Roll No. .....

Question Booklet Number

O. M. R. Serial No.

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

(New Syllabus Effective from 2023)

INDUSTRIAL BIOCHEMISTRY

Paper Code								
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Questions Booklet Series
D

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. Lactic acid is produced by :

(A) Lactobacillus

(B) Yeast

(C) Fungi

(D) Virus

2. Ion exchange separates by :

(A) Charge

(B) Size

(C) Shape

(D) Density

3. Insulin is produced by :

(A) Recombinant DNA

(B) Fermentation only

(C) Plants

(D) Animals

4. Inoculum is :

(A) Final product

(B) Starter culture

(C) Waste

(D) Media

5. Industrial strains are selected for :

(A) Low yield

(B) High productivity

(C) Pathogenicity

(D) Slow growth

6. Industrial fermentation is usually :

(A) Aerobic

(B) Anaerobic

(C) Both (A) and (B)

(D) None of the above

7. Industrial enzymes are produced by :

(A) Microbes

(B) Plants

(C) Animals

(D) All of the above

8. GMP stands for :

(A) Good Manufacturing Practice

(B) General Microbial Process

(C) Growth Management Process

(D) None of the above

9. Glutamic acid is used as :

(A) Sweetener

(B) Flavor enhancer

(C) Acid

(D) Base

10. Foam formation is controlled by :

(A) Antifoam

(B) Oxygen

(C) Nutrients

(D) Water

11. Filtration sterilization is used for :

(A) Solids

(B) Heat-sensitive materials

(C) Metals

(D) None of the above

12. Filtration is used for :

(A) Separation

(B) Growth

(C) Mixing

(D) None of the above

13. Filtrate contains :

(A) Solid

(B) Liquid

(C) Gas

(D) None of the above

14. Fermented food includes :

(A) Yogurt

(B) Bread

(C) Cheese

(D) All of the above

15. Fermentation is carried out in :

(A) Flask

(B) Bioreactor

(C) Test tube

(D) Petri dish

16. Fermentation efficiency depends on :

(A) Microorganism

(B) Media

(C) Conditions

(D) All of the above

17. Fed-batch fermentation is a combination of :

(A) Batch and continuous

(B) Aerobic and anaerobic

(C) Growth and death

(D) None of the above

18. Extraction is used for :

(A) Purification

(B) Growth

(C) Sterilization

(D) None of the above

19. Example of secondary metabolite :

(A) Glucose

(B) Ethanol

(C) Penicillin

(D) Amino acids

20. Example of primary metabolite :

(A) Penicillin

(B) Ethanol

(C) Streptomycin

(D) Tetracycline

21. Ethanol is produced by :

(A) Yeast

(B) Bacteria

(C) Virus

(D) Algae

22. Enzymes are used in :

(A) Detergents

(B) Food

(C) Textile

(D) All of the above

23. Drying improves :

(A) Stability

(B) Shelf life

(C) Storage

(D) All of the above

24. Downstream processing refers to :

(A) Cultivation

(B) Product recovery

(C) Sterilization

(D) Inoculation

25. Dilution rate is :

(A) Feed rate/volume

(B) Volume/feed rate

(C) Growth rate

(D) None of the above

26. Dialysis separates by :

(A) Size

(B) Charge

(C) Density

(D) Shape

27. Death phase shows :

(A) Growth

(B) Decline

(C) Stability

(D) Increase

28. Crystallization is used for :

(A) Purification

(B) Growth

(C) Mixing

(D) None of the above

29. Continuous fermentation involves :

(A) Closed system

(B) Open system

(C) Semi-open

(D) None of the above

30. Contamination leads to :

(A) Loss

(B) Reduced yield

(C) Spoilage

(D) All of the above

31. Clarification removes :

(A) Particles

(B) Cells

(C) Debris

(D) All of the above

32. Citric acid is produced by :

(A) *Aspergillus niger*

(B) *E. Coli*

(C) *Bacillus*

(D) Yeast

33. Chromatography is used for :

(A) Separation

(B) Identification

(C) Purification

(D) All of the above

34. Chemostat is used in :

(A) Batch

(B) Continuous

(C) Fed-batch

(D) None of the above

35. Centrifugation separates based on :

(A) Size

(B) Density

(C) Shape

(D) Color

36. Biosensors use :

(A) Enzymes

(B) Microbes

(C) Electrodes

(D) All of the above

37. Bioremediation uses :

(A) Microbes

(B) Plants

(C) Chemicals

(D) None of the above

38. Bioreactor is also known as :

(A) Fermentor

(B) Separator

(C) Reactor vessel

(D) Both (A) and (C)

