

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

M.Sc. (Bioinformatics)

COURSE CODE : 378

Register Number :

*Signature of the Invigilator
(with date)*

COURSE CODE : 378

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 of the 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. An example of a structural protein which is also an enzyme is
 (A) actin (B) myosin (C) trypsin (D) troponin
2. Which of the following bonds in proteins has a partial double bond character?
 (A) C α -C (B) C α -N (C) C-N (D) C-O
3. The average molecular weight of an amino acid in a protein is
 (A) 125 (B) 120 (C) 110 (D) 137
4. The forces that maintain the three dimensional structure of a protein is mainly
 (A) non-covalent (B) covalent
 (C) coordinate (D) covalent and non-covalent
5. If the molecular mass of an amino acid is 150 Daltons, the molecular mass of a tripeptide of the same amino acid will be
 (A) 450 (B) 486 (C) 504 (D) 414
6. The high solubility of amino acids in water is due to
 (A) presence of side chain (B) dipolar ion structure
 (C) unipolarity (D) hydrophilic nature of amino group
7. Thyroxin is important in the control of
 (A) cellular metabolic rates (B) diabetes mellitus
 (C) mitochondrial respiration (D) calcium uptake
8. Rate of energy storage at consumer level is known as
 (A) net community productivity (B) net primary productivity
 (C) secondary productivity (D) gross primary productivity
9. The phenomenon of genetic drift is most likely to occur in population that are
 (A) small and inbred (B) undergoing gene flow
 (C) allopartic (D) large and panmictic

10. The greatest amount of free energy is available at which of the following levels?
(A) tertiary consumers (B) secondary consumers
(C) decomposers (D) producers
11. The DNA polymerase responsible for replication of mitochondrial DNA is
(A) α (B) β (C) γ (D) ϵ
12. Biochemical mechanism that regulate progression through the cell cycle include
(A) phosphorylation (B) dephosphorylation
(C) protein degradation (D) all the above
13. Which of the following is the principal buffer in interstitial fluid?
(A) hemoglobin (B) albumin
(C) carbonic acid (D) H_2PO_4
14. Among the following components of chloroplast membrane which one is the strongest reducing agent?
(A) reduced cytochrome b6 (B) PQR2
(C) NADPH (D) reduced ferredoxin
15. The growth kinetic that result from metabolizing one sugar before another is referred to as
(A) exponential growth (B) diphasic growth
(C) diauxic growth (D) chemotaxis
16. Melting of DNA results in
(A) decrease in optical density (B) increase in optical density
(C) no change in optical density (D) none
17. High energy bond present in ATP is
(A) ester bond (B) ether bond
(C) phosphoanhydride bond (D) none

18. Sugar-phosphate backbone is
- (A) hydrophobic in nature
 - (B) hydrophilic in nature
 - (C) non covalent in nature
 - (D) none
19. The Z-DNA helix,
- (A) has fewer base pairs per turn than the B-DNA
 - (B) is favoured by an alternative GC sequence
 - (C) tends to be found at the 3' end of genes
 - (D) is the most common conformation of DNA
20. Which of the following finding first gave a strong indication that DNA was genetic material?
- (A) RNA synthesis depends on a DNA template
 - (B) DNA is in the nuclei of all eukaryotic cell
 - (C) Viral nucleic acid can be DNA
 - (D) Transforming activity is due to DNA
21. Chargaff's rules state that
- (A) in RNA, $A = U$, and in DNA, $A = T$
 - (B) $G = C$ in both RNA and DNA
 - (C) $((A+T)/(G+C)) = 1$
 - (D) $((A+G)/(T+C)) = 1$
22. DNA sequencing by Sanger's method involves the use of
- (A) ribonucleotide
 - (B) 3'-deoxyribonucleotide
 - (C) 2', 3'-dideoxyribonucleotide
 - (D) flurodinitrobenzene
23. DNA
- (A) is more susceptible than RNA to degradation at high pH
 - (B) has catalytic activity
 - (C) can hybridize with other DNA molecules but not with RNA
 - (D) has fewer hydroxyl group than RNA

