Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Biotechnology) (Second Semester)
(NEP) EXAMINATION, 2025-26

ENZYMOLOGY

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)**

1. Which of the following support carrier is used in the covalent binding method ?
   (A) Agarose
   (B) Glutaraldehyde
   (C) Both (A) and (B)
   (D) None of the above

2. What does the following equation is also known as the double reciprocal plot ?
   (A) Eadie-Hofstee plot equation
   (B) Miachelis Menten equation
   (C) Lineweaver Burk plot
   (D) Hanes plot equation

3. The pH at which an enzyme carries no net electrical charge is called :
   (A) Isotonic point
   (B) Isoelectric point
   (C) Isobestic point
   (D) None of the above

4. Haemoglobin is an :
   (A) Monomeric protein
   (B) Dimeric protein
   (C) Tetrameric protein
   (D) Trimeric protein

5. Which of the following is false for lactate dehydrogenase (LDH) ?
   (A) It is a tetrameric enzyme
   (B) It catalyzes L-lactate to pyruvate
   (C) It has five isoenzymes
   (D) None of the above

6. Which method is used to remove low molecular weight impurities ?
   (A) Lyophilisation
   (B) Ultrasonication
   (C) Freezing
   (D) Ultrafiltration

7. Which of the following method is involved in enzyme purification ?
   (A) Ultrafiltration
   (B) Dialysis
   (C) Chromatographic techniques
   (D) All of the above

8. During lyophilization (freeze-drying), which of the following processes takes place ?
   (A) Freezing
   (B) Sublimation under low pressure
   (C) Adsorption
   (D) All of the above

9. Which method is commonly used to determine the molecular weight of a purified enzyme ?
   (A) Ion exchange chromatography
   (B) Dialysis
   (C) SDS-PAGE
   (D) Precipitation

10. In the pyruvate dehydrogenase complex, Dihydrolipoyl transacetylase corresponds to which subunit ?

(A) El subunit

(B) E2 subunit

(C) E3 subunit

(D) None of the above

11. In the pyruvate dehydrogenase complex, pyruvate dehydrogenase corresponds to which subunit ?

(A) El subunit

(B) E2 subunit

(C) E3 subunit

(D) None of the above

12. Pyruvate dehydrogenase kinase phosphorylates how many specific serine residues on the E1 subunit of the pyruvate dehydrogenase complex ?

