

ENTRANCE EXAMINATIONS – 2023

Ph.D. Biotechnology

Hall Ticket No.	
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Time : 2 hours

Max. Marks : 70

Instructions:

1. Answers are to be marked on the OMR answer sheet.
2. Hand over the OMR answer sheet at the end of the examination to the invigilator
3. The question paper contains 70 questions of multiple choices, printed in 16 pages including this page. Last two pages to be used for rough work. OMR answer sheet provided separately.
4. All questions carry one mark each.
5. In case the candidates have equal marks, preference will be given towards the candidate who has obtained higher marks in Part-A.
6. There is no negative marking for wrong answer.
7. Non-programmable scientific calculators are permitted.
8. Cell/Mobile Phones are strictly prohibited in the examination hall.

PART-A

1. Find the length of a ladder that is leaning against the wall making 60° angle, with the ground and the foot of the ladder is resting 4.6 m away from the wall.
A. 2.3 m
B. 4.6 m
C. 7.8 m
D. 9.2 m

2. Find the missing number: 1; 28; 92; 217; 433; 776; _____.
A. 924
B. 1148
C. 1288
D. 1304

3. The increasing order of pKa of the following amino acids in aqueous solution is: Gly, Asp, Lys, and Arg
A. Asp < Gly < Arg < Lys
B. Arg < Lys < Gly < Asp

- C. Gly < Asp < Arg < Lys
- D. Asp < Gly < Lys < Arg

4. Increasing temperature results in _____ in the absorbance of double-stranded DNA.

- A. hyperchromic shift
- B. hypochromic shift
- C. bathochromic shift
- D. hypsochromic shift

5. Which of the following agents is used for DNA quantification?

- A. Cetyltrimethylammonium bromide (CTAB)
- B. Dansyl Chloride
- C. Diphenylamine
- D. Chloroform

6. Klenow fragment is derived from

- A. Taq DNA Polymerase
- B. DNA Polymerase I
- C. DNA Polymerase III
- D. DNA Polymerase II

7. The enzyme Sequenase that is used in DNA sequencing has

- A. High processivity
- B. 3' to 5' polymerisation activity
- C. 5' to 3' exonuclease activity
- D. Derived from bacterial DNA Polymerase I

8. If the given amino acid sequence is digested with trypsin enzyme, how many peptides will be released from it?

N-Asp-Ala-Gly-Arg-His-Cys-Asp-Lys-Trp-Lys-Pro-Ser-Glu-Asn-Leu-Ile-Arg-Thr-Tyr-Glu-C

- A. Two
- B. Three

- C. Four
D. Five
9. In the serine proteases, nucleophile is activated primarily by:
- A. Serine
 - B. Histidine
 - C. Aspartate
 - D. Glutamate
10. Which ligand will be employed to purify GST-tagged fusion protein by affinity chromatography?
- A. Glucose
 - B. Maltose
 - C. Imidazole
 - D. Glutathione
11. If protein is unable to bind to the matrix during affinity chromatography, what should not be done to troubleshoot it among the following?
- A. Adjust buffer conditions
 - B. Check plasmid sequence
 - C. Decrease the flow rate of column
 - D. Wash with higher stringency buffer
12. In the ubiquitination process, which enzyme establishes a thioester bond with ubiquitin?
- A. E1
 - B. E2
 - C. E3
 - D. E4
13. A forms complex with L1 with dissociation constant of K_1 and forms complex with L2 with dissociation constant of K_2 , if K_2 is more than K_1 , which is more stable,
- A. AL1 is more stable than AL2
 - B. AL2 is more stable than AL1

- C. Both AL1 and AL2 will be equally stable
D. They don't form any complex
14. If a dextrorotatory compound undergoes SN1 reaction, the product will be
- A. Racemic mixture
 - B. Levorotatory
 - C. Dextrorotary
 - D. Optically inactive
15. In a reaction, if an inverse of velocity versus inverse of substrate concentration plot is linear, this indicates
- A. Reaction is fast reaction
 - B. Reaction is slow reaction
 - C. Product inhibition exist
 - D. There exists a pre-equilibration
16. Manganese forms following oxidation states in orthophosphoric acid in the presence of persulfate,
- A. +4, +7
 - B. +4
 - C. +7
 - D. +2
17. Following compound will absorb at 400 nm
- A. Permanganate
 - B. Dichromate
 - C. Oxalic acid
 - D. Iron phenanthroline
18. In a reaction the product is formed in an exponential pattern, the initial velocity of product formation can be determined by applying,
- A. Linear equation
 - B. Logarithmic equation
 - C. Polynomial equation
 - D. Both logarithmic and polynomial equation

