Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Biotechnology) (Fourth Semester)
(NEP) EXAMINATION, 2025-26
BIOPROCESS TECHNOLOGY

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. The main function of an impeller in stirred tank bioreactor is :

(A) Heating

(B) Cooling

(C) Mixing

(D) Filtration

2. An ideal bioreactor assumes :

(A) Perfect mixing

(B) No mixing

(C) Partial mixing

(D) Turbulent mixing only

3. Continuous sterilization involves which of the following steps ?

(A) Heating → Holding → Cooling

(B) Cooling → Heating → Holding

(C) Holding → Cooling → Heating

(D) Heating → Cooling → Holding

4. The commonly used membrane filter pore size for sterilization of liquid media is :

(A) 5.0 μm

(B) 1.0 μm

(C) 0.45 μm

(D) 0.22 μm

5. Filter sterilization is mainly used for :

(A) Heat-stable media

(B) Gas sterilization

(C) Solid media

(D) Heat-sensitive solutions

6. In continuous sterilization, heating of medium is done using :

(A) Water bath

(B) Heat exchanger

(C) Incubator

(D) Oven

7. Continuous sterilization is preferred in industrial fermentation because it :

(A) Requires less equipment

(B) Uses less pressure

(C) Uses lower temperature

(D) Reduces contamination risk and saves time

8. The typical temperature used for batch heat sterilization of liquid media is :

(A) 80°C

(B) 100°C

(C) 121°C

(D) 150°C

9. Batch sterilization of liquid media is commonly carried out in a :

(A) Autoclave

(B) Incubator

(C) Centrifuge

(D) Laminar airflow

10. Criteria for inoculum transfer include ;

(A) Cell viability

(B) Contamination free culture

(C) Proper growth phase

(D) All of the above

11. Ideal inoculum should be in which phase ?

(A) Lag phase

(B) Log phase

(C) Stationary phase

(D) Death phase

12. The purpose of inoculum development is to :

(A) Increase contamination

(B) Prepare active culture

(C) Stop fermentation

(D) Reduce aeration

13. Carbon to nitrogen ratio affects :

(A) Microbial growth

(B) Product formation

(C) Metabolism

(D) All of the above

14. Media optimization is performed to :

(A) Reduce contamination

(B) Increase product yield

(C) Reduce fermentation time

(D) All of the above

15. Foam formation during fermentation can cause :

(A) Increased yield

(B) Contamination risk

(C) Faster growth

(D) All of the above

16. Which of the following is used as an antifoaming agent ?

(A) Silicone oil

(B) Glucose

(C) Ammonium sulfate

(D) EDTA

17. Trace elements in fermentation medium are required in :

(A) Small quantities

(B) Large quantities

(C) Moderate quantities

(D) Not required

18. Yeast extract mainly provides :

(A) Carbon

(B) Nitrogen and growth factors

(C) Minerals only

(D) Oxygen

19. Molasses is commonly used in fermentation as :

(A) Nitrogen source

(B) Growth factor

(C) Mineral source

(D) Carbon source

20. The primary function of a carbon source in fermentation media is to :

(A) Maintain pH

(B) Provide energy and cell biomass

(C) Control foam formation

(D) Provide vitamins

21. A generalized bioprocess flow sheet includes :

(A) Isolation → Fermentation → Recovery

(B) Fermentation → Isolation → Recovery

(C) Recovery → Isolation → Fermentation

(D) Packaging → Fermentation → Isolation

22. Drying of final product belongs to :

(A) Upstream processing

(B) Downstream processing

(C) Fermentation

(D) Screening

23. Filtration is used in bioprocess for :

(A) Culture preservation

(B) Inoculum preparation

(C) Fermentation

(D) Separation of solids and liquids

24. Centrifugation is used for :

(A) Sterilization

(B) Fermentation

(C) Cell separation

(D) Media preparation

25. Fermentation is classified under :

(A) Downstream processing

(B) Marketing

(C) Packaging

(D) Upstream processing

26. Downstream processing involves :

(A) Inoculum preparation

(B) Product recovery

(C) Media sterilization

(D) Fermentation

27. Upstream processing includes :

(A) Culture preparation

(B) Product purification

(C) Packaging

(D) Storage

28. Cryopreservation temperature is usually :

(A) 0°C

(B) -20°C

(C) -80°C to -196°C

(D) 100°C

29. Periodic subculturing may lead to :

(A) Increased productivity

(B) Sterility

(C) Contamination and mutation

(D) High yield

30. Lyophilization is also known as :

(A) Freezing

(B) Freeze drying

(C) Heating

(D) Autoclaving

31. Enrichment culture technique helps in :

(A) Killing microbes

(B) Purification

(C) Preservation

(D) Selecting desired microorganisms

32. Industrially important microbes are commonly isolated from :

(A) Distilled water

