Roll No. .....

Question Booklet Number

O. M. R. Serial No. | | | | | | | |

M. Sc. (Microbiology) (Fourth Semester) EXAMINATION, 2025-26

(Old Syllabus Effective from 2022)

(Only Back Paper Students)

INDUSTRIAL MICROBIOLOGY

Paper Code							
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Questions Booklet Series
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Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

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.

परीक्षार्थियों के लिए निर्देश :

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 enzyme opens the ß-lactam ring of penicillin and deprives it of all antibacterial activity ?

(A) Cephalosporinase

(B) Penicillinase

(C) Amidase

(D) Acylase

2. Which enzyme was the first to be produced industrially ?

(A) Carboxymethylcellulase

(B) Protease

(C) Takadiastase

(D) Amylase

3. Which microorganism not use as SCP ?

(A) *Pseudomonas aeruginosa*

(B) *Saccharomyces*

(C) *Spirulina*

(D) *Chlorella*

4. Carrier material in biofertilizer is used to :

(A) Kill microbes

(B) Support microbial survival

(C) Increase pH

(D) Increase temperature

5. Which method of attenuation is commonly used to produce vaccines ?

(A) Passage of the virus in an 'unnatural host' or host cell

(B) Treatment with UV radiation

(C) Treatment with detergents

(D) Pasteurization

6. Mycorrhiza improves uptake of :

(A) Nitrogen only

(B) Phosphorus

(C) Oxygen

(D) CO_2

7. Which factor decreases with an increase in scale ?

(A) Temperature

(B) Degree of mixing

(C) Pressure

(D) pH

8. Which method of virus inactivation involves attacking the viral envelope and rendering it dysfunctional ?

(A) Ultraviolet (UV) inactivation

(B) Pasteurization

(C) Acidic pH inactivation

(D) Solvent/detergent inactivation

9. PHA replaces :

(A) Metals

(B) Enzymes

(C) Proteins

(D) Petroleum-based plastics

10. Fed-batch fermentation is used in PHA production to :

(A) Reduce yield

(B) Control substrate concentration

(C) Increase contamination

(D) Reduce oxygen

11. Biofertilizers are applied by :

(A) Seed treatment

(B) Soil application

(C) Root dipping

(D) All of the above

12. Nitrogen-fixing biofertilizer example :

(A) *Rhizobium*

(B) *Penicillium*

(C) *E. coli*

(D) *Clostridium*

13. Carbon sources for PHA include :

(A) Sugars and fatty acids

(B) Only proteins

(C) Only minerals

(D) Only DNA

14. Common organism for PHA production :

(A) *E. coli*

(B) *Penicillium*

(C) *Saccharomyces*

(D) *Cupriavidus necator*

15. Which of the following is not a Carbon source ?

(A) Blackstrap molasses

(B) Corn molasses

(C) Yeast extract

(D) Beet molasses

16. Enzyme responsible for production of dextran by *Leuconostoc mesenteroides* :

(A) Dextran sucrase

(B) Dextran dextrinase

(C) Invertase

(D) Amylase

17. Which mushroom is the most popular edible mushroom in the Western world ?

(A) *Agaricus bisporus*

(B) *Pleurotus*

(C) *Auricularia*

(D) *Lentinula*

18. What triggers the fructification of *Pleurotus ostreatus* ?

(A) Submerged in water

(B) Cold shock treatment

(C) Light cycle

(D) Adequate ventilation

19. Xanthan gum is widely used in :

(A) Antibiotics

(B) Vaccine production

(C) DNA synthesis

(D) Food and oil industry

20. Dextran is produced by :

