ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.

M.Sc. (COMPUTATIONAL BIOLOGY)

COURSE CODE : 310

Register Number : ☐

Signature of the Invigilator
(with date)

COURSE CODE : 310

Time : 2 Hours **Max : 400 Marks**

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. Which one of the following statements is not true?

(A) Trypsin is an endopeptidase

(B) Trypsin cleaves n-terminus to lysine and arginine

(C) Trypsin exhibits autocatalytic activity

(D) Trypsin is synthesized as inactive zymogen precursor

2. How many cycles of PCR are necessary to obtain 10 copies of a gene from a single copy of DNA?

(A) 5 cycles (B) 3 cycles

(C) 4 cycles (D) 10 cycles

3. E-value of significant blast alignment should ideally be

(A) less than 1 and more than 0

(B) more than 1

(C) a negative number

(D) none of these

4. Which is the most common post translation modification seen in secreted proteins

(A) phosphorylation (B) signal peptide

(C) glycosylation (D) acetylation

5. Which one of the following statement is not true for a processed pseudogene?

(A) it lacks intronic regions

(B) it is produced by genome duplication event

(C) it requires reverse transcription activity

(D) none of the above

6. Which chromatography method is based on reversible chemical interactions of high specificity?

(A) reversed phase chromatography

(B) Hydrophobic interaction chromatography

(C) gel permeation chromatography

(D) affinity chromatography

7. Stationary phase in a Reversed-phase chromatography is generally

(A) polar (B) Non-polar

(C) any one of these (D) none of these

8. What is peptide mass fingerprinting?

(A) Peptides are fragmented in the mass spectrometer and a short stretch of amino acids are obtained

(B) Peptides are fragmented in the mass spectrometer and the fragment ion masses are used to search the database

(C) protein is digested and the peptide masses are used to search the database

(D) None of the above

9. What is the nature of amino acids present in the transmembrane domains of proteins?

(A) hydrophobic (B) polar

(C) amphipatic (D) hydrophilic

10. Mass spectrometry derived protein sequences can be used for

(A) identification of novel gene

(B) identification of protein isoforms

(C) identification of post translational modifications

(D) all of the above

11. Which of the following is not a DNA sequence database?

(A) GenBank (B) EMBL

(C) DDBJ (D) PIR

12. BRENDA is a "_____" database.

(A) Protein (B) Nucleic acid

(C) Enzyme (D) Chemical

13. Calculation of isoelectric point and other properties based on the input sequence is possible in

(A) Protein Data bank (B) Swiss-Prot

(C) ExPASy (D) DDBJ

14. PIR (Protein Information Resource) is a "_____" type of database.

(A) Structure (B) Sequence

(C) Ligands (D) Genes

15. PRINTS, BLOCKS, IDENTIFY and PROSITE are all "_____" types of database.

(A) Primary (B) Secondary

(C) Sequence (D) Structure

16. PHYLIP database is used for

(A) Sequence analysis and alignment (B) Phylogenetic analysis

(C) Motif detection (D) Active site analysis

17. The type of helix found in leucine zipper motif

(A) α - helix (B) β - helix

(C) Both α and β - helix (D) Two β - helices

18. The compounds used for denaturation of protein

(A) β - mercapto ethanol (B) Urea

(C) Guanidonium ion (D) All the above

19. The turnover number of enzyme *carbonic anhydrase* with HCO_3^- as substrate in k_{cat} (S^{-1}) is

(A) 0.4 (B) 40,000 (C) 400,000 (D) 40,000,000

20. The important inorganic element that serves as cofactor for *glutathione peroxidase* is

(A) Mn^{2+} (B) Zn^{2+} (C) Mo (D) Se

21. The approximate number of genes in human is:

(A) 15000 (B) 22000 (C) 30000 (D) 35000

22. Which of the following is NOT an assumption under Hardy Weinberg equillibrium:

(A) No mutation (B) Panmictic population

(C) No migration (D) No genetic drift

23. The calcium homeostasis in blood is maintained by:

(A) T3 and T4 (B) Insulin and glucagon

(C) Calcitonin and parathormone (D) Calcitonin and erythropoietin

24. Erythropoietin is secreted by:

(A) Liver (B) Pancreas

(C) Kidney (D) Adrenal

25. Somatomedin is secreted by:

(A) Liver (B) Pancreas

(C) Kidney (D) Adrenal

26. In human ovary, corpus luteum is regressed into:

(A) Corpus regressum (B) Corpus albicans

(C) Corpus mortium (D) Graffian follicle

27. Ovulation in human is triggered by surge in:

(A) FSH (B) LH (C) HCG (D) PMSH

28. Which of the following are least likely to be involved in three dimensional structure of proteins:

(A) Disulphide bonds (B) Hydrogen bonds

(C) Ester bonds (D) Hydrophobic interactions

29. The organelle having high level of acid phosphatase activity is:

(A) Lysosomes (B) Smooth ER

(C) Rough ER (D) mitochondria

30. Polymerase chain reaction needs a thermostable DNA polymerase isolated from a bacterium known as:

(A) Thermus thermus (B) Thermus aquaticus

(C) Thermus marina (D) Thermus namibiensis

31. A beam of light travels obliquely from one medium into another medium of higher index of refraction. All of the following are true statements about the beam of light EXCEPT:

