Sr. No. 1021

Ph.D. ENTRANCE TEST-2023

SUBJECT (BIOCHEMISTRY)

Total Questions: 100
Time Allowed : 110 Minutes

Roll No. | | | | | | |

Instructions for Candidates

1. Write your roll number in the space provided at the top of this page of question booklet and fill up the necessary information in the spaces provided on OMR Answer sheet.
2. OMR Answer sheet has an original copy and a candidate's copy glued beneath it at the top. While making entries in the original copy, candidate should ensure that the two copies are aligned properly so that the entries made in the original copy against each item are exactly copied in the candidate's copy.
3. All entries in the OMR answers sheet including answers to questions are to be recorded in the original copy only.
4. Use only blue/ black ball point pen to darken the circle of correct / most appropriate response. In no case gel/ ink pen or pencil should be used.
5. **Do not darken more the one circle of option for any question. A question with more than one darke response shall be considered wrong.**
6. **There will be no "Negative Marking" for wrong answers.**
7. Only those candidates who would obtain positive score in entrance test examination shall be eligible for admission
8. Do not make any stray mark on the OMR sheet
9. Calculators and mobiles shall not be permitted inside the examination hall
10. Rough work, if any, should be done on the blank sheets provided with the question booklet.
11. OMR answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.
12. Ensure that your OMR Answer sheet has been signed by the invigilator and the candidate himself/herself.
13. At the end of the examination hand over the OMR answer sheet to the invigilator who will first tear off the original OMR sheet in presence of the candidate and hand over the candidate's copy to the candidate.
14. If any of the information in the response sheet/question paper has been found missing or not mentioned as stated above the candidate is solely responsible for that lapse.

SEAL

Part I (General Aptitude 2023)

1. Tariq wants to sell a watch at a profit of 20%. He bought it at 10% less and sold it at ₹ 30 less, but still he gained 20%. The cost price of watch is.....

   A. ₹ 250
   B. ₹ 225
   C. ₹ 240
   D. ₹ 220

2. If today is Sunday then three days from now will be....

   A. Saturday
   B. Friday
   C. Thursday
   D. Wednesday

3. Absar is brother of Mehdi. Iqra is sister of Gulshan. Mehdi is son of Iqra. How is Absar related to Iqra?

   A. Son
   B. Brother
   C. Nephew
   D. Father

4. Ankit can do a piece of work in 6 days and Basharat in 9 days. How many days will both take together to complete the work?

   A. 7.5 days
   B. 5.4 days
   C. 3.6 days
   D. 3 days

5. The book "To Hell and Back: Humans of COVID" is authored by?

   A. Kavitha Iyer
   B. Jhumpa Lahiri
   C. Barkha Dutt
   D. Arundhati Roy

6. If PARTICLE is coded RCTVKENG, then how is SCIENCE coded?

   A. TBJUOMF
   B. TDJFODF
   C. UEKGPEG
   D. QBSUDMF

7. Where is the headquarter of the United Nations Environment Programme (UNEP) located?

   A. Nairobi, Kenya
   B. Venice, Italy
   C. Munich, Germany
   D. Geneva, Switzerland

8. Two years ago, Jane's age was three times Sam's age. If Jane is now 18, how old is Sam?

   A. 6 years
   B. 8 years
   C. 10 years
   D. 12 years

9. If WORK is coded as 4-12-9-16, then how will WOMAN be coded?

   A. 4-12-14-26-13
   B. 4-26-14-13-12
   C. 23-12-26-14-13
   D. 123-15-13-1-14

10. Which of the following states is not included in the sixth schedule of Indian Constitution?

    A. Meghalaya
    B. Tripura
    C. Mizoram
    D. Manipur

11. Letter : Word

A. Homework : School

B. Club : People

C. Product : Factory

D. Page : Book

12. The speed of a bus is 54 km/h if we don't let it stop at any point. If the bus stops at the bus-stops, the speed of the bus is 45 km/h. What is the time that the bus stops for per hour?

A. 7 mins

B. 10 mins

C. 21 mins

D. 22 mins

13. Blood does not coagulate inside the body due to the presence of _____?

A. Fibrin

B. Haemoglobin

C. Heparin

D. Plasma

14. If a triangle has angles measuring 30 degrees, 60 degrees, and 90 degrees, what type of triangle is it?

A. Equilateral

B. Isosceles

C. Scalene

D. Right-angled

15. The ..... of the Minister's statement cannot be verified by people who have no access to official records.

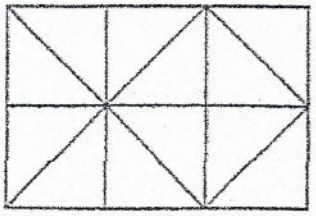
A. veracity

B. verbosity

C. ambiguity

D. validity

16. The number of squares in the given figure is.....



A. 7

B. 8

C. 9

D. 10

17. What is the percentage of profit if the cost price is 95% of the selling price?

A. 5%

B. 5.26%

C. 4%

D. 4.75%

18. If you start facing east and turn 135 degrees clockwise, which direction are you facing now?

A. North

B. West

C. North-East

D. South-East

19. Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) has been extended till which year recently?