(A) One

(B) Two

(C) Three

(D) Four

13. Which of the following will inhibit the pyruvate dehydrogenase complex ?

(A) Increase ATP / ADP ratio

(B) Increase FADH / NAD ratio

(C) Decrease FADH / NAD ratio

(D) All of the above

14. In the pyruvate dehydrogenase complex, the E3 subunit corresponds to :

(A) Dihydrolipoyl transacetylase

(B) Dihydrolipoyl dehydrogenase

(C) Pyruvate dehydrogenase

(D) Glyceraldehyde-3 phosphate dehydrogenase

15. Which reaction is catalyzed by the pyruvate dehydrogenase complex ?

(A) Acetyl-CoA to pyruvate

(B) Pyruvate to Phosphoenolpyruvate

(C) Phosphoenolpyruvate to pyruvate

(D) None of the above

16. Which of the following enzymes are components of the pyruvate dehydrogenase complex ?

(A) Pyruvate dehydrogenase

(B) Dihydrolipoyl isomerase

(C) Dihydrolipoyl phophatase

(D) None of the above

17. The enzyme preparation rennet is mainly used in which industry ?

(A) Baking industry

(B) Butter industry

(C) Cheese industry

(D) Pharma industry

18. The enzyme papain is primarily used for :

(A) Bread baking

(B) Fruit processing

(C) Cheese making

(D) Meat tenderization

19. Which of the following enzyme is used in the brewing industry ?

(A) Fungal α-amylase

(B) β-glucanase

(C) Pectinesterase

(D) All of the above

20. Which enzyme is known to possess antiviral properties ?

(A) Lysozyme

(B) Pectin lyase

(C) Protease

(D) Amylase

21. Which of the following enzymes is not involved in triacylglycerol assays ?

(A) Lipase

(B) Glycerol kinase

(C) Urease

(D) None of the above

22. Which enzyme is commonly used in the treatment of eye infections ?

(A) Asparginase

(B) Penicillinase

(C) Lysozyme

(D) All of the above

23. The enzyme urokinase is primarily used for :

(A) Dissolving blood clots in myocardial infarction

(B) Dissolving blood clots in leg injuries

(C) Dissolving blood clots in any injury

(D) None of the above

24. The enzyme hyaluronidase ..... .

(A) Enhances the rapid absorption of drug injected subcutaneously

(B) Increases tissue permeability

(C) Both (A) and (B)

(D) None of the above

25. Which of the following enzyme preparations is commonly used to treat traumatic, surgical, and orthopedic injuries ?

(A) Pepsin

(B) Elastase

(C) Cellulase

(D) None of the above

26. Which enzyme is used to treat allergic reactions caused by penicillin ?

(A) Gamma – Lactamase
(B) Beta – Lactamase
(C) Alpha – Lactamase
(D) All of the above

27. The enzyme collagenase is used in the treatment of :

(A) Mouth ulcers
(B) Skin ulcers
(C) Stomach ulcers
(D) None of the above

28. Which enzyme is used in the treatment of cancer ?

(A) Pepsin
(B) Asparginase
(C) Aspartase
(D) Aspartic acid

29. In which of the following method, entrapment can be achieved ?

(A) Adsorption
(B) Microencapsulation
(C) Covalent binding
(D) All of the above

30. The enzyme is confined in a molecular cage by which immobilization method ?

(A) Adsorption
(B) Entrapment
(C) Covalent binding
(D) None of the above

31. Which of the following is non-adsorbent ?

(A) Porous carbon
(B) Silica gel
(C) Both (A) and (B)
(D) None of the above

32. The surface of the matrix on which an enzyme is immobilized is known as :

(A) Enzyme immobilization
(B) Carrier matrix
(C) Adsorption
(D) Biosensor matrix

33. Which of the following is a disadvantage of using immobilized enzymes ?

(A) Repeated use of enzymes
(B) Minimal downstream processing
(C) Thermal stability of the enzyme increases
(D) None of the above

34. The catalytic efficiency of two different enzymes is commonly compared using :

(A) Type of product
(B) Enzymes molecular weight
(C) Optimum pH
(D) None of the above

35. Mixed inhibitor binds at :

(A) The active site

(B) Does not bind on enzyme

(C) Binds on substrate

(D) None of the above

36. Which of the following is an example of irreversible inhibitor ?

(A) Iodoacetamide

(B) potassium cyanide

(C) Both (A) and (B)

(D) None of the above

37. Which of the following is not an irreversible inhibitor ?

(A) Disulfiram

(B) Oseltamivir

(C) Protease inhibitors

(D) None of the above

38. The rate determining step of Michaelis-Menten kinetics is :

(A) The ES complex formation step

(B) The ES complex dissociation step to produce products

(C) The Enzyme substrate-binding step

(D) None of the above

39. Which enzyme does not utilize water as a hydroxyl group donor during the substrate breakdown ?

(A) Transferases

(B) Lyases

(C) Hydrolases

(D) Both (A) and (B)

40. Reversible covalent modification of enzymes typically do not involves :

(A) Inhibition of proenzymes

(B) Denaturation of proenzymes

(C) Both (A) and (B)

(D) None of the above

41. Which bond is associated with Enzyme-substrate interaction ?

(A) Hydrogen bonds

(B) Ionic bonds

(C) Both (A) and (B)

