M. Sc. (Biochemistry) (Second Semester)

EXAMINATION, July, 2022

ENZYMOLOGY

Paper Code

BCH 2 0 0 2

Questions Booklet Series

C

Time : 1:30 Hours]

[*Maximum Marks : 100*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 60 questions. Examinee is required to answer any 50 questions in the OMR Answer-Sheet provided and not in the question booklet. If more than 50 questions are attempted by student, then the first attempted 50 questions will be considered for evaluation. 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.

(Remaining instructions on the last page)

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 60 प्रश्न हैं। परीक्षार्थी को किन्हीं 50 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। यदि छात्र द्वारा 50 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 50 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा। 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।

(शेष निर्देश अन्तिम पृष्ठ पर)

(Only for Rough Work)

1. The induced fit model of enzyme action was proposed by :

    (A) Fischer

    (B) Koshland

    (C) Mitchell

    (D) Markert

2. Allosteric inhibition is also known as :

    (A) Competitive inhibition

    (B) Non-competitive inhibition

    (C) Feedback inhibition

    (D) None of the above

3. When the velocity of an enzymatic reaction equals $V_{max}/2$, substrate concentration is :

    (A) Half of K_m

    (B) Equal to K_m

    (C) Twice the K_m

    (D) Far above the K_m

4. In Lineweaver-Burk plot, the *y*-intercept represents :

    (A) V_{max}

    (B) K_m

    (C) $2 K_m$

    (D) $1/K_m$

5. Covalent modification of an enzyme generally requires a :

    (A) Hormone

    (B) cAMP

    (C) Protein kinase

    (D) All of the above

6. Enzymes accelerate the rate of reactions by :

    (A) Increasing the equilibrium constant of reactions

    (B) Increasing the energy of activation

    (C) Decreasing the energy of activation

    (D) Decreasing the free energy change of the reaction

7. Kinetics of an allosteric enzyme is explained by :

    (A) Michaelis-Menten equation

    (B) Lineweaver-Burk plot

    (C) Hill plot

    (D) All of the above

8. Covalent modification of an enzyme usually involves phosphorylation/ dephosphorylation of :

    (A) Serine residue

    (B) Proline residue

    (C) Hydroxylysine residue

    (D) Hydroxyproline residue

9. V_{max} of an enzyme may be affected by :

(A) pH

(B) Temperature

(C) Non-competitive inhibitors

(D) All of the above

10. In enzyme assays, all the following are kept constant, except :

(A) Substrate concentration

(B) Enzyme concentration

(C) pH

(D) Temperature

11. If the substrate concentration is much below the K_m of the enzyme, the velocity of the reaction is :

(A) Directly proportional to substrate concentration

(B) Not affected by enzyme concentration

(C) Nearly equal to V_{max}

(D) Inversely proportional to substrate concentration

12. Pyruvate dehydrogenase complex is regulated by :

(A) Covalent modification

(B) Allosteric regulation

(C) Both (A) and (B)

(D) None of the above

13. An allosteric inhibitor of pyruvate dehydrogenase is :

(A) Acetyl-CoA

(B) ATP

(C) NADH

(D) Pyruvate

14. All of the following are allosteric enzymes, except :

(A) Citrate synthetase

(B) a-Ketoglutarate dehdrogenase

(C) Succinate thiokinase

(D) Succinate dehydrogenase

15. ATP is a co-substrate as well as an allosteric inhibitor of :

(A) Phosphofructokinase

(B) Hexokinase

(C) Glucokinase

(D) None of the above

16. The rate of most enzyme catalysed reactions changes with pH. As the pH increases, this rate :

(A) reaches a minimum, then increases

(B) reaches a maximum, then decreases

(C) increases

(D) decreases

17. The Michaelis-Menten hypothesis :

(A) Postulates the formation of an enzyme substrate complex.

(B) Enables us to calculate the isoelectric point of an enzyme.

(C) States that the rate of a chemical reaction may be independent of substrate concentration.

(D) States that the reaction rate is proportional to substrate concentration.

18. In non-competitive enzyme action :

(A) V_{max} is increased.

(B) Apparent K_m is increased.

(C) Apparent K_m is decreased.

(D) Concentration of active enzyme molecule is reduced.