(A) its speed increases (B) its wavelength decreases

(C) its frequency remains the same (D) it bends toward the normal

32. A mass is suspended from a vertical spring and displaced downward at a distance Y from its equilibrium position. After being released, it oscillates with period T. At a time 5T/4, the velocity of the mass is

(A) a maximum and directed upward

(B) a maximum and directed downward

(C) constant

(D) zero

33. Faraday's law of electromagnetic induction describes how an electric field can be produced at a point in space by

(A) an electric charge
(B) a constant magnetic field
(C) a changing magnetic field
(D) a steady current

34. Which one of the following temperatures is approximately equal to "room temperature"?

(A) 0 K (B) 0 C (C) 100 C (D) 293 K

35. Which would cause a more serious burn: 30 g of steam or 30 g of liquid water, both at 100 C and why is this so?

(A) water, because it is denser than steam.
(B) Steam, because of its specific heat capacity
(C) Steam, because of its latent heat of vaporization
(D) water, because its specific heat is greater than that of steam.

36. Which one of the following is true concerning momentum?

(A) Momentum is a force
(B) Momentum and impulse are measured in the same units.
(C) Momentum is a scalar quantity
(D) The momentum of an object is always positive.

37. The head of a hammer (m=1.5 kg) moving at 4.5 m/s strikes a nail and bounces back with the same speed after an elastic collision lasting 0.075 s. What is the magnitude of the average force the hammer exerts on the nail?

(A) 6.8 N (B) 60 N (C) 90 N (D) 180 N

38. A stationary bomb explodes in space breaking into a number of small fragments. At the location of the explosion, the net force due to gravity is zero newtons. Which one of the following statements concering this event is true?

(A) Kinetic energy is conserved in this process
(B) The fragments must have equal kinetic energies.
(C) The vector sum of the linear momenta of the fragments must be zero
(D) The sum of the kinetic energies of the fragments must be zero.

39. Two cars of equal mass collide on a horizontal frictionless surface. Before the collision, car A is at rest while car B has a constant velocity of 12 m/s. After the collision, the two bodies are stuck together. What is the speed of the composite body (A + B) after the collision?

(A) 3.0 m/s (B) 6.0 m/s (C) 12 m/s (D) 24 m/s

40. Which one of the following statements concerning permanent magnets is false?

(A) The north pole of a permanent magnet is attracted to a south pole

(B) All permanent magnets are surrounded by a magnetic field.

(C) The direction of a magnetic field is indicated by the north pole of a compass.

(D) When a permanent magnet is cut in half, one piece will be a north pole and one piece will be south pole.

41. Which one of the following is an example of an object with kinetic energy not equal to zero?

(A) a satellite in geosynchronous orbit

(B) a stationary pendulum

(C) a car parked at the top of a hill

(D) a boulder resting at the bottom of a cliff

42. A program that can copy itself and infect a computer without the permission or knowledge of the owner is called

(A) Virus (B) Floppy

(C) Monitor (D) Java

43. Which one of the following is responsible for the management and coordination of activities and the sharing of the resource of the computer?

(A) Motherboard (B) Application software

(C) Operating system (D) RAM

44. In computers, '.tmp' extension refers usually to what kind of file?

(A) Image file (B) Video file

(C) Text file (D) Temporary file

45. What does BIOS stand for?

(A) Basic Input Output System

(B) Better Integrated Operating System

(C) Battery Integrated Operating System

(D) Backup Input Output System

46. The specially designed computers to perform very complex calculations extremely rapidly are called as

(A) Laptops
(B) Mainframe computers
(C) Mini computers
(D) Super computers

47. Computers use the ———— language to process data

(A) Assembly language
(B) High level language
(C) Binary language
(D) Representational language

48. Word processing, spreadsheet, and photo-editing are examples of:

(A) Application software
(B) Operating System software
(C) System software
(D) Platform software

49. Which one of the following are specially designed computers that perform complex calculations extremely rapidly.

(A) Servers
(B) Laptops
(C) Supercomputers
(D) Mainframes

50. The steps and tasks needed to process data, such as responses to questions or clicking an icon, are called

(A) Instructions
(B) The operating system
(C) The system unit
(D) Application software

