

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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**M. Sc. (Biochemistry) (Fourth Semester)**  
**EXAMINATION, 2025-26**  
**(New Syllabus Effective from 2023)**  
**INDUSTRIAL BIOCHEMISTRY**

Paper Code							
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Questions Booklet  
Series

**A**

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. Aeration is required for :
  - (A) Anaerobes
  - (B) Aerobes
  - (C) Viruses
  - (D) None of the above
2. Affinity chromatography uses :
  - (A) Specific binding
  - (B) Size
  - (C) Charge
  - (D) Density
3. Agitation helps in :
  - (A) Mixing
  - (B) Heat transfer
  - (C) Oxygen transfer
  - (D) All of the above
4. Amino acids are produced by :
  - (A) Corynebacterium
  - (B) Virus
  - (C) Algae
  - (D) Protozoa
5. Amylase breaks :
  - (A) Protein
  - (B) Starch
  - (C) Lipid
  - (D) DNA
6. Antibiotic resistance is :
  - (A) Good
  - (B) Neutral
  - (C) Bad
  - (D) None of the above
7. Antibiotics are :
  - (A) Primary metabolites
  - (B) Secondary metabolites
  - (C) Enzymes
  - (D) Vitamins
8. Batch fermentation involves :
  - (A) Continuous input/output
  - (B) No addition after start
  - (C) Only output
  - (D) Only input

9. Biofuels include :
- (A) Ethanol
  - (B) Biodiesel
  - (C) Biogas
  - (D) All of the above
10. Biopesticides are derived from :
- (A) Synthetic chemicals
  - (B) Natural organisms or products
  - (C) Metals
  - (D) Plastics
11. Biomass is measured by :
- (A) OD
  - (B) Dry weight
  - (C) Cell count
  - (D) All of the above
12. Which microorganism is commonly used in yogurt production ?
- (A) *Escherichia coli*
  - (B) *Lactobacillus*
  - (C) *Clostridium*
  - (D) *Salmonella*
13. Bioreactor is also known as :
- (A) Fermentor
  - (B) Separator
  - (C) Reactor vessel
  - (D) Both (A) and (C)
14. Bioremediation uses :
- (A) Microbes
  - (B) Plants
  - (C) Chemicals
  - (D) None of the above
15. Biosensors use :
- (A) Enzymes
  - (B) Microbes
  - (C) Electrodes
  - (D) All of the above
16. Centrifugation separates based on :
- (A) Size
  - (B) Density
  - (C) Shape
  - (D) Color

17. Chemostat is used in :
- (A) Batch
  - (B) Continuous
  - (C) Fed-batch
  - (D) None of the above
18. Chromatography is used for :
- (A) Separation
  - (B) Identification
  - (C) Purification
  - (D) All of the above
19. Citric acid is produced by :
- (A) *Aspergillus niger*
  - (B) *E. Coli*
  - (C) *Bacillus*
  - (D) Yeast
20. Clarification removes :
- (A) Particles
  - (B) Cells
  - (C) Debris
  - (D) All of the above
21. Contamination leads to :
- (A) Loss
  - (B) Reduced yield
  - (C) Spoilage
  - (D) All of the above
22. Continuous fermentation involves :
- (A) Closed system
  - (B) Open system
  - (C) Semi-open
  - (D) None of the above
23. Crystallization is used for :
- (A) Purification
  - (B) Growth
  - (C) Mixing
  - (D) None of the above
24. Death phase shows :
- (A) Growth
  - (B) Decline
  - (C) Stability
  - (D) Increase

25. Dialysis separates by :
- (A) Size
  - (B) Charge
  - (C) Density
  - (D) Shape
26. Dilution rate is :
- (A) Feed rate/volume
  - (B) Volume/feed rate
  - (C) Growth rate
  - (D) None of the above
27. Downstream processing refers to :
- (A) Cultivation
  - (B) Product recovery
  - (C) Sterilization
  - (D) Inoculation
28. Drying improves :
- (A) Stability
  - (B) Shelf life
  - (C) Storage
  - (D) All of the above
29. Enzymes are used in :
- (A) Detergents
  - (B) Food
  - (C) Textile
  - (D) All of the above
30. Ethanol is produced by :
- (A) Yeast
  - (B) Bacteria
  - (C) Virus
  - (D) Algae
31. Example of primary metabolite :
- (A) Penicillin
  - (B) Ethanol
  - (C) Streptomycin
  - (D) Tetracycline
32. Example of secondary metabolite :
- (A) Glucose
  - (B) Ethanol
  - (C) Penicillin
  - (D) Amino acids

