Examination: **Ph.D Bioinformatics**

SECTION 1 - SECTION 1

Question No.1

Currently available unique resource for protein sequences is

- Swiss-prot
- TrEMBL
- Uniprot
- PIR

Question No.2

Competitive inhibition of an enzyme by a competitive inhibitor can be overcome simply by

- increasing the concentration of the substrate
- decreasing the concentration of the substrate
- decreasing the temperature of the reaction
- increasing the temperature of the reaction

Question No.3

Which antibiotic is responsible for premature termination of translation in bacteria?

- Chloramphenicol
- Penicillin
- Puromycin
- Tetracycline

Question No.4

Which of the following is a transition

- A to G
- G to C
- A to T
- A to C

Question No.5

Which algorithm is used for global alignment

- Smith Needleman

  Smith Waterman

- Smith Wunsch
- Wunsch Needleman

Question No.6

Next generation sequence analysis requires

- Protein-DNA interactions
- DNA structures
- DNA sequences
- Protein structures

Question No.7

In an enzymatic reaction, if the enzyme concentration is increased from 1mg to 2mg, which of the following statement is correct?

- Km and Vmax will remain constant
- Km and Vmax will increase.
- Km will change while Vmax will remain constant
- Km will remain constant but Vmax will be more

Question No.8

Cation-pi interactions are obtained between the distance between the residues

- Phe and Tyr
- Phe and Trp
- Arg and Arg
- Phe ad Arg

Question No.9

Identify a sequence, which follows the pattern [PLA]-x-G-{KLA}(2)-Y

- PXGK2Y
- LAGRAY
- PPGPPY
- PPGKKY

Question No.10

Which of the statement is correct for archaebacteria?

- Have 9+2 arrangement in flagella
- Cell wall is made up of peptidoglycan

- Lacks intron in gene
- Lack of histone protein

Question No.11

Lipinski's rule of five violates if

- Molecular weight is less than 500
- Hydrogen bond acceptor is less than 10
- Hydrogen bond donor is less than 5
- Hydrogen bond donor is more than 5

Question No.12

One of the reasons why non substrate inducers (e.g. IPTG) are preferred over substrate inducers (e.g. lactose) for induction of an inducible operon is because:

- They interact with the activation sequences and induce enhancers
- They directly interact with the repressor
- They directly interact with the promoter sequences
- They directly interact with the operator region

Question No.13

Gibbs free energy is defined as

- 
- 
- 
- 

Question No.14

The φ and ψ torsion angles are rotations along _____ and _____ bonds, respectively.

- N- Cα and Cα – C
- Cα - C and N- Cα
- C- Cα and Cα - N
- C. N - Cα and C- N

Question No.15

A monoclonal antibody binds to G-actin but not to F-actin. What does this tell you about the epitope recognized by the antibody?

- In F actin enough numbers of epitope arenot there.
- F-actin does not have the epitope against the antibody
- In F- actin the epitopes are glycosylated and not able to bind
- The epitope is likely to be structure that is buried when G-actin polymerizes with F-actin

Question No.16

Which of the following is not a description of dynamic programming algorithm?

- It is sequence alignment method
- It cannot provide an optimal score
- It can handle several comparisons
- It takes care of gaps into account

Question No.17

Tanimoto coefficient is used to

- Compare the structures of ligands
- Identify the similarity between protein and ligand
- Compare the structures of proteins
- Compare the structures of both ligands and proteins

Question No.18

Stochastic search is

- Systematic
- Deterministic
- Random
- Feasible only for low dimensional problems

Question No.19

Which of the following is a food borne toxin?

