Entrance Examinations Model Questions
Model Paper-1 : Bioinformatics

51. Three capacitors are given each of 0.5μF capacitance. Two of these are joined in series and then third in parallel to that system . the resulting capacitance is

a. 0.75	b. 1.50	c. 1.00	d. none

52. The path of the projectile follows the equation

a. y=mx	b. y=mx+c	c. $y=mx^2+c$	d. none

53. The property of water which permits an insect to walk on water is

a. viscosity	b. surface tension	c. tensile strength	d. turgor pressure

54. What is the name of the physical constant with a value of 6.62×10^{-27} erg seconds

a. Plancks constant	b. Avogadro's number	c. Dulong constant	d. De Broglie constant

55. Shell is the exclusive feature of

a. UNIX	b. DOS	c. System software	d. Application software

56. Virtual memory is

a. simple to implement	b. used in all major commercial operating systems	c. less efficient in utilization of memory	d. useful when fast I/O devices are not available

57. _____ is a technique of temporarily removing inactive programs from the memory of computer system

a. Swapping	b. Spooling	c. Semaphore	d. Scheduler

58. The Intel Pentium 4 is the name of

a. mother board	b. computer	c. microprocessor	d. computer company

59. Numbers are stored and transmitted inside a computer in

a. binary form	b. ASCII code form	c. decimal vorm	d. alphanumeric form

60. The expectation value of a quantity is best defined as

a. the largest value	b. the smallest value	c. the average value	d. the most probable value

61. FTP is

a. Mail tranfer potocol	b. File Transfer Protocol	c. File Transformation Program	d. Firewall Type Program

62. Which of the following is considered to be a popular coding scheme?

a. ASCII	b. EBCDIC	c. Unicode	d. All the above

63. A string of eight 0s and 1s is called a:

a. megabyte.	b. byte.	c. kilobyte.	d. gigabyte.

64. Which is a reserved word in the Java programming language?

A. method	B. native	C. subclasses	D. reference

65. Which is a valid keyword in java?

a. interface	b. string	c. Float	d.. unsigned

66. In java which one of the following will declare an array and initialize it with five numbers?

a. Array a = new Array(5);	b. int [] a = {23,22,21,20,19};	c. int a [] = new int[5];	d. int [5] array;

67. In java which is the valid declarations within an interface definition?

a. public double methoda();	b. public final double methoda();	c. static void methoda(double d1);	d. protected void methoda(double d1);

68. In C++ Which of the following type of class allows only one object of it to be created?

a. Virtual class	b. Abstract class	c. Singleton class	d. Friend class

69. In C++ which of the following is correct about function overloading?

a. The types of arguments are different.	b. The order of argument is different.	c. The number of argument is same.	d. Both A and B.

70. In C++ which of the following are available only in the class hierarchy chain?

a. Public data members	b. Private data members	c. Protected data members	d. Member functions

71. Which of the following statements is false regarding the phospholipid bilayer in cell membranes?

a. It is made up of two layers of phospholipid molecules with the tails interacting with each other.	b. Water and ions are unable to cross the bilayer due to the hydrophobic tails of the phospholipid molecules.	c. There are charged groups at the inner and outer surfaces of the cell membrane.	d. The molecules in the bilayer are fluid and so the cell membrane is porous allowing the passage of ions and water across the cell membrane.

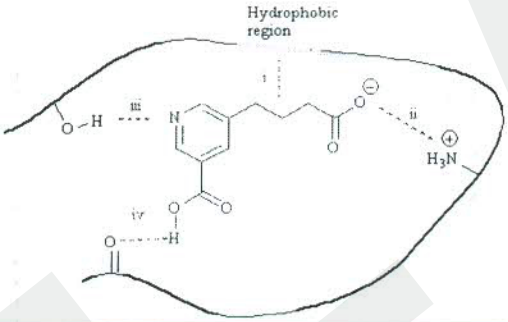
72. Which of the following statements is false?

a. Drug targets are normally macromolecules.	b. Drugs are generally smaller than drug targets.	c. Drugs are generally organic molecules.	d. Drugs act by forming covalent bonds with drug targets.