(A) *Xanthomonas*

(B) *Leuconostoc mesenteroides*

(C) *E. coli*

(D) *Bacillus*

21. Mushroom cultivation is an example of :

(A) Submerged fermentation

(B) Solid-state fermentation

(C) Anaerobic fermentation

(D) Continuous fermentation

22. Spawning refers to :

(A) Harvesting mushrooms

(B) Drying compost

(C) Inoculation with fungal culture

(D) Packaging

23. A major limitation of SCP is :

(A) Low protein content

(B) High lipid content

(C) No growth

(D) High nucleic acid content

24. Chemical *vs*. microbial steroid transformation differs in :

(A) Specificity

(B) Same reaction

(C) Temperature only

(D) pH only

25. Hydroxylation of steroids is catalyzed mainly by :

(A) Lyases

(B) Transferases

(C) Cytochrome P450 monooxygenases

(D) Ligases

26. Subunit vaccines contain :

(A) Whole organism

(B) Specific antigenic parts

(C) DNA only

(D) RNA only

27. Priming dose is generally applied :

(A) After production

(B) Before viral induction

(C) During purification

(D) After harvesting

28. Antibiotic production typically occurs during :

(A) Lag phase

(B) Log phase

(C) Stationary phase

(D) Death phase

29. Streptomycin production organism belongs to :

(A) Actinomycetes

(B) Fungi

(C) Yeast

(D) Virus

30. Vaccine formulation includes :

(A) Only antigen

(B) Only water

(C) Only preservatives

(D) Antigen + adjuvant + stabilizers

31. Insulin production in yeast is advantageous due to :

(A) Anaerobic growth

(B) Secretion of protein into medium

(C) No fermentation

(D) Low yield

32. The key challenge in interferon production is :

(A) Fermentation only

(B) Oxygen limitation

(C) High sugar consumption

(D) Downstream processing due to low concentration

33. Human interferon production traditionally uses which cell system ?

(A) *E. coli*

(B) *Human leukocyte cell lines*

(C) *Saccharomyces cerevisiae*

(D) *Aspergillus niger*

34. Steroid biotransformation primarily involves :

(A) Microbial enzymatic modification

(B) Chemical hydrolysis

(C) Thermal degradation

(D) Physical separation

35. Streptomycin is produced by :

(A) *Penicillium chrysogenum*

(B) *Streptomyces griseus*

(C) *E. coli*

(D) *Bacillus subtilis*

36. 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

37. What is the major advantage of trickling generator for acetic acid production ?

(A) Better flavour

(B) Less manpower

(C) Less chances of contamination

(D) Higher yields

38. For citric acid fermentation, preferred substrate is :

(A) Protein

(B) Sucrose/molasses

(C) Lipid

(D) Ethanol

39. Glutamic acid overproduction occurs under :

(A) Biotin limitation

(B) High biotin

(C) No oxygen

(D) High pH

40. Vitamin B12 contains which metal ion ?

(A) Iron

(B) Magnesium

(C) Cobalt

(D) Zinc

41. Acetic acid production is classified as :

(A) Anaerobic fermentation

(B) Oxidative fermentation

(C) Mixed acid fermentation

(D) Lactic fermentation

42. Why is malting with grains of different sizes problematic for beer quality ?

(A) It reduces protein content.

(B) It reduces germination speed.

(C) It decreases flavor and color components.

(D) It results in heterogeneous malt.

43. Malolactic fermentation :

(A) Reduces total acidity

(B) Produces lactic acid

(C) Both (A) and (B)

(D) Only (B)