33. Extraction is used for :
- (A) Purification
  - (B) Growth
  - (C) Sterilization
  - (D) None of the above
34. Fed-batch fermentation is a combination of :
- (A) Batch and continuous
  - (B) Aerobic and anaerobic
  - (C) Growth and death
  - (D) None of the above
35. Fermentation efficiency depends on :
- (A) Microorganism
  - (B) Media
  - (C) Conditions
  - (D) All of the above
36. Fermentation is carried out in :
- (A) Flask
  - (B) Bioreactor
  - (C) Test tube
  - (D) Petri dish
37. Fermented food includes :
- (A) Yogurt
  - (B) Bread
  - (C) Cheese
  - (D) All of the above
38. Filtrate contains :
- (A) Solid
  - (B) Liquid
  - (C) Gas
  - (D) None of the above
39. Filtration is used for :
- (A) Separation
  - (B) Growth
  - (C) Mixing
  - (D) None of the above
40. Filtration sterilization is used for :
- (A) Solids
  - (B) Heat-sensitive materials
  - (C) Metals
  - (D) None of the above

41. Foam formation is controlled by :
- (A) Antifoam
  - (B) Oxygen
  - (C) Nutrients
  - (D) Water
42. Glutamic acid is used as :
- (A) Sweetener
  - (B) Flavor enhancer
  - (C) Acid
  - (D) Base
43. GMP stands for :
- (A) Good Manufacturing Practice
  - (B) General Microbial Process
  - (C) Growth Management Process
  - (D) None of the above
44. Industrial enzymes are produced by :
- (A) Microbes
  - (B) Plants
  - (C) Animals
  - (D) All of the above
45. Industrial fermentation is usually :
- (A) Aerobic
  - (B) Anaerobic
  - (C) Both (A) and (B)
  - (D) None of the above
46. Industrial strains are selected for :
- (A) Low yield
  - (B) High productivity
  - (C) Pathogenicity
  - (D) Slow growth
47. Inoculum is :
- (A) Final product
  - (B) Starter culture
  - (C) Waste
  - (D) Media
48. Insulin is produced by :
- (A) Recombinant DNA
  - (B) Fermentation only
  - (C) Plants
  - (D) Animals
49. Ion exchange separates by :
- (A) Charge
  - (B) Size
  - (C) Shape
  - (D) Density
50. Lactic acid is produced by :
- (A) Lactobacillus
  - (B) Yeast
  - (C) Fungi
  - (D) Virus

51. Lag phase shows :
- (A) Rapid growth
  - (B) Adaptation
  - (C) Death
  - (D) Decline
52. Laminar airflow provides :
- (A) Turbulence
  - (B) Sterile air
  - (C) Heat
  - (D) Pressure
53. Lipase breaks :
- (A) Fat
  - (B) Protein
  - (C) Sugar
  - (D) DNA
54. Log phase shows :
- (A) No growth
  - (B) Maximum growth
  - (C) Death
  - (D) Decline
55. Lyophilization means :
- (A) Freeze drying
  - (B) Heating
  - (C) Cooling
  - (D) Mixing
56. Media used in fermentation contains :
- (A) Nutrients
  - (B) Water only
  - (C) Oxygen only
  - (D) None of the above
57. Most industrial microbes are :
- (A) Pathogenic
  - (B) Non-pathogenic
  - (C) Harmful
  - (D) Toxic
58. Organic acids are :
- (A) Citric acid
  - (B) Lactic acid
  - (C) Acetic acid
  - (D) All of the above
59. Oxygen limitation leads to :
- (A) Reduced growth
  - (B) Increased growth
  - (C) No effect
  - (D) Death only

60. Oxygen transfer rate depends on :
- (A) Agitation
  - (B) Aeration
  - (C) Both (A) and (B)
  - (D) None of the above
61. Penicillin is produced by :
- (A) Aspergillus
  - (B) Penicillium
  - (C) Rhizopus
  - (D) Yeast
62. pH in fermentor is controlled by :
- (A) Acid/base addition
  - (B) Temperature
  - (C) Pressure
  - (D) Light
63. SCP means :
- (A) Single cell protein
  - (B) Simple cell protein
  - (C) Small cell protein
  - (D) None of the above
64. Specific growth rate is denoted by :
- (A)  $\mu$
  - (B)  $\lambda$
  - (C)  $\theta$
  - (D)  $\pi$
65. Stationary phase shows :
- (A) Growth > death
  - (B) Growth = death
  - (C) Death > growth
  - (D) No cells
66. Sterilization by heat uses :
- (A) Autoclave
  - (B) Filter
  - (C) UV
  - (D) Chemicals
67. Substrate utilization rate depends on :
- (A) Growth
  - (B) Conditions
  - (C) Both (A) and (B)
  - (D) None of the above
68. Temperature affects :
- (A) Growth
  - (B) Enzyme activity
  - (C) Product formation
  - (D) All of the above
69. Upstream processing includes :
- (A) Product purification
  - (B) Culture preparation
  - (C) Packaging
  - (D) Marketing