(D) None of the above

42. Compared to an enzyme-catalyzed reaction, an uncatalyzed reaction has :

(A) Lower activation energy

(B) Moderate activation energy

(C) Higher activation energy

(D) None of the above

43. Product inhibition refers to :

(A) Enzymatic activation

(B) Feedback inhibition

(C) Intermediate inhibition

(D) None of the above

44. Which enzymes can function without the need for coenzymes ?

(A) Intracellular enzymes

(B) Mitochondrial enzymes

(C) Both (A) and (B)

(D) None of the above

45. Antibodies that possess catalytic activity are known as :

(A) Apezymes

(B) Abzymes

(C) Apozymes

(D) Both (B) and (C)

46. Which of the following is not a proenzyme (inactive precursor of an enzyme) ?

(A) Chymotrypsin

(B) Trypsin

(C) Both (A) and (B)

(D) Pepsinogen

47. The combination of an apoenzyme and its coenzyme is known as :

(A) Helloenzyme

(B) Holoenzyme

(C) Alloenzyme

(D) Uloenzyme

48. An enzyme exhibits its maximum catalytic activity at :

(A) Precatalytic pH

(B) Optimum pH

(C) Optimum temperature

(D) Both (B) and (C)

49. Which bond is usually not associated with Enzyme-substrate interaction ?

(A) Hydrogen bonds

(B) Ionic bonds

(C) Covalent bonds

(D) Van der Waal's force of attraction

50. Enzymes are usually :

(A) Thermostable

(B) Protein

(C) Both (A) and (B)

(D) None of the above

51. An apoenzyme is primarily composed of :

(A) Vitamin

(B) Amino acids

(C) Lipid

(D) Carbohydrate

52. A coenzyme is typically :

(A) A protein

(B) A metal ion

(C) Always an inorganic compound

(D) Usually vitamin

53. An enzyme functions to :

(A) Increases reaction time

(B) Increases activation energy

(C) Does not change activation energy

(D) Decreases activation energy

54. The molecule that binds directly to an enzyme and increases its catalytic rate is called :

(A) Modulator

(B) Inhibitor

(C) Regulator

(D) Activator

55. The Michaelis-Menten equation produces which type of kinetic curve ?

(A) Hyperbolic curve

(B) Sigmoidal curve

(C) Straight line with negative slope

(D) Parabolic curve

56. Which X-ray diffraction data used for the determination of protein structure ?

(A) The number of electrons in the crystal.

(B) The size of the protein in the crystal.

(C) The strength of the X-ray beam used in the experiment.

(D) The electron density at different locations in the crystal.

57. Which of the following methods is typically employed to determine the purity of a protein sample ?

(A) Western blotting

(B) Estimation of enzymatic activity

(C) SDS-PAGE

(D) None of the above

58. When a mixture of protein and a high concentration of residual salt is applied to a gel filtration column, what happens to the salt ?

(A) Elute before the protein.

(B) Stick to the column.

(C) Remain at the top of the column.

(D) Elute from the column after the protein.

59. Which salt is commonly used for fractional precipitation in protein purification ?

(A) Sodium chloride

(B) Ammonium sulphate

(C) Guanidinium HCL

(D) Ammonium perchlorate

60. Which is not true ?

(A) Enzymes are proteins that function as catalysts.

(B) Enzymes are specific.

(C) Enzyme activity can be regulated.

(D) Enzyme activity cannot be regulated

61. A protein that binds two ligands without cooperativity will show :

(A) A hyperbolic binding curve

(B) A sigmoidal binding curve

(C) Both (A) and (B)

(D) None of the above

62. The cooperativity of O_2 binding to haemoglobin results in a :

(A) Extensive protein conformational change.

(B) Release of H^+ with the dissociation of O_2.

(C) Both (A) and (B)

(D) None of the above

63. Allosteric effects that occur in haemoglobin :

(A) Important for maintaining Fe in the Fe^{2+} state.

(B) Minimize oxygen delivery to the tissues.