19. An allosteric enzyme influences the enzyme activity by :

(A) Competiting for the catalytic site with the substrate

(B) Changing the specificity of the enzyme for the substrate

(C) Changing the conformation of the enzyme by binding to a site other than catalytic site

(D) Changing the nature of the products formed

20. Which of the following regulatory reactions involves a reversible covalent modification of an enzyme ?

(A) Phosphorylation of serine OH on the enzyme

(B) Allosteric modulation

(C) Competitive inhibition

(D) Non-competitive inhibition

21. A competitive inhibitor of an enzyme has which of the following properties ?

(A) It is frequently a feedback inhibitor.

(B) It becomes covalently attached to an enzyme.

(C) It decreases the V_{max}.

(D) It interferes with substrate binding to the enzyme.

22. When [s] is equal to K_m, which of the following conditions exist ?

(A) Half the enzyme molecules are bound to substrate.

(B) The velocity of the reaction is equal to V_{max}.

(C) The velocity of the reaction is independent of substrate concentration.

(D) Enzyme is completely saturated with substrate.

23. Which of the following statements about an enzyme exhibiting allosteric kinetics with cooperative interaction is false ?

(A) A plot of $V-V_k$ [s] has a sigmaidal shape

(B) An inhibitor may increase the apparent K_m

(C) Lineweaver-Burk plot is useful for determining K_m and V_{max}

(D) Removal of allosteric inhibitor may result in hyperbolic V-S [s] plot

24. 'Lock' and 'Key' model of enzyme action proposed by Fisher implies that :

(A) The active site is flexible and adjusts to substrate.

(B) The active site requires removal of PO_4 group.

(C) The active site is complementary in shape to that of the substrate.

(D) Substrates change conformation prior to active site interaction.

25. In competitive inhibition which of the following kinetic effect is true ?

(A) Decreases both K_m and V_{max}

(B) Increases both K_m and V_{max}

(C) Decreases K_m without affecting V_{max}

(D) Increases K_m without affecting V_{max}

26. Enzymes increase the rates of reactions by :

(A) Increasing the free energy of activation

(B) Decreasing the energy of activation

(C) Changing the equilibrium constant of the reaction

(D) Increasing the free energy change of the reaction

27. Which of the following statements is true ?

(A) Enzymes have names endingase.

(B) Enzymes are highly specific in their action.

(C) Enzymes are living organisms.

(D) Enzymes get activated on heating.

28. Enzymes activity is controlled by :

    (A) pH of the solution

    (B) Temperature

    (C) Concentration of the enzyme

    (D) Concentration of the substrate

29. Which of the following is not true regarding enzymes ?

    (A) They catalyze only a particular type of reaction.

    (B) They remain active even after separation from the source.

    (C) They are destroyed after the completion of the reaction they catalyse.

    (D) They are irreversibly destroyed at high temperature.

30. The rate of an enzyme-catalyzed reaction was measured using several substrate concentrations that were much lower than K_m, the dependence of reaction velocity on substrate concentration can best be described as :

    (A) Independent of enzyme concentration

    (B) A constant fraction of V_{max}

    (C) Equal to K_m

    (D) Proportional to the substrate concentration

31. A Holoenzyme is :

    (A) Functional unit

    (B) Apoenzyme

    (C) Coenzyme

    (D) All of the above

32. Enzymes, which are produced in inactive form in the living cells. are called :

    (A) Papain

    (B) Lysozymes

    (C) Apoenzymes

    (D) Proenzymes

33. Activation or inactivation of certain key regulatory enzymes is accomplished by covalent modification of the amino acid :

    (A) Tyrosine

    (B) Phenylalanine

    (C) Lysine

    (D) Serine

34. The enzyme which can add water to a carbon-carbon double bond or remove water to create a double bond without breaking the bond is :

    (A) Hydratase

    (B) Hydroxylase

    (C) Hydrolase

    (D) Esterase

35. Fischer's 'lock and key' model of the enzyme action implies that :

(A) The active site is complementary in shape to that of substance only after interaction.

(B) The active site is complementary in shape to that of substance.

(C) Substrates change conformation prior to active site interaction.

(D) The active site is flexible and adjusts to substrate.

36. From the Lineweaver-Burk plot of Michaelis-Menten equation, K_m and V_{max} can be determined when V is the reaction velocity at substrate concentration S, the X-axis experimental data are expressed as :

(A) $1/V$

(B) V

(C) $1/S$

(D) S

37. A sigmoidal plot of substrate concentration ([S]) *vs.* reaction velocity (V) may indicate :

(A) Michaelis-Menten kinetics

(B) Co-operative binding

(C) Competitive inhibition

(D) Non-competitive inhibition

38. The kinetic effect of purely competitive inhibitor of an enzyme :

(A) Increases K_m without affecting V_{max}

(B) Decreases K_m without affecting V_{max}

(C) Increases V_{max} without affecting K_m

(D) Decreases V_{max} without affecting K_m

39. An inducer is absent in the type of enzyme :

(A) Allosteric enzyme

(B) Constitutive enzyme

(C) Co-operative enzyme

(D) Isoenzymic enzyme

40. In reversible non-competitive enzyme activity inhibition :

(A) V_{max} is increased.