24. Which of the following reagents and condition will denature dsDNA?
P. heat Q. urea
R. Extreme pH S. Ethanol
(A) P,Q (B) P,Q,R (C) P,R (D) P,Q,R,S
25. Which of the following statement is true about mitochondrial DNA?
(A) it is dsDNA
(B) it contain intron
(C) a single large transcript is made and then cleaved to release individual RNAs
(D) all the above
26. Rosalind Franklin's pictures of DNA double helix were taken using the technique known as
(A) diffraction (B) fluorescence
(C) transmission electron microscopy (D) X-ray crystallography
27. Glucose and mannose are epimers. This means that
(A) they are mirror images of each other
(B) one is an aldose the other a ketose
(C) they rotate plane polarized light in opposite direction
(D) they differ only in the configuration of one carbon atom
28. The chitin in fungal cell wall is
(A) a protein (B) a glycoprotein
(C) a polysaccharide (D) a lipopolysaccharide
29. O-glycosidic bond in polysaccharides form between
(A) anomeric carbon and alkoxy oxygen
(B) anomeric oxygen and alkoxy carbon
(C) anomeric hydrogen and alkoxy carbon
(D) none of the above

30. Suppose that we have N carbon atoms, where N is a number large enough to give us a pile of carbon atoms whose mass is 12.0 grams. How much would the same number, N , of oxygen atoms weigh?
- (A) 16.0 g (B) 20.0 g
(C) 25.0 g (D) None of the above
31. Threading
- (A) Protein structure prediction (B) Genome annotation
(C) Sequence alignment (D) Sequence analysis
32. A hidden Markov model of a conserved region in a multiple sequence alignment
- (A) Profile hidden Markov model (B) Block hidden Markov model
(C) Pattern hidden Markov model (D) Domain hidden Markov model
33. The presence of a set of homologous genes in the same order on two different genomes
- (A) Codon usage (B) Synteny
(C) Karyotype (D) None of the above
34. A palm tree was 90 cm high, when it was planted. It grows by an equal number of cm each year and at the end of the seventh year it was one ninth taller than at the end of the twelfth year
- (A) 30 (B) 45 (C) 57 (D) 18
35. The entire collection of proteins that are encoded by the genome of an organism
- (A) Proteome (B) Proteomics
(C) Both (A) and (B) (D) None of the above
36. Wavelength of any radiations from electromagnetic spectrum is
- (A) Directly proportional to its frequency
(B) Inversely proportional to its frequency
(C) Inversely proportional to its velocity
(D) None of the above

37. Imagine a place in the *cosmos* far from all gravitational and frictional influences. Suppose that you visit that place (just suppose) and throw a rock. The rock will
- (A) Gradually stop
 - (B) Continue in motion in the same direction at constant speed
 - (C) Continue in motion in the same direction at different speed
 - (D) None of the above
38. Stringency-refers to
- (A) Minimum number of matches required within a window for Filtering
 - (B) Maximum number of matches required within a window for Filtering
 - (C) Both (A) and (B)
 - (D) None of the above
39. An airplane accelerates down a runway at 3.20 m/s^2 for 32.8 s until it finally lifts off the ground. Determine the distance traveled before takeoff
- (A) $d = 1720 \text{ m}$
 - (B) $d = 0 \text{ m}$
 - (C) $d = 10 \text{ m}$
 - (D) $d = 17.2 \text{ m}$
40. A pair of electric charges of equal magnitude but opposite sign, separated by some, usually small, distance
- (A) Insulator
 - (B) Magnetic dipole
 - (C) Electric dipole
 - (D) None of the above
41. The path difference between two monochromatic light waves of wavelength 4000 \AA is $2 \times 10^{-7} \text{ m}$. The phase difference between them is
- (A) π
 - (B) 2π
 - (C) $3\pi/2$
 - (D) $\pi/2$
42. Bimetal strips are used in
- (A) metal thermometers
 - (B) relays for opening or closing electrical circuits
 - (C) thermostats
 - (D) all of above

