) piezo-electric biosensor
50. An analytical device which converts biological response into electrical signal is :
- (A) Bioanalytical device
  - (B) Biosensor
  - (C) Transformer
  - (D) Transistor
51. Father of Biosensor is :
- (A) Buchner
  - (B) Leland C Clark
  - (C) C Linnaeus
  - (D) Sunner
52. Components of Biosensor are :
- (A) Bioreceptor, Transducer, Signal Processor and Display
  - (B) Transducer, Signal Processor and Display
  - (C) Analyser, Transducer, Signal Processor and Display
  - (D) Transformer, Transducer, Signal Processor

53. Smart watch is an example of :
- (A) Chemical Biosensor
  - (B) Electronic device
  - (C) Wearable Biosensor
  - (D) Nanosensor
54. Which of the following is/are unit operation ?
- (A) Centrifugation
  - (B) Filtration
  - (C) Chromatography
  - (D) All of the above
55. Saccharification is \_\_\_\_\_.
- (A) Conversion of Protein into sugar
  - (B) Conversion of Fat into starch
  - (C) Hydrolysis of complex sugars
  - (D) Denaturation of enzymes
56. Which process is also called product recovery ?
- (A) Upstream processing
  - (B) Mid-stream processing
  - (C) Downstream processing
  - (D) Biological processing
57. The scale-up process is preferred to which condition ?
- (A) The migration of a process from the lab-scale to the pilot plant-scale
  - (B) The migration of a process from the bench-scale to the lab-scale
  - (C) The migration of a process from the small-scale to the lab-scale
  - (D) The migration of a process from the bench-scale to the small-scale
58. In Fermentation, Product yield is :
- (A) Amount of product produced per gram of substrate consumed
  - (B) Amount of sugar consumed per unit time
  - (C) Amount of product produced per unit time
  - (D) All of the above
59. In a bioprocess, productivity is defined as :
- (A) Amount of product produced per gram of substrate consumed
  - (B) Amount of sugar consumed per unit time
  - (C) Amount of product produced per unit time
  - (D) All of the above
60. An ideal fermentive strain should have :
- (A) High yield
  - (B) High productivity
  - (C) High substrate and product tolerance
  - (D) All of the above

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the most correct/appropriate answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ☒ (B) (C) (D)

Q. 2 (A) (B) ☒ (C) (D)

Q. 3 (A) ☒ (B) (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से एक सबसे सही अथवा सबसे उपयुक्त उत्तर छोटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ☒ (B) (C) (D)

प्रश्न 2 (A) (B) ☒ (C) (D)

प्रश्न 3 (A) ☒ (B) (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।