S–1379

Sub. Code
23MBT1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Biotechnology

BIOCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the application of the Henderson-Hasselbalch equation?

2. Define gluconeogenesis.

3. How do you define phospholipids?

4. Give the names of two eicosanoids.

5. What is ATP, and why is it called the universal energy currency?

6. Define oxidative Phosphorylation.

7. What is transamination?

8. Name any two essential amino acids.

9. Differentiate between purine and pyrimidine bases.

10. What is the salvage pathway of nucleotide synthesis?

Part B (5 × 5 = 25)

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

11. (a) Describe the Henderson-Hasselbalch equation and how biological systems use it.

Or

(b) Give an explanation of the composition and function of the amino acid buffer system.

12. (a) Explain the biological relevance of lipids and classify them.

Or

(b) Write down the phospholipid biosynthesis process.

13. (a) Explain in brief about the law of thermodynamics.

Or

(b) Explain the function of the electron transport chain in oxidative Phosphorylation.

14. (a) Discuss about the chemical characteristics and categorization of amino acids.

Or

(b) Describe the metabolism of nitrogen and its importance.

15. (a) Outline the composition and role of pyrimidines.

Or

(b) Demonstrate the process of nucleotide de novo synthesis.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the various biological buffer systems and how they help the body's pH equilibrium.

17. Give a detailed explanation of the biosynthesis and metabolism of fatty acids.

18. Discuss about oxidative Phosphorylation and electron transport chain in biological system.

19. Explain about nitrogen metabolism and the production and breakdown of amino acids.

20. Elaborate the production and breakdown of pyrimidines and purines, emphasizing their biological importance.

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S–1380

Sub. Code
23MBT1C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Biotechnology

MOLECULAR GENETICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. Define Genetic code.

2. What are DNA markers?

3. What is DNA replication?

4. Define Radiation.

5. Define Cytosine deamination

6. What is Mismatch repair?

7. Define allele frequency.

8. What is random mating in a population?

9. What is extra-chromosomal heredity?

10. Mention any two features of plasmids.

Part B (5 × 5 = 25)

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

11. (a) What is the concept of colinearity genes and proteins? Give examples.

Or

(b) Describe the different types of repetitive DNA in the eukaryotic genome.

12. (a) Explain the types of mutation.

Or

(b) Describe the role of histones in gene regulation.

13. (a) Explain the mechanisms of DNA damage.

Or

(b) Describe Barbara McClintock discovery of transposable elements in maize.

14. (a) How does dominance complicate the estimation of allele frequencies?

Or

(b) Define inbreeding and explain its effect on genotype frequencies.

15. (a) Describe the structure and function of F-plasmid.

Or

(b) Write the main objectives of the Human Genome Project (HGP)?

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Compare and contrast different DNA marker technologies (VNTR, STR, SNP) in genetic analysis.

17. Discuss structural chromosomal abnormalities and their effects on human health.

18. Explain internal and external agents that cause DNA damage with examples.

19. Discuss the Hardy-Weinberg equilibrium principle, including its applications and limitations.

20. Explain in detail the discovery, structure and functions of plasmids.

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S–1381

Sub. Code
23MBT1C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Biotechnology

MOLECULAR CELL BIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Endosymbiotic theory.

2. Extra cellular matrix.

3. Trafficking of proteins.

4. Oxidative stress.

5. Polytene chromosome.

6. Nuclear envelop.

7. Cell signaling.

8. Steps of transduction.

9. Tumor suppressor genes.

10. Mitogens.

Part B (5 × 5 = 25)

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

11. (a) Differentiate between Transmission and Scanning Electron Microscope.

Or

(b) Brief about the Extra cellular matrix.

12. (a) Give an account on DNA replication.

Or

(b) Compare the similarities of Solenoid and Zigzag model.

13. (a) Explain about the nuclear pore complexes.

Or

(b) Briefly explain about the nucleus.

14. (a) Describe the steps and cycle of eukaryotic cell based on molecular.

Or

(b) Mention briefly about cell signaling.

15. (a) Describe the stages of cancer cell.

Or

(b) What is apoptosis? Write the significance of apoptosis.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Enumerate an account on organelles of the eukaryotic cell and its function.