A. 2025

B. 2028

C. 2030

D. 2032

20. Who is the present chairman of ISRO?

A. Sh. Heeralal Samariya

B. Sh. Harsh Chouhan

C. Sh. Ravneet Kaur

D. Sh. S Somanath

End of Part I

PART-II

21. The secondary, but not the primary, immune response is based on:

a) Memory

b) The bonus effect of multivalency

c) Complement activation

d) Clonal selection

22. IgE

a) Is abundant in saliva

b) Binds strongly to mast cells.

c) Cannot bind to macrophages.

d) Activates the complement cascade.

23. The MHC class I heavy chain consists of:

a) Beta2-microglobulin.

b) Three Ig-type domains.

c) A truncated MHC class II heavy chain.

d) Three globular domains.

24. α-D-glucose and β-D-glucose are

a) Stereoisomers

b) Epimers

c) Anomers

d) Keto-aldo pairs

25. A nucleic acid was analyzed and found to contain 37 percent A, 16 percent G, 22 percent C, and 25 percent T. The nucleic acid must be:

a) single-stranded RNA

b) single-stranded DNA

c) double-stranded RNA

d) double-stranded DNA

26. Which of the following statements about membrane fluidity is correct?

a) Membrane fluidity is increased when there is a high proportion of trans unsaturated fatty acids in the glycerophosphate molecules that make up the bilayer.

b) Membrane fluidity is decreased when there is a high proportion of cis unsaturated fatty acids in the glycerophosphate molecules that make up the bilayer.

c) Membrane fluidity is increased when there is a high proportion of cis unsaturated fatty acids in the glycerophosphate molecules that make up the bilayer.

d) Membrane fluidity is increased when there is a high proportion of saturated fatty acids in the glycerophosphate molecules that make up the bilayer.

27. Eukaryotic RNA polymerase II synthesizes which of the following?

a) RNA molecules that are precursors of rRNAs

b) RNA molecules that are precursors of mRNAs

c) RNA molecules that are precursors of tRNAs

d) RNA molecules that are precursors of snRNAs

28. Which of the following reactions is required for proofreading (i.e. correcting replication errors) during DNA replication by DNA polymerase III?

a) 3' - 5' exonuclease activity

b) 5' - 3' exonuclease activity

c) 3' - 5' endonuclease activity

d) 5' - 3' endonuclease activity

29. What properties of a protein does hydrophobic interaction chromatography exploit for purification?

a) Charged amino acids

b) Hydrophobic amino acids on the protein surface

c) Molecular weight

d) Enzyme activity

30. What would the expected effect be on a PCR reaction if the primers used were slightly shorter and more variable than the intended oligonucleotide sequences?

a) The PCR reaction would not commence

b) The PCR reaction would end after one cycle

c) The reaction would generate a single short PCR product

d) The reaction would yield a mixture of non-specific products

31. During glycolysis, Fructose 1, 6 bishosphate is cleaved into two 3carbon intermediates by the enzyme:

a) Enolase A
b) Fructokinase
c) Aldolase
d) Diphosphofructophosphatose

32. Which one of the following is a rate limiting enzyme of gluconeogenesis?

a)Hexokinase
b)Phosphofructokinase
c)Pyruvate carboxylase
d)Pyruvate kinase

33. Which component of transcribed RNA in eukaryotes is present in the initial transcript but is removed before translation occurs:

a) Intron
b) 3' Poly A tail
c) Ribosome binding site
d) 5 'cap

34. Plasmid vectors for cloning

a) can generally accommodate larger inserts than phage vectors can
b) grow within bacteria, and are present in bacterial colonies on an agar plate
c) can accommodate inserts of over 100 kilobases include centromeres to allow propagation in yeast
d) burst bacteria and form plaques on a "lawn" of bacteria

35. Confluency refers to

a) the area that each cell occupies
b) the viable cells per ml.
c) the ratio of area occupied by the cells and the total area available
d) the area below the line of a growth curve

36. Citrulline is an intermediate of

a) TCA cycle
b) Urea cycle
c) Pentose cycle
d) Calvin cycle

37. Which of the following statements about fatty acid synthesis is correct?

a) Fatty acids can be used to synthesise glucose.

b) Fatty acids can be synthesised from glucose.

c) Fatty acids can be used to synthesise amino acids.

d) Fatty acids are important in protein synthesis.