73. Which of the following statements is false with respect to a binding site?

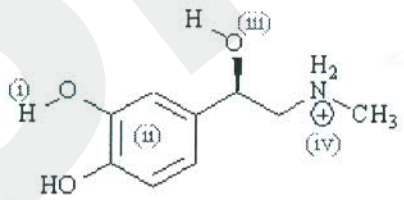
a. It is part of a macromolecule that acts as a drug target.	b. It contains binding groups.	c. It is normally a hollow or cleft on the surface of the drug target.	d. It is usually hydrophilic in nature.

74. Consider the molecule bound to a binding site and identify the binding interactions (i-iv) shown as dotted lines.



a. i = Van der Waals interaction	b. ii = Ionic bond	c. iii = N…H-O Hydrogen bond	d. iv =O…H-O Hydrogen bond

75. Identify the binding interactions that might be possible at the specified positions of the following drug:



Adrenaline

a. i = Hydrogen bond donor	b. ii = Van der Waals interaction	c. iii = Hydrogen bond acceptor	d. iv = Ionic interaction

76. What is unique about glycine with respect to other natural amino acids?

a. It can form peptide bonds with other amino acids.	b. It has no side chain.	c. It contains an amine functional group and a carboxylic acid functional group attached to the same carbon.	d. It exists as a zwitterion.

77. Which of the following descriptions best describes the secondary structure of proteins?

a. The arrangement of different protein subunits in a multiprotein complex.	b. The order in which amino acids are linked together in a protein.	c. The overall three dimensional shape of a protein.	d. Regions of ordered structure within a protein.

78. Which of the following descriptions best describes the tertiary structure of proteins?

a. The arrangement of different protein subunits in a multiprotein complex.	b. The order in which amino acids are linked together in a protein.	c. The overall three dimensional shape of a protein.	d. Regions of ordered structure within a protein.

79. Identify the strongest form of intermolecular bonding that could be formed involving the residue of the amino acid threonine.

a. Ionic bond	b. Hydrogen bond	c. Van der Waals interactions	d. None of the options are correct

80. Identify the strongest form of intermolecular bonding that could be formed involving the residue of the amino acid arginine

a. Ionic bond	b. Hydrogen bond	c. Van der Waals interactions	d. None of the options are correct

81. Which of the following statements is incorrect regarding carrier proteins?

a. They are present in cell membranes	b. They serve to carry non polar molecules across the cell membrane	c. They are required to transport amino acids across cell membranes	d. They are not required to transport steroids across cell membranes

82. Which of the following statements is true regarding tubulin?

a. It is a structural protein	b. It is a component of ribosomes	c. All anticancer drugs that act on tubulin do so by preventing it polymerising into microtubules	d. It has an important role to play in cell metabolism

83. Which of the following statements best describes an amino acid residue?

a. The portion of an amino acid that remains once a peptide bond has been formed.	b. The structure that is formed following the hydrolysis of a peptide or protein.	c. The side chain of an amino acid.	d. The head group of an amino acid.

84. What term is used for enzymes such as COX-1 and COX-2 which vary in structure and location but which catalyse the same reaction?

a. Isosteres	b. Isozymes	c. Isotopes	d. Isomers

85. Which of the following statements is not true regarding the active site of an enzyme?

a. An active site is normally on the surface of an enzyme.	b. An active site is normally hydrophobic in nature.	c. Substrates fit into active sites and bind to functional groups within the active site.	d. An active site contains amino acids which are important to the binding process and the catalytic mechanism.

86. Which of the following is not a neurotransmitter?

a. Glycine	b. Cyclic GMP	c. γ-aminobutyric acid	d. Serotonin

87. Which of the following statements is not true regarding the binding site of a receptor?

a. The binding site is normally a hollow or cleft in the surface of an receptor.	b. The binding site is normally hydrophilic in nature.	c. Chemical messengers fit into binding sites and bind to functional groups within the binding site.	d. The binding site contains amino acids which are important to the binding process.

