

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

--	--	--	--	--	--	--	--

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

### EXAMINATION, 2022-23

### INDUSTRIAL MICROBIOLOGY

Paper Code

M	I	C	4	0	0	1
---	---	---	---	---	---	---

Questions Booklet  
Series

A

Time : 1:30 Hours ]

[ Maximum Marks : 75

#### Instructions to the Examinee :

परीक्षार्थियों के लिए निर्देश :

1. Do not open the booklet unless you are asked to do so.
  2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. 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.
1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
  2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। 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. Which of the following procedures is the most advanced method for strain improvement ?
  - (A) rDNA Technology
  - (B) Conjugation
  - (C) Transformation
  - (D) Transduction
2. Which of the following carbohydrates are mainly present in whey ?
  - (A) Glucose
  - (B) Lactose
  - (C) Fructose
  - (D) Sucrose
3. Which of the following cannot induce mutations ?
  - (A) X-rays
  - (B) Gamma rays
  - (C) UV radiation
  - (D) Chlorine
4. Which of the following is a process for penicillin recovery ?
  - (A) Adsorption on activated carbon
  - (B) Direct crystallization
  - (C) Degumming
  - (D) Distillation
5. Blue-green algae are chiefly used as biofertilizer in the crop of\_\_\_\_\_.
  - (A) Mustard
  - (B) Paddy
  - (C) Gram
  - (D) Wheat
6. Which of the following is a downstream process ?
  - (A) Product recovery
  - (B) Screening
  - (C) Media formulation
  - (D) Sterilization of media
7. In fermentor the top portion left without broth is called :
  - (A) Shaft
  - (B) Head space
  - (C) Impeller
  - (D) Sparger
8. Which of the following is not used to develop biofertilizer ?
  - (A) Mycorrhiza
  - (B) *Rhizobium*
  - (C) *Agrobacterium*
  - (D) *Nostoc*

9. Alcoholic fermentation is carried out by :
- (A) *Lactobacillus*
  - (B) *Bacillus*
  - (C) *Saccharomyces cerevisiae*
  - (D) *Escherichia coli*
10. Which of the following techniques is not used for isolation and screening of desired microorganisms ?
- (A) Crowded plate technique
  - (B) Auxanographic technique
  - (C) Enrichment culture technique
  - (D) Hanging drop method
11. \_\_\_\_\_ involves the physical binding of the enzymes on the surface on an inert support.
- (A) Adsorption
  - (B) Cross linking
  - (C) Encapsulation
  - (D) Lattice entrapment
12. The efficiency of cell disruption in a bead mill depends on the :
- (A) Concentration of the cells
  - (B) Amount and size of beads
  - (B) Type and rotational speed of agitation
  - (D) All of the above
13. Term ATCC stands for :
- (A) Aerobic type culture collection
  - (B) Anaerobic type culture collection
  - (C) American type culture collection
  - (D) None of the above
14. Microorganisms use substrate to make single-cell proteins :
- (A) Industrial wastes
  - (B) Agriculture wastes
  - (C) Methane
  - (D) All of the above
15. Which of the following reactions occurs during the sterilization which results in browning of media ?
- (A) Sandmeyer reaction
  - (B) Maillard reaction
  - (C) Cannizzaro reaction
  - (D) Gattermann reaction
16. Which of the following is not the objective of impeller used in fermenters ?
- (A) Air dispersion
  - (B) Heat transfer
  - (C) Oxygen transfer
  - (D) Introduces air in media