(B) Soil samples

(C) Sterile air

(D) Blood plasma

33. Which phase is metabolically most active ?

(A) Lag phase

(B) Log phase

(C) Stationary phase

(D) Death phase

34. Which fermentation type reduces catabolite repression ?

(A) Batch

(B) Continuous

(C) Fed-batch

(D) Solid state

35. Microbial specific growth rate is denoted by :

(A) K

(B) V

(C) D

(D) μ

36. Which bacterial growth phase shows nutrient limitation ?

(A) Lag phase

(B) Log phase

(C) Stationary phase

(D) Early phase

37. Continuous culture maintains cells in :

(A) Lag phase

(B) Log phase

(C) Stationary phase

(D) Death phase

38. Which mode is widely used in antibiotic production ?

(A) Batch fermentation

(B) Continuous fermentation

(C) Fed-batch fermentation

(D) Solid fermentation

39. In batch fermentation, nutrients are :

(A) Added only once

(B) Continuously added

(C) Removed continuously

(D) Replaced continuously

40. Turbidostat is used in :

(A) Batch fermentation

(B) Continuous fermentation

(C) Fed-batch fermentation

(D) Solid fermentation

41. Death phase is characterized by :

(A) Constant growth

(B) No change in cell number

(C) Increased growth

(D) Decline in viable cells

42. Fed-batch fermentation is mainly used to :

(A) Increase substrate inhibition

(B) Prevent substrate inhibition

(C) Reduce oxygen supply

(D) Reduce growth

43. Which phase has equal rate of cell growth and cell death ?

(A) Log phase

(B) Stationary phase

(C) Lag phase

(D) Decline phase

44. Chemostat is an example of :

(A) Batch fermentation

(B) Continuous fermentation

(C) Fed-batch fermentation

(D) Solid-state fermentation

45. Which phase shows maximum metabolite production (secondary metabolites) ?

(A) Lag phase

(B) Log phase

(C) Death phase

(D) Stationary phase

46. The exponential phase is also called :

(A) Log phase

(B) Lag phase

(C) Death phase

(D) Stationary phase

47. The lag phase in microbial growth represents :

(A) Maximum cell division

(B) Cell death

(C) Adaptation to new environment

(D) Constant growth

48. Continuous fermentation is best described as :

(A) Closed system

(B) Semi-closed system

(C) Static system

(D) Open system with continuous input and output

49. In fed-batch fermentation :

(A) Medium is continuously removed

(B) Substrate is added during fermentation

(C) Cells are continuously harvested

(D) No nutrients are added

50. Batch fermentation is characterized by :

(A) Continuous addition of nutrients

(B) Removal of culture during growth

(C) No addition or removal of medium during operation

(D) Continuous removal of product

51. Bioprocess technology in environmental applications is mainly used for :

(A) Petroleum refining

(B) Cement production

(C) Wastewater treatment

(D) Mining operations

52. Production of ethanol using yeast is an example of :

(A) Chemical synthesis

(B) Distillation

(C) Polymerization

(D) Fermentation technology

53. Bioprocess technology is widely used in the production of :

(A) Plastics only

(B) Antibiotics and vaccines

(C) Metals only

(D) Glass products

54. Final stage of downstream processing is :

(A) Fermentation

(B) Packaging

(C) Extraction

(D) Cell disruption

55. Packaging is important for :

(A) Stability and storage

(B) Cell growth

(C) Fermentation

(D) Extraction

56. Freeze drying is also known as :

(A) Spray drying

(B) Air drying

(C) Lyophilization

(D) Vacuum drying

57. Drying is important for :

(A) Product stability

(B) Fermentation

(C) Extraction

(D) Cell growth

58. Crystallization is used for :

(A) Cell disruption

(B) Final purification

(C) Fermentation

(D) Extraction

59. Ion exchange chromatography separates based on :

(A) Size

(B) Charge

(C) Density

(D) Shape

60. Ultrafiltration membranes typically retain :

(A) Small molecules

(B) Solvents

(C) Salts

(D) Proteins

61. Ultrafiltration separates molecules based on :

(A) Charge

(B) Size

(C) Density

(D) Color

62. Ammonium sulfate is commonly used for :

(A) Protein precipitation

(B) Filtration

(C) Drying

(D) Chromatography

63. Activated charcoal is commonly used for :

(A) Filtration

(B) Crystallization

(C) Centrifugation

(D) Adsorption

64. Batch extraction is based on :

(A) Density difference

(B) Solubility difference

(C) Size difference

(D) Charge difference

65. Mechanical cell disruption method includes :

(A) Detergent treatment

(B) Solvent extraction

(C) Enzyme treatment

(D) Sonication

66. Cell disruption is required for :

(A) Intracellular products

(B) Extracellular products

(C) Fermentation.