17. Compare the significance of transcription, translation and post translational modification.

18. Describe in detail the global structure of chromosome.

19. Identify the importance of MAP kinase ad Wnt pathway.

20. Explain in detail process about Rb and p53 tumor suppressor genes.

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S–1382

Sub. Code
23MBT1E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Biotechnology

ELECTIVE – BIOINSTRUMENTATION

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. Write the principle of phase contrast microscopy.

2. Define fluorescent microscope

3. What is svedberg unit?

4. Write the application of centrifuge in biological research.

5. What is HPLC and its applications?

6. Define 2-D gel electrophoresis

7. Write the difference between PAGE and SDS-PAGE?

8. List out the application of ELISA.

9. Write the application of UV spectroscopy.

10. How is autoradiography used in biological research?

Part B (5 × 5 = 25)

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

11. (a) Explain in detail about principle and application of fluorescence microscope.

Or

(b) Summarize the Principle and application of atomic force microscopy.

12. (a) Differentiate between isopycnic and rate zonal centrifugation.

Or

(b) Describe the principle, procedure and the advantages of paper chromatography.

13. (a) Write the principle, types, and applications of gel electrophoresis.

Or

(b) Explain the differences between agarose gel electrophoresis and SDS-PAGE.

14. (a) Explain the working principle and applications of NMR spectroscopy.

Or

(b) Discuss the importance and applications of infrared (IR) spectroscopy in biological studies.

15. (a) Describe the principle and applications of Radiation Dosimetry in biological research.

Or

(b) Explain the working of a GM counter and its role in radiation detection

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the principle, types, and applications of SEM and TEM microscopy techniques used in biological research.

17. Describe the process of centrifugation, its types, and its applications in biotechnology.

18. Discuss the principles and applications blotting techniques.

19. Elaborate agarose gel electrophoresis and SDS-PAGE, with their applications.

20. Describe the working principle, procedure, and significance of PCR and RT-PCR.

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S–1384	Sub. Code
	23MBT1E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Biotechnology

Elective – ENZYMOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Brief the effect of temperature on enzyme function.

2. Comment on electrophoresis.

3. Comment on limitations of Michaelis-Mention equation.

4. Give Eadie hofstee equation.

5. Differentiate holoenzyme from core enzyme.

6. Brief about the nucleophilic group of enzyme catalyst.

7. Define three point interaction theory of an enzyme.

8. Give two salient features of lysozyme.

9. Give two examples of coenzymes.

10. Define sigmoidal kinetic enzymes.

Part B (5 × 5 = 25)

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

11. (a) Describe principle, working and applications of affinity chromatography.

Or

(b) Discuss the common and systematic rules for naming of enzymes?

12. (a) Derive an equation for Hanes plot with graphical representation.

Or

(b) Define the equations for line-weaver and Burke plot.

13. (a) Explain physical method determination of amino acid residues at active site.

Or

(b) Explain the concept of enzyme catalysis by acid-base catalysis and nucleophilic and electrophilic attack?

14. (a) Explain the structure and mechanism of DNA polymerase III.

Or

(b) How carboxypeptidase -A catalyse the reaction?

15. (a) Aspartate transcarbomylase (ACT) is an allosteric enzyme. Demonstrate with suitable illustrations.

Or

(b) Explain enzymes used in diagnostics. Give any two examples.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. How are enzymes classified based on the type of reaction they catalyse

17. Considering the following data of an enzyme-catalyzed reaction:

Substrate concentration [S] Mol	Velocity (v) (nmol/L/min)
7×10^{-6}	20
8×10^{-5}	48
1×10^{-5}	60
1×10^{-4}	79
1×10^{-3}	80
1×10^{-2}	80

From the data, (a) calculate Vmax of the reaction; (b) Calculate Km of the reaction; (c) Calculate the velocity of the reaction when the substrate concentration is 3.33×10^{-6} M; (d) Calculate the velocity of the reaction at a substrate concentration of 8×10^{-5} M, if the enzyme concentration is doubled.

18. Explain the structural complexity of fatty acid synthetase complex. How its function is regulated?

19. Write an account on enzyme immobilization.

20. Explain reversible and irreversible enzyme inhibition.

S–1391

Sub. Code
23MBT2S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Biotechnology

TISSUE ENGINEERING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is tissue engineering?