(B) K_m is increased.

(C) K_m is decreased.

(D) Concentration of active enzyme is reduced.

41. In reversible non-competitive enzyme activity inhibition :

(A) Inhibitor bears structural resemblance to substrate.

(B) Inhibitor lowers the maximum velocity attainable with a given amount of enzyme.

(C) K_m is increased.

(D) K_m is decreased.

42. In competitive enzyme activity inhibition :

(A) The structure of inhibitor generally resembles that of the substrate

(B) Inhibitor decreases apparent K_m

(C) K_m remains unaffective

(D) Inhibitor decreases V_{max} without affecting K_m

43. In enzyme kinetics V_{max} reflects :

(A) The amount of an active enzyme

(B) Substrate concentration

(C) Half the substrate concentration

(D) Enzyme substrate complex

44. In enzyme kinetics K_m implies :

(A) The substrate concentration that gives one half V_{max}

(B) The dissocation constant for the enzyme substrate complex

(C) Concentration of enzyme

(D) Half of the substrate concentration required to achieve V_{max}

45. In competitive enzyme activity inhibition :

(A) Apparent K_m is decreased.

(B) Apparent K_m is increased.

(C) V_{max} is increased.

(D) V_{max} is decreased.

46. In non-competitive enzyme activity inhibition, inhibitor :

(A) Increases K_m

(B) Decreases K_m

(C) Does not affect K_m

(D) None of the above

47. An enzyme catalyzing oxidoreduction, using oxygen as hydrogen acceptor is :

(A) Cytochrome oxidase

(B) Lactate dehydrogenase

(C) Malate dehydrogenase

(D) Succinate dehydrogenase

48. The enzyme using some other substance, not oxygen as hydrogen acceptor is :

(A) Tyrosinase

(B) Succinate dehydrogenase

(C) Uricase

(D) Cytochrome oxidase

49. An enzyme which uses hydrogen acceptor as substrate is :

(A) Xanthine oxidase

(B) Aldehyde oxidase

(C) Catalase

(D) Tryptophan oxygenase

50. The pH optima of most of the enzymes is :

(A) Between 2 and 4

(B) Between 5 and 9

(C) Between 8 and 12

(D) Above 12

51. The isoenzymes of LDH :

(A) Differ only in a single amino acid

(B) Differ in catalytic activity

(C) Exist in 5 forms depending on M and H monomer contents

(D) Occur as monomers

52. Factors affecting enzyme activity :

(A) Concentration

(B) pH

(C) Temperature

(D) All of the above

53. Lineweaver-Burk double reciprocal plot is related to :

(A) Substrate concentration

(B) Enzyme activity

(C) Temperature

(D) Both (A) and (B)

54. One of the enzymes regulating glycolysis

is :

(A) Phosphofructokinase

(B) Glyceraldehyde-3-phosphate

   dehydrogenase

(C) Phosphotriose isomerase

(D) Phosphohexose isomerase

55. Pyruvate dehydrogenase a multienzyme

complex is required for the production

of :

(A) Acetyl-CoA

(B) Lactate

(C) Phosphoenol pyruvate

(D) Enol pyruvate

56. Characteristic features of active site are :

(A) Flexible in nature

(B) Site of binding

(C) Acidic

(D) Both (A) and (B)

57. An example of enzyme inhibition :

(A) Reversible inhibition

(B) Irreversible inhibition

(C) Allosteric inhibition

(D) All of the above

58. Example of enzyme specificity :

(A) Stereospecificity

(B) Reaction specificity

(C) Substrate specificity

(D) All of the above

59. The hypothesis to explain enzyme-

substrate complex formation :

(A) Lock and key model

(B) Induced fit theory

(C) Proenzyme theory

(D) Both (A) and (B)

60. Enzymes which catalyse binding of two

substrates by covalent bonds are known

as :

(A) Lyases

(B) Hydrolases

(C) Ligases

(D) Oxidoreductases

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the most correct/appropriate 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 ny 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 एक सबसे सही अथवा सबसे उपयुक्त 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।