19. Rukmini decided to wish her friend Sayani on her recovery from illness. She started from her school and cycled 20 m towards North. Then she turned right and went 30 m to a flower shop. After buying flower, she cycled in the right direction for 35 m to reach the chocolate shop. There she bought some chocolates and started cycling left for 15 m. From there she took another left and moved 15 m to reach Shayani's house. In which direction and how many meters is she from her school?

- A. 45 m East
- B. 30 m West
- C. 30 m East
- D. 15 m West

20. Which of the following is **NOT** a segmentation method

- A. Fixed circle
- B. Histogram
- C. Variable circle
- D. Dendrogram

21. Match the following

I. Pubmed				1. Resource of protein-protein interactions
II. AlphaFold				2. Literature database
III. DIP				3. Provides functional analysis of proteins
IV. InterPro				4. Predicted protein structure resource
I	II	III	IV	
A. 1	2	3	4	
B. 2	4	1	3	
C. 4	3	2	1	
D. 3	4	1	2	

22. Calculate the angle between the hour hand and the minute hand of a clock at 5.30.

- A. 15°
- B. 05°
- C. 12°

D. 17°

23. Match the following.

- | | |
|------------|--|
| I. SCOP | 1. Resource of protein-protein interactions |
| II. PDB | 2. A substitution matrix |
| III. PAM | 3. Repository of the 3D structures of biological molecules |
| IV. STRING | 4. Database for comparing and classifying protein structures |

- | | I | II | III | IV |
|----|---|----|-----|----|
| A. | 1 | 2 | 4 | 3 |
| B. | 4 | 3 | 2 | 1 |
| C. | 2 | 1 | 4 | 3 |
| D. | 2 | 3 | 4 | 1 |

24. Sucrose show

- A. Negative with Tollen's and positive with Fehling's reagents
- B. Negative with Tollen's and Fehling's reagents
- C. Positive with Tollen's and Fehling's reagents
- D. Positive with Tollen's and Negative with Fehling's reagent

25. Which of the following is closely related to molecular size distribution?

- A. vibrational frequency
- B. sedimentation velocity
- C. van 't Hoff factor
- D. Maxwell's relations

26. Find the probability that a leap year has 52 Sundays

- A. 2/7
- B. 3/7
- C. 5/7
- D. 4/7

27. Normalization of transcript expression is performed by calculating

- A. RMPK
- B. RMP
- C. RPKM

D. RKPM

28. Which of the following is the strongest base?

- A. CH_3ONa
- B. NaNH_2
- C. $\text{CH}_3\text{CH}_2\text{Li}$
- D. $\text{CH}_3\text{CO}_2\text{Na}$

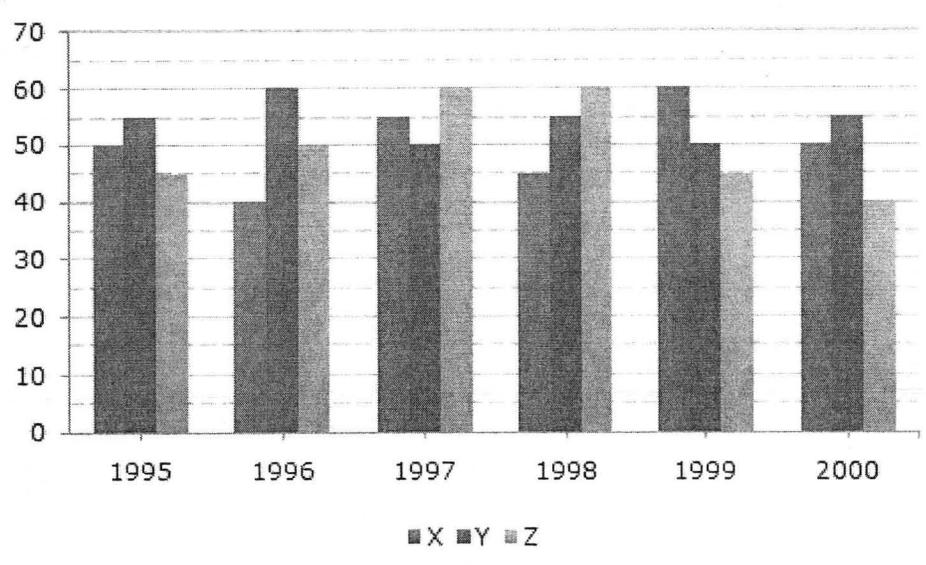
29. 70 gm of Nitrogen gas at 50 atm. and 25°C is allowed to expand isothermally. What is the no. of gm molecules of N_2 initially?