17. Algal pigments are produced at industrial level using which fermenter ?
- (A) Stirred tank fermenter
  - (B) Photobioreactors
  - (C) Air lift bioreactor
  - (D) Bubble column bioreactor
18. Which is not the carrier material used for biofertilizer development ?
- (A) Peat
  - (B) Lignite
  - (C) Vermiculite
  - (D) Jaggery
19. Which of the following is not a type of fermentation process ?
- (A) Continuous culture
  - (B) Batch fermentation
  - (B) Fed-batch fermentation
  - (D) Small batch fermentation
20. Which substrate is used for the isolation of protease-producing microbes ?
- (A) Wheat bran
  - (B) Rice bran
  - (C) Paddy straw
  - (D) All of the above
21. Which of the following instruments works on the principle of batch sterilization ?
- (A) Incubator
  - (B) Autoclave
  - (C) Centrifuge
  - (D) Laminar Air Flow
22. What do you mean by "Trophophase" ?
- (A) Production of waste materials
  - (B) Production of topical products
  - (C) Production of primary metabolites
  - (D) Production of secondary metabolites
23. A major ingredient of penicillin production media is :
- (A) Corn meal
  - (B) Corn steep liquor
  - (C) Cane steep liquor
  - (D) None of the above
24. Which of the following raw materials has a substantial impact on glutamic acid production ?
- (A) Biotin
  - (B) Glycerol
  - (C) Yeast extract
  - (D) Corn-steep liquor

25. Which of the following shows zone of inhibition when a particular organism is grown on petri plate ?
- (A) Growth factor producer
  - (B) Antibiotic producer
  - (C) Organic acid producer
  - (D) Amino acid producer
26. Malolactic fermentation is known for :
- (A) reducing wine acidity
  - (B) producing aroma and flavor changes
  - (C) Only (A)
  - (D) Both (A) and (B)
27. Which of the following is not an example of malt adjuncts ?
- (A) Wheat
  - (B) Maize
  - (C) Rice
  - (D) Water
28. Dual fermentation for L-Lysine involves strains defective for :
- (A) DAP decarboxylase
  - (B) Aspartokinase
  - (C) Homoscrine dehydrogenase
  - (D) None of the above
29. The boiling of grains during the mash step leads to :
- (A) Saccharification
  - (B) Mashing
  - (C) Decoction
  - (D) Malting
30. Primary metabolite levels are controlled by :
- (A) rDNA Technology
  - (B) Feedback mechanism
  - (C) Incubating the microorganism in dark
  - (D) Adding the inhibitors
31. Which organism was used to produce recombinant insulin ?
- (A) Cyanobacteria
  - (B) *E. coli*
  - (C) *Rhizobium meliloti*
  - (D) *Bacillus subtilis*
32. Which strategy may be necessary when it is not feasible to render the working environment completely safe ?
- (A) Inspection and audit
  - (B) Administrative control
  - (C) Personal protective equipment
  - (D) Engineering control

33. Vinegar fermentation involves :
- (A) Yeasts only
  - (B) Yeasts with lactic bacteria
  - (C) Yeasts with acetic acid bacteria
  - (D) Yeasts with butyric acid bacteria
34. Which of the following was the first amino acid to be produced commercially ?
- (A) L-glutamic acid
  - (B) L-lysine
  - (C) L-cysteine
  - (D) L-methionine
35. \_\_\_\_\_ is a method of enzyme immobilization.
- (A) Transmission
  - (B) Transcription
  - (C) Encapsulation
  - (D) Fermentation
36. First recombinant vaccine was against :
- (A) Hepatitis B
  - (B) Chicken pox
  - (C) HIV
  - (D) Hepatitis C
37. Increased permeability in glutamic acid producing bacteria can be accomplished by :
- (A) Biotin deficiency
  - (B) Addition of penicillin
  - (C) Both (A) and (B)
  - (D) Only (B)
38. Diaminopimelic acid (DAP) is produced by which of the following microorganisms ?
- (A) *E. coli*
  - (B) *Enterobacter aerogenes*
  - (C) *Bacillus subtilis*
  - (D) *Streptococcus equisimilis*
39. \_\_\_\_\_ in 1983 used recombinant DNA technology to produce insulin.
- (A) Eli Lilly
  - (B) Emily Lilly
  - (C) Lilly Rose
  - (D) Amy Sanger
40. The separation of solid particles from the fermentation broth can be accomplished by :
- (A) Centrifugation
  - (B) Filtration
  - (C) Both (A) and (B)
  - (D) None of the above