2. Define Morphogenesis.

3. What is organotypic?

4. Definition of 3D cell culture.

5. What are Scaffolds?

6. Give examples for extracellular matrix.

7. Define Bioartificial pancreas.

8. Write the Hematopoietic system.

9. What is stem cell?

10. Write about cellular engineering.

Part B (5 × 5 = 25)

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

11. (a) Describe the biology of tissue engineering.

Or

(b) Explain the tissue differentiation.

12. (a) Discuss the In vitro control of tissue development.

Or

(b) What are the types of engineered tissue?

13. (a) Discuss the polymers and nanocomposites.

Or

(b) Explain the transplanting engineered cells.

14. (a) Describe the red blood cell substitutes.

Or

(b) Write the renal replacement procedure.

15. (a) Write the functions of structural tissue engineering.

Or

(b) Explain about brain implants.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elaborate the principles of tissue engineering.

17. Describe about the tissue engineering bioreactors with application.

18. Write an essay on various biomaterials used in tissue engineering.

19. Explain the principle behind the functioning of Artificial Womb.

20. Write an essay on Periodontal applications in tissue engineering.

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S–1392

Sub. Code
23MBT3C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Biotechnology

BIOINFORMATICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the role of artificial intelligence in biomedical research?

2. Differentiate between DNA and protein sequence databases.

3. What is the purpose of the scoring alignment, gap penalty method?

4. Explain the significance of heuristic algorithms in sequence alignment.

5. What is the importance of regulatory sequence analysis?

6. Define protein secondary structure prediction.

7. What are structure analysis tools? Give examples.

8. What is the significance of metabolic reconstruction in bioinformatics?

9. How does bioinformatics help in disease gene identification?

10. What are the major steps in drug discovery?

Part B (5 × 5 = 25)

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

11. (a) Explain the role of BLAST and FASTA in bioinformatics.

Or

(b) What is gene ontology (GO) data? How is it useful?

12. (a) Describe Smith Waterman algorithms used in sequence alignment.

Or

(b) Explain the significance of pairwise sequence alignment with an example.

13. (a) What are genome maps and markers? Explain their importance.

Or

(b) Discuss the role of SCOP and CATH in protein structure visualization.

14. (a) Explain the importance of transcriptional profiling in bioinformatics.

Or

(b) What are the two methods of phylogenetic analysis? How is it used in bioinformatics?

15. (a) How can bioinformatics he used to identify disease pathogens?

Or

(b) What is target identification in drug discovery review? Explain its significance.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the different types of biological databases and their significance in bioinformatics.

17. Discuss the different scoring methods used in sequence alignment with examples. How are PAM and BLOSUM scoring matrices different?

18. Describe the process of genome sequencing and explain how bioinformatics helps in genome analysis.

19. What are the visualization tools for bioinformatics? Explain the working and applications of RasMol, PyMol, and Chimera.

20. Explain QSAR in drug discovery. How does it help in predicting the biological activity of molecules?

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S–1393	Sub. Code 23MBT3C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Biotechnology

IMMUNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is CMI specificity?

2. What are the cells and organs of the immune system?

3. State Phagocytic cells.

4. Epitopes.

5. HLA tissue typing.

6. Tumour antigen.

7. Macrophage activation.

8. Mode of activation of C proteins.

9. Principles of immune techniques.

10. VDRL test.

Part B (5 × 5 = 25)

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

11. (a) Describe about self vs non-self- discrimination.

Or

(b) Explain about the origin of lymphoid tissue.

12. (a) Differentiate between K and NK cells.

Or

(b) Explain how is antibody diversity generated.

13. (a) List out the Vaccination Schedule and its uses.

Or

(b) Write the Structure of CLASS I and Class II MHC molecules.

14. (a) Discuss the Hypersensitivity reactions and its types.

Or

(b) What are the Biological functions of C Proteins. Explain.

15. (a) Explain the principles and methods of RIA.

Or

(b) Write the methodology of ELISPOT assay.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the different types of immunity.

17. Write in detail about the structure and functions of immunoglobulins.

18. What is Immunosuppressive therapy. Explain in detail.

19. Explain about the Classical and alternative pathways of C proteins.

20. Give a detailed account on CMI techniques

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S–1394

Sub. Code
23MBT3C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

Third Semester

Biotechnology

BIOPROCESS TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Write the general requirements of fermentation?

