**Roll No. .....**

| Question Booklet Number |
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**O. M. R. Serial No.**

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

## (New Syllabus Effective from 2023)

## ENVIRONMENTAL BIOCHEMISTRY

| Paper Code | | | | | | | | |
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| Questions Booklet Series |
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| 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. Population ecology primarily focuses on :

(A) Individual physiology

(B) Population structure, dynamics, and interactions

(C) Molecular biology

(D) Taxonomy

2. A population with high natality and low mortality will show :

(A) Declining growth

(B) Stable population

(C) Exponential growth

(D) Extinction

3. Age structure influencing future population growth is best represented by :

(A) Growth curve

(B) Life table

(C) Pyramid diagram

(D) Biomass

4. A population with more post-reproductive individuals will likely :

(A) Grow rapidly

(B) Decline over time

(C) Remain stable

(D) Show exponential growth

5. Which is a density-dependent factor ?

(A) Flood

(B) Temperature

(C) Competition

(D) Earthquake

6. If a population exceeds carrying capacity, it will :

(A) Continue growing indefinitely

(B) Crash or stabilize due to resource limitation

(C) Show no change

(D) Immediately go extinct

7. Density-independent factors include :

(A) Predation

(B) Disease

(C) Competition

(D) Natural disasters

8. Logistic growth differs from exponential growth by :

(A) Unlimited resources

(B) Inclusion of carrying capacity

(C) No growth

(D) Negative growth

9. A J-shaped curve indicates :

(A) Stable population

(B) Resource limitation

(C) Exponential growth without constraints

(D) Decline phase

10. A species with high density but low frequency suggests :

(A) Uniform distribution

(B) Clumped distribution

(C) Random distribution

(D) Rare species

11. Frequency indicates :

(A) Biomass

(B) Distribution of species

(C) Growth rate

(D) Productivity

12. Dominance is best measured by :

(A) Number of individuals

(B) Biomass or basal area

(C) Height

(D) Leaf number

13. Community structure includes :

(A) Only species richness

(B) Trophic levels and interactions

(C) Only population density

(D) Only abiotic factors

14. High species diversity generally leads to :

(A) Low stability

(B) High resilience and stability

(C) No change

(D) Increased extinction

15. Primary succession starts on :

(A) Previously vegetated land

(B) Bare substrate without life

(C) Grassland

(D) Forest

16. Secondary succession proceeds faster than primary succession because :

(A) No competition

(B) Soil and seed bank already present

(C) More disturbances

(D) Less nutrients

17. The sequence of communities in succession is called :

(A) Biome

(B) Sere

(C) Niche

(D) Habitat

18. A climax community is dynamic because :

(A) No species change

(B) Continuous minor changes maintain equilibrium

(C) Rapid species turnover

(D) No interactions occur

19. Evolutionary ecology studies :

(A) Genetic changes independent of environment

(B) Adaptations shaped by environmental pressures

(C) Only fossil records

(D) Only molecular evolution

20. Natural selection favors traits that :

(A) Are random

(B) Increase reproductive success in a given environment

(C) Reduce survival

(D) Are always dominant

21. Which pollutant is primarily responsible for photochemical smog formation ?

(A) $SO_2$

(B) NOx and hydrocarbons

(C) $CO_2$

(D) $O_3$ (stratospheric)