41. What is the fermenter's primary purpose ?
- (A) To recover the product  
 (B) To provide optimum growth conditions to organisms and obtain the desired product  
 (C) To sterilize the medium  
 (D) To purify the product
42. Which of the following processes does not use physiochemical properties to differentiate between impurities and the product ?
- (A) Filtration  
 (B) Batch adsorption  
 (C) Isoatachoporesis  
 (D) Crystallisation
43. The fungus \_\_\_\_\_ is most commonly used for industrial production of citric acid.
- (A) *Aspergillus niger*  
 (B) *Escherichia coli*  
 (C) *Gluconobactor suboxidance*  
 (D) *Lactobacillus pentosus*
44. For thorough mixing of medium and inoculum the part of fermentor useful is :
- (A) Shaft  
 (B) Headspace  
 (C) Impeller  
 (D) Sparger
45. Which of the following serve as important biofertilizers in paddy field ?
- (A) Rhizobia  
 (B) Frankia  
 (C) Nitrobacter  
 (D) Cyanobacteria
46. What do you mean by 'scale-up' ?
- (A) Reducing the fermentation's size.  
 (B) Expanding the fermentation process.  
 (C) Lowering the agitation's velocity.  
 (D) Accelerating the fermentation process.
47. Which of the subsequent species produces streptomycin ?
- (A) *S. ramosus*  
 (B) *S. griseus*  
 (C) *S. aureofaciens*  
 (D) *S. griseoflavus*

48. Pro-hormone insulin has an additional stretch that goes by the name of :
- (A) B-peptide
  - (B) G-peptide
  - (C) C-peptide
  - (D) S-peptide
49. Appropriate strains employed in industry go by the names :
- (A) Genetically stable
  - (B) Nontoxic
  - (C) Genetically regarded as safe (GRAS)
  - (D) None of the above
50. Subunit vaccination is everything, excluding :
- (A) A purified part or pieces of the antigen
  - (B) Hepatitis-B vaccine
  - (C) A whole purified virus
  - (D) An expensive type of vaccine
51. Sterilisation of media components that are heat labile involves :
- (A) Chemical disinfectant
  - (B)  $\gamma$  - Radiation
  - (C) UV light
  - (D) Filtration
52. In the industrial production of streptomycin, the byproduct is :
- (A) Vitamin-B12
  - (B) Vitamin-C
  - (C) Vitamin-B6
  - (D) Ethanol
53. Which of the following bacterial species is known for its high rate of biomass production ?
- (A) *Methylophilus methylotrophus*
  - (B) *Xanthomonas*
  - (C) *Clostridium*
  - (D) *Rhizomonas*
54. Industrial production of Vitamin-B12 is from :
- (A) *Propionibacterium* sps.
  - (B) *Pseudomonas* sps.
  - (C) Both (A) and (B)
  - (D) None of the above
55. 6-amino penicillic acid is prepared from penicillin sps by :
- (A) Penicillinase
  - (B) Acylase
  - (C) Oxidase
  - (D)  $\beta$ -lactamase

56. Interferon is produced using :
- (A) Finite cell line
  - (B) Continuous cell line
  - (C) Primed continuous cell line
  - (D) Primed and induced continuous cell line
57. What is used to produce Spirit vinegar ?
- (A) Fruit juices
  - (B) Malted grain
  - (C) Ethanol
  - (D) Ale
58. Which of the following is the most common source of SCP ?
- (A) Mold
  - (B) Yeast
  - (C) Algae
  - (D) Bacteria
59. The enzymes used to synthesize dextran from sucrose are :
- (A) Levan sucrose
  - (B) Dextran dextrinase
  - (C) Invertase
  - (D) Dextransucrase
60. What criteria are used to evaluate profitability ?
- (A) Gross margin
  - (B) Payback time
  - (C) Both (A) and (B)
  - (D) None of the above
61. *Agaricus bisporus* is also known as :
- (A) Button mushroom
  - (B) Oyster mushroom
  - (C) Straw mushroom
  - (D) Winter mushroom
62. Mealworm-based biological recovery techniques are employed for :
- (A) PHA
  - (B) Xanthan
  - (C) Dextran
  - (D) All of the above
63. Which carrier substance is utilised for the production of biofertilizers ?
- (A) Peat
  - (B) Jaggery
  - (C)  $\text{CaCO}_3$
  - (D) Dust

