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
C

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. Phase II reactions generally involve :

(A) Oxidation

(B) Reduction

(C) Conjugation with endogenous molecules

(D) Hydrolysis

2. Bioavailability refers to :

(A) Rate of drug metabolism

(B) Fraction of administered drug reaching systemic circulation

(C) Drug elimination rate

(D) Drug toxicity level

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

(A) Clearance

(B) Half-life

(C) Volume of distribution

(D) Bioavailability

4. Cytochrome P450 enzymes are primarily involved in :

(A) Drug absorption

(B) Drug excretion

(C) Drug metabolism

(D) Drug transport

5. Phase I reactions in drug metabolism include :

(A) Conjugation

(B) Hydrolysis, oxidation, reduction

(C) Protein synthesis

(D) Filtration

6. Biotransformation of drugs mainly occurs in the :

(A) Brain

(B) Liver

(C) Skin

(D) Muscle

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

(A) Kidney

(B) Heart

(C) Lung

(D) Liver

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

(A) Pharmacodynamics

(B) Pharmacokinetics

(C) Toxicology

(D) Pharmacognosy

9. Pharmacokinetics mainly deals with :

(A) Drug mechanism of action

(B) Drug toxicity

(C) Movement of drugs in the body

(D) Drug synthesis

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

(A) Preclinical studies

(B) Clinical trials

(C) Drug discovery

(D) Post-marketing surveillance

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

(A) Botanical pesticides

(B) Mineral pesticides

(C) Chemical pesticides

(D) Microbial pesticides

12. Bioaccumulation refers to :

(A) Breakdown of pollutants

(B) Accumulation of substances in organisms

(C) Removal of toxins

(D) Filtration of water

13. Which process uses microorganisms to treat wastewater ?

(A) Fermentation

(B) Composting

(C) Activated sludge process

(D) Pasteurization

14. Phytoremediation involves :

(A) Use of animals

(B) Use of plants to remove pollutants

(C) Use of chemicals

(D) Use of heat

15. Which organism is commonly used in bioremediation ?

(A) Virus

(B) Birds

(C) Insects

(D) Fungi and bacteria

16. 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

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

(A) Endotoxin

(B) Cry toxin

(C) Exotoxin

(D) Mycotoxin

18. Which bacterium is widely used as a biopesticide ?

(A) *Bacillus thuringiensis*

(B) *Rhizobium*

(C) *Azotobacter*

(D) *Nitrosomonas*

19. Biogas contains :

(A) Methane

(B) CO_2

(C) H_2

(D) All of the above

20. Which temperature range is ideal for refrigeration ?

(A) 0-5°C

(B) 10-15°C

(C) 20-25°C

(D) 30-35°C

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

(A) Sodium chloride

(B) Sugar

(C) Vinegar

(D) Oil

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

(A) Fermentation

(B) Dehydration

(C) Oxidation

(D) Freezing

23. Which packaging method removes air to prevent oxidation ?

(A) Canning

(B) Vacuum packaging

(C) Freezing

(D) Drying

24. Food irradiation helps to :

(A) Increase moisture

(B) Destroy microbes and pests

(C) Add flavor

(D) Change color

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

(A) Freezing

(B) Fermentation

(C) Drying

(D) Irradiation

26. Bioreactor control includes :

(A) pH

(B) Temperature

(C) DO

(D) All of the above

27. Pasteurization is mainly used to :

(A) Sterilize food completely

(B) Kill harmful microorganisms

(C) Add nutrients

(D) Remove moisture

28. Food preservation primarily aims to :

(A) Improve color

(B) Increase weight

(C) Prevent spoilage

(D) Enhance taste

29. Yield coefficient is :

(A) Product/substrate

(B) Biomass/substrate

(C) Both (A) and (B)

