R7669	Sub. Code
	502101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Bioinformatics

INTRODUCTION TO BIOINFORMATICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The scoring systems is called a _____ which is derived from statistical analysis of residue substitution data from sets of reliable alignments of highly related sequences.

   (a) substitution matrix

   (b) sequence alignment

   (c) sequence identity

   (d) sequence homology

2. ORF stands for _____.

   (a) Open reading frequency

   (b) Open random frame

   (c) Open reading Frame

   (d) None of these

3. Among the following which one is not the approach to the local alignment?

(a) Smith-Waterman algorithm

(b) K-tuple method

(c) Words method

(d) Needleman-Wunsch algorithm

4. Pair of stereoisomers that are mirror images of one other is known as

(a) Enantiomer (b) Conformer

(c) Duplicate (d) Ligand

5. The stepwise method for solving problems in computer science is called

(a) Flowchart (b) Algorithm

(c) Procedure (d) Sequential design

6. BankIt and Sequin are sequence submission tools in

(a) DDBJ (b) GenBank

(c) PDB (d) EMBL

7. Which of the following is the metabololic database?

(a) KEGG (b) PIR

(c) PDB (d) OMIM

8. Which of the following are applications of bioinformatics?

(a) Drug designing

(b) Data storage and management

(c) Understand the relationships between organisms

(d) All of the above

9. Full form of URL is

(a) Uniform Resource Locator

(b) Uniform Registered Link

(c) Uniform Resource Link

(d) Unified Resource Link

10. Operating system is

(a) A collection of software routines

(b) A collection of input-output devices

(c) A collection of hardware components

(d) All of the above

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Enumerate the applications of bioinformatics in different fields.

Or

(b) Explain the Unique features of the UNIX/Linux operating system.

12. (a) What are the different scoring matrices used in sequence alignment?

Or

(b) Differentiate Global and local sequence alignments.

13. (a) Give an account on the Drug interaction databases.

Or

(b) Explain the Search tools for retrieving data from biological databases.

14. (a) Give an account on different chemical structure representations.

Or

(b) Write a note on the Chemical structure visualization tools.

15. (a) Discuss the advantages of telemedicine.

Or

(b) Explain what is medical coding and transcription.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Explain the role of computers in integrating biological data.

17. Explain briefly the algorithms employed in sequence alignment.

18. Describe the classification of Biological databases.

19. Discuss briefly the different tools used in cheminformatics.

20. Explain in detail, the role of informatics in Health care management.

21. Describe the different methods of Multiple sequence alignment.

22. Write in detail, the chemical databases that provide structural data.

23. Explain the advantages of informatics in Pharmacy systems.

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R7670	Sub. Code 502102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Bio Informatics

MOLECULAR CELL BIOLOGY AND BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

(All questions carry equal marks)

1. Transverse diffusion (flip-flop) is the movement of _____

   (a) cholesterol molecule

   (b) amino acid

   (c) protein

   (d) phospholipid

2. Lactose utilization by E. coil requires _____

   (a) Lac-Z

   (b) Lac-A

   (c) Lac-Y

   (d) Lac-I

3. Sucrose and lactose are ————————

(a) monosaccharides

(b) disaccharides

(c) pentoses

(d) polysaccharides

4. In eukaryotic replication, helicase loading occurs at all replicators during

(a) G0 phase (b) G1 phase

(c) S phase (d) G2 phase

5. Primary storage of food in animals is through ————————

(a) Fats (b) Glucose

(c) Glycogen (d) Galactose

6. ATP and GTP are ————————

(a) cells (b) receptors

(c) nucleotides (d) nucleic acids

7. Giant polytene chromosomes are found in ————————

(a) Egg of fruit fly

(b) Salivary gland of larvae of fruit fly

(c) Salivary gland of adult fruit fly

(d) All of the mentioned

8. The most important point mutations is found in

(a) Thalassemia

(b) Night blindness

(c) Sickle cell anemia

(d) Downs syndrome

9. Proto-oncogenes can be transformed to oncogenes by all of the following mechanisms except _____

(a) Elimination of their start signals for translation

(b) During a viral infection cycle

(c) Chromosomal rearrangements

(d) Chemically induced mutagenesis

10. What is the genotype of the person suffering from Klinefelter's syndrome?

(a) 44+ XXX (b) 42+ XXX

(c) 44+ XXY (d) 42+ XXY

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Compare and contrast prokaryotic and eukaryotic cell.

Or

(b) Explain Transmembrane signals and their receptors.

12. (a) Structure of kinetochore.

Or

(b) Centrosome and its functions.

13. (a) Explain about classification, properties and organization of Carbohydrates.

Or

(b) Structure, properties and functions of DNA.

14. (a) Development of mapping population in plants.