43. The work done in an adiabatic change in a particular gas depends upon only
- (A) change in specific heat (B) change in volume
(C) change in pressure (D) change in temperature
44. The first law of thermodynamics is a restatement of the
- (A) law of conservation of momentum
(B) newton's law of cooling
(C) law of conservation of mass
(D) law of conservation of energy
45. If all the external forces on a liquid drop are eliminated, then the shape of the liquid drop will be determined only by
- (A) viscosity (B) surface tension
(C) heat content (D) specific gravity
46. What is the name given to series?
 $1 + 1/2 + 1/3 + 1/4 + 1/5 + 1/6 + 1/7 + 1/8 + 1/9$
- (A) Harmonic series (B) Fibonacci series
(C) Fourier series (D) Arithmetic series
47. Convert 1789 to roman figure
- (A) MDCCCLXXXIX (B) MMDCLIX
(C) MCDXCIX (D) DCCMIX
48. A 2-kg object is moving horizontally with a speed of 4 m/s. How much net force is required to keep the object moving at this speed and in this direction?
- (A) 8 N (B) 0 N
(C) 50 N (D) None of the above
49. Can you tell at what time between 7 and 8 o'clock, the two hands of a clock, will be in a straight line?
- (A) 7.05 (B) 7.10 (C) 7.25 (D) 7.55

50. Seven men arrive at a meeting, and each of them shakes hands once with each of the others. How many handshakes does that make?
- (A) 21 (B) 16 (C) 17 (D) 12
51. The first researcher to sequence a genome, in 1977, was
- (A) Todd Golub (B) Frederick Sanger
(C) Craig Venter (D) Stephen Fodor
52. The translated genes of genomes that encode proteins are referred to as
- (A) The open reading frame (B) Introns
(C) Codons (D) Pseudogenes
53. Of the organisms that follow, what has the largest genome size?
- (A) The ulcer-causing bacterium, *Helicobacter pylori*
(B) The malarial parasite *Plasmodium*
(C) The fruit fly, *Drosophila melanogaster*
(D) Commercial rice, *Oryza sativa*
54. Genes for typical single-character Mendelian traits are called
- (A) Segmental duplications (B) Multigene families
(C) Tandem clusters (D) Single-copy genes
55. What percentage of the human genome is comprised of structural DNA?
- (A) 1% (B) 10% (C) 24% (D) 20%
56. X-ray crystallography is used to study
- (A) structure of lipids
(B) composition of proteins and nucleic acids
(C) arrangement of proteins
(D) three dimensional structure of proteins

57. The isolation of individual organelles from homogenates is achieved through
- (A) Differential centrifugation
 - (B) Chromatography
 - (C) X-ray diffraction
 - (D) Employment of different solvents
58. What is the primary objective of cell fractionation?
- (A) to view the structure of cell fractionation
 - (B) to identify the enzymes outside the organelles
 - (C) to determine the size of various organelles
 - (D) to separate the organelles
59. High wavelength UV rays are used in a
- (A) fluorescent microscope
 - (B) polarizing microscope
 - (C) ultraviolet microscope
 - (D) phase-contrast microscope
60. Lipids, proteins and carbohydrates mainly constitute cell membrane. With respect to their mutual proportions, which of the following statements is correct?
- (A) all the three are in equal proportions
 - (B) lipids are in least proportion
 - (C) carbohydrates are in least proportion
 - (D) proteins are in least proportion
61. I love to mix drinks. When I have one glass of lemonade and one glass of orangeade, each glass containing same amount, I take two ounces full of the orangeade and mix it with lemonade, then I take 2 ounces full of this mixture and put it back in the orangeade. What do you think of the resulting mixture? What do you think?
- (A) There is more orangeade in the lemonade
 - (B) There is more lemonade in the orangeade
 - (C) Both are equal amount
 - (D) Neither of answer is true

