Roll No. .....

Question Booklet Number

O. M. R. Serial No.

B. Sc. (Biotechnology) (Fourth Semester) EXAMINATION, 2022-23

INTERMEDIARY METABOLISM

Paper Code						
B	B	T	4	0	0	2

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. Identify the reduced form of coenzymes :

(A) NAD^+

(B) FAD

(C) NADH

(D) Ubiquinone

2. Which one of the following vitamin is a precursor of FAD..... :

(A) Vitamin B_1

(B) Vitamin B_2

(C) Vitamin B_3

(D) Vitamin B_5

3. Gain of electrons can be termed as.....

(A) Metabolism

(B) Anabolism

(C) Oxidation

(D) Reduction

4. Identify the reduced agent in the following reaction :

Glyceraldehyde-3-Phosphate + NAD^+ 1, 3 $\longrightarrow$ bisphosphoglcerate + NADH :

(A) Glyceraldehyde-3-Phosphate

(B) NADH

(C) 1, 3 bisphosphoglcerate

(D) NAD^+

5. Which of the following enzyme catalyzes the last step of glycolysis ?

(A) Hexokinase

(B) Pyruvate kinase

(C) Phosphofructokinase-1

(D) Enolase

6. A single molecule of Acetyl-CoA generates ..... molecules of NADH during Krebs crycle.

(A) Four

(B) Three

(C) Two

(D) One

7. What is the general term used for the anaerobic degradation of glucose to obtain energy ?

(A) Anabolism

(B) Oxidation

(C) Fermentation

(D) Metabolism

8. Cleavage of Fructose 1, 6-biophosphate yields ..... .

(A) Two aldoses

(B) Two ketoses

(C) An aldose and a ketose

(D) Only a ketose

9. The total number of ATP molecules synthesized in the glycolysis by substrate level phosphorylation :

(A) Two

(B) Four

(C) Six

(D) Eight

10. What is the first step in the payoff phase of glycolysis ?

(A) Reduction of 1,3-bisphophoglycerate to glyceraldehyde 3-phosphate

(B) Oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate

(C) Reversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate

(D) Irreversible conversion of dihydroxyacetone phosphate to glyceraldehydes 3-phosphate

11. High concentration of glucose 6-phosphate is inhibitory to ..... .

(A) Hexokinase

(B) Pyruvate kinase

(C) Enolase

(D) Phosphofructokinase-I

12. The product formed in the first substrate level phosphorylation in glycolysis is ..... .

(A) Pyruvate

(B) 3-phosphoglycerate

(C) 1, 3-bisphosphoglycerate

(D) 2-phosphoglycerate

13. Glycolysis converts ..... .

(A) Glucose into pyruvate

(B) Glucose into phosphoenolpyruvate

(C) Fructose into pyruvate

(D) Fructose into phosphoenolpyruvate

14. Which of the following statements is false about ATP hydrolysis ?

(A) It is highly exergonic

(B) $\Delta G'^{o} = -30.5$ kJ/mol

(C) $\Delta G'^{o} = 30.5$ kJ/mol

(D) All of the above

15. When one molecule of glucose is oxidized to two molecules of lactate during anaerobic glycolysis, which of the following statements is false ?