39. Which microorganism is commonly used in yogurt production ?

(A) *Escherichia coli*

(B) *Lactobacillus*

(C) *Clostridium*

(D) *Salmonella*

40. Biomass is measured by :

(A) OD

(B) Dry weight

(C) Cell count

(D) All of the above

41. Biopesticides are derived from :

(A) Synthetic chemicals

(B) Natural organisms or products

(C) Metals

(D) Plastics

42. Biofuels include :

(A) Ethanol

(B) Biodiesel

(C) Biogas

(D) All of the above

43. Batch fermentation involves :

(A) Continuous input/output

(B) No addition after start

(C) Only output

(D) Only input

44. Antibiotics are :

(A) Primary metabolites

(B) Secondary metabolites

(C) Enzymes

(D) Vitamins

45. Antibiotic resistance is :

(A) Good

(B) Neutral

(C) Bad

(D) None of the above

46. Amylase breaks :

(A) Protein

(B) Starch

(C) Lipid

(D) DNA

47. Amino acids are produced by :

(A) Corynebacterium

(B) Virus

(C) Algae

(D) Protozoa

48. Agitation helps in :

(A) Mixing

(B) Heat transfer

(C) Oxygen transfer

(D) All of the above

49. Affinity chromatography uses :

(A) Specific binding

(B) Size

(C) Charge

(D) Density

50. Aeration is required for :

(A) Anaerobes

(B) Aerobes

(C) Viruses

(D) None of the above

51. Phase II reactions generally involve :

(A) Oxidation

(B) Reduction

(C) Conjugation with endogenous molecules

(D) Hydrolysis

52. Bioavailability refers to :

(A) Rate of drug metabolism

(B) Fraction of administered drug reaching systemic circulation

(C) Drug elimination rate

(D) Drug toxicity level

53. Which pharmacokinetic parameter represents the volume in which the drug is distributed ?

(A) Clearance

(B) Half-life

(C) Volume of distribution

(D) Bioavailability

54. Cytochrome P450 enzymes are primarily involved in :

(A) Drug absorption

(B) Drug excretion

(C) Drug metabolism

(D) Drug transport

55. Phase I reactions in drug metabolism include :

(A) Conjugation

(B) Hydrolysis, oxidation, reduction

(C) Protein synthesis

(D) Filtration

56. Biotransformation of drugs mainly occurs in the :

(A) Brain

(B) Liver

(C) Skin

(D) Muscle

57. The first-pass metabolism occurs primarily in the :

(A) Kidney

(B) Heart

(C) Lung

(D) Liver

58. Which process describes the absorption, distribution, metabolism, and excretion of drugs ?

(A) Pharmacodynamics

(B) Pharmacokinetics

(C) Toxicology

(D) Pharmacognosy

59. Pharmacokinetics mainly deals with :

(A) Drug mechanism of action

(B) Drug toxicity

(C) Movement of drugs in the body

(D) Drug synthesis

60. Which phase of drug development involves testing on human volunteers ?

(A) Preclinical studies

(B) Clinical trials

(C) Drug discovery

(D) Post-marketing surveillance

61. Which type of biopesticide uses living organisms to control pests ?

(A) Botanical pesticides

(B) Mineral pesticides

(C) Chemical pesticides

(D) Microbial pesticides

62. Bioaccumulation refers to :

(A) Breakdown of pollutants

(B) Accumulation of substances in organisms

(C) Removal of toxins

(D) Filtration of water

63. Which process uses microorganisms to treat wastewater ?

(A) Fermentation

(B) Composting

(C) Activated sludge process

(D) Pasteurization

64. Phytoremediation involves :

(A) Use of animals

(B) Use of plants to remove pollutants

(C) Use of chemicals

(D) Use of heat

65. Which organism is commonly used in bioremediation ?

(A) Virus

(B) Birds

(C) Insects

(D) Fungi and bacteria

66. 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

67. The toxin produced by *Bacillus thuringiensis* is called :

(A) Endotoxin

