Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Biochemistry) (Second Semester) (NEP)
EXAMINATION, 2022-23

ENZYMOLOGY

Paper Code							
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Questions Booklet Series
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. Holoenzyme is made of :

(A) Apoenzyme and Zymogen

(B) Apoenzyme and Co-enzyme

(C) Co-enzyme and Prosthetic group

(D) Prosthetic group and Co-factor

2. Example of a Pro-enzyme :

(A) Pepsinogen

(B) Trypsin

(C) Chymotrypsin

(D) Lysine

3. Activity of allosteric enzymes is influenced by :

(A) Allosteric modulators

(B) Allosteric site

(C) Catalytic site

(D) None of the above

4. Feedback inhibition means :

(A) Initial product inhibition

(B) End product inhibition

(C) Enzymatic induction

(D) None of the above

5. In competitive inhibition, inhibitors bear a close structural similarity with the :

(A) Co-enzyme

(B) Co-factor

(C) Prosthetic group

(D) Substrate

6. Enzyme acts best at a particular temperature called :

(A) Catalytic temperature

(B) At normal body temperature

(C) Optimum temperature

(D) None of the above

7. "Ping Pong" reaction is the other name for :

(A) Single-substrate reaction

(B) Single-displacement bi-substrate reaction

(C) Double-displacement bi-substrate reaction

(D) Lysine

8. Uncatalyzed reaction shows ..... activation energy.

(A) Lower

(B) Higher

(C) Moderate

(D) Optimum

9. Lock and Key model is also known as :

(A) Template model

(B) Induced fit model

(C) Khosland's model

(D) Enzyme-substrate interaction model

10. Which of the following statements is incorrect ?

(A) Enzymes are protein in nature

(B) Enzymes are colloidal in nature

(C) Enzymes are thermolabile

(D) Enzymes are inorganic catalyst

11. Apoenzymes dissociates from co-enzymes due to :

(A) Change in pH

(B) Change in temperature

(C) Change in substrate concentration

(D) Change in inhibitor concentration

12. Which of the following enzyme inhibitions shows decreased K_m value ?

(A) Competitive inhibition

(B) Un-competitive inhibition

(C) Non-competitive inhibition

(D) Feedback inhibition

13. Reversible covalent modification involves :

(A) Activation of proenzymes

(B) Inhibition of proenzymes

(C) Denaturation of proenzymes

(D) None of the above

14. Enzymes are named after their substrates by adding suffix :

(A) -in

(B) -ase

(C) -ose

(D) -sin

15. An enzyme brings about :

(A) Reduction in activation energy

(B) Increase in reaction time

(C) Increase in activation energy

(D) All of the above

16. Which one among the following is the example of competitive inhibition of an enzyme ?

(A) Succinic dehydrogenase by malonic acid

(B) Cytochrome oxidase by cyanide

(C) Hexokinase by glucose-6-phosphate

(D) Carbonic anhydrase by carbon dioxide

17. This enzyme was first isolated and purified in the form of crystals :

(A) Urease

(B) Pepsin

(C) Amylase

(D) Ribonuclease

18. Koshland proposed which model

(A) Fluid mosaic model

(B) Induced fit model

(C) Lock and key model

(D) Reflective index model

19. The term enzyme was coined by ..... .

(A) F. W. Kuhne

(B) Emil Fischer

(C) James Sumner

(D) Maud Menten

20. When substrate concentration is equal to K_m value :

(A) half of the enzyme molecules are bound to the substrate molecules and the other half are free

(B) maximum enzyme moleules are taking part in the reaction

(C) The reaction is now at equilibrium

(D) Maximum velocity is achieved

21. When an inhibitor binds to an enzyme at a place other than the active site, but only when the enzyme and substrate are already bound in complex, which of the following best represents the situation ?

(A) Competitive inhibition

(B) Allostery

(C) Uncompetitive inhibition

(D) Non-competitive inhibition

22. Which of the following best describes the class of enzymes that break bonds by generating a new double bond or ring structure rather than by hydrolysis or oxidation ?

