R5979	Sub. Code 502101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

First Semester

Bioinformatics

INTRODUCTION TO BIOINFORMATICS

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Explain the role of computers in biology.

2. What are the open resources available in bioinformatics?

3. What is multiple sequence alignment?

4. Elucidate the various tools used in sequence alignment methods.

5. Define the Entrez system.

6. Explain the significance of biological databases.

7. Define cheminformatics.

8. What are the different chemical structure representation formats?

9. Define medical transcription.

10. What are the ethical issues in medical informatics?

Part B (5 × 5 = 25)

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

11. (a) Write a note on the applications of bioinformatics.

Or

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

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

Or

(b) Explain the Smith–Watermann algorithm of sequence alignment.

13. (a) Give an account on the Specialized Biological databases.

Or

(b) What are the different ways of Retrieving data from biological databases?

14. (a) Give an account on chemical databases.

Or

(b) Explain the different chemical structure visualization tools.

15. (a) Discuss about telemedicine and telehealth.

Or

(b) Explain the applications of informatics in pharmacy.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the concept of open resources in bioinformatics.

17. Explain briefly the algorithms employed in sequence alignment.

18. Describe with examples 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.

———————

R5980	Sub. Code 502102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

First Semester

Bioinformatics

BIOCHEMISTRY AND MOLECULAR CELL BIOLOGY

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is a monosaccharide?
2. What is a nucleotide?
3. What are lipids?
4. What are cyclins?
5. Define the term Gene.
6. What is codominance?
7. What is bacterial transformation?
8. What is Pedigree analysis?
9. What is Plasmid?
10. What is a Liposome?

Part B (5 × 5 = 25)

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

11. (a) What are amino acids? Classify Amino acids.

Or

(b) List the differences between a prokaryotic and a eukaryotic cell.

12. (a) Explain the double helix structure of Deoxy Ribonucleic Acid (DNA).

Or

(b) Explain Hardy Wienberg principles.

13. (a) Explain Linkage Maps.

Or

(b) Explain the Mendelian Dihybrid cross with a suitable example.

14. (a) Explain the structure and functions of Mitochondria.

Or

(b) Explain the components of a Pedigree chart and its importance in genetics.

15. (a) Explain the different levels of protein structure organization.

Or

(b) Explain the term extra chromosomal inheritance.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. What is cell cycle? Explain the various steps and regulation of cell cycle.

17. What are Vitamins? Classify and explain the importance and deficiency of any two of them.

18. Explain the various stages and features of Mitosis with appropriate diagrams.

19. What is recombinant DNA technology? Explain the components and its applications.

20. Explain eukaryotic genome organisation.

———————

R5981	Sub. Code
	502103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

First Semester

Bioinformatics

MATHEMATICS AND STATISTICS FOR BIOLOGISTS

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Find the Eigenvalues of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

2. What is Borel set in Mathematics?

3. How do you describe a Lorenz curve?

4. Why does sampling error occur?

5. Define Sample space.

6. What is Type I error in hypothesis testing?

7. What is Spearman's rank correlation coefficient? When do you use rank correlation?

8. What are the different properties of correlation coefficient?

9. What is the difference between ANOVA and *t* test?

10. Define Null hypothesis.

Part B (5 × 5 = 25)

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

All questions carry equal marks.

11. (a) Write short notes on Partial Differential Equations (PDE).

Or

(b) Find $\frac{dy}{dx}$ for $y = \frac{(1-x)\sqrt{x^2+2}}{(x+3)\sqrt{x-1}}$

12. (a) Prove the identity $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$.

Or

(b) A class consists of 14 students, one of them is a girl student. In how many ways can the class committee of 3 students be formed such that (i) there are people of both gender (ii) all the members is of the same gender.

13. (a) Write down the properties of Geometric mean and Harmonic mean

Or

(b) Ten participants in a contest are ranked by two judges as follows.

X:	1	6	5	10	3	2	4	9	7	8
Y:	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient.

14. (a) State the different characteristics of a Binomial experiment. What is the difference between binomial and Poisson distribution?

Or

(b) Give some short notes on Spearman's Rank correlation.

15. (a) How to analyze your data with tests of significance? Describe *T*-test and its various types.