51. Match the following terms with their meanings:

I.	Data	a.	the main circuit board in the system unit
II.	Memory	b.	representation of a fact or idea (unprocessed information)
III.	Output	c.	processed data or information
IV.	Storage	d.	holds instructions or data that the CPU processes
V.	Motherboard	e.	data or information that can be accessed again

(A) I – b, II – d, III – c, IV – e, V – a
(B) I – b, II – c, III – a, IV – d, V – e
(C) I – b, II – c, III – a, IV – e, V – d
(D) I – a, II – d, III – c, IV – e, V – b

52. Modern computers do not work with decimal numbers. Instead, they process binary numbers i.e., groups of 0's and 1's. because

(A) Electronic devices are most reliable when designed for two state operation

(B) Memory is only possible for binary numbers

(C) With decimal numbers, the circuits are complex and costly

(D) Binary circuits are simple

53. The process of forming curd is called

(A) Sublimation reaction

(B) Condensation reaction

(C) Fermentation reaction

(D) Reduction reaction

54. Who solved the structure of collagen

(A) Venki Ramakrishnan

(B) G.N. Ramachandran

(C) Sir. C.V. Raman

(D) Wim Hole

55. Let us assume Carbon, Oxygen and Hydrogen mixture gives methanol. Which would be appropriate equation for this reaction?

(A) $C + H + O \rightarrow CH3OH$

(B) $C + 4H + O \rightarrow CH3OH$

(C) $C + H_2 + O_2 \rightarrow CH3OH$

(D) $C_2 + H_2 + O_2 \rightarrow CH3OH$

56. Balance the following chemical reaction $Fe + Cl_2 \rightarrow FeCl_3$

(A) $2Fe + 3Cl_2 \rightarrow 2FeCl_3$

(B) $Fe + 3Cl_2 \rightarrow 2FeCl_3$

(C) $2Fe + 2Cl_2 \rightarrow 2FeCl_3$

(D) $Fe + Cl_2 \rightarrow FeCl_3$

57. The smallest unit of life is

(A) DNA molecule

(B) Organelle

(C) Cell

(D) Virus

58. Similarity is measured by

(A) Correlation

(B) Mean

(C) Median

(D) Mode

59. Mention the type of following reaction

$CH_3\text{-}CH_2OH + HCl \rightarrow CH_3\text{-}CH_2Cl + H_2O$

(A) Addition (B) Substitution

(C) Hydrogenation (D) Elemination

60. Natural amino acids found in following conformation

(A) L and D (B) D and R

(C) L (D) D and S

61. Chiral carbon is the one

(A) Having all four different attached group

(B) Radio labeled carbon

(C) Carbon used in C^{13} NMR spectroscopy

(D) Carbon present other than organic compounds

62. L and D notation for chemical samples was denoted based on

(A) Ramachandran plot

(B) Linus Pauling and Robert Corey's prediction

(C) Emil Fischer's work

(D) IUPAC rule

63. Zwitter ions are the one

(A) Having Neutral and free radicals

(B) Having Negative ions and free radicals

(C) Having positive and negative ions

(D) Having positive ion and free radicals

64. A messenger RNA is 666 nucleotides long, including the initiator and termination codons. The number of amino acids in the protein translated from this mRNA is