- A. 1.4
- B. 2.5
- C. 2.8
- D. 1.8

30. One of the following is not entropy driven process,

- A. Base stacking
- B. Cooperative multimerization of proteins
- C. Base pairing
- D. Virus capsid formation

31. Anjali is selling three brands of dress materials X, Y and Z. The production of three types of materials (in thousands) for the period of 1995-2000 has been expressed in the following bar graph.



Find out the total production of Z material in 1997 and 1998 is what percentage of the total production of X material in 1995 and 1996?

- A. 96.67%
- B. 133.33%
- C. 115%
- D. 120%

32. You have purified a recombinant protein from bacteria having molecular weight of 18 kDa. The absorbance at 280nm of 40 μ l purified protein, diluted to 1ml is 0.225. The pathlength of the cuvette used for measuring protein absorbance was 1 cm. If the molar extinction coefficient of the recombinant protein is 9,970 $M^{-1}cm^{-1}$, the concentration of the protein would be

- A. 10 mg/ml
- B. 0.1mg/ml
- C. 1 gm/ml
- D. 0.1 gm/ml

33. You have subjected the mixture of glutamic acid (pI=3.2), arginine (pI=10.8) and valine (pI=6.0) to electrophoresis. Which amino acid (s) migrate toward the anode when the electrophoresis is carried out at pH of 7.1?

- A. Arginine
- B. Valine
- C. Glutamic acid and Arginine

D. Valine and Glutamic acid

34. Samtools are used:

- A. For visualization
- B. To align the reads
- C. For processing of aligned reads.
- D. For differential gene expression

35. Intramolecular hydrogen bonds are formed in solution of following molecule,

- A. Parahydroxy benzoic acid
- B. Toluidine
- C. Orthohydroxy benzoic acid
- D. Phenol

PART-B

36. Zinc finger motif is a specific characteristic of proteins, which statements are true about it?

- I. It is only found in eukaryotic organisms.
 - II. It is generally between 23 and 30 amino acids long.
 - III. Proteins containing the zinc finger motif act as DNA-binding proteins.
 - IV. Zn^{2+} ion of the motif interacts directly with phosphate of DNA.
- A. I and II
 - B. II and III
 - C. III and IV
 - D. I and IV

37. Chromatin Immuno-precipitation (ChIP) Assay is used to investigate the interaction between proteins and DNA. Which is not correct statement for it?

- A. It may provide quantitative data
- B. It may be used for high throughput screening
- C. It analyses DNA-protein interactions in living cells
- D. It has ability to profile a promoter for different proteins

38. Deubiquitinating enzymes (DUBs) play several roles in the ubiquitin pathway, except:

- A. Recycling of ubiquitin

- B. Processing of ubiquitin precursors
- C. Editing or rescue of ubiquitin conjugates
- D. Assembly of unanchored ubiquitin oligomers

39. Align the given type of post-translational modifications of proteins in Group I with the participating amino acids in Group II

Group I	Group II
a. N-linked glycosylation	1. Serine
b. C-linked glycosylation	2. Lysine
c. Phosphoglycosylation	3. Tryptophan
d. N-Acetylation	4. Arginine