38. Which of the following is NOT required for a PCR reaction?

a)A thermostable DNA polymerase

b)Dideoxy-dNTPs (ddNTPs)

c)Template DNA

d)Primers

39. Which of the following role is performed by a bacteriophage in transduction?

a) a) vector

b) b) donor

c) c) recipient

d) d) epsom

40. In DNA, mutations at G-C sequences occur quite frequently, since 5-methyl cytosine easily deaminates to form:

a) Thymine

b) Adenine

c) Guanine

d) Cytosine

41. Which of the following events can induce a transient arrest in the translation of a secretory protein?

a) Binding of a polysome to an ER receptor

b) Binding of SRP to an N-terminal signal sequence

c) Binding of snRPPs to the large ribosomal subunit

d) Cleavage of the signal sequence by signal peptidase

42. Cyclins are proteins involved in the regulation of

a) Cell cycle protein kinases

b) Circadian rhythms

c) Synthesis of cAMP

d) Membrane circulation via exocytosis & endocytosis

43. Translocation of most proteins into ER requires all of the following EXCEPT

a) A signal sequence

b) A signal receptor protein

c) GTP

d) Signal peptidase

44. Protein Kinase A is also known as

a) AMP-activated protein kinase

b) cAMP-activated protein kinase

c) GMP-activated protein kinase

d) Ca^{2+}-activated protein kinase

45. One letter code for the glutamine is

a) G

b) K

c) Q

d) N

46. Which of the following reactions is unique to gluconeogenesis?

a) Lactate → Pyruvate

b) Phosphoenol pyruvate → pyruvate

c) Oxaloacetate → phosphoenol pyruvate

d) Glucose-6-phosphate → Fructose-6-phosphate

47. The technique for purification of proteins that can be made specific for a given protein is

a) Gel filtration chromotography

b) Ion exchange chromatography

c) Electrophoresis

d) Affinity chromatography

48. All the following are omega-6 -fatty acids except

a) Linoleic acid

b) α-Linolenic acid

c) γ-Linolenic acid

d) Arachidonic acid

49. Bacterial cells capable of transformation are referred to as

a) recombinant

b) competent

c) conjugant

d) none of the above

50. Positive stranded RNA viruses have which of the following characteristics?

a) Their genome RNA can be translated directly as mRNA

b) They have to transcribe their genome RNA to a mirror image copy as a mRNA

c) This genome is circular

d) Their RNA genome is segmented

PART-III

51. Replication of a bacterial chromosome normally starts at a fixed point called:
    a) replication fork
    b) recognition site
    c) oriV
    d) ter

52. Enzymes that regulate the process of supercoiling termed as;
    a) DNA helicases
    b) topoisomerases
    c) nucleases
    d) DNA polymerases

53. Which of the following is true for Satellite DNA?
    a) Occurs mostly near the centromeres of chromosomes
    b) may be involved in attachment of the mitotic spindle
    c) consists of huge numbers of tandem repeats of short (up to 30 bp) sequences.
    d) All of the above are correct.

54. Insertional inactivation of the lacZ gene on a plasmid can be used to screen for recombinants on a plate containing:
    a) Tetracycline and ampicillin
    b) Tetracycline only
    c) IPTG and X-gal.
    d) IPTG only

55. Three genes of E.Coli responsible for the mismatch repair are
    a) mutS, mutL, mut H
    b) mutA, mutB, mut C
    c) mutX, mutY, mut Z
    d) All of the above

56. Cancer cells often have reduced amounts of cell surface proteins, including class I MHC antigens. Which of the following cells of the immune system can exploit this property to kill cancer cells?

a) Cytotoxic T-cells
b) Natural killer cells
c) Helper T-cells
d) Macrophages

57. Where do precursor T-lymphocytes develop into fully competent but not yet activated T-cells?

a) The thymus gland
b) The bone marrow
c) The lymph nodes
d) The spleen

58. MHC class II molecules are found on:

a) Virtually all cells in the body.
b) B cells, dendritic cells and macrophages.
c) Only gamma-interferon activated cells.
d) Virtually all nucleated cells in the body.