(A) Ligases

(B) Isomerases

(C) Transferas

(D) Lyases

23. ..... are the substances which decreases the activity of enzyme.

(A) Isoenzyme

(B) Inhibitor

(C) Metalloenzyme

(D) Coenzyme

24. It is very powerful analytical technique of separating two enzyme having very little difference of 0.1 unit in their pH :

(A) Gel-filtration

(B) IEF

(C) SDS-PAGE

(D) Centrifugation

25. If the enzyme solubility increases with the addition of low concentration of salt, it is due to the phenomenon called ..... .

(A) Salting-in

(B) Salting-out

(C) Precipitation

(D) Dialysis

26. ..... reaction is independent of the concentration of any reactant.

(A) First-order

(B) Zero-order

(C) Second-order

(D) Third-order

27. ..... are the enzymes which contain another site other than active site.

(A) Multi enzyme

(B) Allosteric enzyme

(C) Oligomeric enzyme

(D) Monomeric enzyme

28. The inhibition in which inhibitor combine with free enzyme is called ..... .

(A) Competitive inhibition

(B) Uncompetitive Inhibition

(C) Non-Competitive Inhibition

(D) Feedback Inhibition

29. ..... is the amount of energy required to proceed from reactant state to the transition state.

(A) Transition energy

(B) Activation energy

(C) Mechanical energy

(D) Chemical energy

30. In certain metabolic pathways, a number of enzymes are required. These multienzyme complexes occur enclosed in :

(A) Membrane

(B) Area within ATP

(C) Microbodies

(D) Endoplasmic reticulum

31. Enzyme can be made functionless by :

(A) Removing its product as fast as fast it is formed

(B) Doubling its concentration

(C) Decreasing its concentration

(D) Blocking its active site

32. In the modern system of nomenclature which one of the following enzyme occupies Ist position ?

(A) Oxidoreductase

(B) Transferase

(C) Hydrolase

(D) Ligase

33. Zymogens are :

(A) Enzyme acting on starch

(B) Group of zymase enzymes

(C) Inactive enzyme precursors

(D) None of the above

34. Which of the following (s) is/are serine proteases ?

(A) Chymotrypsin

(B) Trypsin

(C) Elastase

(D) All of the above

35. Which of the following is false statement with regard to comparison between Serine and HIV proteases ?

(A) Both use nucleophilic attack to hydrolyze the peptide bond

(B) Both require water to complete the catalytic cycle

(C) Both forms an acyl-enzyme intermediate

(D) Both show specificity for certain amino acid sequences

36. The nucleophile in serine proteases is :

(A) Serine

(B) Water

(C) Both (A) and (B)

(D) Asparagine

37. The role of Asp 102 and His 57 during trypsin catalysis is to :

(A) neutralize the charge on the other's side chain

(B) keep the specificity pocket open

(C) function as a proton shuttle

(D) clamp the substrate into the active site

38. Common feature in all serine proteases is a :

(A) hydrophobic specificity pocket

(B) hydrophilic specificity pocket

(C) cluster of reactive serine residues

(D) single reactive serine residue

39. The transition state of a catalyzed reaction is :

(A) a highly-populated intermediate on the reaction pathway.

(B) higher in energy than that of an uncatalyzed reaction.

(C) lower in energy than that of an uncatalyzed reaction.

(D) lower in energy than the reaction substrate.