64. Which of the following process encourages grain germination ?
- (A) Malting
  - (B) Milling
  - (C) Mashing
  - (D) Boiling
65. Azolla is used as biofertilizer as it has :
- (A) Large quantity of humus
  - (B) Cyanobacteria
  - (C) Frankia
  - (D) Rhizobia
66. Mushrooms are a food that has low content of :
- (A) Protein
  - (B) Folic acid
  - (C) Vitamin B-12
  - (D) Carbohydrate
67. Which one of the following is not correctly matched ?
- (A) Azolla — Maize
  - (B) Azotobacter — Wheat
  - (C) *Rhizobium leguminisarum* — Pea
  - (D) Blue-green algae — Paddy
68. Intracellular insulin expression as fusion protein products does not result in :
- (A) Formation of insoluble aggregates
  - (B) Protects proinsulin from proteolysis
  - (C) Inclusion body formation
  - (D) Extracellular release of insulin
69. The family of the hop plant is :
- (A) Cannabinaceae
  - (B) Boraginaceae
  - (C) Brassicaceae
  - (D) Apocynaceae
70. A bioreactor is :
- (A) Culture containing radioactive isotopes
  - (B) Hybridoma
  - (C) Culture for synthesis of new chemicals
  - (D) Fermentation tank
71. The discovery that leads to the development of first antibiotic was made by :
- (A) Jenner
  - (B) Fleming
  - (C) Pauling
  - (D) Pasteur

72. What are the types of PHA ?
- (A) scl
  - (B) mcl
  - (C) Both (A) and (B)
  - (D) None of the above
73. How is streptomycin recovered ?
- (A) Paper chromatography
  - (B) Hydrophobic chromatography
  - (C) Size exclusion chromatography
  - (D) Ion exchange chromatography
74. Which steroid is used for microbial transformation ?
- (A) Cortisol
  - (B) Cholesterol
  - (C) Testosterone
  - (D) Progesterone
75. Effective poliomyelitis vaccines were developed by culturing the virus of poliomyelitis on the kidney cells of which animal ?
- (A) Cow
  - (B) Monkey
  - (C) Giraffe
  - (D) Pig
76. What variables affect the fermentation process' economics ?
- (A) The price of raw materials
  - (B) The length of the fermentation cycle
  - (C) The yield of the fermentation
  - (D) All of the above
77. Grist is :
- (A) coarse powder obtained after milling of malted barley
  - (B) an aqueous extract of malt
  - (C) malted barley
  - (D) coagulated protein obtained during boiling
78. Which adjuvant in vaccine development is least frequently used ?
- (A) Formaldehyde
  - (B) Aluminium hydroxide
  - (C) Aluminium sulphate
  - (D) Potassium aluminium sulphate
79. Which among the following is an attenuated vaccine ?
- (A) Salk vaccine
  - (B) Sabin vaccine
  - (C) Pertussis vaccine
  - (D) Tetanus vaccine