44. Which enzyme is responsible for the hydrolysis of starch during mashing ?

(A) Amylase

(B) Lipase

(C) Cellulase

(D) Protease

45. Fermentation temperature affects beer quality by influencing :

(A) Only color

(B) Flavor compound formation

(C) Only pH

(D) Only oxygen

46. The role of malting in beer production is to :

(A) Activate enzymes for starch breakdown

(B) Produce ethanol

(C) Sterilize barley

(D) Remove proteins

47. The organism primarily used in wine fermentation is :

(A) *Aspergillus niger*

(B) *Saccharomyces cerevisiae*

(C) *Bacillus subtilis*

(D) *Rhizopus*

48. Wort is defined as :

(A) Fermented beer

(B) Unfermented extract from malt

(C) Wine intermediate

(D) Yeast biomass

49. What is the term for the discipline known as 'Industrial Hygiene' in other parts of the world ?

(A) Environmental Hygiene

(B) Health Safety

(C) Occupational Hygiene

(D) Hazards Control

50. If purification level increases, cost will :

(A) Decrease

(B) Increase

(C) Remain same

(D) Become zero

51. Upstream *vs*. downstream differs in :

(A) Production *vs*. recovery

(B) Both same

(C) Both purification

(D) Both sterilization

52. What are some measures commonly used to assess profitability ?

(A) Gross margin, return on investment, and payback time

(B) Capital investment, operating cost, and revenues

(C) Yield losses and energy costs

(D) Product recovery and purification

53. The unit cost of the bulk product primarily depends on which factors ?

(A) QA and QC

(B) Fermentation yield and fermentation cycle time

(C) Capital investment and operating costs

(D) Labor and materials

54. When should hazards ideally be identified and controlled in the workplace ?

(A) After workers report health issues

(B) During annual inspections

(C) Only after incidents occur

(D) During the planning stage or when conditions/processes change

55. Which method of solid-liquid separation in downstream processing involves the use of gas bubbles to adsorb cells and solid particles ?