62. How many domains are there in immunoglobulin heavy chain constant region?
(A) 2 (B) 3 (C) 6 (D) 5
63. A man, when asked by his niece how old he was, replied, "My age is now four times yours, but five years ago it was five times yours." How old was he?
(A) 80 (B) 60 (C) 37 (D) 45
64. I have five letters and five addressed envelopes. If I place the letters in the envelopes at random, what are the chances that only four letters are in their correct envelopes?
(A) Nil (B) 1 (C) 2 (D) 4
65. The chromosome number of a human genome is 46, which was initially discovered by
(A) Tijo and Levan (B) Karl Land Steiner
(C) Watson and Crick (D) Kary Mullis
66. A child who has had one previous immunization against tetanus is given the second immunization in the recommended series, three months later. In what way would you expect the immune response to the second immunization to differ most significantly from the response to the first?
(A) The second response will be slower, but more prolonged
(B) The second response will be larger, but shorter
(C) The second response will produce more antibody, but after a longer lag
(D) The second response will produce a higher ratio of IgG to IgM
67. Penicillin is selectively toxic to bacteria because it damages a bacterial structure, essential for cell viability, with no counterpart in mammalian cells. What structure is damaged by penicillin?
(A) Bacterial flagella (B) Teichoic acid
(C) Lipid A (D) Peptidoglycan

68. A car travels 90. meters due north in 15 seconds. Then the car turns around and travels 40. meters due south in 5.0 seconds. What is the magnitude of the average velocity of the car during this 20. -second interval?
- (A) 2.5 m/s (B) 5.0 m/s (C) 6.5 m/s (D) 7.0 m/s
69. A lab report reads "Gram-negative bacilli were observed in a sputum smear". How did the bacteria appear under the microscope, after Gram-staining?
- (A) Red, round cells (B) Blue, round cells
(C) Red, rod-shaped cells (D) Blue, rod-shaped cells
70. What is the function of DNA polymerase III?
- (A) It attaches the RNA primers to the DNA strand
(B) It adds nucleotide pairs to the growing DNA strand
(C) It adds single nucleotides to the growing DNA strand
(D) It unwinds the DNA
71. A balloon is rising vertically up with a velocity of 29ms^{-1} . A stone is dropped from it and it reaches the ground in 10 seconds. The height of the balloon when the stone was dropped from it is ($g = 9.8 \text{ ms}^{-2}$)
- (A) 100 m (B) 200 m (C) 400 m (D) 150 m
72. A man, standing between two cliffs, claps his hands and starts hearing a series of echoes at intervals of one second. If the speed of sound in air is 340 m/s, the distance between the cliffs is
- (A) 340 m (B) 1620 m (C) 680 m (D) 1700 m
73. When a body is earth connected, electrons from the earth flow into the body. This means that the body is
- (A) Uncharged (B) Charged positively
(C) Charged negatively (D) An insulator
74. A count rate meter shows a count of 240 per minute for a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half life of the source is
- (A) 20 min (B) 30 min (C) 80 min (D) 120 min

75. The refractive index of a particular material is 1.67 for blue light, 1.65 for yellow light and 1.63 for red light. The dispersive power of the material is
(A) 0.0615 (B) 0.024 (C) 0.031 (D) 1.60
76. The spectrum obtained from the chromospheres of the sun at the time of total solar eclipse is
(A) Continuous emission spectrum (B) Line absorption spectrum
(C) Line emission spectrum (D) Band absorption spectrum
77. Heavy water is
(A) water, in which soap does not lather
(B) compound of heavy oxygen and heavy hydrogen
(C) compound of deuterium and oxygen
(D) water at 4°C
78. When a body moves in a circular path, no work is done by the force since
(A) there is no displacement
(B) there is no net force
(C) force and displacement are perpendicular to each other
(D) the force is always away from the centre
79. The bodies of masses 1 Kg and 2 Kg have equal momentum. Then their ratio of kinetic energies are
(A) 1:3 (B) 1:1 (C) 2:1 (D) 3:1
80. The DDBJ was started in the year of
(A) 1974 (B) 1980 (C) 1986 (D) 1989
81. The genome size of *Arabidopsis thaliana* is
(A) 1,21,524 bp (B) 1,54,478 bp
(C) 1,21,024 bp (D) 1,34,525 bp