(C) Optimize oxygen delivery to the tissues.

(D) All of the above

64. The dissociation constant (K_d) is defined as :

(A) A measure of how easily the alpha and beta subunits combine to form haemoglobin.

(B) The inverse of the Hill coefficient.

(C) The inverse of the association constant.

(D) All of the above

65. Which feature indicates negative cooperative binding in enzymes or proteins ?

(A) A hill plot with a slope equal to one.

(B) A hill plot with a slope less than one.

(C) A hill plot with a slope greater than one.

(D) None of the above

66. Which feature indicates positive cooperative binding in enzymes or proteins ?

(A) A hill plot with a slope equal to one.

(B) A hill plot with a slope greater than one.

(C) A hill plot with a slope less than one.

(D) None of the above

67. The 'Ping Pong' enzyme mechanism is another name for :

(A) Single displacement bi-substrate reaction

(B) Single-substrate reaction

(C) Double-displacement bi-substrate reaction

(D) None of the above

68. In steady-state enzyme kinetics, which assumption is considered valid ?

(A) The concentration of [S] is decreasing.

(B) The concentration of [ES] is constant.

(C) The total amount of enzyme decreases.

(D) All of the above

69. In which situation does an enzyme-catalyzed reaction follow first-order kinetics ?

(A) When substrate concentration is much lower than K_m

(B) When substrate concentration is much higher than K_m

(C) When the enzyme is fully saturated with substrate

(D) When the reaction rate is independent of substrate concentration

70. Which type of enzyme kinetics is observed when the reaction reaches a plateau (maximum rate) phase ?

(A) First order kinetics

(B) Zero order kinetics

(C) Second order kinetics

(D) Pseudo order

71. Turnover number is also known as :

(A) K_{cat}

(B) V_{max}

(C) Enzyme activity

(D) Specific activity

72. Which type of enzyme inhibition results in a decrease in the Michaelis constant (K_m) ?

(A) Competitive

(B) Uncompetative inhibition.

(C) Non-competitive

(D) Both (A) and (C)

73. Which type of enzyme inhibition occurs when the inhibitor binds exclusively to the enzyme-substrate (ES) complex ?

(A) Uncompetitive

(B) Competitive

(C) Non-competitive

(D) None of the above

74. Which statement correctly describes the Michaelis constant (K_m) ?

(A) It is the measure of the stability of the EP complex

(B) A low K_m indicates weak substrate binding

(C) A low K_m indicates strong substrate binding

(D) None of the above

75. A competitive inhibitor of an enzyme is usually :

(A) Highly reactive compound.

(B) Metal ion such as Hg^{2+} or Pb^{2+}

(C) Substrate analogs.

(D) Poison.

76. A non-competitive inhibitor :

(A) It changes the y-intercept

(B) Increases V_{max}

(C) Both (A) and (B)

(D) None of the above

77. What change does a competitive inhibitor cause in the Lineweaver-Burk (double reciprocal) plot of an enzyme-catalyzed reaction ?

(A) It moves the entire curve to the left.

(B) It changes the y-intercept.

(C) It has no effect on the slope.

(D) None of the above

78. An allosteric inhibitor of an enzyme normally ..... .

(A) Denatures the enzyme

(B) Binds to the active site

(C) Speedup the enzyme catalysis

(D) Participates in feedback regulation

79. In an enzyme catalyzed reaction the K_m obtained was 10 mM and V_{max} was 200 μmol/min. Which one of the following options represents the initial velocity of the reaction at a substrate concentration of 10 mM ?

(A) 25 μmol/min

(B) 50 μmol/min

(C) 100 μmol/min

(D) 75 μmol/min

80. Uncompetitive inhibitor :

(A) Binds to an enzymesubstrate complex

(B) Changes apparent K_m of the enzyme

(C) Lowers the V_{max} of the reaction.