22. Increase in particulate matter (PM2.5) mainly affects :

(A) Stratosphere

(B) Respiratory efficiency and visibility

(C) Soil fertility

(D) Ocean salinity

23. High BOD in water indicates :

(A) Low organic load

(B) High oxygen content

(C) High microbial activity consuming oxygen

(D) Absence of pollutants

24. If eutrophication increases, dissolved oxygen will :

(A) Increase continuously

(B) Initially increase then sharply decrease

(C) Remain constant

(D) Become zero immediately

25. Lignin-rich effluents are difficult to degrade due to :

(A) Simple structure

(B) Aromatic complex polymer

(C) High solubility

(D) Low molecular weight

26. Accumulation of lignin in water bodies leads to :

(A) Increased transparency

(B) Reduced light penetration and photosynthesis

(C) Increased oxygen levels

(D) Faster decomposition

27. Phosphate-containing detergents contribute to :

(A) Acid rain

(B) Eutrophication

(C) Ozone depletion

(D) Global cooling

28. Replacement of non-biodegradable detergents with biodegradable ones will :

(A) Increase foam persistence

(B) Reduce long-term water pollution

(C) Increase BOD permanently

(D) Cause toxicity

29. Synthetic dyes in water primarily affect :

(A) pH only

(B) Light penetration and aquatic life

(C) Temperature only

(D) Salinity

30. Colored effluents reduce aquatic productivity because :

(A) Increase nutrients

(B) Block sunlight penetration

(C) Increase oxygen

(D) Increase pH

31. Which property makes heavy metals highly toxic ?

(A) Volatility

(B) Non-biodegradability and bioaccumulation

(C) High solubility

(D) Low density

32. Biomagnification leads to highest toxin concentration in :

(A) Producers

(B) Primary consumers

(C) Top predators

(D) Decomposers

33. Pharmaceutical pollutants in water may cause :

(A) Increased oxygen

(B) Antibiotic resistance

(C) Decreased BOD

(D) Water purification

34. Continuous exposure to low levels of drugs in water results in :

(A) Acute toxicity only

(B) Chronic ecological effects

(C) No biological impact

(D) Instant death of organisms

35. Pulp and paper mill effluents are rich in :

(A) Proteins

(B) Lignin and chlorinated compounds

(C) Oxygen

(D) Nitrogen gas

36. Sugar mill effluent has high :

(A) Heavy metals

(B) Organic load and BOD

(C) Oxygen

(D) Salinity

37. Discharge of untreated industrial effluents will :

(A) Increase dissolved oxygen

(B) Decrease BOD

(C) Deplete oxygen and harm aquatic life

(D) Improve water quality

38. Electrostatic precipitators are used to remove :

(A) Gaseous pollutants

(B) Particulate matter

(C) Liquid waste

(D) Heat

39. Cyclone separators remove :

(A) Fine gases

(B) Coarse particles

(C) Dissolved solids

(D) Microbes

40. Efficiency of pollution control devices depends on :

(A) Only cost

(B) Pollutant type and particle size

(C) Weather only

(D) Water content only

41. UV-B radiation primarily causes :

(A) Bone growth

(B) DNA damage

(C) Photosynthesis increase

(D) Cooling

42. Gamma rays are harmful because they :

(A) Are visible

(B) Are highly ionizing and penetrating

(C) Are low energy

(D) Do not affect cells

43. Depletion of ozone layer results in :

(A) Reduced UV radiation

(B) Increased UV exposure on Earth

(C) Decreased temperature

(D) Increased oxygen

44. Greenhouse gases include :

(A) $O_2$

(B) $CO_2$ and $CH_4$

(C) $N_2$

(D) $H_2$

45. Increase in greenhouse gases leads to :

(A) Global cooling

(B) Enhanced heat trapping and climate change

(C) Ozone formation

(D) Reduced evaporation

46. Biodegradable pollutants are :

(A) Persistent

(B) Broken down by microorganisms

(C) Toxic metals

(D) Plastics

47. Non-degradable pollutants accumulate because they :

(A) Are rapidly degraded

(B) Resist microbial decomposition

(C) Are soluble

(D) Are volatile

48. Primary treatment removes :

(A) Dissolved pollutants

(B) Suspended solids

(C) Nutrients

(D) Microorganisms

49. Secondary treatment mainly involves :

(A) Chemical oxidation

(B) Biological degradation of organic matter

