Entrance Examinations Model Questions
Model Paper - 4 : Bioinformatics

51. 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

52. Which of the following organisms is not represented in LocusLink?

(a) Mouse

(b) Fly

(c) Human

(d) Escherichia coli

53. Raw DNA sequences (other than Refseq) in the EMBL and NCBI databases:

(a) Overlap entirely

(b) Overlap to a substantial degree but have distinct sequences

(c) Have a little overlap

(d) None of the above

54. Which is the first sequenced free-living bacterial genome?

(a) Phage154 genome

(b) Caenorhabdtis elegans

(c) Escherichia coli

(d) Haemophilus influenza

55. Which of the following amino acids is least mutable according to the PAM scoring matrix?

(a) Alanine

(b) Glutamine

(c) Methionine

(d) Cysteine

56. You have two distantly related proteins which BLOSUM or PAM matrix is best to use to compare them?

(a) BLOSUM45 or PAM250

(b) BLOSUM45 or PAM1

(c) BLOSUM80 or PAM250

(d) BLOSUM80 or PAM1

57. As the E value of a BLAST search becomes smaller

(a) The value k also become smaller

(b) The score tends to be larger

(c) The probability P tends to be larger

(d) The extreme value distribution becomes less skewed.

58. The stage of RNA processing includes all of the following except:

(a) Splicing

(b) Export

(c) Methylation

(d) Surveillance.

59. Most microarrays consists of a solid support on which is immobilized:

(a) DNA

(b) RNA

(c) Genes

(d) Transcripts

60. Principal components analysis (PCA):

(a) Minimizes entropy to visualize the relationships amoung genes and proteins

(b) Can be applied to gene expression data from microarrays but not to protein analyses

(c) Can be performed by agglomerative or divisive strategies

(d) Reduces highly dimensional data to show the relationships among genes or among samples

61. The An advantage of X-ray crystallography relative to NMR for structure determination is that using X-ray crystallography:

(a) It is easier to solve the structure of transmembrane domain-containing proteins.

(b) It is easier to grow crystals than to prepare samples for NMR.

(c) It is easier to interpret diffraction data.

(d) It is easier to determine the structures of large proteins.

62. Homology modeling may be distinguished from ab initio prediction because:

(a) Homology modeling requires a model to be built

(b) Homology modeling requires alignment of a target to a template

(c) Homology modeling is usefully applied to any protein sequence

(d) The accuracy of homology modeling is independent of the percentage identity between the target and template

63. Why doesn't ClustalW (a program that employs the Feng and Doolitle progressive alignment algorithm) report expect values?

(a) ClustalW does report expect values

(b) ClustalW uses global alignments for which E value statistic are not available

(c) E value statistics are not relevant to multiple sequence alignment

(d) ClustalW uses local alignment for which E value statistics are not available.

64. Which of the following is not a database connecting primarily of Hidden Markov Models?

(a) Pfam

(b) PRINTS

(c) SMARTS

(d) TIGRFAMS

65. According to the molecular clock hypothesis:

(a) All proteins evolve at the same constant rate

(b) All proteins evolve at a rate that matches the fossil record

(c) For every given protein, the rate of molecular evolution gradually slows down like a clock that runs down

(d) For every given protein, the rate of molecular evolution is approximately constant in all evolutionary lineages.

66. Which one of the following is a character-based phylogenetic algorithm?

(a) Neighbor Joining

(b) Kimura

(c) Maximum likelihood

(d) PAUP

67. The two main features of any phylogenetic tree are

(a) The clades and the nodes

(b) The topology and the branch length

(c) The clades and the root

(d) The alignment and the boot strap

68. An example of an Operational Taxonomic Unit (OUT) is

(a) Multiple sequence alignment

(b) Protein sequence

(c) Clade

(d) Node

69. A typical eukaryotic mitochondrial genome encodes about how many proteins (excluding RNAs)?

(a) 10

(b) 100

(c) 1000

(d) 10,000

70. The biggest problem in predicting protein coding genes from genome sequencing algorithm is that

(a) The software is difficult to use

(b) The false negative rate is high; many exons are missed

(c) The false-positive rate is high; many exons are falsely assigned

(d) The false-positive rate is low; many exons have unknown function.