70. Vitamin B<sub>12</sub> is produced by :
- (A) Bacteria
  - (B) Virus
  - (C) Plant
  - (D) Animal
71. Waste treatment uses :
- (A) Microorganisms
  - (B) Heat
  - (C) Pressure
  - (D) None of the above
72. Yield coefficient is :
- (A) Product/substrate
  - (B) Biomass/substrate
  - (C) Both (A) and (B)
  - (D) None of the above
73. Food preservation primarily aims to :
- (A) Improve color
  - (B) Increase weight
  - (C) Prevent spoilage
  - (D) Enhance taste
74. Pasteurization is mainly used to :
- (A) Sterilize food completely
  - (B) Kill harmful microorganisms
  - (C) Add nutrients
  - (D) Remove moisture
75. Bioreactor control includes :
- (A) pH
  - (B) Temperature
  - (C) DO
  - (D) All of the above
76. Which method removes water from food to increase shelf life ?
- (A) Freezing
  - (B) Fermentation
  - (C) Drying
  - (D) Irradiation
77. Food irradiation helps to :
- (A) Increase moisture
  - (B) Destroy microbes and pests
  - (C) Add flavor
  - (D) Change color

78. Which packaging method removes air to prevent oxidation ?
- (A) Canning
  - (B) Vacuum packaging
  - (C) Freezing
  - (D) Drying
79. The browning of cut fruits is mainly due to :
- (A) Fermentation
  - (B) Dehydration
  - (C) Oxidation
  - (D) Freezing
80. Which preservative is commonly used in jams and jellies ?
- (A) Sodium chloride
  - (B) Sugar
  - (C) Vinegar
  - (D) Oil
81. Which temperature range is ideal for refrigeration ?
- (A) 0-5°C
  - (B) 10-15°C
  - (C) 20-25°C
  - (D) 30-35°C
82. Biogas contains :
- (A) Methane
  - (B) CO<sub>2</sub>
  - (C) H<sub>2</sub>
  - (D) All of the above
83. Which bacterium is widely used as a biopesticide ?
- (A) *Bacillus thuringiensis*
  - (B) *Rhizobium*
  - (C) *Azotobacter*
  - (D) *Nitrosomonas*
84. The toxin produced by *Bacillus thuringiensis* is called :
- (A) Endotoxin
  - (B) Cry toxin
  - (C) Exotoxin
  - (D) Mycotoxin
85. Bioremediation refers to :
- (A) Use of chemicals to clean pollutants
  - (B) Use of organisms to degrade pollutants
  - (C) Physical removal of waste
  - (D) Burning of waste

86. Which organism is commonly used in bioremediation ?
- (A) Virus
  - (B) Birds
  - (C) Insects
  - (D) Fungi and bacteria
87. Phytoremediation involves :
- (A) Use of animals
  - (B) Use of plants to remove pollutants
  - (C) Use of chemicals
  - (D) Use of heat
88. Which process uses microorganisms to treat wastewater ?
- (A) Fermentation
  - (B) Composting
  - (C) Activated sludge process
  - (D) Pasteurization
89. Bioaccumulation refers to :
- (A) Breakdown of pollutants
  - (B) Accumulation of substances in organisms
  - (C) Removal of toxins
  - (D) Filtration of water
90. Which type of biopesticide uses living organisms to control pests ?
- (A) Botanical pesticides
  - (B) Mineral pesticides
  - (C) Chemical pesticides
  - (D) Microbial pesticides
91. Which phase of drug development involves testing on human volunteers ?
- (A) Preclinical studies
  - (B) Clinical trials
  - (C) Drug discovery
  - (D) Post-marketing surveillance
92. Pharmacokinetics mainly deals with :
- (A) Drug mechanism of action
  - (B) Drug toxicity
  - (C) Movement of drugs in the body
  - (D) Drug synthesis
93. Which process describes the absorption, distribution, metabolism, and excretion of drugs ?
- (A) Pharmacodynamics
  - (B) Pharmacokinetics
  - (C) Toxicology
  - (D) Pharmacognosy

94. The first-pass metabolism occurs primarily in the :
- (A) Kidney
  - (B) Heart
  - (C) Lung
  - (D) Liver
95. Biotransformation of drugs mainly occurs in the :
- (A) Brain
  - (B) Liver
  - (C) Skin
  - (D) Muscle
96. Phase I reactions in drug metabolism include :
- (A) Conjugation
  - (B) Hydrolysis, oxidation, reduction
  - (C) Protein synthesis
  - (D) Filtration
97. Cytochrome P450 enzymes are primarily involved in :
- (A) Drug absorption
  - (B) Drug excretion
  - (C) Drug metabolism
  - (D) Drug transport
98. Which pharmacokinetic parameter represents the volume in which the drug is distributed ?
- (A) Clearance
  - (B) Half-life
  - (C) Volume of distribution
  - (D) Bioavailability
99. Bioavailability refers to :
- (A) Rate of drug metabolism
  - (B) Fraction of administered drug reaching systemic circulation
  - (C) Drug elimination rate
  - (D) Drug toxicity level
100. Phase II reactions generally involve :
- (A) Oxidation
  - (B) Reduction
  - (C) Conjugation with endogenous molecules
  - (D) Hydrolysis

***(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 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।