40. The catalytic region in which a small portion of molecules are involved in catalysis is called :

(A) Inactive site

(B) Duplication site

(C) Active site

(D) Allosteric site

41. The factors that can affect the rate of actions of enzymes includes :

(A) substrate concentration

(B) pH

(C) temperature

(D) All of the above

42. How is the rate of enzyme catalysed reactions affected by every 10° C rise of temperature ?

(A) Halves

(B) Becomes four times

(C) Doubles

(D) Remains unchanged

43. How many models are there which describes the mechanism of enzyme action ?

(A) 2

(B) 3

(C) 4

(D) 6

44. After the formation of which complex, product is formed ?

(A) EI

(B) ES

(C) EP

(D) None of the above

45. Which of the following statement is NOT true ?

(A) Changes in quaternary structure reduces the catalytic activity

(B) Substrate binds on the allosteric site

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

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

46. In the human body optimum temperature for enzymatic activities is :

(A) 37-degree Celsius

(B) 25-degree Celsius

(C) 20-degree Celsius

(D) 15-degree celsius

47. Which among them is not attribute of enzymes ?

(A) Specific in nature

(B) Protein in chemistry

(C) Consumed in reaction

(D) Increased rate of reaction

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

(A) Formation of the product

(B) K_m value

(C) Molecular size of the enzymes

(D) pH of the optimum value

49. In competitive inhibition :

(A) K_m is decreased and V_{max} is increased

(B) K_m is increased and V_{max} is increased

(C) K_m is decreased and V_{max} is normal

(D) K_m is increased and V_{max} is normal

50. Enzymes differ from inorganic catalysts in that they are highly specific. Which property of an enzyme is responsible for this specificity ?

(A) The insoluble nature of enzymes

(B) The high molecular mass of enzymes

(C) The surface configuration of enzymes

(D) The absence of metallic ions in an enzyme

51. Name an enzyme which is not proteinaceous in nature ?

(A) Cellulase

(B) Xylanases

(C) Ribozyme

(D) Peptidase

52. Michaelis and Menten derived their equation using which of the following assumption ?

(A) Rate limiting step in the reaction is the breakdown of ES complex to product and free enzyme.

(B) The rate limiting step in the reaction is the formation of ES complex.

(C) Concentration of the substrate can be ignore(D)

(D) Non-enzymatic degradation of the substrate is the major step

53. Enzymes commonly employ one or more of the following strategies to catalyze specific reactions :

(A) Acid-base catalysis

(B) Covalent catalysis

(C) Metal ion catalysis

(D) All of the above

54. RNase use one of the following mechanism of catalysis :

(A) Acid base catalysis

(B) Covalent catalysis

(C) Metal ion catalysis

(D) All of the above

55. Catalytic triads of chymotrypsin includes :

(A) Lysine 57, glutamate 102, threonine 195

(B) Histidine 57, Aspartate 102, Serine 195

(C) Arginine 92, Aspartate 105 Threonine 198

(D) Histidine 57, Glutamate 102, Serine 195

56. 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

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

(A) Allosteric enzyme

(B) Constitutive enzyme

(C) Co-operative enzyme

(D) Isoenzymic enzyme

58. 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

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

(A) Substrate concentration

(B) Enzyme activity

(C) Temperature

(D) Both (A) and (B)

60. Phosphofructokinase key enzyme in glycolysis is inhibited by :

(A) Citrate and ATP

(B) AMP

(C) ADP

(D) TMP

61. Hexokinase is inhibited in an allosteric manner by :

(A) Glucose-6-Phosphate

(B) Glucose-1-Phosphate

(C) Fructose-6-phosphate

(D) Fructose-1, 6-biphosphate

62. Pyruvate dehydrogenase a multienzyme complex is required for the production of :

(A) Acetyl-CoA

(B) Lactate

(C) Phosphoenolpyruvate

(D) Enolpyruvate

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

(A) V_{max}

(B) K_m

(C) K_m

(D) $1/K_m$

64. In competitive inhibition, the inhibitor :

(A) Competes with the enzyme

(B) Irreversibly binds with the enzyme

(C) Binds with the substrate

(D) Competes with the substrate

65. Competitive inhibition can be relieved by raising the :

(A) Enzyme concentration
(B) Substrate concentration
(C) Inhibitor concentration
(D) None of the above

66. All is true about non-competitive inhibition except :

(A) V_{max} decreases
(B) K_m altered
(C) The inhibitor binds at a site different from the active site
(D) None of the above