88. Which of the following terms best describes the study of which functional groups are important in binding a drug to its target binding site, and the identification of a pharmacophore?

a. Pharmacokinetics	b. Structure based drug design	c. Pharmacodynamics	d. Structure activity relationships

89. Which of the following statements best describes the potency of a drug?

a. The maximum biological effect resulting from a drug binding to its target.	b. The measure of how strongly a drug binds to a receptor.	c. The amount of drug required to produce a defined biological effect.	d. The lifetime of the drug in the body.

90. Which of the following symbols represents the inhibitory or affinity constant?

a. IC_{50}	b. K_i	c. K_d	d. EC_{50}

91. Which of the following statements is true regarding small G-proteins?

a. Ras is an example of a typical G-protein.	b. Small G proteins have two subunits rather than three.	c. Small G-proteins are directly activated by receptors.	d. Small G-proteins bind GDP in the resting state and GTP in the active state.

92. Which of the following statements is not true about DNA secondary structure?

a. There is a minor groove and a major groove.	b. A purine base pairs up with a pyrimidine base.	c. The phosphate groups are positioned to the inside of the structure.	d. The base pairs are stacked.

93. What non-covalent bonding interactions do the nucleic acid bases form in DNA secondary structure?

a. Ionic bonds only	b. Hydrogen bonds only	c. Van der Waals interactions only	d. Hydrogen bonds and van der Waals interactions

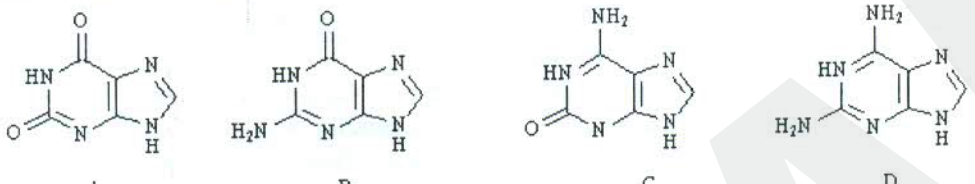
94. What is the name of the structure that is involved in modification of messenger RNA and includes small nuclear ribosomal RNA?

a. Endoplasmic reticulum	b. Nucleus	c. Ribosome	d. Spliceosome

95. What is the term for the portion of messenger RNA that is excised when the molecule undergoes a splicing modification?

a. Intron	b. Exon	c. Exclusion	d. Inclusion

96. Which of the following structures is guanine?



A B C D

a. Structure A	b. Structure B	c. Structure C	d. Structure D

97. Which of the following types of RNA helps to catalyse the synthesis of proteins?

a. rRNA	b. mRNA	c. tRNA	d. snRNA

98. Which of the following statements is true?

a. Drugs entering the blood supply are evenly distributed round the blood supply within one minute, resulting in an even distribution to different organs.	b. Drugs entering the blood supply are unevenly distributed round the blood supply within one minute, but are evenly distributed to different organs.	c. Drugs entering the blood supply are unevenly distributed round the blood supply within one minute resulting in an uneven distribution to different organs.	d. Drugs entering the blood supply are evenly distributed round the blood supply within one minute, and are unevenly distributed to different organs.

99. How can advantage be taken of the blood brain barrier in drug design?

a. Drugs can be made more hydrophobic such that they act in the brain and not peripherally.	b. Drugs can be made more hydrophilic such that they act in the brain and not peripherally.	c. Drugs can be made more hydrophobic such that they act peripherally and not in the brain.	d. Drugs can be made more hydrophilic such that they act peripherally and not in the brain.