(A) Lactate dehydrogenase reaction producers no ATP

(B) Lyceraldehyde 3-P dehydrogenase reaction produces 2 ATP molecules

(C) Pyruvate kinase reaction produces 2 ATP molecules

(D) Phosphofructokinase-1 reaction uses 1 ATP molecule

16. Maltose hydrolysis yields ..... .

(A) D-galactose and D-glucose

(B) 2-D-glucose

(C) *n*-D-glucose

(D) 2-D-fructose

17. Hydrolysis of lactose yields ..... .

(A) D-galactose and D-glucose

(B) D-glucose and D-glucose

(C) D-galactose and D-fructose

(D) D-fructose and D-glucose

18. Formation of one molecule of glucose from pyruvate requires ..... .

(A) 2 ATP, 2 GTP and 2 NADH

(B) 4 ATP, 1 GTP and 2 NADH

(C) 3 ATP, 2 GTP and 2 NADH

(D) 4 ATP, 2 GTP and 2 NADH

19. When glucose is converted to lactate by anaerobic glycolysis, equivalent number of ATPs derived is ?

(A) 1

(B) 2

(C) 3

(D) 4

20. Which enzyme is involved in the pathway of ethanol fermentation ?

(A) Hexokinase

(B) Pyruvate decarboxylase

(C) Pyruvate dehydrogenase

(D) Pyruvate kinase

21. Which enzyme is involved in the pathway of synthesis of acetyl-coA ?

(A) Hexokinase

(B) Pyruvate decarboxylase

(C) Pyruvate dehydrogenase

(D) Pyruvate kinase

22. Which enzyme catalyzes the conversion of pyruvate to oxaloactate ?

(A) Pyruvate carboxylase

(B) Pyruvate dehydrogenase

(C) Pyruvate kinase

(D) Phosphofructokinase-I

23. In the TCA cycle, which of the following combines with Acetyl-CoA to form a 6 carbon compound ?

(A) Oxaloacetate

(B) Fumarate

(C) Pyruvate

(D) Malate

24. Oxaloacetate is reduced to malate by ..... .

(A) Pyruvate carboxylase

(B) Malate dehydrogenase

(C) Pyruvate kinase

(D) Phosphofructokinase-1

25. Which one out of the following enzymes acts in the pentose phosphate pathway ?

(A) Aldolase

(B) Glycogen phosphorylase

(C) Pyruvate kinase

(D) 6-phosphogluconate dehydrogenase

26. Products of glucose oxidation essential for oxidative phosphorylation are :

(A) Pyruvate

(B) Acetyl-CoA

(C) NADPH and ATP

(D) NADH and $FADH_2$

27. Which of the following complexes of electron transport chain does not account for the pumping out of protons from the mitochondrial matrix ?

(A) Complex I

(B) Complex III

(C) Complex II

(D) Complex IV

28. Oxidation of 3 molecules of glucose by pentose phosphate pathway results in the production of :

(A) 3 molecules of pentose, 6 molecules of NADPH and 3 molecules of CO_2

(B) 4 molecules of pentose, 6 molecules of NADPH and 3 molecules of CO_2

(C) 4 molecules of pentose, 3 molecules of NADPH and 3 molecules of CO_2

(D) 3 molecules of pentose, 4 molecules of NADPH and 3 molecules of CO_2

29. The use of NADPH generated from pentose phosphate pathway cannot be ..... :

(A) Oxidized in the electron transport chain to provide 38 ATPs

(B) Used for the synthesis of fatty acids

(C) Used for steroid synthesis

(D) All of the above

30. Glucagon is released from ..... :

(A) Muscle

(B) Pancreas

(C) Kidneys

(D) Epithelial tissues

31. Protein that contains a nucleic acid derivative of riboflavin is called ..... :

(A) Nucleic acid

(B) Amino acid

(C) Flavoprotein

(D) None of the above

32. The process in which green plants synthesize organic food by utilizing carbon dioxide and water as raw materials, in the presence of sunlight is called as ..... :

(A) Respiration

(B) Food synthesis

(C) Photosynthesis

(D) Light synthesis

33. Complex II of electron transport chain is also called ..... :

(A) NADH dehydrogenase

(B) Succinate dehydrogenase

(C) Cytochrome bc1 complex

(D) Cytochrome oxidase

34. NADH and $FADH_2$ is associated with respectively :

(A) Complex II and complex III of electron transport chain

(B) Complex I and complex III of electron transport chain

(C) Complex III and complex IV of electron transport chain

(D) Complex I and complex II of electron transport chain

35. In the electron transport chain, each pair of electron donated by NADH releases sufficient energy to produce ..... .

(A) 0.5 ATP

(B) 1.5 ATP

(C) 2.5 ATP

(D) 3.5 ATP

36. Which of the following is *not true* for cytochrome C oxidase complex ?

(A) It donates electrons to O_2.

(B) It accepts electrons from cytochrome c.

(C) It pumps two protons out of the mitochondrial matrix.

(D) It is not inhibited by cyanide.

37. Where does oxidative phosphorylation take place ?

(A) Ribosomes

(B) Nucleus

(C) Mitochondria

(D) Cell Membrane

38. Every cycle of β-oxidation produces ..... .

(A) 1 FAD, 1 NAD^+ and 2 CO_2 molecules

(B) 1 $FADH_2$, 1 NADH and 1 acetyl co-A

(C) 1 $FADH_2$, 1 NAD^+ and 1 acetyl co-A

(D) 1 FAD, 1 NADH and 2 CO_2 molecules

39. ATP synthesis via chemiosmosis mechanism is driven by ..... .

(A) ATP Dehydrogenase

(B) ATP Synthase

(C) Kinase

(D) Phosphatase

40. The stromain chloroplast contains a number of ..... made up disc-like ..... .

(A) Grana, thylakoids

(B) Grana, lamellae

(C) Thylakoids, grana

(D) Lamellae, grana

41. NADP is a cofactor used in ..... .

(A) Catabolic reactions

(B) Anabolic reactions

(C) Elimination reaction

(D) Redox reactions

42. Which of the following is the Complex I of ETS ?

(A) NADH dehydrogenase

(B) Cytochrome c oxidase

(C) Cytochrome bc_1

(D) Succinate dehydrogenase

43. $NADP^+$ in its reduced form is ..... .