82. The Genome Survey Sequence (GSS) division of GenBank contains the following data except
- (A) Cosmid/BAC/YAC end sequences
 - (B) Exon-trapped genomic sequences
 - (C) High throughput genomic sequences
 - (D) The Alu polymerase chain reaction sequences
83. Which of the following databases is automatically classified by CluSTr?
- (A) TrEMBL
 - (B) PIR
 - (C) UniProt
 - (D) MIPS
84. The secondary structure of a protein can be determined by
- (A) NMR spectrometry, X-ray crystallography and CD spectrometry
 - (B) NMR spectrometry, X-ray crystallography and Fluorescence spectrometry
 - (C) X-ray crystallography, UV-visible spectrometry and Fluorescence spectrometry
 - (D) CD spectrometry, Mass spectrometry and Fluorescence anisotropy
85. 'Daptomycin' is a drug derived from
- (A) *Streptomyces roseosporus*
 - (B) *Streptomyces hygroscopicus*
 - (C) *Nocardia autotrophica*
 - (D) None of these
86. Which of the following is a drug-metabolizing enzyme?
- (A) Phenol sulfotransferases
 - (B) CYP1A1
 - (C) UDP glucuronyl transferases
 - (D) All of the above

87. An atom emits a photon when one of its electrons
- (A) Jumps from one energy level to another
 - (B) Collides with another electron
 - (C) Jumps from a higher energy to lower energy
 - (D) Jumps from a lower to higher energy
88. When a radioactive element emits an alpha particle
- (A) Its mass number increases by 4 units
 - (B) Its charge decreases by 2 units
 - (C) Its mass number and charge decreases by 4 units
 - (D) Its mass number decreases by 4 units and atomic number decreases by 2 units
89. A distinct and characteristic functional group in fats is
- (A) A ketone group
 - (B) A CO-NH group
 - (C) An ester group
 - (D) An alcoholic group
90. Proteins are hydrolysed by enzymes into
- (A) Dicarboxylic acids
 - (B) Hydroxyl acids
 - (C) Amino acids
 - (D) Aromatic acids
91. The phenomenon of emission of light in a chemical reaction is known as
- (A) Chemiluminescence
 - (B) Photosensitization
 - (C) Bioluminescence
 - (D) Photosynthesis
92. Nucleophilic reagents are known as
- (A) Lewis acids
 - (B) Lewis bases
 - (C) Oxidizing agents
 - (D) Reducing agents
93. The work that is done to remove an electron from an atom is called
- (A) Ionization potential
 - (B) Electronegativity
 - (C) Electron affinity
 - (D) Bond energy

94. Which of the following polysaccharide is not a polymer of glucose?
(A) Amylose (B) Glycogen (C) Inulin (D) Cellulose
95. Resistance to antibiotics in bacteria is carried in the
(A) Exons (B) Introns (C) Plasmids (D) Heteromeres
96. The oxygen dissociation curve of normal adult hemoglobin is most effectively shifted to the right by
(A) Increased 1,3-bisphosphoglycerate
(B) Increased 2,3-bisphosphoglycerate
(C) Cooperative binding of oxygen
(D) Increased pH
97. Nucleic acids can be detected at
(A) 280 nm (B) 260 nm (C) 540 nm (D) 650 nm
98. RNA samples are commonly converted to cDNA or cRNA for microarray studies and visualized by labeling with
(A) Radioactivity or phosphorescence
(B) Radioactivity or fluorescence
(C) Radioactivity or RNA probes
(D) Radioactivity or DNA probes
99. The two main features of any phylogenetic tree is
(A) the clades and the nodes
(B) the topology and the branch lengths
(C) the clades and the root
(D) the alignment and the bootstrap
100. To maintain computer files in an orderly fashion means to organize them
(A) Hierarchically (B) Randomly
(C) Linearly (D) Orthogonally