67. Which of the following is an example of a suicidal enzyme ?

(A) Cyclooxygenase
(B) Phospholipase
(C) 5′ Nucleotidase
(D) Transketolase

68. Which of the following is not true of transition-state analogues ?

(A) They mimic the transition state of an enzyme-catalysed reaction
(B) They react irreversibly with the enzyme
(C) They are bound more strongly than the substrate or the product
(D) They require the presence of a stable functional group to mimic the functionality present in the transition state

69. Hydrolytic enzymes, which act at low pH are called as :

(A) proteases
(B) amylases
(C) hydrolases
(D) peroxidases

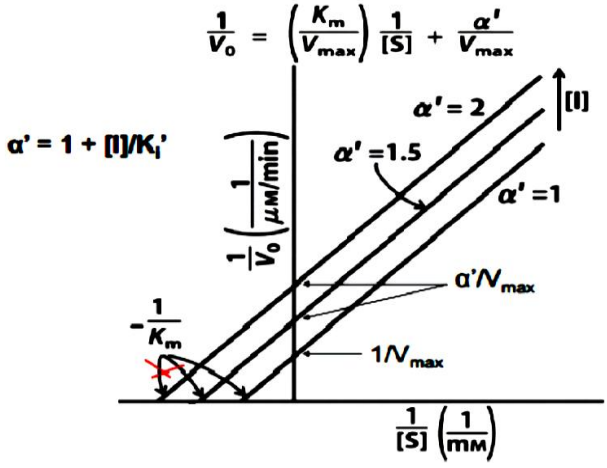
70. Three of the following statements about enzymes are correct and one is wrong. Which one is wrong ?

(A) Enzymes require optimum pH for maximal activity
(B) Enzymes are denatured at high temperature but in certain exceptional organisms they are effective even at temperatures 80°-90°C
(C) Enzymes are highly specific
(D) Most enzymes are proteins but some are lipids

71. Transition state structure of the substrate formed during an enzymatic reaction is :

(A) transient but stable
(B) permanent but unstable
(C) transient and unstable
(D) permanent and stable

72. Which of the options is correct regarding the inhibition shown in the Lineweaver-Burk plot below ?



(A) Uneompetitive inhibition
(B) Competitive inhibition
(C) Allosteric inhibition
(D) Non-competitive inhibition

73. What is the active site of the enzyme ?
(A) Where modulators bind
(B) Where substrates bind
(C) Both (A) and (B)
(D) None of the above

74. Competitive inhibitors stop an enzyme from working by :
(A) changing the shape of the enzyme
(B) merging with the substrate instead
(C) blocking the active site of the enzyme
(D) combining with the product of the reaction

75. The minimum amount of energy needed for a process to occur is called the :
(A) Minimal energy theory
(B) Process energy
(C) Kinetic energy
(D) Activation energy

76. ..... occurs when the inhibitory chemical, which does not have to resemble the substrate, binds to the enzyme other than at the active site.
(A) Noncompetitive inhibition
(B) Competitive inhibition
(C) Uncatalysed reaction
(D) All (A), (B) and (C)

77. A certain enzyme will hydrolyze egg white but not starch. Which statement best explains this observation ?
(A) Starch molecules are too large to be hydrolyzed
(B) Enzyme molecules are specific in their actions
(C) Egg white acts as a coenzyme for hydrolysis
(D) Starch is composed of amino acids.

78. All of the following are the properties of enzymes except :
(A) Enzymes are stereo specific
(B) Enzymes remain unaltered after the reaction
(C) Most of the enzymes are proteins
(D) They are heat stable

79. An enzyme that catalyzes the reaction A $\leftrightarrow$ B changes the :
(A) Heat of reaction
(B) Entropy of reaction
(C) Equilibrium constant
(D) Rate of forward and backward reaction

80. In a cell, the actual free energy change ($\Delta G'$) associated with an enzyme catalyzed reaction is usually different from the standard free change ($\Delta G^{0'}$) of the same reaction due to :