59. The antigen moiety on an antigen-presenting cell recognized by the alpha beta T-cell receptor is:

a)Native protein antigen plus major histocompatibility complex (MHC) molecule.
b)Processed (peptide) antigen plus MHC.
c)Processed peptide antigen.
d)Native antigen.

60. Schizophrenia has a heritability of 0.8. Choose the most accurate from the following options.

a) Schizophrenia is inherited from a parent 80% of the time
b) Schizophrenia is 100% dependent upon genetic inheritance
c) Schizophrenia is largely influenced by environmental factors
d) Schizophrenia is both influenced by environmental factors and dependent upon genetic inheritance

61. During the thawing process it is important to transition the cells from the vapor phase of liquid nitrogen to 37°C

a) slowly, so the cells have time to acclimate to 37°C
b) as quickly as possible in a 37°C water bath
c) by warming the vial in your hand
d) as you spray 70% alcohol onto the vial

62. What is the minimum number of transesterification reactions needed to splice an intron from an mRNA transcript?

a) One
b) Two
c) Three
d) Four

63. Which of the following metabolic processes occurs in the mitochondria?

a) Cholesterol synthesis
b) Fatty acid synthesis
c) Glycolysis
d) Fatty acid beta-oxidation

64. Palindromic sequences in DNA

a) Reflect the same sequence on two sides
b) Form "blunt" ends when cut by restriction enzymes
c) Not useful in recombinant DNA experiments
d) All of the above

65. The pathway of a tRNA during polypeptide elongation on the ribosome is-

a) A site → P site → E site
b) P site → entry site → exit site
c) A site → P site → entry site
d) P site → A site → E site

66. At what stage of meiosis does crossover occur?

a) Anaphase I
b) Metaphase I
c) Prophase I
d) Telophase I

67. Chloroplast is similar to mitochondria in having

a) Double layered membrane
b) Circular DNA
c) 70s Ribosomes
d) All of these

68. If the DNA of a species has a mole fraction of G+C = 0.48, the mole fraction of A will be:

a) 0.20
b) 0.26
c) 0.48
d) 0.52

69. Plasmid A and B were digested with BamH1 and analysed by "agarose gel electrophoresis". If plasmid A gave two fragments & plasmid B gave three fragments, then which of the following inferences are correct.

(P) plasmid A has three sites for BamH1 and is circular.
(Q) plasmid B has three sites for BamH1 and is circular.
(R) plasmid A has two sites for BamH1 and is linear
(S) plasmid B has two sites for BamH1 and is linear

A. P and Q
B. Q and S
C. P and S
D. Q and R

70. tRNA synthesis in eukaryotes is done by:

a) RNA pol I
b) RNA pol II
c) RNA pol III
d) Both pol I & pol II

71. Which of the following statement(s) is/are correct? Spliceosomes

(P)Are composed of RNA and proteins.

(Q) Recognise RNA sequence that signal for removal of introns.

(R) Can produce different RNA molecules by splicing at alternate sites.

a) P and Q
b) P and R
c) Q and R
d) P, Q & R.

72. Histone octomer comprises of
    a) H1, H2A, H2B & H3
    b) H1, H2A, H2B, H3 & H4
    c) H1, H2A, H3 & H4
    d) H2A, H2B, H3 & H4

73. A mutation in a codon leads to the substitution of one amino acid with another. What is the name for this type of mutation?
    a) nonsense mutation
    b) missence mutation
    c) operator mutation
    d) frameshift mutation

74. An extra finger in humans is rare but is due to a dominant gene. When one parent is normal and the other parent has an extra finger but is heterozygous for the trait, what is the probability that the first child will be normal?
    a) 0%.
    b) 25%.
    c) 50%.
    d) 75%..

75. When the linear form of glucose cyclizes, the product is a(n):
    a) glycoside.
    b) hemiacetal.
    c) anhydride.
    d) lactone.

76. Tay-Sachs disease is the result of a genetic defect in the metabolism of:
    a) gangliosides
    b) triacylglycerols
    c) sterols.
    d) vitamin D.

77. Peripheral membrane proteins:

a) penetrate deeply into the lipid bilayer.

b) can only be released from membranes by detergent treatment.

c) behave like typical soluble proteins when released from membranes.

d) are generally bound covalently to phospholipid head groups.

78. Which of the following molecular genetic techniques is used to identify protein-protein interactions?

a) southern hybridisation analysis

b) yeast two-hybrid system

c) polymerase chain reaction

d) northern hybridisation analysis

79. The mononuclear phagocyte system does not include:

a) Monocytes

b) Kupffer cells.

c) Kidney mesangial cells.

d) Endothelial cells.