Or

(b) Describe in brief about computer software packages used for statistical analysis.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Find the Eigen values and the Eigenvectors of the matrix

$$A = \begin{vmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{vmatrix}.$$

17. Calculate mean, median and mode for the marks obtained by 49 students.

Class mark:	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of students:	5	6	15	10	5	4	2	2

18. Differentiate the following pairs of concepts:

(a) Correlation and regression.

(b) Independent and mutually exclusive events.

(c) Discrete and continuous probability distribution.

19. State and prove the additional rule of probability. It is given that the two events A and B are both independent and mutually exclusive. Show that atleast one of them must have zero probability.

20. What is chi-square test of goodness of fit? Write its application in bioinformatics?

———————

R5982	Sub. Code
	502501

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

First Semester

Bioinformatics

GENERAL CHEMISTRY

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. What are the conditions for aromaticity?

2. Here (A) reagent to carry out the reaction for synthesis of ketone (B). Find the (A) and (b) $R-C\equiv N \xrightarrow{A} B$.

3. What is the difference between S_E1 and S_E2 reactions?

4. What is the meaning of nucleophiles?

5. Which type of bond is strong, ionic (pr) covalent? Why?

6. What is conjugated acid and base?

7. Give an examples for one-dimensional, two dimensional and three dimensional nano materials.

8. Define co-polymerization with suitable examples.

9. What are the four fundamental elements of the living things?

10. Define Bohr effect.

Part B (5 × 5 = 25)

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

11. (a) Explain the mechanism of Dow process with suitable examples.

Or

(b) Explain the mechanism of Paal-Knorr furan synthesis with suitable examples.

12. (a) (i) Discuss about S_N1 and S_N2 reactions with mechanism.

(ii) Why the tertiary carbocation is more stable than primary and secondary carbocations?

Or

(b) Explain how the neighboring groups influence in both nucleophilic, electrophilic substitution reactions with suitable examples.

13. (a) Explain molecular orbital theory with examples.

Or

(b) Explain about hard-soft acid –base (HSAB) theory with its applications.

14. (a) Explain the synthesis and classification of self-assembled nanoparticles with examples.

Or

(b) Draw the chemical structure and mention its applications.

(i) Polymethacrylate

(ii) Cyclodextrin.

15. (a) Explain the oxygen transport mechanism of the hemoglobin and myoglobin in living organism.

Or

(b) Write a brief notes on ferredoxin and rubredoxin.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Explain the complete synthesis of the alcohol and ketone with suitable examples.

(b) Give a brief account of annulenes and fulvenes with examples.

17. Discuss on substituted nucleophilic and electrophilic reactions with suitable examples.

18. Elaborate the valance bond theory and free electron theory for conductor, isulator and semiconductor with examples.

19. Explain the mode of action and side effects of ampicillin and cis-platin.

20. Explain the used and side effects of steroids with more examples.

———————

R5983	Sub. Code
	502301

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021

Third Semester

Bioinformatics

GENETICS AND GENETIC ENGINEERING

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. List any two X- linked syndromes

2. What is pedigree analysis?

3. Define Trisomy.

4. Define mutation and list its types.

5. List various protein purification techniques.

6. Distinguish any two key points on prokaryotic and eukaryotic genome.

7. Define regulatory gene

8. Explain the important properties of malignant cells.

9. Define genetic Engineering.

10. Define pesticide.

Part B (5 × 5 = 25)

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

11. (a) Give a brief account on Law of segregation with suitable example.

Or

(b) Write a brief note on importance of linkage and crossing over.

12. (a) Write a brief note on complementary gene interaction.

Or

(b) Explain supplementary gene interaction with suitable example.

13. (a) List out the difference of prokaryotic and eukaryotic system.

Or

(b) Briefly discuss on post transcriptional modification.

14. (a) Define proto oncogene. Briefly explain its function in cell division.

Or

(b) Write a note on tumor suppression gene.

15. (a) Illustrate the Agrobacterium mediated gene delivery method.

Or

(b) Briefly discuss the herbicide resistance.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain mitochondrial inheritance and its significance.

17. Define Rh factor and explain Rh incompatibility in human.

18. Illustrate any two protein purification techniques and its applications.

19. Briefly discuss the Chromosome abnormalities in acute promyelocytic leukemia (APL).

20. Write an essay on application of plant genetic engineering.

———————

R5984

Sub. Code
502302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

Third Semester

Bioinformatics

STRUCTURAL BIOLOGY

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define Point group.
2. Define Diffraction.
3. Bragg's law.
4. Write structure factor equation.
5. Explain Mathew's coefficient.
6. Explain the term Mosoicity.
7. Why do crystals diffract X-rays?
8. Explain Hydrogen bond.
9. What is Laue's condition?
10. What is a dihedral angle?