100. Drugs can be excreted from the body by various routes. Which of the following is generally the most important route?

a. Sweat	b. Lungs	c. Kidneys	d. Bile duct

101. Which of the following terms is the study of how a drug interacts with its target binding site at the molecular level?

a. Pharmacokinetics	b. Structure-based drug design	c. Pharmacodynamics	d. Structure-activity relationships

102. Which type of functional group would be useful to have in a drug designed to treat a gut infection?

a. An aromatic ring	b. An alcohol group	c. A carboxylate group	d. A ketone

103. Which of the following analytical techniques provides the greatest structural information on a lead compound?

a. Nuclear magnetic resonance spectroscopy	b. Ultra-violet spectroscopy	c. Infra-red spectroscopy	d. Elemental analysis

104. Which of the following is not an endogenous compound?

a. Active principle	b. Pharmacophore	c. Lead compound	d. Orphan drug

105. Which of the following statements is not true of herbal medicines?

a. Herbal medicines contain a single active principle that is responsible for its action.	b. Herbal medicines can have side effects.	c. It is more difficult to receive an overdose of an active drug if it is present in a herbal medicine rather than as a pure medicine.	d. Certain compounds in herbal medicines may enhance the activity of the active principle.

106. Which of the following areas of study is part of preclinical trials?

a. Drug design	b. Lead discovery	c. Formulation	d. Structure-activity relationships

107. Which of the following definitions best describes the LD_{50} of a drug?

a. The dose of a drug required to produce 50% of a maximum effect.	b. The dose of a drug required to produce a measurable effect in 50% of the animals tested.	c. The ratio of LD_{50} to ED_{50}.	d. The dose of a drug required to kill 50% of a group of animals.

108. What is meant by chiral switches?

a. The ability of a drug target to bind both possible enantiomers of a chiral drug in two different binding modes	b. The epimerisation of a chiral centre	c. The patenting of the opposite enantiomer of a chiral drug that is already on the market	d. The patenting of the active enantiomer of a racemic drug which is already on the market

109. What is meant by an orphan drug?

a. A novel pharmaceutical agent	b. A drug which is effective against a relatively rare medical problem	c. A compound that has a useful biological activity and is the starting point for the design of a new drug	d. An established drug that acts as the reference point for related drugs

110. Which of the following physicochemical properties is least commonly considered in QSAR studies?

a. Hydrophobicity	b. Electronic influence of substituents	c. Dipole moment	d. Size of substituents

111. What does CoMFA stand for in 3D QSAR?

a. Compound molecular formula assessment	b. Compound mass field analysis	c. Comparative molecular field analysis	d. Comparative modelling force field analysis

112. Which of the following is not crucial for 3D QSAR studies?

a. Identification of the active conformation for each molecule	b. Identification of the pharmacophore for each molecule	c. Alignment of each molecule	d. Identification of the target structure

113. Which of the following statements is true?

a. The value of the regression coefficient is not acceptable.	b. Activity increases with hydrophobic substituents on the aromatic ring.	c. Activity increases with electron donating substituents on the aromatic ring.	d. Activity increases with electron withdrawing substituents on the aromatic ring.

114. Which of the following software programs is not dedicated to the creation of 3D chemical models?

a. DOCK	b. Alchemy	c. Hyperchem	d. Discovery Studio Pro

115. Which of the following is associated with conformational searching?

a. LUDI	b. DOCK	c. Monte Carlo method	d. CoMFA

116. Molecular dynamics can be used to search for different conformations of a molecule. Which of the following statements is false?

a. A variety of different conformations are generated by 'heating' the molecule to 900K.	b. The position and velocity of each atom is measured after each nanosecond of movement	c. The programme treats each atom as a moving sphere	d. Each atom is only allowed to move a fraction of a bond length between each cycle of calculations

117. Which of the following statements is true?

a. energy minimisation is carried out using molecular mechanics	b. energy minimisation is used to find the most stable conformation for a molecule	c. energy minimisation is carried out by varying only bond angles and bond lengths	d. energy minimisation stops when a structure is formed with a much greater stability than the previous one in the process

118. What is meant by a local energy minimum in conformational analysis?

a. it is a localised region of a molecule which is free of steric strain	b. it is the most stable conformation of a structure	c. it is the initial structure that is formed when a 3D model is created, prior to energy minimisation	d. it is the closest stable conformation to the starting structure

119. What is meant by a global energy minimum in conformational analysis?

a. It is a localised region of a molecule which is free of steric strain.	b. It is the most stable conformation of a structure.	c. It is the initial structure that is formed when a 3D model is created, prior to energy minimisation.	d. It is the closest stable conformation to the starting structure.