(A) Activation energy is different

(B) Reaction is always near the equilibrium

(C) Reactions may be regulated allosterically

(D) Reactants are not at 1.0 M concentration

81. Which of the following is a mechanism of enzyme action to enhance rate of reaction ?

(A) Catalysis by proximity and orientation

(B) Acid-base catalysis

(C) Covalent catalysis

(D) All of the above

82. Which of the following enzymes do not catalyze oxidation reduction reaction ?

(A) Dehydrogenases

(B) Hydrolases

(C) Peroxidases

(D) Oxygenases

83. In the feedback regulation the end product binds at :

(A) Active site

(B) Allosteric site

(C) E-S complex

(D) None of the above

84. The group of enzymes that catalyze the joining together of two molecules is :

(A) Transferases

(B) Ligases

(C) Lyases

(D) Isomerases

85. Which of the following is not a serine protease ?

(A) Chymotrypsin

(B) Elastase

(C) Thrombin

(D) Carboxypeptidase

86. Activation energy is free energy difference between the :

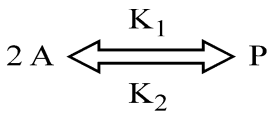
(A) Substrate and products

(B) Substrate and transition state

(C) Transition state and product

(D) Sum of all the above

87. In the given reaction two molecules of A combine to form products. What is the order of the reaction ?



(A) First order for forward reaction and second order for backward reaction

(B) second order for forward reaction and first order for backward reaction

(C) First order for both forward and backward reaction

(D) Second order for both forward and backward reaction

88. All of the covalent modifications regulate enzyme kinetics except :

(A) Methylation

(B) Acetylation

(C) ADPribosylation

(D) None of the above

89. Which of the statement is not correct about the active site of the enzyme :

(A) Active site is a two-dimensional cleft

(B) Takes up a relatively small part of the total volume of an enzyme

(C) Binds to substrates with multiple covalent interactions.

(D) The specificity of binding depends on the precisely defined arrangement of atoms in an active site.

90. A higher activation energy of the reaction means :

(A) Higher reaction rate

(B) Slower reaction rate

(C) No reaction

(D) None of the above

91. Binding energy of the enzyme and substrate interaction at active site is used to :

(A) Lower substrate entropy and desolvation of the substrate

(B) Induces the distortion in substrate

(C) Induces conformational change in the enzyme active site

(D) All of the above

92. A significant part of the energy used for enzymatic rate enhancements is derived from weak interactions :

(A) Hydrophobic

(B) H-bonding

(C) Ionic interaction

(D) All of the above

93. Enzyme naming and classification system was given by :

(A) IUB

(B) IUPAC

(C) IUCB

(D) None of the above

94. Which one of the following statements about coenzyme is not true ?

(A) They are organic or metallo-organic compounds required by the enzymes for their activities.

(B) They act as either transient carriers of specific atom or functional groups or an electron(s).

(C) Mostly derived from vitamins

(D) They always bind to the enzyme non covalently

95. Kinase enzyme belongs to :

(A) Isomerase

(B) Ligase

(C) Transferase

(D) Oxidoreductase

96. A metal ion or organic compound that is very tightly or even covalently bound to the enzyme is called as :

(A) Substrates

(B) Cofactor

(C) Prosthetic group

(D) Coenzyme

97. What information does a Lineweaver-Burk plot provide that a typical Michaelis-Menten plot does not ?

(A) V_i

(B) K_m

(C) V_{max}

(D) None of these answers

98. Which of the following can be used to determine the rate of enzyme-catalyzed reactions ?

(A) Rate of disappearance of the enzyme

(B) Rate of disappearance of the substrate

(C) Rate of disappearance of the product

(D) Change in volume of the solution

99. In a chemical process, which of the following modifications cannot be achieved by an enzyme ?

(A) Change in enthalpy

(B) Change in reverse reaction rate

(C) Change in activation energy

(D) Change in forward reaction rate

100. Zn^{+2} is the cofactor in following enzymes except :

(A) Carbonic anhydrase

(B) Alcohol dehydrogenase

(C) Carboxypeptidases

(D) Pyruvate kinase

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 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 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।