Part B (5 × 5 = 25)

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

11. (a) Explain Lattices.

Or

(b) Write about Crystal systems and Symmetry.

12. (a) Explain Synchrotron radiation and its application.

Or

(b) Write about NMR in structure determination.

13. (a) Explain Direct method to solve the structure of a small molecule.

Or

(b) Explain Least squares techniques.

14. (a) Explain Molecular replacement.

Or

(b) (i) How are data sets scaled? Write equation for the scale factor.

(ii) In what three ways can phases be improved by density modification?

15. (a) Explain Ramachandran plot.

Or

(b) Write short note on hydrophobic interaction, Van der waals force.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain any TWO :
    (a) Atomic scattering factor
    (b) Structure factor
    (c) electron density calculation.

17. Explain any TWO :
    (a) Powder diffraction
    (b) Neutron diffraction
    (c) Cryo-EM.

18. Explain any TWO :
    (a) Patterson method
    (b) Fourier refinement
    (c) Structure validation.

19. Explain :
    (a) Protein structural hierarchy
    (b) Folds and motifs.

20. Application of X-ray crystallography in drug design.

———————

R5985	Sub. Code 502303

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

Third Semester

Bioinformatics

PHARMACOGENOMICS

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

Define/explain ALL of the following.

All Questions carry equal marks.

1. Splice sites
2. Genomic assembly
3. BLAST2
4. AVID
5. Pharmacokinetics
6. Gene based targets
7. Nanopore sequencing
8. SAGE database
9. TCGA
10. Cancer prognosis

Part B (5 × 5 = 25)

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

11. (a) Describe briefly about Lac operon prediction of gene.

Or

(b) Give a short account on Metagenomics.

12. (a) Differentiate between PipMaker from MultiPipMaker.

Or

(b) State the role of active and binding sites.

13. (a) Write the significance of ADME predictions of gene.

Or

(b) Enumerate the importance of personalized medicine.

14. (a) Explain briefly about SNP array.

Or

(b) Comment on Ilumina Genome Analyzer.

15. (a) Discuss the possible role of bioinformatics in cancer diagnosis.

Or

(b) How will you correlating clinical outcomes with genomic data?

Part C

(3 × 10 = 30)

Answer any **three** questions.

All questions carry equal marks

16. Discuss the role of gene expression profiling.

17. Elaborate about Clusters of Orthotogous Groups (COGs).

18. Describe the process in structural pharmacogenomics.

19. Write an essay on the significance of NGS in pharmacogenomics.

20. Enumerate the cancer specific databases and list their significance.

———————

R5986	Sub. Code 502508

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2021

Third Semester

Bioinformatics

PROGRAMMING IN C AND C++

(CBCS – 2019 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What are the different datatypes in C?

2. Define the terms loops and branching.

3. What is the use of pointers?

4. Define the term of C preprocessor.

5. Give the syntax of structure.

6. What are the file input and output operations done in C and C++?

7. Define the term inheritance.

8. What is the use of exception handling? In C++.

9. Define memory management in C++.

10. How to pass value to a function using pointer?

Part B (5 × 5 = 25)

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

11. (a) Discuss in detail about statement, identifier, expressions explain them with examples.

Or

(b) Explain in detail about string handling function in C.

12. (a) Explain in detail about storage classes with examples.

Or

(b) Discuss about one and two dimensional arrays with example.

13. (a) Explain union with examples.

Or

(b) Discuss : standard functions in the 'C' graphic module.

14. (a) What is polymorphism? Explain it with an example.

Or

(b) Discuss about the basic concepts of object oriented programming.

15. (a) How to convert a DNA sequence to RNA sequence using C and C++ programs? Illustrate.

Or

(b) How to find GC content using structures in C? Explain it in detail.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Elaborate on various control statements used in C. Give example for each statement.

17. Describe in detail about function prototype with examples.

18. Explain in detail about 'C' structures with an example.

19. Discuss about error handling and exception handling in C++.

20. Elaborate any one bioinfomatics application program using C++.

———————