120. Which of the following statements is true?

a. The most stable conformation of a drug is not necessarily the active conformation.	b. The active conformation is the most reactive conformation of a structure.	c. The active conformation is the conformation adopted by a target binding site when it binds a drug.	d. The active conformation can be determined by conformational analysis.

121. Which of the following statements is not true of cyclic structures?

a. They are normally more rigid than acyclic structures	b. They have fewer possible conformations	c. They are useful in determining the active conformation of a series of related compounds	d. They are easier to synthesise than more flexible acyclic molecules

122. What term is used to describe the process by which drugs are fitted into their target binding sites using molecular modeling

a. Energy minimization	b. Conformational searching	c. Docking	d. Overlaying

123. Which of the following statements concerning the BLOSUM62 matrix below is correct?

a. Alanine is aligned with arginine more often than expected by chance.	b. Alanine never changes to cysteine.	•c. Tryptophan evolves the slowest.	d. The off-diagonal elements are proportional to the rates of substitution from one amino acid to another.

124. Which of these statements about multiple alignments is correct?

a. It is not possible to define a dynamic programming algorithm to align more than two sequences.	•b. The guide tree in CLUSTALW is produced using a distance matrix method.	c. The guide tree in CLUSTALW does not influence the final alignment.	d. All three of the above statements.

125. The expected distribution of scores from the BLAST algorithm is an Extreme Value distribution because ...

a. ... it uses ungapped alignments.	b. ... it is derived as an approximation to a dynamic programming algorithm.	c. ... it returns the highest scoring match from a database.	d. ... it uses a probabilistic alignment model.

126. Which of these statements about phylogenetic methods is correct?

a. Bootstrapping can be used as a measure of confidence of the evolutionary model used in the phylogeny.	b. Bootstrapping cannot be done if the rate of substitution varies across sites.	c. Transition substitutions will usually saturate at a smaller divergence time than transversion substitutions.	d. Long branch attraction arises when the lengths of the sequences in the analysis vary a great deal.

127. Which of the following statements about phylogenetic methods is correct?

a. The Maximum Likelihood method determines the tree for which the likelihood of the tree given the data is largest.	b. The Maximum Likelihood tree may sometimes contain branches of zero length.	c. If the trees from Maximum Likelihood, Parsimony and Neighbour-Joining methods all have the same topology, this must be the correct topology.	d. In Bayesian phylogenetic methods, if the prior probabilities of two trees are equal, then the posterior probabilities must also be equal.

128. In PROSITE, the term PATTERN indicates that the entry describes:

a. a block	b. a profile	c. a regular expression	d. a fuzzy regular expression

129. In PROSITE, the NR lines indicate:

a. the comment field	b. the list of true-positive sequences matched by the signature	c. the statistics of the diagnostic performance of the signature	d. the non-redundant list of sequences whose 3D structure are known

130. UniProt is:

a. the universal protein sequence database derived from SWISS-PROT and TrEMBL	b. the universal protein resource derived from SWISS-PROT, TrEMBL and PIR-PSD	c. the universal protein family resource	d. the universal protein structure database

131. The Twilight Zone is the region of sequence similarity:

a. above 50% identity	b. where sequence alignments are not statistically significant, as the same alignment may have arisen by chance	c. below 50% identity	d. where sequences fail to be detected by even the most sensitive sequence-based search algorithms

132. Phylogenetic studies using small sub-unit rRNA showed that...

a.... there are three principal domains of life known as animals, plants and bacteria.	b. ...the root of the tree of life is thought to be on the branch separating the bacteria from the other two domains of life.	c. ...there was an RNA world in the early stages of evolution of life on earth in which RNA carried out the roles played by DNA and proteins in today's organisms.	d. ... the rRNA genes in chloroplast genomes have a recognizable similarity to those in Cyanobacteria.