- Tetanus Toxin
- Botulinum Toxin
- Diptheria Toxin
- Cholera Toxin

Question No.20

How many atoms (minimum) are required to compute torsional angles

- 2

- 4
- 3
- 5

Question No.21

How many rooted trees can be obtained using 4 sequences

- 47
- 3
- 15
- 1

Question No.22

In sequence alignment, the occurrence of more substitutions, insertions, and deletions may indicate the presence of

- Turn in the protein structure
- Loop in the protein structure
- α-Helix in the protein structure
- β-Sheet in the protein structure

Question No.23

Two main components of docking are

- Knowledge based and empirical based parameters
- Selection of software and input parameters
- Protein and ligand preparation
- Conformational sampling and scoring functions

Question No.24

DCMU inhibits photosynthesis at photosystem during

- QA to QB
- Phe to QA
- QB to Cyt-bf6
- Cyt-bf6 to PC

Question No.25

Tryptic digest of a heptapeptide built from 3 lysine (K), 2 Alanine (A), 1 Tyrosine (T) and 1 Phenylalanine(F) yielded tri and tetrapeptide. Which of the following is the correct sequence of the peptide?

- KYKAAKF
- YKAAFKK
- KYAAKFK
- KAYAKFK

Question No.26

Most of the known three-dimensional structures of proteins are determined by

- Electron microscopy
- NMR spectroscopy
- X-ray crystallography
- Others

Question No.27

AGO proteins are associated with

- RNAi effector complex
- Histone complex
- Tryptophan operon
- SOS mechsnism

Question No.28

Plant dissipate excess excitation energy as heat so as to protect from photo-oxidative damage. The mechanism is known as

- Photo inhibition
- Warburg effect
- Non photochemical quenching
- Photochemical quenching

Question No.29

PSSM stands for

- Point specific scoring matrices
- Point specific scrambled matrices
- Position specific scanning matrices
- Position specific scoring matrices

Question No.30

An important role of Fas and Fas ligand is to mediate elimination of tumor cells by killer lymphocytes. In a study of 35 primary lung and colon tumors, half of the

tumors were found to have amplified and over-expressed a gene for a “secreted protein” that binds to the Fas ligand. The main reason for the survival of these tumor cells by this “secreted Fas ligand binding protein” may be attributed to its:

- anti-contatct inhibition activity.
- cellular defense activity against immune cytotoxic killing
- anti- proliferative activity
- decoy receptor activity

Question No.31

Conservation score of a site corresponds to its

- Codon occupancy
- Hydrophobicity
- Size
- Evolutionary rate

Question No.32

SRP selectively recognizes ER signal sequences on newly synthesized proteins. This is an outcome of

- Hydrogen bonding
- Formation of covalent intermediate.
- Hydrophobic interactions
- Ionic interactions

Question No.33

Secondary structure prediction using statistical analysis is proposed by

- Rost and Sandor
- Barton
- GOR
- Chou-Fasman

Question No.34

Simple Sequence Repeats (SSR) markers are derived from

- Promoter sequences
- Non coding sequences only
- Both coding and non-coding sequences
- Coding sequences only

Question No.35

The sequences ATAGAGA and TAGAGA show continuous dots in dot plot at

- Far away from the diagonal
- Diagonal
- Close to diagonal
- No continuous dots in the plot

Question No.36

AUC for a random ROC curve is

- 0.0
- 1.0
- 0.75
- 0.5

Question No.37

In the Newick format ((I,II),III) which are close to each other

- I and III
- I, II and III
- I and II
- II and III

Question No.38

What is the sequence identity of the following sequence
MLIPLAIWKV
MVASLDTFRA

- 20%
- 60%
- 80%
- 10%

Question No.39

For the following alignment (match score: 1; mismatch score: 0, gaps: -1) what is the net score?
ATAGATA
AAAA-CA

- 3
- 1
- 2
- 4

Question No.40

Fluorescence recovery after photobleaching (FRAP) is a powerful technique for calculating

- the diffusion coefficient of membrane lipids and proteins
- the distance between a lipid and membrane protein
- the rate of synthesis of membrane proteins
- the extent of signal transduction in membrane upon ligand receptor interactions.

Question No.41

Which antibiotic will inhibit protein synthesis in chloroplast?

- Ricin
- Rifamicin
- Chloramphenicol
- Cyclohexamide

Question No.42

Cholodny- Went model explains:

- The phloem loading in plants
- The differentiation of secondary meristems from permanent tissues
- The mechanism of nitrate absorption by the root hairs
- The tropism in plants

Question No.43

FASTA format starts with

- *
- >
- ^
- <

Question No.44

Excess oxygen consumed after a vigorous exercise is:

- To increase the concentration of lactic acid in the muscle
- To pump out lactic acid from muscle
- To reduce dissolved carbon dioxide in blood
- To make ATP for gluconeogenesis.