Or

(b) Elaborate Sex-linked Inheritance with examples.

15. (a) What are Oncogenes and how it is activated.

Or

(b) Properties of malignant cells.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Gene expression in eukaryotes.

17. Explain plasma membrane and its properties.

18. Stages of meiosis with neat sketch.

19. Explain the structure of nitrogenous bases.

20. Explain gene mapping methods.

21. Explain Mendelian Principles.

22. Chromosomal abnormalities and disorders- Elaborate

23. Explain the mechanism of genome alterations.

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R7671	Sub. Code
	502103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Bioinformatics

MATHEMATICS AND STATISTICS FOR BIOLOGISTS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** questions.

1. If $\sin x = 0$, then $x =$ ——————

   (a) $n\pi$ (b) $(2\pi + 1)\pi/2$

   (c) $(n+1)/\pi$ (d) $n\pi/2$

2. Find the value of $(1+i)^{100}$

   (a) $2^{100}(\cos 100\pi + i \sin 100\pi)$

   (b) $2^{100}(\cos 25\pi) + i \sin 25\pi$

   (c) $2^{50}(\cos 100\pi + i \sin 100\pi)$

   (d) $2^{50}(\cos 25\pi + i \sin 25\pi)$

3. The geometric mean of two numbers is 6 and their arithmetic mean is 6.5. The numbers are

   (a) (3,12) (b) (4,9)

   (c) (2,18) (d) (7,6)

4. Which one of the following is a non probability sampling method?

(a) Simple Random sampling

(b) Stratified sampling

(c) Cluster sampling

(d) Quota sampling

5. Consider a set of 18 simples from a standard normal distribution. We square each sample and sum all the squares. The number of degrees of freedom for a chi square distribution will be

(a) 17 (b) 18

(c) 19 (d) 20

6. If $P(A) = 1/5$, $P(B) = 0$, then what will be the value of $P(A \mid B)$?

(a) 0 (b) 1

(c) not defined (d) $1/5$

7. If the covariance between x and y is 12, various of x is 64 and variance of y is 36, then what is the correlation coefficient?

(a) 1/4 (b) 1/3

(c) 1/2 (d) 2/3

8. Consider the following statements.

(1) Two independent variables are always uncorrelated.

(2) The coefficient of correlation between two variables x and y is positive when x decreases then y decreases. Which of the statements is/are correct?

(a) 1 only (b) 2 only

(c) both (1) and (2) (d) neither (1) and (2)

9. A statement whose validity is tested on the basis of a sample is called?

(a) null hypothesis (b) statistical hypothesis

(c) simple hypothesis (d) composite hypothesis

10. Alternative hypothesis is also called as?

(a) composite hypothesis

(b) research hypothesis

(c) simple hypothesis

(d) null hypothesis

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) The Taylor series for $f(x) = 7x^2 - 6x + 1$ at $x = 2$ is given by $a + b(x-2) + c(x-2)^2$. Find the value of $a + b + c$.

Or

(b) Integrate the following.

(i) $\int \left(10x^3 - \frac{4}{x^5} + \frac{2}{\sqrt{3x+5}}\right) dx$

(ii) $\int \sin 5x \cos 2x dx$

12. (a) Consider the following grouped frequency distribution.

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	1	2	4	6	4	3

What is mean deviation about the median?

Or

(b) If A is the arithmetic mean and G is the geometric mean of two unequal positive real numbers p and q, then prove $A > G > \frac{G^2}{A}$.

13. (a) A dice is tossed 120 times with the following results.

no. turned up	1	2	3	4	5	6
frequency	30	25	18	10	22	15

Test the hypothesis that the dice is unbiased $(\chi^2 = 11.7)$ calculate the frequency observed for chi square distribution.

Or

(b) Three companies A, B and C supply 25%, 35% and 40% of the notebooks to a school. Past experience shows that 5%, 4% and 2% of the notebooks produced by these companies are defective. If a notebook was found to be defective, what is the probability that the notebook was supplied by A?

14. (a) For the following data.

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

If the regression equation of y and x is $y = 0.929x + 7.284$, find the correlation coefficient.

Or

(b) $x = 2y + 4$ and $y = kx + 6$ are the lines of regression of on y and y on x respective. Find the value of k, if value of v is 0.5.

15. (a) Testing two computer processors for speed. Form a confidence interval for the difference in cpu speed, from the following speed data (in Mhz). Assume both populations are normal with equal variances and use a 95% confidence level.

	Cpu_x	Cpu_y
Number tested	17	14
Sample mean	3004	2538
Sample standerd deviation	74	56

Or

(b) Given below is a summary of AVOVA for four groups of students tested in a research project.