(A) Centrifugation

(B) Filtration

(C) Flotation

(D) Flocculation

56. What material is commonly used to make pilot-scale fermenters ?

(A) Hastelloy

(B) Ceramics

(C) Glass

(D) Stainless steel

57. If cells must be broken mechanically, suitable method is :

(A) Solvent extraction

(B) Enzymatic treatment

(C) High-pressure homogenization

(D) Filtration

58. If recovery yield increases from 50% to 80%, cost per unit will :

(A) Increase

(B) Decrease

(C) Remain same

(D) Double

59. For cell separation at industrial scale, most efficient equipment is :

(A) Tray dryer

(B) Disc centrifuge

(C) Table top centrifuge

(D) Spectrophotometer

60. If product is heat-sensitive, best drying method is :

(A) Spray drying

(B) Boiling

(C) Freeze drying

(D) Evaporation

61. Primary recovery *vs.* purification differs in :

(A) Removal of solids *vs.* fine purification

(B) Same

(C) Both drying

(D) Both packaging

62. Effluent treatment is applied to :

(A) Increase contamination

(B) Reduce pollution

(C) Increase cost

(D) Improve mutation

63. Intracellular products require :

(A) Filtration only

(B) Sterilization

(C) Cell disruption

(D) Cooling

64. A major cost component in fermentation is :

(A) Raw materials

(B) Color

(C) Centrifuge

(D) Volume

65. Economic fermentation requires :

(A) High cost raw materials

(B) Cheap and efficient raw materials

(C) Long fermentation time

(D) Low yield

66. A researcher cultivating algae for biofuel should use :

(A) Trickling filter

(B) Autoclave

(C) Fermenter

(D) Photobioreactor

67. A researcher wants uniform mixing; the best choice is :

(A) Bubble column

(B) Stirred tank fermenter

(C) Packed bed

(D) Tray fermenter

68. Selection of fermenter type depends mainly on :

(A) Color of media

(B) Type of microorganism and process requirement

(C) Size only

(D) Shape only

69. In trickling filters, microorganisms grow as :

(A) Free cells

(B) Spores

(C) Biofilm

(D) Plankton

70. Bubble column *vs*. airlift fermenter differs in :

(A) Presence of draft tube

(B) Temperature

(C) pH

(D) Sterility

71. If oxygen transfer is low, which component should be optimized ?

(A) Sparger

(B) Jacket

(C) Valve

(D) Sensor

72. The function of a jacket in fermenter is to :

(A) Mix culture

(B) Control temperature

(C) Provide oxygen

(D) Remove foam

73. For shear-sensitive cells, the best fermenter type is :

(A) Stirred tank

(B) Fluidized bed

(C) Packed bed

(D) Airlift fermenter

74. Continuous fermentation involves :

(A) No input/output

(B) Continuous addition and removal of medium

(C) Closed system

(D) No oxygen

75. Airlift fermenters use :

(A) Mechanical agitation

(B) Chemical mixing

(C) Air circulation

(D) Centrifugation

76. Baffles in a fermenter are used to :

(A) Increase foaming

(B) Prevent vortex formation

(C) Reduce oxygen

(D) Heat media

77. Excess foam in fermenter affects :

(A) Oxygen transfer

(B) Sterility

(C) Mutation

(D) Temperature

78. Wet heat sterilization is preferred because :

(A) Less effective

(B) More expensive

(C) More efficient and economical

(D) Causes mutation

79. *In situ* sterilization means :

(A) Sterilization inside fermenter

(B) Sterilization outside fermenter

(C) Filtration

(D) Dry heat

80. Immobilized enzymes are widely used in :

(A) Screening

(B) Mutation

(C) Industrial bioprocesses

(D) Sterilization

81. Excessive heating of media can cause :

(A) Sterility

(B) Caramelization of sugars

(C) Increased oxygen

(D) Mutation

82. Why is agitation required in fermenters ?

(A) To sterilize

(B) To improve mixing and oxygen transfer

(C) To reduce temperature

(D) To kill microbes

83. Standard sterilization temperature in autoclave is :

(A) 100°C

(B) 120°C

(C) 121°C

(D) 80°C

84. A fermenter is defined as :

(A) Storage vessel

(B) Sterilization chamber

(C) Special vessel for microbial growth

(D) Cooling system

85. A researcher simulating industrial conditions in lab is performing :

(A) Isolation

(B) Mutation

(C) Scale-up

(D) Scale-down

86. Why mixing is difficult at large scale ?

(A) Sterility

(B) Mutation

(C) Low volume

(D) Increased volume and viscosity

87. Mutation *vs*. recombination differs in :

(A) Both identical

(B) Random *vs*. targeted changes

(C) Both reduce yield

(D) Both preserve strains

88. Entrapment method involves :

(A) Surface binding

(B) Chemical destruction

(C) Sterilization

(D) Physical confinement in matrix

89. Fermenters must maintain :

(A) Random conditions

(B) Controlled environmental parameters

(C) High contamination

(D) Low oxygen always

90. One commonly used immobilization method is :

(A) Distillation

(B) Adsorption

(C) Sterilization

(D) Centrifugation

91. Scale-up in fermentation refers to :

(A) Decreasing volume

(B) Mutation of microbes

(C) Increasing production scale

(D) Preservation

92. Why are natural habitats preferred for isolation ?

(A) Less microbes

(B) High microbial diversity

(C) Sterility

(D) No competition

93. Most efficient strategy for industrial production is :

(A) Random isolation

(B) Only maintenance

(C) Screening + strain improvement

(D) Only mutation

94. Which method is best for long-term preservation ?

(A) Subculturing

(B) Screening

(C) Incubation

(D) Lyophilization

95. Economic feasibility depends mainly on :

(A) Color of culture

(B) Yield and cost of substrate

(C) Shape of colony

(D) Size of cell

96. Primary screening mainly detects :

(A) Yield

(B) Genetic structure

(C) Presence of desired activity

(D) Storage capacity

97. Primary *vs*. secondary screening differs in :

(A) Media composition

(B) Yield estimation

(C) Temperature

(D) pH

98. Use of mutagens like UV is part of :

(A) Screening

(B) Isolation

(C) Strain improvement

(D) Maintenance

99. Maintenance techniques are used to :

(A) Destroy microbes

(B) Preserve characteristics

(C) Increase contamination

(D) Reduce yield

100. A microorganism used in industry for production is called :

(A) Wild strain

(B) Producer strain

(C) Contaminant

(D) Mutant

(Only for Rough Work)

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 छाँटना 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।