71. Many hundred of genomes have now been completlely sequenced. In term of the genus and species of various genomes, the majority of them are

(a) Viral

(b) Bacterial

(c) Archael

(d) Eukaryotic

72. The HIV-genome contains protein-coding genes. The number of Genbank accession numbers for these nine genes is approximately

(a) 9

(b) 900

(c) 9,000

(d) 90,000

73. One of the most remarkable features of the schizosaccharomyces pombe genome is that:

(a) It is predicted to encode fewer than 5000 proteins making its genome (and proteome) smaller than even some bacterial genome

(b) Its genome size is approximately the same as that of Saccharomyces cerevisase

(c) It has many genes that are homologous to bacterial genes as it has gene that are homologous to Saccharomyces cerevisae genes

(d) None of the above

74. How are the mouse and human genomes different?

(a) The mouse genome has a lower GC content

(b) The mouse genome has a more protein coding genes

(c) The mouse genome has undergone specific expansions of genes encoding particular protein functions such as olfactory receptors

(d) The mouse genome has fewer telomerase repeats per chromosome on average.

75. Approximately how large is the human genome?

(a) 130Mb

(b) 300Mb

(c) 3000Mb

(d) 30,000Mb

76. Approximately how many structures are available (till now) in Protein Data Bank (PDB)

(a) 30,000

(b) 4,000

(c) More than 92000

(d) 40,000

77. Two-dimensional gels are used to

(a) Separate DNA fragments

(b) Separate RNA fragments

(c) Separate different proteins

(d) Observe a protein in two dimensions

78. In humans, disorders that are inherited by simple Mendelian inheritance account for about what percentage of all human disease?

(a) 1%

(b) 10%

(c) 50%

(d) It is impossible to accurately measure the percentage

79. Northern blots probe

(a) DNA

(b) RNA and proteins

(c) RNA

(d) DNA and RNA

80. A "YAC" is a useful

(a) vector

(b) screen

(c) host

(d) probe

81. The quaternary structure of proteins is represented by the

(a) Amino acid sequence

(b) Alpha helix

(c) Arrangements of subunits

(d) beta-pleated sheet

82. The most abundant element found in living organisms is ?

(a) Hydrogen

(b) Water

(c) Carbon

(d) Nitrogen

83. In active enzyme without cofactor is called

(a) Coenzyme

(b) apoenzyme

(c) Prosthetic group

(d) None of the above

84. Lyases catalyzes reaction around

(a) Single bond

(b) Double bond

(c) Co-ordinate bond

(d) all of the above

85. Abzymes are

(a) Hydrolases

(b) Antigen

(c) Antibody

(d) Proteases

86. What tags are mandatory when creating HTML to display an applet

(a) name, height, width

(b) code, name

(c) codebase, height, width

(d) code, height, width

87. Which of the following statements are true?

(a) UTF characters are all 8-bits.

(b) UTF characters are all 16-bits.

(c) UTF characters are all 24-bits.

(d) Unicode characters are all 16-bits

88. Which of the following are true about the Error and Exception classes?

(a) Both classes extend throwable.

(b) The Error class is final and the Exception class is not.

(c) The Exception class is final and the Error is not.

(d) Both classes implement throwable.

89. Which are keywords in Java?

(a) NULL

(b) size of

(c) synchronized

(d) All of the above

90. Which of the following operators are used in conjunction with the super references?

(a) The new operator

(b) The instance of operator

(c) The dot operator

(d) None of the above

91. Which of the following are primitive types?

(a) byte

(b) String

(c) integer

(d) Float

92. What is the value of a [3] as the result of the following array declaration?

(a) 1

(b) 2

(c) 3

(d) 4

93. Protein secondary structure prediction algorithms typically calculate the likelihood that a protein:

(a) Forms alpha helices

(b) Forms alpha helices and beta sheets

(c) Forms alpha helices, beta sheets, and coils

(d) Forms alpha helices, beta sheets, coils and multimers

94. The C value paradox is that

(a) The nucleotide C is underrepresented in some genomes

(b) The genome size of various eukaryotes correlates poorly with the number of protein coding gens of the organism

(c) The genome size of various eukaryotes correlates poorly with the biological complexity of the organism

(d) The genome size of various eukaryotes correlates poorly with the evolutionary age of the organism.

95. Hundreds or thousands of sequence repeats, each consisting of a unit of about 4 to 8 nucleotides are commonly found where?