(C) Filtration

(D) Chlorination only

50. Tertiary treatment is essential when :

(A) Only solids are present

(B) Removal of nutrients and toxins is required

(C) Water is clean

(D) No treatment is needed

51. Toxicity of agrochemicals in plants often leads to :

(A) Increased photosynthesis

(B) Inhibition of enzymatic pathways

(C) Increased nutrient uptake

(D) Enhanced respiration

52. Lipophilic toxicants tend to :

(A) Be rapidly excreted

(B) Accumulate in fatty tissues

(C) Remain only in blood

(D) Be non-toxic

53. Bioaccumulation differs from biomagnification in that it :

(A) Occurs only in plants

(B) Refers to buildup within a single organism

(C) Occurs only at higher trophic levels

(D) Does not involve toxins

54. Free radicals are harmful because they :

(A) Stabilize molecules

(B) Initiate chain reactions damaging biomolecules

(C) Increase enzyme activity

(D) Reduce oxidation

55. Oxidative stress occurs when :

(A) Antioxidants exceed free radicals

(B) Free radical production exceeds antioxidant defense

(C) No oxygen is present

(D) Only enzymes are active

56. Which acts as a natural antioxidant ?

(A) Vitamin C

(B) Carbon dioxide

(C) Nitrogen

(D) Methane

57. Xenobiotics are characterized by :

(A) Being essential nutrients

(B) Being foreign to biological systems

(C) Being always biodegradable

(D) Being non-toxic

58. Persistent xenobiotics pose long-term risk because they :

(A) Degrade rapidly

(B) Accumulate and resist metabolism

(C) Are water-soluble

(D) Are volatile

59. Bioremediation uses organisms to :

(A) Produce pollutants

(B) Convert pollutants into less toxic forms

(C) Increase toxicity

(D) Stop decomposition

60. Effectiveness of bioremediation depends on :

(A) Only temperature

(B) Microbial activity, nutrients, and environmental conditions

(C) Only pollutants

(D) Only water

61. Phytoremediation is best suited for :

(A) Air purification only

(B) Removal of heavy metals from soil

(C) Noise control

(D) Heat reduction

62. Vermiculture improves soil fertility by :

(A) Increasing toxins

(B) Enhancing nutrient availability

(C) Reducing microorganisms

(D) Increasing salinity

63. Earthworms enhance soil quality mainly by :

(A) Reducing aeration

(B) Increasing aeration and organic matter decomposition

(C) Removing nutrients

(D) Producing toxins

64. Detoxification of xenobiotics primarily involves :

(A) Photosynthesis

(B) Enzymatic transformation

(C) Mechanical filtration

(D) Diffusion only

65. Phase I detoxification reactions generally :

(A) Make compounds more lipophilic

(B) Introduce reactive groups for further metabolism

(C) Eliminate toxins completely

(D) Prevent metabolism

66. Cytochrome P450 enzymes are mainly involved in :

(A) Digestion

(B) Detoxification

(C) Respiration

(D) Photosynthesis

67. Environmental monitoring includes :

(A) Ignoring pollutants

(B) Measuring and assessing environmental quality

(C) Producing chemicals

(D) Eliminating species

68. Bioindicators are useful because they :

(A) Replace instruments

(B) Reflect cumulative environmental effects

(C) Only detect physical factors

(D) Do not respond to pollutants

69. Ecosystem analysis focuses on :

(A) Only species count

(B) Structure, function, and energy flow

(C) Only abiotic factors

(D) Only genetics

70. Disturbance in detoxification pathways in organisms will :

(A) Increase resistance

(B) Increase toxicity effects

(C) Have no impact

(D) Improve metabolism

71. Acute toxicity is best characterized by :

(A) Low dose over long duration

(B) High dose exposure with rapid onset of effects

(C) No observable effect

(D) Genetic mutation only

72. A compound showing no immediate toxicity but causing damage after prolonged exposure is classified as :

(A) Acute toxicant

(B) Chronic toxicant

(C) Non-toxic

(D) Teratogen

73. Sub-acute toxicity testing typically involves :

(A) Single dose exposure

(B) Repeated exposure over short duration

(C) Lifetime exposure

(D) *In vitro* testing only

74. $LD_{50}$ is used to measure :