133. Which of these statements about the origin of mitochondria is true?

a. An organism in which functional copies of genes have been transferred from the mitochondrion to the nucleus is said to have undergone secondary endosymbiosis.	b. The mitochondrial genomes of all known eukaryotes are thought to share a common origin in a single occurrence of endosymbiosis.	c. One piece of evidence that mitochondria arose from endosymbiotic bacteria is that the mitochondrial genome of *Trypanosoma brucei* has many organizational features in common with bacterial genomes.	d. Eukaryotes may be defined as cells possessing mitochondria.

134. Which of the following statements about bacterial genomes is true?

a. The smallest known bacterial genome has approximately 500 genes.	b. The smallest known bacterial genome is approximately 65 kb long.	c. A single-celled eukaryote like *S. cerevisiae* has roughly 100 times as many genes as a bacterium like *E. coli*.	d. The genomes of bacteria living as intracellular parasites tend to be larger than those of free-living bacteria because the parasites require complex genetic systems to combat the immune system of their hosts.

135. Which of the following biases in a microarray experiment could be eliminated by a dye flip experiment?

a. Errors arising from varying numbers of cells of different types in a tissue sample.	b. Systematic variation of spot size across an array.	c. Non-specific hybridization of RNA to the probe sequence.	d. None of these.

136. Names of three macromolecules are

a. enzyme, glucose, DNA	b. glucose, protein, lipid	c. protein, polysaccharide, DNA	d. amino acid, glucose, ATP

137. Which disease is not caused by a virus

a. Influenza	b. Polio	c. HIV	d. TB

138. In the formation of a macromolecule, what type of bond would join two amino acid subunits

a. ionic bond	b. hydrogen bond1	c. peptide bond	d. phosphodiester bond

139. How can three resistances of value 2ohms, 3ohms, and 6ohms be connected to give an effective resistance of 4ohms

a. 3ohms and 6ohms in series and then 2ohms in parallel	b. 3ohms and 2ohms in series and then 6ohms in parallel	c. 3ohms and 2ohms in parallel and then 6ohms in series	d. 3ohms and 6ohms in parallel and then 2ohms in series

140. Dr. Venkatraman Ramakrishnan received the Noble Perize for his work on

a. HIV	b. AIDS	c. Ribosomes	d. Malaria

141. Nanotechnology has applications in

a. Physics	b. Chemistry	c. Medicine	d. All the above

142. Biophysical techniques include

a. Ultracentrifugation	b. Osmosis	c. Chromatography	d. All the above

143. Dr. Perutz received the Noble Prize for his work on

a. Penicillin	b. Hemoglobin	c. DNA	d. Collagen

144. Prof. G. N. Ramachandran contributed to

a. Phi-Psi plot	b. Collagen structure	c. Anomalous scattering	d. All the above

145. Protein folding is contributed by

a. Intramolecular interaction	b. water mediated interaction	c. disulphide bridges	d. all the above

146. The two amino acids contain that contain Sulphur atom are

a. Gly and Cys	b. Met and Leu	c. Ser and Met	d. Cys and Met

147. The quaternary structure of hemoglobin is

a. dimer	b. pentamer	c. trimer	d. tetramer

148. Number of entries in Protein Data Bank

a. >80,000	b. <40,000	c. <20,000	d. > a Lakh

149. Lipinski's Rule in drug design states that molecular weight of drug molecule should be

a. >500 Da	b. <500 Da	c. >1000 Da	d. >10000 Da

150. In docking for the hydrogen bond interactions the hydrogen are from

a. ligand alone	b. macromolecule alone	c. ligand and macromolecules	d. none of the above

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