(a) In interspersed repeats

(b) In processed pseudogenes

(c) In telomers

(d) In segmentally duplicated regions

96. The *E.coli* genome encodes about 4,300 protein-coding genes. The total number of *E.coli* introns is approximately

(a) 10

(b) 430

(c) 4,300

(d) 43,000

97. The smallest prokaryotic genomes tend to be those of

(a) Extremophiles

(b) Viruses

(c) Intracellular bacteria

(d) Bacilli

98. The main idea of the Clusters of Orthologous Genes (COG) database is

(a) To classify proteins from completely sequenced prokaryotic genomes based on orthologous relationships

(b) To provide multiple sequence alignments of completed prokaryotic genomes

(c) To provide a functional classification system for proteins

(d) To predict the function of individual eukaryotic proteins based on the conserved families in prokaryotes.

99. There are several thousand known viruses, while there are many millions of prokaryotes and eukaryotes. The most likely explanation for the small number of viruses is that

(a) We have not yet learned how to detect viruses

(b) We have not yet learned how to sequence most viruses

(c) There are few viruses because their needs for survival are highly specialized

(d) Viruses use an alternative genetic code

100. In general, if you compare the size of a pattern (also called a motif or fingerprint) and a domain

(a) They are about the same size.

(b) The pattern is larger

(c) The pattern is smaller

(d) The comparison always depends on the particular proteins in question

101. A glass rod rubbed with silk acquires a charge of 8 x 10-12C. The number of electrons it has gained or lost

a) 5×10^{-7} (gained)

b) 5×10^{7} (lost)

c) c. 2×10^{-8} (lost)

d) d. -8×10^{-12} (lost)

102. The electrostatic force between two point charges kept at a distance d apart, in a medium $\varepsilon r = 6$, is 0.3 N. The force between them at the same separation in vacuum is

a) 20 N

b) 0.5 N

c) 1.8 N

d) 2 N

103. Electric field intensity is 400Vm-1 at a distance of 2m from a point charge. It will be 100 Vm-1 at a distance?

a) 50 cm

b) 4 cm

c) 4 m

d) 1.5 m

104. Two point charges +4q and +q are placed 30 cm apart. At what point on the line joining them the electric field is zero ?

a) 15cm from the charge q

b) 7.5cm from the charge q

c) 20cm from the charge 4q

d) 5cm from the charge q

105. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences

a) only a net force

b) only a torque

c) both a net force and torque

d) neither a net force nor a torque

106. If a point lies at a distance x from the midpoint of the dipole, the electric potential at this point is proportional to

a) $1/x^2$

b) $1/x^3$

c) $1/x^4$

d) $1/x^{3/2}$

107. Electric potential energy (U) of two point charges is

a) $q_1q_2/4\pi\varepsilon_0r^2$

b) $q_1q_2/4\pi\varepsilon_0r$

c) $pE\cos\theta$

d) $pE\sin\theta$

108. The work done in moving 500μC charge between two points on equipotential surface is

a) zero

b) finite positive

c) finite negative

d) infinite

109. Which of the following quantities is scalar?

a) dipole moment

b) finite positive

c) electric field

d) electric potential

110. The unit of permittivity is

a) $C^2N^{-1}m^{-2}$

b) Nm^2C^{-2}

c) Hm^{-1}

d) $NC^{-2}m^{-2}$

61. The capacitance of a parallel plate capacitor increases from 5 μf to 60 μf when a dielectric is filled between the plates. The dielectric constant of the dielectric is

a) 65
b) 55
c) 12
d) 10

62. A hollow metal ball carrying an electric charge produces no electric field at points

a) outside the sphere
b) on its surface
c) inside the sphere
d) at a distance more than twice