(D) Packaging

67. High-speed centrifuges are used for :

(A) Large particles

(B) Small particles

(C) Liquid mixing

(D) Drying

68. Which filtration method uses pressure difference ?

(A) Gravity filtration

(B) Chromatography

(C) Sedimentation

(D) Vacuum filtration

69. The first step in downstream processing usually involves :

(A) Chromatography

(B) Cell separation

(C) Drying

(D) Packaging

70. Major challenge in gene therapy is :

(A) Delivery efficiency

(B) Safety

(C) Immune response

(D) All of the above

71. Ex vivo gene therapy involves :

(A) Gene transfer inside body

(B) Gene transfer outside body

(C) Protein injection

(D) Cell transplantation

72. Gene therapy is used to treat :

(A) Genetic disorders

(B) Certain Cancers

(C) Immune deficiency

(D) All of the above

73. Gene therapy involves :

(A) Protein injection

(B) DNA introduction

(C) Enzyme treatment

(D) Vaccine production

74. Common biomaterial used in tissue engineering :

(A) Collagen

(B) Plastic

(C) Metal

(D) Rubber

75. Bioreactors in tissue engineering are used for :

(A) Cell culture

(B) Cell growth

(C) Tissue formation

(D) All of the above

76. Stem cells are used in tissue engineering because they :

(A) Die quickly

(B) Divide rapidly

(C) Differentiate into multiple cell types

(D) Produce toxins

77. Scaffold in tissue engineering provides :

(A) Structural support

(B) Nutrients

(C) Oxygen

(D) Hormones

78. Tissue engineering combines :

(A) Biology and chemistry

(B) Cells and biomaterials

(C) Physics and mathematics

(D) Microbiology and geology

79. Bioreactors used in wastewater treatment are :

(A) Fermenters

(B) Bioreactors

(C) Activated sludge tanks

(D) All of the above

80. Biological wastewater treatment reduces :

(A) COD

(B) BOD

(C) Organic load

(D) All of the above

81. Sludge digestion mainly occurs under :

(A) Aerobic condition

(B) Alkaline condition

(C) Neutral condition

(D) Anaerobic condition

82. Trickling filters are used in :

(A) Primary treatment

(B) Secondary treatment

(C) Tertiary treatment

(D) Sludge treatment

83. BOD stands for :

(A) Biomass Oxygen Demand

(B) Bacterial Oxygen Demand

(C) Biochemical Oxygen Demand

(D) None of the above

84. Activated sludge process is used for :

(A) Air purification

(B) Metal extraction

(C) Soil treatment

(D) Water purification

85. The byproduct of baker yeast fermentation is :

(A) Methane

(B) Ethanol

(C) Lactic acid

(D) Ammonia.

86. Molasses is commonly used in baker yeast production because it is rich in :

(A) Lipids

(B) Proteins

(C) Sugars

(D) Vitamins

87. Baker's yeast is mainly composed of which microorganism ?

(A) Lactobacillus

(B) Saccharomyces cerevisiae

(C) Aspergillus niger

(D) Penicillium chrysogenum

88. The major advantage of stirred tank bioreactor is :

(A) Poor mixing

(B) No monitoring

(C) No aeration

(D) Easy control and scalability

89. Sparger in bioreactor is used for :

(A) Heating

(B) Aeration

(C) Cooling

(D) Filtration

90. Dead zones in bioreactors lead to :

(A) Efficient mixing

(B) Increased temperature

(C) High oxygen transfer

(D) Reduced productivity

91. Photo bioreactors require :

(A) Darkness

(B) Light source

(C) Vacuum

(D) Pressure

92. Photo bioreactors are used for cultivation of :

(A) Bacteria only

(B) Fungi only

(C) Algae and photosynthetic organisms

(D) Viruses

93. Airlift bioreactors consist of :

(A) Draft tube

(B) Condenser

(C) Evaporator

(D) Filter

94. Airlift loop bioreactors use :

(A) Mechanical stirring

(B) Air circulation

(C) Magnetic stirring

(D) Ultrasonic waves

95. Trickle bed bioreactors are mainly used for :

(A) Gas-liquid reactions.

(B) Liquid-solid reactions

(C) Gas-liquid-solid reactions

(D) Only solid reactions.

96. Fluidized bed reactors provide :

(A) Poor mass transfer

(B) Low oxygen transfer

(C) No mixing

(D) High mass transfer

97. Bubble column bioreactors have :

(A) Moving parts

(B) No moving parts

(C) Impellers

(D) Rotors

98. Bubble column bioreactors operate based on :

(A) Mechanical agitation

(B) Gas sparging

(C) Magnetic mixing

(D) Ultrasonic mixing

99. Packed bed bioreactors contain :

(A) Free cells

(B) Dead cells

(C) Suspended cells

(D) Immobilized cells

100. Baffles in stirred tank bioreactor help to :

(A) Increase foaming

(B) Prevent vortex formation

(C) Reduce aeration

(D) Reduce mixing

(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।