Source of variance	SS (Sum of squeres)	df (Degree of freedom)	Ms (Mean sum of squares)
between groups	76	3	23.33
within groups	122	16	7.62

What will be the value of 'F' for the above data?

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Find all eigen values and corresponding eigen vectors for the matrix A if $\begin{pmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{pmatrix}$

17. Solve: $\left(x^3 + 3xy^2\right)dx + \left(y^3 + 3x^2y\right)dy = 0$

18. The consumption of number of guava and orange on a particular week by a family are given below.

No : of Guavas	3	5	6	4	3	5	4
No : of Orangs	1	3	7	9	2	6	2

Which fruit is consistently consumed by the family?

19. Consider the Markov Chain with three states, $S = \{1,2,3\}$ that has the following transition matrix

$$P = \begin{pmatrix} 1/2 & 1/4 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{pmatrix}$$

(a) Draw the state transition diagram for this chain

(b) If we know $P(x_1 = 1) = P(x_1 = 2) = 1/4$, find $P(x_1 = 3, x_2 = 2, x_3 = 1)$.

20. Calculate the Karl Pearson's coefficient of correlation of the following data.

x	28	45	40	38	35	33	40	32	36	33
y	23	34	33	34	30	26	28	31	36	35

21. Calculate the regression coefficient and obtain the line of regression for the following data.

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

22. If $z = (\cos\theta + i\sin\theta)$, show that $z^n + 1/z^n = 2\cosh\theta$ and $z^n - \left[\frac{1}{z^n}\right] = 2i\sin n\theta$

23. Solve: $\left(2\sqrt{xy} - xy\right)dy + ydx = 0$

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R7672	Sub. Code
	502501

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2022

First Semester

Bioinformatics

GENERAL CHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** questions.

1. Which of the following is not isoelectronic with a noble gas?

   (a) S^{2-} (b) Ba^{+}

   (c) Al^{3+} (d) Sb^{3-}

2. The bond length of C-C bonds in benzene is

   (a) 110 pm (b) 156 pm

   (c) 121 pm (d) 139 pm

3. Which of the following is the reactive species in the nitration of benzene?

   (a) NO_2^{+} (b) NO_2^{-}

   (c) NO_3 (d) HNO_3

4. Overtones are observed in

   (a) near IR region (b) far IR region

   (c) mid IR region (d) Not in IR region

5. The example of a synthetic biodegradable polymer is

(a) Polyethylene glycol

(b) Polystyrene

(c) Acrolein

(d) LDPE

6. The colour of the nanogold particles is _____

(a) Yellow (b) Orange

(c) Red (d) Variable

7. Myoglobin binding of O_2 depends on _____

(a) Hemoglobin concentration

(b) O_2 concentration and affinity of myoglobin for O_2

(c) K_a

(d) K_d

8. Which of the following are the biological functions of Mg^{+2}?

(i) Present in chlorophyll and helps in photosynthesis

(ii) Activation of enzymes

(iii) Information carrier

(iv) Osmotic balance

(a) (i), (ii), (iii) (b) (ii), (iii), (iv)

(c) (i), (ii) (d) (iii), (iv)

9. All of the following are topically used sulphonamides except?

(a) Sulphacetamide

(b) Sulphadiazine

(c) Silver sulphadiazine

(d) Mafenide

10. Benzylpenicillin is the chemical name for which of the following penicillin?

(a) Penicillin G (b) Penicillin V

(c) Penicillin F (d) Phenethicilin

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss the molecular orbital theory.

Or

(b) Explain the compound's stability using the hardness and softness theory.

12. (a) State any five differences between non-aromaticity and anti-aromaticity with examples.

Or

(b) What is fingerprint region? Explain the principle of IR spectroscopy.

13. (a) Compare one-dimensional, two-dimensional, and three-dimensional nanomaterials with examples.

Or

(b) State the chemical formula and structure of cyclodextrin and ethyl cellulose with its uses in the pharmaceutical industry.

14. (a) Explain the structure and function of hemoglobin and hemocyanin.

Or

(b) Describe the structural function of the blue copper protein.

15. (a) Discuss the chemistry of Benzathiane penicillin and its side effects.

Or

(b) Discuss the synthetic methodology of chloramphenicol.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Discuss the Lowry Bronsted concept of acid-base theory.

17. Explain free electron theory and molecular orbital theory

18. Explain the criteria for aromaticity using Huckel's rule with suitable examples.

19. Derive Beer Lambert' s law. State the limitations of Beer lamberts law.

20. Explain the preparation methodology of polyvinyl alcohol and its uses.

21. Explain in detail the structure and function of ferredoxin and rubredoxin.

22. Discuss the chemistry of Ampicillin and Amodiaquine.

23. Explain the synthetic methodology of sulphamethoxazole and its side effects.

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