(A) Safe dose

(B) Dose causing 50% mortality in test organisms

(C) Minimum dose

(D) Maximum tolerance

75. If two chemicals have the same $LD_{50}$, but one causes effects at lower doses chronically, it is :

(A) Less toxic

(B) More hazardous in long-term exposure

(C) Non-toxic

(D) Only acutely toxic

76. A substance that alters DNA sequence is :

(A) Carcinogen

(B) Mutagen

(C) Teratogen

(D) Allergen

77. A chemical causing cancer without directly mutating DNA is classified as :

(A) Direct mutagen

(B) Non-genotoxic carcinogen

(C) Teratogen

(D) Antioxidant

78. Teratogenic effects are most critical during :

(A) Adult stage

(B) Embryonic development

(C) Old age

(D) Post-reproductive phase

79. The primary basis of antidotal therapy is to :

(A) Increase toxin absorption

(B) Neutralize or eliminate toxin action

(C) Enhance toxicity

(D) Delay metabolism

80. Activated charcoal is effective as an antidote because it :

(A) Chemically destroys toxins

(B) Adsorbs toxins, reducing their bioavailability

(C) Increases metabolism

(D) Acts as enzyme inhibitor

81. Which statement best defines ecology at an advanced level ?

(A) Study of organisms only

(B) Study of energy flow only

(C) Study of interactions among organisms and their abiotic environment across scales

(D) Study of plants only

82. Which factor is most likely to act as a limiting factor in desert ecosystems ?

(A) Light

(B) Water availability

(C) Oxygen

(D) Carbon dioxide

83. The biosphere is best described as :

(A) Sum of all ecosystems functioning independently

(B) Global ecological system integrating all living beings and their relationships

(C) Only terrestrial ecosystems

(D) Only aquatic ecosystems

84. Increased complexity in a food web generally leads to :

(A) Decreased stability

(B) Increased stability due to alternative pathways

(C) No change

(D) Collapse of ecosystem

85. Removal of a top predator is most likely to cause :

(A) Increase in producers

(B) Trophic cascade

(C) Decrease in herbivores

(D) No effect

86. Why is energy flow unidirectional in ecosystems ?

(A) Energy is recycled.

(B) Energy is lost as heat at each trophic level.

(C) Producers consume energy.

(D) Consumers produce energy.

87. Which trophic level has maximum energy ?

(A) Primary consumers

(B) Secondary consumers

(C) Producers

(D) Tertiary consumers

88. An inverted pyramid of biomass is typical of :

(A) Grasslands

(B) Forests

(C) Aquatic ecosystems

(D) Deserts

89. If energy transfer efficiency increases from 10% to 20%, the food chain will :

(A) Shorten

(B) Lengthen

(C) Remain unchanged

(D) Collapse

90. Which ecosystem has the highest productivity per unit area ?

(A) Desert

(B) Open ocean

(C) Tropical rainforest

(D) Tundra

91. Ecosystem development (succession) ultimately leads to :

(A) Instability

(B) Increased entropy only

(C) Climax community with dynamic equilibrium

(D) Loss of biodiversity

92. Two species cannot coexist indefinitely if they occupy identical :

(A) Habitats

(B) Niches

(C) Food chains

(D) Biomes

93. Realized niche is smaller than fundamental niche due to :

(A) Abiotic factors only

(B) Biotic interactions like competition

(C) Climate change

(D) Mutation

94. Net Primary Productivity (NPP) is :

(A) Total energy fixed

(B) GPP-respiration losses

(C) Energy consumed by herbivores

(D) Total biomass

95. High standing crop with low productivity indicates :

(A) Rapid turnover

(B) Slow turnover and long-lived biomass

(C) High energy loss

(D) Unstable ecosystem

96. Which is a reliable ecological indicator of air pollution ?

(A) Moss

(B) Lichens

(C) Algae

(D) Ferns

97. Ecological efficiency is generally limited to ~10% due to :

(A) Nutrient loss

(B) Heat loss via respiration

(C) Lack of food

(D) Competition

98. Edge effect leads to higher biodiversity because :

(A) Reduced competition

(B) Overlapping niches of adjacent communities

(C) Lower predation

(D) Less light

99. Which cycle has a significant gaseous phase ?

(A) Phosphorus cycle

(B) Nitrogen cycle

(C) Sulfur cycle

(D) Calcium cycle

100. Disturbance in carbon cycle (e.g., deforestation) primarily leads to :

(A) Increased soil fertility

(B) Increased atmospheric $CO_2$

(C) Decreased oxygen

(D) Reduced temperature

*(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।