Question No.45

The molecular weight of a protein is 30Kda. The minimal length of mRNA encoding this polypeptide will be close to

- 900
- 800
- 1000
- 300

Question No.46

If the solvent accessibility of Lys28 in bound and unbound forms is 72.3A^2 then

- It is not at the interface
- Information is not sufficient to define the binding sites
- It is at the interface
- Neighboring residue information is necessary to define the binding site

Question No.47

Which databases contain small molecules?

- PDB and ZINC
- ZINC and TrEMBL
- ZINC and ChEMBL
- DDBJ and PDB

Question No.48

The most pleiotropic colony stimulating factor is

- GM- CSF
- G-CSF
- M-CSF
- IL-3

Question No.49

The major function of cortical granules in the cytoplasm of the egg is to:

- Allowing meiosis to complete
- Fast block polyspermy
- Helping in the reorganization of sperm
- Slow block polyspermy

Question No.50

What is the principle of homology modelling?

- If two sequences are similar, their binding sites are similar
- If two sequences are similar, their active sites are similar
- If two sequences are similar, their secondary structures are similar
- If two sequences are similar, their 3D structures are also similar

Question No.51

Which of the following is a Cobalt containing vitamin?

- Vitamin B_2
- Vitamin B_{12}
- Vitamin B_4
- Vitamin B_6

Question No.52

Which of the following group of amino acids are aromatic?

- Phe, Trp and Val
- Phe, Tyr and Trp
- Trp, Tyr and Ile
- Ala, Leu and Val

Question No.53

In a protein, if Glu in the vicinity of Lys is mutated to Val, what will happen to the stability?

- Better packing
- Removal of ion pairs
- Formation of hydrogen bonds
- Formation of ion pairs

Question No.54

Agrobacterium tumefaciens causes crown gall diseases in dicot plants. Which phytohormones are present in the T- DNA?

- Cytokinin and brassicosteroids
- Cytokinin only
- Auxin and cytokinin
- Auxin only

Question No.55

An IgG and IgM samples (against human RBC surface antigen) were treated with β- mercaptoethanol independently and tried for agglutinating human RBCs with a view to check the hemagglutination titer of the two samples. Which one of the following results is correct in this context?

- The titre og IgG was found to be drastically decreased in comparison with that of IgM remaining unaltered
- β- mercaptoethanol was unable to craft any chemical change on IgG and IgM.
- Both IgG and IgM exhibited the same titre
- The titre og IgM was found to be drastically decreased in comparison with that of IgG remaining unaltered.

Question No.56

In biological system amplification of signal is a key fundamental regulatory principle. Which of the following is NOT an amplification system?

- Complement activation
- Cilia movement in cochlea
- Transmembrane receptor mediated gene expression
- Blood clotting

Question No.57

Transport of cargo from nucleus to cytoplasm through nuclear pore is regulated by

- Ran GTPase
- Rab GTPase
- Ras GTPase
- Rho GTPase

Question No.58

A gene was cloned into a unique *Hind*III restriction site present in the ampicilin resistance gene of a vector that contains both ampicillin and kanamycin resistant genes. To select only for recombinant clones, the transformation mixture should be plated on which of the following plates?

- Kanamycin containing plate followed replica plating on ampicillin containing plate
- Ampicilin containing plate
- Ampicilin plus kamamycin containing plate
- Ampicillin containing plate followed replica plating on kanamycin containing plate

Question No.59

For the following assignment (B: positive), what is the sensitivity?
Experimental: NNBBBBNNBNNNNBBN
Predicted: NNBBBBNNNNBBBBNN

- 68.80%
- 66.6%
- 71.4%
- 31.2%

Question No.60

What makes stem cells different from other cell types?