80. Which of the following monosaccharides is not an aldose?

a) Ribose

b) Glucose

c) Fructose

d) Glyceraldehyde

81. In prokaryotes, the primate molecule is linked directly to a DNA helices to form a unit on the lagging strand called a:

a) Desmosome

b) Primosome

c) Primahelicase

d) Helicoprimase

82. _____ recombination involves the formation of a very short heteroduplex joint, and it therefore requires a short DNA sequence that is same on both donor and recipient DNA molecules:

a) Conservative site-specific
b) Transpositional site-specific
c) semi-conservative site-specific
d) Semi-transpositional site-specific

83. In Cathrin coated vesicles, _____ link the Cathrin to the vesicle membrane and also trap specific cargo molecules for packaging into the vesicle.

a) COPI
b) COPII
c) Adaptin
d) SNARE

84. If the genome of a newly isolated virus displays the base composition (A = 27% G = 30% T = 21% C = 22%). the virus most likely consists of _____.

a) single-stranded DNA
b) double-stranded DNA
c) single-stranded RNA
d) double-stranded RNA

85. The fatty acids can be transported into and out of mitochondria through

a) Active transport
b) Facilitated transfer
c) Non-facilitated transfer
d) None of these

86. Catalytic activity of salivary amylase requires the presence of

a) Chloride ions
b) Bromide ions
c) Iodide ions
d) All of these

87. Phenylalanine hydroxylase converts phenylalanine into _____.

a) tryptophan
b) alanine
c) tyrosine
d) histidine

88. During denaturation of proteins, all of the following are disrupted except

a) Primary structure
b) Tertiary structure
c) Secondary structure
d) Quaternary structure

89. One round of Edman degradation of the peptide:

H_2N—Gly—Arg—Lys—Phe— Asp—COOH would result in which of the following structures or their phenyl isothiocyanate derivatives?

a) H_2N—Gly—Arg—COOH + H_2N—Lys— Phe— Asp—COOH
b) H_2N—Gly—Arg—Lys—Phe—COOH + Asp
c) H_2N—Arg—Lys—Phe—Asp—COOH + Gly
d) H_2N—Gly—Arg—Lys—COOH + H_2N—Phe —Asp—COOH

90. Acetyl CoA carboxylase regulates fatty acid synthesis by which of the following mechanism?

a) Allosteric regulation
b) Covalent modification
c) Induction and repression
d) All of these

91. When choline of lecithin is replaced by ethanolamine, the product is

a) Spingomyelin
b) Cephalin
c) Plasmalogens
d) Lysolecithin

92. The sequence of the redox carrier in respiratory chain is

a) NAD—FMN—Q—cyt b—cyt c_1—cyt c—cyt aa_3 → O_2

b) FMN—Q—NAD—cyt b—cyt aa_3—cyt c_1— cyt c → O_2

c) NAD—FMN—Q—cyt c_1—cyt c—cyt b—cyt aa_3 → O_2

d) NAD—FMN—Q—cyt b—cyt aa_3—cyt c—cyt c_1→ O_2

93. In mammalian liver the rate controlling enzyme in porphyrin biosynthesis is

a) ALA synthase

b) ALA hydratase

c) Uroporphyrinogen I synthase

d) Uroporphyrinogen III cosynthase

94. Action of insulin on lipid metabolism is

a) It increases lipolysis and increases triglyceride synthesis

b) It decreases lipolysis and increases triglyceride synthesis

c) It decreases lipolysis and decreases triglyceride synthesis

d) It increases synthesis of triglyceride and increased ketogenesis

95. Retinoblastoma can result from a mutation in

a) ras proto-oncogene

b) erbB proto-oncogene

c) p 53 gene

d) Rb 1 gene

96. Sulphur is not present in

a) Thiamine

b) Lipoic acid

c) Thymine

d) Biotin

97. Approximately what fraction of human genome encodes proteins?

A. 2%

B. 25%

C. 52%

D. 100%

98. Which is NOT needed to establish compatibility between potential recipient and donor pair?

a) Recipient HLA typing

b) Donor HLA typing

c) Recipient anti-HLA antibody testing

d) Donor anti-HLA antibody testing

99. Production of biologically active 1,25(OH)Vitamin D is mediated by 1α-hydroxylase in which organ(s)

a) Skin

b) Liver

c) Kidney

d) Skin and liver

100. Which of following two scientists won the 2020 Nobel Prize in Chemistry for their work on CRISPR-Cas9.

a) Francis Collins & Craig venter

b) George Church & Feng Zhang

c) Jack Szostak & Elizabeth Blackburn

d) Emmanuelle Charpentier & Jennifer Doudna

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