(A) 222 (B) 221

(C) 223 (D) 220

65. The R group found in amino acids consists of

(A) an amine group (B) a hydroxyl group

(C) an amine group and a carboxyl group (D) at least a hydrogen atom

66. The empirical formula for carbohydrates is

(A) $(CH_2O)_n$ (B) 2(CHO)n

(C) $(C_2HO)_n$ (D) $(CHO)_2$

67. The protein surface tends to be more _____ than the inner core.

(A) hydrophilic (B) hydrophobic

(C) aromatic (D) acidic

68. Transmembrane regions of membrane proteins are usually more

(A) Hydrophilic (B) Hydrophobic

(C) Acidic (D) Basic

69. Irregular heart beat is due to the deficiency of

(A) Copper (B) Magnesium

(C) Potassium (D) Sodium

70. The median of the following data :

5, 8, 11, 8, 10, 16, 13, 8, 10, 7

(A) 10 (B) 9 (C) 8 (D) 7

71. The mode of the following data:

3, 8, 5, 4, 7, 2, 9

(A) 5.4 (B) 4.5

(C) 4 (D) Does not exist

72. The ozone layer is formed by the reaction of

(A) Oxygen and IR rays (B) Oxygen and chlorine

(C) Oxygen and carbon dioxide (D) Oxygen and UV rays

73. The value of is ${}^6C_2$

(A) 18 (B) 20

(C) 24 (D) 15

74. A box contains 6 red and 4 black balls. One ball is drawn, what is the probability that it is red?

(A) 3/5 (B) 2/5 (C) 1/5 (D) 1/10

75. If a Sample Space

S = {1,2,3,4,5,6} and an event C = {2,3,5} then C^C is equal to

(A) {1,4,6} (B) {1,3,5} (C) {2,4,6} (D) {1,2,3,5}

76. Which of the following statement is true for tRNA molecules?

(A) it binds to DNA to initiate translation

(B) it gives the stability to ribosomes

(C) there is at least one form for each kind of amino acid

(D) it transfers the code from nucleus to cytoplasm

77. Which pair of amino acid absorbs the most UV light at 280nm?

(A) Thr and His (B) Trp and Tyr

(C) Cys and Asp (D) Phe and Pro

78. 'Dead', non-functional copies of genes present elsewhere in the genome, but no longer of any use, are called as

(A) Pseudogenes (B) Selfish genes

(C) Jumping genes (D) Holandric genes

79. The primary action of steroid hormones is at the level of

(A) replication (B) transcription

(C) translation (D) post transcriptional modification

80. Yeast artificial chromosomes are used for

(A) genome sequencing (B) transfer plant genes to yeast

(C) finding gene marker (D) fermentation technology

81. Genes for typical single-character Mendelian traits are called

(A) segmental duplications (B) multigene families

(C) tandem clusters (D) single-copy genes

82. When a T-cell recognized an antigen, it

(A) moves from the thymus to the spleen (B) multiplies

(C) releases interferons (D) releases antibodies

83. The field of study which involves the sequencing of the genomes of organisms is

(A) proteomics (B) bioinformatics

(C) genomics (D) molecular genetics

84. The correlation coefficient between any two variables

(A) does not depend on the origin or scale of the observations

(B) depend on the origin or scale of the observations

(C) does not depend on the origin but depends on scale of the observations

(D) does not depend on scale but depends on origin of the observations

85. A class contains 10 male and 20 female students, of which half the male and half the female students have brown-eyes. What is the probability p that a student chosen at random is a male or has brown-eyes

(A) 1/6 (B) 2/3 (C) 1/3 (D) 5/6

86. A fair coin is tossed three times. What is the probability of appearing exactly 2 heads?

(A) 1/4 (B) 1/8 (C) 3/8 (D) 3/4

87. The period of revolution of sun at pole is

(A) 1 day (B) 25 days (C) 34 days (D) 7 days

88. The rate of the first order reaction depends on the

(A) Concentration of the reactant (B) Concentration of the product

(C) Time (D) Temperature

89. First free-living organism with known complete genomes sequence :

(A) Mycoplasma genitalium (B) Saccharomyces cerevisae

(C) Haemophilus influenzae (D) Synechocystis sp.

90. The number of genes present in a nematode worm (*Caenorhabditis elegans*) is:

(A) 14,000 (B) 18,000 (C) 22,000 (D) 30,000

91. The neutral theory of evolution was proposed by:

(A) Motoo Kimura (B) JBS Haldane

(C) Charles Darwin (D) R.A. Fisher

92. The average length of a gene (ORF) in prokaryotes and eukaryotes is:

(A) 600 bases (B) 800 bases (C) 1000 bases (D) 1200 bases

93. Scale-free biological network is characterized by:

(A) Power law degree distribution (B) Logarithmic degree distribution

(C) Exponential degree distribution (D) Geometric degree distribution

94. Retrotransposons comprise about 90% of the genome in:

(A) Human (B) Rice (C) Maize (D) Zebrafish

95. Which of the following method is NOT used to study protein-protein interaction:

(A) Yeast two- hybrid analysis (B) Affinity chromatography

(C) Coimmunoprecipitation (D) MALDI

96. The trichromatic vision in old world monkeys is evolved by:

(A) Whole genome duplication (B) Gene duplication

(C) Retrotransposition (D) Lateral gene transfer

97. A gene desert in a genome contains:

(A) Low number of genes (B) High number of disease genes

(C) Low number of essential genes (D) High number of dispensable genes

98. A genetic change that occurs between 1% to 99% of individuals in a population:

(A) Polymorphism (B) Mutation

(C) Substitution (D) Recombination

99. A genetic change that is completely fixed in a population:

(A) Polymorphism (B) Mutation

(C) Substitution (D) Recombination

100. The trigonometric expression $\cos^2\theta - \sin^2\theta$ is equivalent to

(A) $2\cos^2\theta - 1$ (B) $1 + 2\sin^2\theta$

(C) $2\cos^2\theta + 1$ (D) $1 - 2\cos^2\theta$

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