- Stem cell divide to give rise to a daughter stem cell an another cell that divides and differentiates into only one cell type
- Most cell type can divide, but only stem cells can differentiate into a specific cell type
- Stem cells divide asymmetrically to give rise to a daughter cell which remains as a stem cell and a second daughter cell that divides and differentiates into one or more cell types.
- Stem cells divide rapidly to develop a population of cells that will differentiate into a set of cell types

Question No.61

If n is the number of sequences and m is the length of the sequences, the order of complexity is multiple sequence alignment is

- m/n
- m^n
- mn
- m+n

Question No.62

Secondary structure of RNA is stabilized by hydrogen bonding between

- GC only
- GC, AU and GU
- GC and AT
- GC and AU

Question No.63

The stimulation of antigen specific T cells by appropriately presented antigen alone results in

- Cytotoxicity

- Cell division
- Production of IL3
- Allergy

Question No.64

Which one of the following type of cells will migrate after injury in the central nervous system?

- Microglia
- Ependymal cells
- Oligodendrocytes
- Astrocytes

Question No.65

Which is the correct hierarchy of gene activity in early Drosophila development?

- Gap, segment polarity, pair rule, homeotic gene.
- Gap, maternal, segment polarity, pair rule
- Maternal, gap, pair-rule, segment polarity
- Maternal, pair rule, gap, segment polarity

Question No.66

Phylogenetic relationship can be represented using

- Dendogram
- Data retrieving tool
- Data search engine
- Gene Bank

Question No.67

Mitotic cyclin CDK activity peaks in M phase. This is because

- Mitotic cyclin is synthesized only in S phase
- The kinase subunit is activated by dephosphorylation only in M phase.
- Threshold level of mitotic cyclin accumulates only in late G2
- Cyclin subunit is activated by phosphorylation only in M phase

Question No.68

Which energy is dominant in the unfolded state of a protein?

- Entropy

- van der Waals
- Hydrophobic
- Electrostatic

Question No.69

It has been observed that bacteria secrete certain chemicals at high population density to check the population size. This phenomenon is termed as

- Interspecific competition
- Population control
- Allelopathy
- Quorum sensing

Question No.70

The first small pox vaccine is an example of

- Chemically attenuated vaccine
- Vaccine without adjuvant.
- Heat killed vaccine
- Live vaccine

Question No.71

The fundamental equation used in the classical molecular dynamics simulation is

- Newton’s equation of motion
- Law of gravity
- Schrödinger equation
- Van der Waals equation of state

Question No.72

Which of the following monochromatic lights are more suitable for plant growth?

- Blue, far red
- Red, blue, far red
- Red, green
- Red, far red

Question No.73

A TLC run on rat liver phospholipids is sprayed with ninhydrin, and the colour is allowed to develop. Which phospholipids can be detected in this way?

- DP PC
- Lecithin
- PS
- DS PC

Question No.74

Which plant has been used in phytoremediation for uptake of cadmium from the contaminated soil?

- *Silene vulgaris*
- *Helianthus annus*
- *Brassica juncea*
- *Oscimum basalicum*

Question No.75

Proteins containing alternate alpha helices and beta strands belong to

- All-beta class
- Alpha+beta class
- All-alpha class
- Alpha/beta class

Question No.76

What is the range of Perason's correlation coefficient?

- -1 to +1
- -1 to 0
- 0 to 1
- None of these

Question No.77

Hydrophobic Interaction in Protein describes

- Water-Charged Molecule Interaction
- Water- Water Interaction
- Water-Polar Molecules Interaction
- Water-Non Polar Molecule Interaction

Question No.78

Alpha helical conformation of globular protein can be determined by:

- Circular dicrhroism

- Atomic Force Microscopy
- Electron microscopy
- UV-Vis absorbance spectroscopy

Question No.79

A gene is regulated by a novel transcription factor. The following techniques may be used to identify the cis- regulatory element in the 1Kb promoter sequence of the gene where the novel transcription factor binds:
i. Bioinformatic analysis
ii. Cell based reporter assay
iii. S1 nuclease assay
iv. Electrophoretic mobility shift assay
v. DNAse1 foot printing analysis.

Which one of the following can help to identify the cis- element?