80. What is the precursor of penicillin ?
- (A) Benzylpenicillin
  - (B) Isopenicillin N
  - (C) Phenylacetic acid
  - (D) L- $\alpha$  aminoadipic acid
81. From which animals were insulin obtained in the early days ?
- (A) Insects
  - (B) Lizard and snakes
  - (C) Cats and dogs
  - (D) Cattle and pigs
82. Which of the following yeasts can be used to produce microbial protein ?
- (A) *Eremothecium ashbyi*
  - (B) *Candida utilis*
  - (C) *Saccharomyces cerevisiae*
  - (D) *Candida milleri*
83. The process of making malt as soluble as possible by using enzymes adjuncts etc. is known as :
- (A) Brewing
  - (B) Malting
  - (C) Mashing
  - (D) Pitching
84. Which of the subsequent fermentation techniques is used to create penicillin ?
- (A) Aerobic fermentation followed by anaerobic fermentation
  - (B) Anaerobic fermentation
  - (C) Aerobic fermentation
  - (D) Anaerobic fermentation followed by aerobic fermentation
85. Which media component is not used for large scale production of fermentation product ?
- (A) Carbon source
  - (B) Nitrogen source
  - (C) Phosphorus source
  - (D) Agar-agar
86. Which of the following is not a phase of the brewing process ?
- (A) Fermentation
  - (B) Pre-fermentation
  - (C) Wort manufacture
  - (D) Post-fermentation

87. Which of the following is not a Carbon source ?
- (A) Blackstrap molasses
  - (B) Whey
  - (B) Yeast extract
  - (D) Beet molasses
88. Malting process allows malt amylase and proteinases to degrade starch and protein to :
- (A) glucose and peptone as well as peptides
  - (B) glucose and amino acids
  - (C) maltose and peptone as well as peptides
  - (D) maltose and amino acids
89. Which of the following materials is used as bioplastic ?
- (A) Dextran
  - (B) Polyester
  - (C) Polyhydroxybutyrate
  - (D) Polystyrene
90. Which of the following statements regarding scale-up research is false ?
- (A) The similarity in the geometry of the fermenter used
  - (B) The similarity in the configuration of the fermenter used
  - (C) There should a minimum of three or four stages of increment
  - (D) Increasing power is a jump in scale
91. Which technique does not represent a dehydration-based microbial preservation technique ?
- (A) Lyophilisation
  - (B) Liquid Nitrogen freezing
  - (C) Drying on silica gel
  - (D) L-Drying
92. Foam generation during fermentation can be controlled by :
- (A) Silicone
  - (B) Lard oil
  - (C) Mechanical foam breaker
  - (D) All of the above

93. Which one is not a type of fermentor ?
- (A) Airlift bioreactor
  - (B) Packed bed bioreactor
  - (C) Tubelight bioreactor
  - (D) Membrane bioreactor
94. Which of the following is not a type of mutation ?
- (A) Point mutations
  - (B) Frameshift mutations
  - (C) Sense mutation
  - (D) Missense mutations
95. By which of the following processes, the germination process is stopped ?
- (A) Steeping
  - (B) Kilning
  - (C) Conditioning
  - (D) Mashing
96. Which of the following shows clear zone when a particular organism growth on indicator media ?
- (A) Growth factor producer
  - (B) Antibiotic producer
  - (C) Organic acid producer
  - (D) Amino acid producer
97. What characteristics must be screened for selection of industrial strain ?
- (A) Desirable property
  - (B) Strain stability
  - (C) Growth on cheap substrate material
  - (D) All of the above
98. Metal precipitation in media is avoided by addition of :
- (A) EDTA
  - (B) yeast extract
  - (C) Only (A)
  - (D) Both (A) and (B)
99. The term Racking refers to :
- (A) stacking unlabeled wine in bins for aging
  - (B) adding yeast to initiate fermentation
  - (C) storing hoses to drain on a slanted board
  - (D) removing clear liquid from sediment
100. Sodium or potassium metabisulphate is added to crushed grapes to :
- (A) enhance the flavouring compound
  - (B) check the undesirable organisms
  - (C) maintain pH
  - (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 correct answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ● (C) (D)

Q. 2 (A) (B) ● (D)

Q. 3 (A) ● (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 सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (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।