(D) None of the above

30. Waste treatment uses :

(A) Microorganisms

(B) Heat

(C) Pressure

(D) None of the above

31. Vitamin B_{12} is produced by :

(A) Bacteria

(B) Virus

(C) Plant

(D) Animal

32. Upstream processing includes :

(A) Product purification

(B) Culture preparation

(C) Packaging

(D) Marketing

33. Temperature affects :

(A) Growth

(B) Enzyme activity

(C) Product formation

(D) All of the above

34. Substrate utilization rate depends on :

(A) Growth

(B) Conditions

(C) Both (A) and (B)

(D) None of the above

35. Sterilization by heat uses :

(A) Autoclave

(B) Filter

(C) UV

(D) Chemicals

36. Stationary phase shows :

(A) Growth > death

(B) Growth = death

(C) Death > growth

(D) No cells

37. Specific growth rate is denoted by :

(A) μ

(B) λ

(C) θ

(D) π

38. SCP means :

(A) Single cell protein

(B) Simple cell protein

(C) Small cell protein

(D) None of the above

39. pH in fermentor is controlled by :

(A) Acid/base addition

(B) Temperature

(C) Pressure

(D) Light

40. Penicillin is produced by :

(A) Aspergillus

(B) Penicillium

(C) Rhizopus

(D) Yeast

41. Oxygen transfer rate depends on :

(A) Agitation

(B) Aeration

(C) Both (A) and (B)

(D) None of the above

42. Oxygen limitation leads to :

(A) Reduced growth

(B) Increased growth

(C) No effect

(D) Death only

43. Organic acids are :

(A) Citric acid

(B) Lactic acid

(C) Acetic acid

(D) All of the above

44. Most industrial microbes are :

(A) Pathogenic

(B) Non-pathogenic

(C) Harmful

(D) Toxic

45. Media used in fermentation contains :

(A) Nutrients

(B) Water only

(C) Oxygen only

(D) None of the above

46. Lyophilization means :

(A) Freeze drying

(B) Heating

(C) Cooling

(D) Mixing

47. Log phase shows :

(A) No growth

(B) Maximum growth

(C) Death

(D) Decline

48. Lipase breaks :

(A) Fat

(B) Protein

(C) Sugar

(D) DNA

49. Laminar airflow provides :

(A) Turbulence

(B) Sterile air

(C) Heat

(D) Pressure

50. Lag phase shows :

(A) Rapid growth

(B) Adaptation

(C) Death

(D) Decline

51. Lactic acid is produced by :

(A) Lactobacillus

(B) Yeast

(C) Fungi

(D) Virus

52. Ion exchange separates by :

(A) Charge

(B) Size

(C) Shape

(D) Density

53. Insulin is produced by :

(A) Recombinant DNA

(B) Fermentation only

(C) Plants

(D) Animals

54. Inoculum is :

(A) Final product

(B) Starter culture

(C) Waste

(D) Media

55. Industrial strains are selected for :

(A) Low yield

(B) High productivity

(C) Pathogenicity

(D) Slow growth

56. Industrial fermentation is usually :

(A) Aerobic

(B) Anaerobic

(C) Both (A) and (B)