63. A charge of 60 C passes through an electric lamp in 2 minutes. Then the current in the lamp is

a) 30 A
b) 1 A
c) 0.5 A
d) 5 A

64. A toaster operating at 240V has a resistance of 120Ω. The power is

a. 400 W

b. 2 W

c. 480 W

d. 240 W

65. In the case of insulators, as the temperature decreases, resistivity

a. decreases

b. increases

c. remains constant

d. becomes zero

66. According to Faraday's law of electrolysis, when a current is passed, the mass of ions deposited at the cathode is independent of

a. current

b. charge

c. time

d. resistance

67. Phosphor-bronze wire is used for suspension in a moving coil galvanometer, because it has

a. high conductivity

b. high resistivity

c. large couple per unit twist

d. small couple per unit twist

68. Electromagnetic induction is not used in

a. transformer

b. room heater

c. AC generator

d. choke coil

119. The self-inductance of a straight conductor is

a. zero

b. infinity

c. very large

d. very small

120. Transformer works on

a. AC only

b. DC only

c. both AC and DC

d. AC more effectively than DC

121. Which of the following devices does not allow d.c. to pass through?

a. resistor

b. capacitor

c. inductor

d. all the above

122. In an electromagnetic wave

a. power is equally transferred along the electric and magnetic fields
b. power is transmitted in a direction perpendicular to both the fields
c. power is transmitted along electric field
d. power is transmitted along magnetic field

123. When a drop of water, is introduced between the glass plate and plano convex lens in Newton's rings system, the ring system

a. contracts

b. expands

c. remains same

d. first expands, then contracts

/24. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light?

a. bands disappear

b. no change

c. diffraction pattern becomes narrower and crowded together

d. diffraction pattern becomes broader and farther apart

/25. According to Rutherford atom model, spectrum of an atom is

a. line spectrum

b. continuous spectrum

c. band spectrum

d. none of the above

/26. A force of 5N is applied to one end of a spring balance and a force of 5 N is applied simultaneously at the other end in the opposite direction. The reading of the balance will be

a. N

b. 3N

c. 5 N

d. 500 N

127. If the earth shrinks, what will be the effect on the value of acceleration due to gravity g ?

a. It will decrease

b. It will increase

c. It will become zero

d. It will become infinite

128. At sea level, a body will have minimum weight at

a. pole

b. equator

c. 42° south latitude

d. 37° north latitude

129. If air is blown under one of the pans of a physical balance in equilibrium, then the pan will

a. be disturbed

b. go up

c. go down

d. become vertical

130. Bimetal strips are used in

a. metal thermometers

b. relays for opening or closing electrical circuits

c. thermostats

d. all of above

131. The computer code for the decimal number 23 is

(a) 10111

(b) 11011

(c) 01010

(d) 11111

132. Which one of the following terms is used to indicate the natural tendency of an object to remain at rest or in motion at a constant speed along a straight line?

(a) Force

(b) Equilibrium

(c) Velocity

(d) Inertia

133. A rock is suspended from a string and moves downward at constant speed. Which statement is true concerning the tension in the string if air resistance is ignored?

(a) The tension is greater than the weight of the rock

(b) The tension is zero Newton

(c) The tension is less than the weight of the rock

(d) The tension is equal to the weight of the rock

134. A 20 kg wooden box if suspended from a fixed beam by two vertical ropes. What is the tension in each rope?

(a) 390 N

(b) 100 N

(c) 200 N

(d) 40 N

135. A net force F is required to give an object with mass m an acceleration a. If a net force 6F is applied to an object with mass 2m, what is the acceleration on this object?

(a) a

(b) 2a

(c) 3a

(d) 6a

136. A horse pulls a cart along a flat road. Consider the following four forces that arise in this situation. Which two forces form an "action-reaction" pair that obeys Newtons third law?

1. the force of the horse pulling on the cart
2. the force of the cart pulling on the horse
3. the force of the horse pushing on the road
4. the force of the road pushing on the horse

i.3 and 4

ii.2 and 4

iii.2 and 3

iv.1 and 4

137. 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

138. 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

139. 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

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

(a) 0 K

(b) 0 C

(c) 100 C

(d) 293 K

141. 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.

142. 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.

143. 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

14. 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.

15. 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

16. 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.

17. 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

148. Which one of the following statements concerning kinetic energy is true?

(a) It is directly proportional to velocity

(b) It is measured in Newton's/kilogram

(c) It is a quantitative measure of inertia

(d) It is always positive

149. A bicyclist is travelling at a speed of 20.0 m/s as he approaches the bottom of a hill. Neglect the effects of friction and determine the maximum vertical height the bicyclist ascends to.

(a) 40.8 m

(b) 20.4 m

(c) 3.70 m

(d) 11.2 m

150. Which one of the following choices is an example of a non-conservative force?

(a) elastic spring force

(b) electrical force

(c) kinetic frictional force

(d) gravitational force