(A) NAD

(B) NADH

(C) NADPH

(D) DPH

44. NADH produced during glycolysis transfer electrons to the electron transport chain via :

(A) Malate-Asparate Shuttle

(B) Glycerol 3-phosphate Shuttle

(C) Both of the above

(D) None of the above

45. Which of the following is the correct equation of photosynthesis ?

(A) $6\,CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

(B) $12H_2O \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

(C) $6CO_2 + 6O_2 \rightarrow C_6H_{12}O_6 + 12H_2O$

(D) $6CO_2 \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

46. The first stable compound of Krebs cycle is ..... .

(A) Citrate

(B) Cis-Aconitate

(C) Moxaloacetate

(D) Malate

47. During photosynthesis, which light is least effective ?

(A) Green light

(B) Sunlight

(C) Yellow light

(D) Blue light

48. Other than CO_2 and light, which is used as the raw material for photosynthesis ?

(A) O_2

(B) CO_2

(C) H_2O

(D) MnO_2

49. How many double bonds are present in the linoleic acid ?

(A) One

(B) Two

(C) Three

(D) Four

50. Which of the following is an essential fatty acid ?

(A) Palmitic acid

(B) Oleic acid

(C) Stearic acid

(D) Linolenic acid

51. Ergosterol is a sterol found in the cell membrane of ..... .

(A) Bacteria

(B) Mammals

(C) Fungi

(D) Plants

52. Pentose phosphate pathway and malic enzymes provide ..... required for fatty acid synthesis ?

(A) NADH

(B) FAD

(C) $FADH_2$

(D) NADPH

53. How many rounds of β-oxidation are necessary to metabolize palmitic acid (16 : 0) ?

(A) Six

(B) Seven

(C) Eight

(D) Nine

54. Which is the site of dark reaction of photosynthesis ?

(A) Matrix

(B) Stroma

(C) Cytochrome

(D) All of the above

55. Carnitine Shuttle system has an important role in ..... .

(A) β-oxidation of fatty acids

(B) Fatty acid synthesis

(C) Unsaturation of fatty acid

(D) All of the above

56. Identify the 5-carbon metabolite ..... :

(A) Citrate

(B) α- ketoglutarate

(C) Succinate

(D) Malate

57. How many carbon atoms does OAA contain ?

(A) 3

(B) 2

(C) 4

(D) 1

58. Where are ketone bodies synthesized ?

(A) Brain

(B) Muscles

(C) Liver

(D) Adipose tissues

59. Identify the ketone bodies :

(A) Acetone

(B) Acetoacetate

(C) Hydroxybutyrate

(D) All of the above

60. Insulin stimulates :

(A) Glycogenolysis

(B) Gluconeogenesis

(C) Glycogenesis

(D) Fatty acid oxidation

61. Which of the following condenses acyl and malonyl groups during fatty acid biosynthesis ?

(A) Acyl carrier protein

(B) Acetyl-CoA ACP transacetylase

(C) β-ketoacyl ACP synthase

(D) Malonyl-CoA ACP transferase

62. Which one of the following is the source of electrons in photosynthesis ?

(A) Carbohydrates

(B) CO

(C) Water

(D) NADH

63. Proline is the cyclized derivative of :

(A) Glutamate

(B) Arginine

(C) Glutamine

(D) Serine

64. Which of the following amino acid is the precursor of cysteine ?

(A) Proline

(B) Glutamine

(C) Serine

(D) Glutamate

65. Which of the following is a non-essential amino acid ?

(A) Methionine

(B) Threonine

(C) Lysine

(D) Proline

66. Light energy is converted to chemical energy in the presence of :

(A) Chloroplast

(B) Ribosomes

(C) Mitochondria

(D) Stomata

67. Identify the aromatic amino acid :

(A) Proline

(B) Lysine

(C) Tryptophan

(D) Leucine

68. Oxaloacetate is a precursor of aspartate and :

(A) Serine

(B) Tyrosine

(C) Tryptophan

(D) Lysine

69. Pyruvate is a precursor of :

(A) Tyrosine

(B) Histidine

(C) Phenylalanine

(D) Valine

70. When a molecule of palmitic acid (16 : 0) is completely oxidized by β-oxidation, how many molecules of Acetyl CoA are formed ?

(A) Seven

(B) Eight

(C) Nine

(D) Ten

71. When a molecule of palmitic acid (16 : 0) is completely oxidized by β-oxidation, how many molecules of NADH and $FADH_2$ are generated ?