- i and ii.
- v only
- iii and v
- iv only

Question No.80

Empirical scoring function depends on

- Bond length, bond angle and torsional angle
- Least square fit between experimental affinity and computed parameters
- Non-covalent interactions
- Force field of the method

Question No.81

Which of the following experimental designs is most suited to answer whether a newly discovered transposable element in yeast transposes through an mRNA intermediate?

- Introduce an intron which can be spliced out, in the transposable element and test the presence or absence of the intron at a newly transposed site.
- Sequence the transcriptome of the yeast cell to see the presence of corresponding mRNA.
- Using suitable bioinformatical tool predict whether an mRNA intermediate can be formed.
- Block transcription and test whether transposition occurs.

Question No.82

Molecular Mechanics Calculations are based on

- Force Filed Parameters
- Velocity of atoms in molecules
- Displacement of atoms in molecules
- Acceleration of atoms in molecules

Question No.83

Which of the following software is used to remove redundancy in protein sequences?

- AL2CO
- ClustalW
- CD-HIT
- BLAST

Question No.84

Which of the following enzyme of nitrogen metabolism is located in plastid?

- Nitrogenase
- Nitrate reductase
- Aspartate Synthetase
- Nitrite reductase

Question No.85

Which of the following describe bioinformatics

- Sanger sequencing
- Prediction of protein three-dimensional structures
- Gel electrophoresis
- Determination of protein three-dimensional structures

Question No.86

Bootstrapping is used for evaluating the

- Sensitivity
- Confidence level
- Accuracy
- ROC

Question No.87

100ml of 0.1M sodium acetate solution has a pH of 8.90. To this solution 1000ulof 1M acetic acid (pKa= 4.76) of pH 2.80 is added. The pH of this mixture will be

- 4.76
- 2.80
- 8.90
- 5.76

Question No.88

The major function of surfactant protein secreted by the lungs is:

- Do not allow the growth of bacteria
- Keeps aleveoli inflated
- Stops entry of dust particles into the lungs
- Helps in absorption of oxygen

Question No.89

The secondary antibodies routinely used for the detection of primary antibodies in western blot are

- Anti idiotypic
- Antiisotypic
- Anti paratypic.
- Anti allotypic

Question No.90

Number of available structures in PDB is approximately

- 10,000
- 140,000
- 75,000
- 1 million

Question No.91

Which atoms are required for the formation of a hydrogen bond

- Only two electronegative atoms
- Two electronegative atoms and two hydrogens
- Only one electronegative atom and a hydrogen
- Two electronegative atoms and a hydrogen

Question No.92

Which of the following is a nucleotide sequence data base?

- PROSITE
- TREMBL
- EMBL
- SWISS PROT

Question No.93

If a query sequence has no detectable homology with known structures, which method is the best for obtaining the 3D structure?

- Fold recognition
- Homology modelling
- Ab initio
- Hybrid model

Question No.94

In a-helix rise per residue is

- 42 A
- 1 A
- 1.5 A
- 2.5 A

Question No.95

Membrane asymmetry can be regulated by

- F1-ATPase
- Flippase
- ABC transporters
- Glycosylation of integral membrane proteins

Question No.96

Vasopressin secretion does NOT increase with

- vomiting
- an increase in extracellular fluid volume
- standing
- exercise

Question No.97

The molecular weight of the peptide LEEGQEVSFEE is [Ala: 85; Cys: 115; Asp: 130; Glu: 145; Phe: 160; Gly:70; His: 150; Ile: 125; Lys: 145; Leu: 125; Met: 143: Asn: 130; Pro: 110; Gln: 140; Arg: 170; Ser: 100; Thr: 115; Val: 110; Trp: 200; Tyr: 175]

- 1146
- 1268
- 1430
- 1250

Question No.98

In QSAR models data should be

- At least 5 times more than descriptors
- Same as descriptors
- 100 times more than descriptors
- 5 time less than descriptors

Question No.99

PAM matrix depends on

- Genetic code
- Mutation rate
- Size
- Hydrophobicity

Question No.100

In a protein of 100 residues, 90 are binding and 10 are non-binding. If a prediction method predicts all the 100 residues as binding, what is the accuracy? Is it a good method?

- 10%, bad
- 90%, good
- 90%, bad
- 10%, good