2. What is solid substrate?

3. What is surface reactors?

4. Define Body construction.

5. What is Flocculation?

6. List out the sedimentation principles.

7. Define Ultrafiltration.

8. What is down stream process?

9. Define secondary metabolites.

10. Why is yeast commonly used in anaerobic fermentation?

Part B (5 × 5 = 25)

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

11. (a) Discuss the slurry fermentation and its application.

Or

(b) Write the microbial cell culture.

12. (a) Describe the types of bioreactors.

Or

(b) Explain the production penicillin and insulin.

13. (a) Write the methods of lysis.

Or

(b) Describe the precipitation methods.

14. (a) Explain he chromatography techniques.

Or

(b) Write the operation on rotary dryer.

15. (a) What is the main difference between aerobic and anaerobic fermentation?

Or

(b) Discuss the effluent treatment and fermentation economics.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. What are the application of immobilized enzymes in biotechnology and industry?

17. Elaborate the media for industrial fermentation and sterilization.

18. Explain the principles and applications of method of filtration in bioseparation.

19. Discuss the crystallization process and whole broth process.

20. Explain the role of microbial fermentation in the production of commercially important metabolites.

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S–1395

Sub. Code
23MBT3E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

Third Semester

Biotechnology

Elective : NANOBIOTECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What did Richard Feynman say about nanotechnology? —
2. What are the classification of nanomaterials based on composition?
3. What are the applications of nanofibers?
4. What is biosynthesis of nano materials?
5. What are the applications of nanotechnology in textile industry?
6. What are polymeric nanoparticles?
7. Write the importance of lab-on-a-chip technology.
8. What are the health risks associated with nanoparticles?
9. Define nanotoxicology and its significance.
10. How do magnetic nanoparticles help in hyperthermia treatment?

Part B (5 × 5 = 25)

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

11. (a) Define nanotechnology and explain its significance in biotechnology.

Or

(b) Describe the classification of nanobiomaterials.

12. (a) Explain the top-down and bottom-up approaches for nanomaterial synthesis.

Or

(b) What are quantum dots? Write their applications.

13. (a) How are nanomaterials used in food and cosmetic applications?

Or

(b) Discuss the role of nanotechnology in the textile industry.

14. (a) What are nano-carriers? Explain their role in drug delivery.

Or

(b) How do magnetic nanoparticles assist in imaging and hyperthermia treatment?

15. (a) What are the health risks associated with nanoparticles in mammalian systems?

Or

(b) Explain the importance of safety regulations for nanoparticles.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the classification of nanomaterials.

17. Discuss the different methods for the preparation of nanomaterials such as polymer, ceramic and metal-based materials.

18. Describe the applications of nanomaterials in medicine, including their use in bone substitutes, dentistry and bio-sensors.

19. Explain the role of nanomaterials in drug delivery. Discuss polymeric nanoparticles, nanocarriers, and magnetic nanoparticles for targeted drug delivery and personalized medicine.

20. What is nanotoxicology? Discuss the potential health risks, biological responses, and safety regulations associated with nanoparticles in mammalian systems.

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S–1397

Sub. Code
23MBT3S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Biotechnology

GENE MANIPULATION TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Restriction enzymes.

2. Vectors.

3. DNA Library.

4. List the vectors used in the construction of CDNA.

5. Genome sequencing.

6. Transcriptomics.

7. List any four-protein engineered pharmaceutical products.

8. Give an example of therapeutic protein.

9. Define - Gene cloning.

10. What do you mean by bioethics?

Part B (5 × 5 = 25)

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

11. (a) Write about Cutting and joining reactions.

Or

(b) Write the principles of Agarose gel electrophoresis.

12. (a) Explain - Genomic DNA libraries.

Or

(b) Describe about Chromosome walking.

13. (a) Write a brief note on Sanger's sequencing.

Or

(b) Discuss about DNA Microarray.

14. (a) Briefly explain about protein engineering.

Or

(b) Elucidate site directed mutagenesis.

15. (a) Give an account on Reporter genes.

Or

(b) What are the advantages of transgenic plants?

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the principle and process of PCR.

17. Enumerate about the Preparation of BAC.

18. What is Whole genome shot gun sequencing approach? Explain in detail.

19. What are Therapeutic proteins? How are therapeutic proteins produced?

20. Explain the process of Animal cloning. What are problems with animal cloning?

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