(D) None of the above

57. Industrial enzymes are produced by :

(A) Microbes

(B) Plants

(C) Animals

(D) All of the above

58. GMP stands for :

(A) Good Manufacturing Practice

(B) General Microbial Process

(C) Growth Management Process

(D) None of the above

59. Glutamic acid is used as :

(A) Sweetener

(B) Flavor enhancer

(C) Acid

(D) Base

60. Foam formation is controlled by :

(A) Antifoam

(B) Oxygen

(C) Nutrients

(D) Water

61. Filtration sterilization is used for :

(A) Solids

(B) Heat-sensitive materials

(C) Metals

(D) None of the above

62. Filtration is used for :

(A) Separation

(B) Growth

(C) Mixing

(D) None of the above

63. Filtrate contains :

(A) Solid

(B) Liquid

(C) Gas

(D) None of the above

64. Fermented food includes :

(A) Yogurt

(B) Bread

(C) Cheese

(D) All of the above

65. Fermentation is carried out in :

(A) Flask

(B) Bioreactor

(C) Test tube

(D) Petri dish

66. Fermentation efficiency depends on :

(A) Microorganism

(B) Media

(C) Conditions

(D) All of the above

67. Fed-batch fermentation is a combination of :

(A) Batch and continuous

(B) Aerobic and anaerobic

(C) Growth and death

(D) None of the above

68. Extraction is used for :

(A) Purification

(B) Growth

(C) Sterilization

(D) None of the above

69. Example of secondary metabolite :

(A) Glucose

(B) Ethanol

(C) Penicillin

(D) Amino acids

70. Example of primary metabolite :

(A) Penicillin

(B) Ethanol

(C) Streptomycin

(D) Tetracycline

71. Ethanol is produced by :

(A) Yeast

(B) Bacteria

(C) Virus

(D) Algae

72. Enzymes are used in :

(A) Detergents

(B) Food

(C) Textile

(D) All of the above

73. Drying improves :

(A) Stability

(B) Shelf life

(C) Storage

(D) All of the above

74. Downstream processing refers to :

(A) Cultivation

(B) Product recovery

(C) Sterilization

(D) Inoculation

75. Dilution rate is :

(A) Feed rate/volume

(B) Volume/feed rate

(C) Growth rate

(D) None of the above

76. Dialysis separates by :

(A) Size

(B) Charge

(C) Density

(D) Shape

77. Death phase shows :

(A) Growth

(B) Decline

(C) Stability

(D) Increase

78. Crystallization is used for :

(A) Purification

(B) Growth

(C) Mixing

(D) None of the above

79. Continuous fermentation involves :

(A) Closed system

(B) Open system

(C) Semi-open

(D) None of the above

80. Contamination leads to :

(A) Loss

(B) Reduced yield

(C) Spoilage

(D) All of the above

81. Clarification removes :

(A) Particles

(B) Cells

(C) Debris

(D) All of the above

82. Citric acid is produced by :

(A) *Aspergillus niger*

(B) *E. Coli*

(C) *Bacillus*

(D) Yeast

83. Chromatography is used for :

(A) Separation

(B) Identification

(C) Purification

(D) All of the above

84. Chemostat is used in :

(A) Batch

(B) Continuous

(C) Fed-batch

(D) None of the above

85. Centrifugation separates based on :

(A) Size

(B) Density

(C) Shape

(D) Color

86. Biosensors use :

(A) Enzymes

(B) Microbes

(C) Electrodes

(D) All of the above

87. Bioremediation uses :

(A) Microbes

(B) Plants

(C) Chemicals

(D) None of the above

88. Bioreactor is also known as :

(A) Fermentor

(B) Separator

(C) Reactor vessel

(D) Both (A) and (C)

89. Which microorganism is commonly used in yogurt production ?

(A) *Escherichia coli*

(B) *Lactobacillus*

(C) *Clostridium*

(D) *Salmonella*

90. Biomass is measured by :

(A) OD

(B) Dry weight

(C) Cell count

(D) All of the above

91. Biopesticides are derived from :

(A) Synthetic chemicals

(B) Natural organisms or products

(C) Metals

(D) Plastics

92. Biofuels include :

(A) Ethanol

(B) Biodiesel

(C) Biogas

(D) All of the above

93. Batch fermentation involves :

(A) Continuous input/output

(B) No addition after start

(C) Only output

(D) Only input

94. Antibiotics are :

(A) Primary metabolites

(B) Secondary metabolites

(C) Enzymes

(D) Vitamins

95. Antibiotic resistance is :

(A) Good

(B) Neutral

(C) Bad

(D) None of the above

96. Amylase breaks :

(A) Protein

(B) Starch

(C) Lipid

(D) DNA

97. Amino acids are produced by :

(A) Corynebacterium

(B) Virus

(C) Algae

(D) Protozoa

98. Agitation helps in :

(A) Mixing

(B) Heat transfer

(C) Oxygen transfer

(D) All of the above

99. Affinity chromatography uses :

(A) Specific binding

(B) Size

(C) Charge

(D) Density

100. Aeration is required for :

(A) Anaerobes

(B) Aerobes

(C) Viruses

(D) None of the above

(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।