(B) Cry toxin

(C) Exotoxin

(D) Mycotoxin

68. Which bacterium is widely used as a biopesticide ?

(A) *Bacillus thuringiensis*

(B) *Rhizobium*

(C) *Azotobacter*

(D) *Nitrosomonas*

69. Biogas contains :

(A) Methane

(B) CO_2

(C) H_2

(D) All of the above

70. Which temperature range is ideal for refrigeration ?

(A) 0-5°C

(B) 10-15°C

(C) 20-25°C

(D) 30-35°C

71. Which preservative is commonly used in jams and jellies ?

(A) Sodium chloride

(B) Sugar

(C) Vinegar

(D) Oil

72. The browning of cut fruits is mainly due to :

(A) Fermentation

(B) Dehydration

(C) Oxidation

(D) Freezing

73. Which packaging method removes air to prevent oxidation ?

(A) Canning

(B) Vacuum packaging

(C) Freezing

(D) Drying

74. Food irradiation helps to :

(A) Increase moisture

(B) Destroy microbes and pests

(C) Add flavor

(D) Change color

75. Which method removes water from food to increase shelf life ?

(A) Freezing

(B) Fermentation

(C) Drying

(D) Irradiation

76. Bioreactor control includes :

(A) pH

(B) Temperature

(C) DO

(D) All of the above

77. Pasteurization is mainly used to :

(A) Sterilize food completely

(B) Kill harmful microorganisms

(C) Add nutrients

(D) Remove moisture

78. Food preservation primarily aims to :

(A) Improve color

(B) Increase weight

(C) Prevent spoilage

(D) Enhance taste

79. Yield coefficient is :

(A) Product/substrate

(B) Biomass/substrate

(C) Both (A) and (B)

(D) None of the above

80. Waste treatment uses :

(A) Microorganisms

(B) Heat

(C) Pressure

(D) None of the above

81. Vitamin B_{12} is produced by :

(A) Bacteria

(B) Virus

(C) Plant

(D) Animal

82. Upstream processing includes :

(A) Product purification

(B) Culture preparation

(C) Packaging

(D) Marketing

83. Temperature affects :

(A) Growth

(B) Enzyme activity

(C) Product formation

(D) All of the above

84. Substrate utilization rate depends on :

(A) Growth

(B) Conditions

(C) Both (A) and (B)

(D) None of the above

85. Sterilization by heat uses :

(A) Autoclave

(B) Filter

(C) UV

(D) Chemicals

86. Stationary phase shows :

(A) Growth > death

(B) Growth = death

(C) Death > growth

(D) No cells

87. Specific growth rate is denoted by :

(A) μ

(B) λ

(C) θ

(D) π

88. SCP means :

(A) Single cell protein

(B) Simple cell protein

(C) Small cell protein

(D) None of the above

89. pH in fermentor is controlled by :

(A) Acid/base addition

(B) Temperature

(C) Pressure

(D) Light

90. Penicillin is produced by :

(A) Aspergillus

(B) Penicillium

(C) Rhizopus

(D) Yeast

91. Oxygen transfer rate depends on :

(A) Agitation

(B) Aeration

(C) Both (A) and (B)

(D) None of the above

92. Oxygen limitation leads to :

(A) Reduced growth

(B) Increased growth

(C) No effect

(D) Death only

93. Organic acids are :

(A) Citric acid

(B) Lactic acid

(C) Acetic acid

(D) All of the above

94. Most industrial microbes are :

(A) Pathogenic

(B) Non-pathogenic

(C) Harmful

(D) Toxic

95. Media used in fermentation contains :

(A) Nutrients

(B) Water only

(C) Oxygen only

(D) None of the above

96. Lyophilization means :

(A) Freeze drying

(B) Heating

(C) Cooling

(D) Mixing

97. Log phase shows :

(A) No growth

(B) Maximum growth

(C) Death

(D) Decline

98. Lipase breaks :

(A) Fat

(B) Protein

(C) Sugar

(D) DNA

99. Laminar airflow provides :

(A) Turbulence

(B) Sterile air

(C) Heat

(D) Pressure

100. Lag phase shows :

(A) Rapid growth

(B) Adaptation

(C) Death

(D) Decline

(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।