- A. a-1, b-2, c-3, d-4
- B. a-2, b-1, c-4, d-3
- C. a-3, b-1, c-4, d-2
- D. a-4, b-3, c-1, d-2

40. The additional role(s) of amino acids in plants, besides acting as building blocks include

- (i) Serve to transport nitrogen from source to sink tissues
- (ii) Serve as precursors to phytohormones
- (iii) contribute to animal nutrition
- (iv) participate in lipid synthesis

The correct answer is

- A. (i) and (iv)
- B. (i) and (ii)
- C. (iii) and (iv)
- D. (ii) and (iv)

41. Which of the following cell type in the brain are capable of phagocytosis as part of immune function?

- A. Schwann Cells
- B. Oligodendrocytes
- C. Microglia
- D. Macroglia

42. Match the following Enzymes in Part A with their substrates in Part B

Part A	Part B
1. Aminotransferase	(i) Methionine
2. SAM synthetase	(ii) 2-ketoisovalerate
3. Aspartate Kinase	(iii) Homoserine 4-phosphate
4. Threonine synthase	(iv) Aspartate

The correct pairs include

- A. 1. (iv) 2. (iii) 3. (i) 4. (ii)
- B. 1. (iii) 2. (i) 3. (iv) 4. (ii)
- C. 1. (ii) 2. (i) 3. (iv) 4. (iii)
- D. 1. (ii) 2. (iii) 3. (iv) 4. (i)

43. The alternative oxidase (AOX) pathway of mitochondrial electron transport chain has the following characteristic features

- (i) Transfer electrons from ubiquinol to oxygen
- (ii) Five ATP are synthesized in this pathway
- (iii) It is a multi-enzyme complex
- (iv) It has molecular mass of 32 kDa

The correct statements are

- A. (i) and (iii)
- B. (ii) and (iii)
- C. (ii) and (iv)
- D. (i) and (iv)

44. Glutathione is a

- A. Amino acid
- B. Dipeptide
- C. Tripeptide
- D. Tetrapeptide

45. In an enzyme-substrate reaction, the addition of an inhibitor did not change the V_{\max} value (consider that the reaction follows Michaelis-Menten mechanism). The inhibitor is a

-
- A. Competitive inhibitor

- B. Uncompetitive inhibitor
 - C. Non-competitive inhibitor
 - D. Passive inhibitor
46. Which of the following method can be used for global gene expression profiling
- A. qRT-PCR
 - B. Northern blotting
 - C. DNA Microarray
 - D. Western blotting
47. Tetracycline inhibits the
- A. interaction between tRNA and mRNA
 - B. translocation of mRNA through ribosome
 - C. peptidyl transferase activity
 - D. binding of amino-acyl tRNA to ribosome
48. The nerve centres in the brain which controls body temperature urge for the eating is
- A. Hypothalamus
 - B. Cerebellum
 - C. Pons
 - D. Thalamus
49. Which of the following pairs of subcellular structures distinguishes from the other cell types
- A. Perikaryon
 - B. Vacuoles and fibers
 - C. Flagellum and medullary sheath
 - D. Nucleus and mitochondria
50. The active cyclin CDK complex regulates the cell cycle through
- A. Phosphorylation of specific proteins
 - B. Dephosphorylation of specific proteins

- C. Methylation of specific proteins
D. Cleavage of specific proteins
51. Which of the following is not an actual cell cycle check point
A. G1 check point
B. M check point
C. Spindle check point
D. S check point
52. Which one among the following inhibits inflammation
A. TNF
B. ROs
C. Protein C
D. Neuropeptides
53. The cell line used for the production of polio vaccine was...
A. CHO cell line
B. Dog kidney cell line
C. Primate kidney cell line
D. Mouse fibroblast cell line
54. Name the organ in which the malarial parasite could reside and stay dormant for up to one year during the transmission of the disease in humans
A. Kidney
B. Liver
C. Intestines
D. Gall's bladder
55. Blackwater fever is a special manifestation of malaria caused by;
A. *P. falciparum*
B. *Trypanosomes*
C. *Leishmania*
D. *None of the above*
56. The most active stage of feeding in lepidopteran insects
A. Egg
B. Larva