(D) All of the above

81. Which assumption was considered by Michaelis and Menten in deriving their enzyme kinetics equation ?

(A) Substrate bound to enzyme at any given moment is small compared to the amount of free substrate.

(B) Non enzymatic degradation of substrate is the major step

(C) Concentration of the substrate can be ignored.

(D) None of the above

82. In a catalyzed reaction, the transition state is characterized as :

(A) Having higher energy than in an uncatalyzed reaction

(B) Having lower energy than in an uncatalyzed reaction

(C) Having lower energy than the substrate

(D) Being weakly bound to the enzyme/catalyst

83. How does the active site of an enzyme differ from an antibody-antigen binding site ?

(A) It contains modified amino acids.

(B) It catalyzes a chemical reaction.

(C) It contains amino acids without side chains.

(D) All of the above are correct.

84. The active site of an enzyme is complementary to the ..... .

(A) Allosteric molecule

(B) Product

(C) Substrate

(D) None of the above

85. The catalytic efficiency of two different enzymes can be compared by the :

(A) Formation of the product

(B) Molecular size of the enzymes

(C) pH of optimum value

(D) K_{cat} / K_m value

86. Which one of the following statements regarding V_{max} and K_m is true ?

(A) V_{max} is the maximum rate at which a particular enzyme-catalysed reaction can proceed.

(B) A small value of K_m tells us that an enzyme binds strongly to its substrate

(C) A large value of K_m tells us that an enzyme shows little specificity for a given substrate

(D) All of the above

87. In which of the following model, enzyme is considered as non- flexible ?

(A) Lock and key

(B) Induced fit model

(C) Lock induced model

(D) None of the above

88. Which of the following statement is incorrect ?

(A) Changes in quaternary structure reduces the catalytic activity

(B) Specificity allows the enzymes to co-exist in the same cell without any interference

(C) Lock and key model is also known as rigid template model.

(D) None of the above

89. Who proposed induced fit model ?

(A) Daniel Emil

(B) Daniel Emil Koshland

(C) Daniel Fisher Koshland

(D) Daniel Koshland

90. In which of the following model, enzyme is considered as pre-shaped ?

(A) Key induced Model

(B) Lock induced model

(C) Lock and key model

(D) Induced fit model

91. The class of enzymes which contains extensive group of enzymes are ..... .

(A) Ligases

(B) Aldolases

(C) Lyases

(D) Oxidoreductases

92. Lactate dehydrogenase is the example of which category of enzyme classification ?

(A) Ligase

(B) Lyase

(C) Oxidoreductase

(D) Isomerase

93. Alanine racemase is the example of which category of enzyme classification ?

(A) Ligase

(B) Isomerase

(C) Lyase

(D) None of the above

94. Lyases catalyzes addition and elimination reactions and often form a new ..... .

(A) Triple bond in the product

(B) Two triple bond in the product

(C) Tetra bond in the product

(D) Double bond in the product

95. Enzyme without its cofactor called ?

(A) Apoenzyme

(B) Apkoenzyme

(C) Holoenzyme

(D) Halloenzyme

96. Systematic classification of enzyme is developed by :

(A) Internal Enzyme Centre

(B) International Enzyme Commission

(C) International Enzyme Corporation

(D) International Enzyme Company

97. According to which model substrate is capable of inducing the proper alignment of the active site of the enzyme ?

(A) Lock and key model

(B) Fluid mosaic model

(C) Key fit model

(D) None of the above

98. The lock and key model was given by :

(A) Daniel Fischer

(B) Dany Fischer

(C) Don Fischer

(D) None of the above

99. Choose the correct statement regarding lock and key model :

(A) Enzyme and substrate posses' specific complementary geometric shapes

(B) Active site of enzyme is rigid

(C) Active site is flexible

(D) All of the above

100. Enzymes are primarily composed of :

(A) Steroid

(B) Nucleotides

(C) Amino acids

(D) Lipid

(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।