(A) Seven

(B) Eight

(C) Nine

(D) Ten

72. Which of the following gives rise to Valine and Isoleucine ?

(A) Pyruvate

(B) Glutamate

(C) Aspartate

(D) Serine

73. Which of following is common compound shared by TCA cycle and Urea Cycle ?

(A) α-Ketoglutarate

(B) Succinyl-CoA

(C) Oxaloacetate

(D) Fumarate

74. Nitrogen atoms of urea produced in the urea cycle are derived from :

(A) Ammonia and aspartic acid

(B) Nitrate

(C) Nitrite

(D) All of the above

75. Which of the following is an important precursor in the pyrimidine biosynthesis ?

(A) Glycine

(B) Aspartate

(C) Serine

(D) Leucine

76. Kreb Cycle is ..... in nature.

(A) Anabolic

(B) Catabolic

(C) Amphibolic

(D) None of the above

77. Urea cycle converts :

(A) Keto acids into amino acids

(B) Amino acids into keto acids

(C) Ammonia into a less toxic form

(D) Ammonia into a more toxic form

78. Conversion of dUMP to dTMP is catalyzed by :

(A) Thymidylate synthase

(B) Dihydrofolatereductase

(C) Dihydroorotase

(D) Cytidylate synthase

79. Adenosine deaminasedeaminates adenosine to :

(A) Hypoxanthine

(B) Inosine

(C) Xanthine

(D) Guanosine

80. Which of the following amino acid is exclusively ketogenic ?

(A) Leucine

(B) Asparagine

(C) Threonine

(D) Proline

81. The first intermediate with a complete purine ring is :

(A) Inosinate

(B) Formate

(C) Aspartate

(D) Glycine

82. Which of the following amino acid is exclusively glucogenic ?

(A) Arginine

(B) Leucine

(C) Lysine

(D) Threonine

83. Phenylketonuria (PKU) is a genetic disorder caused by a deficiency in which enzyme ?

(A) Phenylalanine hydroxylase

(B) Tyrosine hydroxylase

(C) Tryptophan hydroxylase

(D) Histidine hydroxylase

84. Which of the following yields Acetyl-CoA via Acetoacetyl-CoA ?

(A) Leucine

(B) Isoleucine

(C) Threonine

(D) Alanine

85. In the reduction of pyruvate to lactate, which of the following is regenerated ?

(A) H^+

(B) NADH

(C) NAD^+

(D) FAD

86. Albmism is a disorder caused by a deficiency in which enzyme ?

(A) Phenylalanine hydroxylase

(B) Tyrosinase

(C) Tryptophan hydroxylase

(D) Histidine hydroxylase

87. Which of the following produces pyruvate ?

(A) Leucine

(B) Isoleucine

(C) Lysine

(D) Alanine

88. Which of the following is not the precursor for the *de novo* purine biosynthesis ?

(A) Aspartic Acid

(B) Glycine

(C) Glutamine

(D) Arginine

89. Which of the following produces α-ketoglutarate ?

(A) Leucine

(B) Threomne

(C) Methionine

(D) Proline

90. 3-phosphoglycerate is not the metabolic precursor for :

(A) Serine

(B) Glycine

(C) Cysteine

(D) Arginine

91. The accumulation of this substance in the body causes gout :

(A) Blood plasma

(B) WBC

(C) Uric acid

(D) Synovial fluid

92. Which one of the following is the end product of gluconeogenesis ?

(A) Pyruvate

(B) Citrate

(C) Glucose

(D) Glycine

93. Which of the following is not a monosaccharide with 5 carbon atoms ?

(A) Arabinose

(B) Xylulose

(C) Trehalose

(D) Ribulose

94. Glycolysis begins with which of the following reactions ?

(A) Reduction

(B) Oxidation

(C) Phosphorylation

(D) Acidification

95. Urea production occurs almost exclusively in :

(A) Kidney

(B) Liver

(C) Blood

(D) Urine

96. In which of the following forms, glucose is stored in the liver ?

(A) Glycogen

(B) Starch

(C) Dextrin

(D) Cellulose

97. Lignin is derived from :

(A) Phenylalanine

(B) Valine

(C) Tryptophan

(D) Arginine

98. Where are the enzymes for β-oxidation present ?

(A) Nucleus

(B) Cytosol

(C) Mitochondria

(D) Golgi Apparatus

99. Which of the following is an analogous to starch ?

(A) Cellulose

(B) Glycogen

(C) Sucrose

(D) Chitin

100. Which of the following are the storage polysaccharides ?

(A) Glycogen

(B) Cellulose

(C) Chitin

(D) Glucose

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।