- C. Pupa
- D. Moth

57. Identify the false statement with reference to *Spodoptera frugiperda*

- A. Its commonly called as fall army worm
- B. It invaded India in 2018
- C. Its monophagous
- D. It majorly damage maize among wide host range

58. Match the following

- | Part A | Part B |
|---------------------|----------------------|
| 1. Melanization | (i) Zymogen |
| 2. Prophenoloxidase | (ii) Immune response |
| 3. plasmatocytes | (iii) Phenoloxidase |
| 4. Melanin | (iv) Phagocytosis |
- A. 1. (iv) 2. (iii) 3. (i) 4. (ii)
 - B. 1. (iii) 2. (iv) 3. (ii) 4. (i)
 - C. 1. (ii) 2. (iii) 3. (iv) 4. (i)
 - D. 1. (iii) 2. (i) 3. (iv) 4. (ii)

59. Chou–Fasman method is known to predict.

- A. Translated sequence of a gene
- B. ORF from a DNA sequence
- C. Secondary structure of a protein
- D. Tertiary structure of a protein

60. Which of the following is the distance-based phylogenetic method?

- A. Range-Distance
- B. Neighbor-Joining
- C. Maximum Likelihood

D. Maximum Parsimony

61. In neurons, because the resting potential is _____, depolarization means _____, while hyperpolarisation means _____

- A. negative, more positive, more negative
- B. negative, more negative, more positive
- C. positive, more positive, more negative
- D. positive, more negative, more positive

62. PROSITE is used to find

- A. Protein tertiary structure
- B. Interacting proteins
- C. Biologically meaningful patterns or profiles of protein
- D. Orthologous protein

63. Reciprocal best BLAST hit method can be used to identify

- A. Orthologous relation
- B. Proteins secondary structure
- C. Molecular Modelling
- D. Regulatory elements

64. Which of the following algorithm are used for sequence alignment?

- i. Needleman–Wunsch
- ii. Smith–Waterman
- iii. Garnier–Robson
- iv. Werner-Arber

- A. i and ii
- B. ii and iv
- C. i and iii
- D. ii and iii

65. Which of the following **is not** applicable to DNA topoisomerase?

- A. It has endonuclease activity
- B. It may have an ATP binding domain
- C. The active site Tyrosine is phosphorylated during its association with DNA
- D. It can untie knots present in DNA molecules

66. In passive agglutination test
- A. Antibody is coated on the inert material
 - B. Antigen is coated on the inert material
 - C. Enzyme is coated on the inter material
 - D. Substrate is coated on the material
67. Which of the following is not the DNA polymorphism
- A. Single nucleotide variant
 - B. DNA methylation
 - C. Tandem repeats
 - D. Microsatellites
68. The basic unit for Baltimore system of virus classification is
- A. Genome
 - B. mRNA formation
 - C. Transmission
 - D. Replication
69. Which of the following cannot be used in analysing the structure of RNA
- A. DNase I
 - B. DMS
 - C. RNase T1
 - D. RNase VI
70. Which of the following virus infects only humans
- A. Measles
 - B. Chikungunya
 - C. HIV
 - D. Zika

C-14.

Rough Work

University of Hyderabad
Ph.D. Entrance Examinations - 2023

School/Department/Centre
Course: Ph.D.

: School of Life Sciences
Subject : Biotechnology and Bioinformatics

Q. No.	Answer	Q. No.	Answer	Q. No.	Answer
1	D	26	C	51	D
2	C	27	C	52	C
3	A	28	C	53	C
4	A	29	B	54	B
5	C	30	C	55	A
6	B	31	B	56	B
7	A	32	A	57	C
8	C	33	D	58	D
9	B	34	C	59	C
10	D	35	C	60	B
11	D	36	B	61	A
12	A	37	B	62	C
13	A	38	D	63	A
14	A	39	D	64	A
15	D	40	B	65	C
16	A	41	C	66	B
17	B	42	C	67	B
18	C	43	D	68	B
19	A	44	C	69	A
20	D	45	A	70	A
21	B	46	C		
22	A	47	D		
23	B	48	A		
24	B	49	A		
25	B	50	A		

Note/Remarks :



Signature

School/Department/Centre

HEAD

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