S–3470

Sub. Code
23MBT1C3

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Biotechnology

MOLECULAR CELL BIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define passive transport with two examples.

2. What is the two primary functions of ECM?

3. Describe three types of RNA polymerase.

4. Describe mitochondria are known as “powerhouse of the cell?

5. Explain the role of nucleus pore complex.

6. Differentiate chromatin and chromosome.

7. Explain intrinsic pathway of apoptosis.

8. Define cell cycle.

9. Definition of carcinogenesis.

10. Describe tumour suppressor genes with examples.

Part B (5 × 5 = 25)

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

11. (a) Explain the basic properties of cells.

Or

(b) List down the applications of electron microscopy in cell biology.

12. (a) Write a short note on DNA replication.

Or

(b) Explain the structure of nucleic acid.

13. (a) List down the functions of nucleus.

Or

(b) Explain the types and biological functions of DNA supercoiling.

14. (a) Explain the molecular regulation of the cell cycle.

Or

(b) Write a note on apoptosis.

15. (a) Write a note on oncogenes and proto-oncogenes.

Or

(b) Explain mitogens.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the cell junctions contribute to communication between cells and explain the structural differences between tight and gap junctions.

17. Explain the transcription process and its regulation.

18. Describe the global structure of a eukaryotic chromosome with diagram.

19. Brief note on MAP kinase and JAK-STAT signalling pathways.

20. Explain the stages of carcinogenesis.

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S–3472

Sub. Code
23MBT2C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Biotechnology

MICROBIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Biovars.
2. Acetogenesis.
3. Enriched media.
4. Numerical aperture.
5. Microbiome.
6. Endophyte.
7. Epidemiology.
8. Antiseptic.
9. Extremphiles.
10. Ammonification.

Part B (5 × 5 = 25)

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

11. (a) Explain the role of pH on the growth of bacteria.

Or

(b) Cite the difference between biovars and serovars.

12. (a) Discuss about the Phase contrast microscope.

Or

(b) State the classification of control of microbial growth.

13. (a) Mention about the host microbe interaction.

Or

(b) Explain shortly about normal microbial flora.

14. (a) Write the general properties of disease causing bacteria.

Or

(b) Hand wash is the one of the best control measure — Justify.

15. (a) Mention the scope of environmental microbiology.

Or

(b) State the biotechnological application of extremophiles.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Draw a neat diagram of bacterial structure with explains the parts.

17. Write in detail about identification of bacteria.

18. Build the epidemiology of microorganisms.

19. Explain in detail about COVID-19.

20. Discuss in details about types and applications of biofertilizers.

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S–3473

Sub. Code
23MBT2C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Biotechnology

PLANT AND ANIMAL BIOTECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are synthetic seeds?

2. Mention any two therapeutic applications of alkaloids.

3. What is Ti plasmid?

4. Name the secondary metabolites.

5. Define prophylaxis.

6. What is cryopreservation?

7. Define karyotyping.

8. List two somatic cell cloning techniques.

9. Identify cell synchronization.

10. What is a fluidized bed reactor?

Part B (5 × 5 = 25)

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

11. (a) Outline the micropropagation process.

Or

(b) Describe the stages of somatic embryogenesis.

12. (a) What are molecular markers? Write their types and applications.

Or

(b) Write the principle and procedure of RFLP.

13. (a) Discuss the technique of hybridoma.

Or

(b) Describe the concept and uses for monoclonal antibodies.

14. (a) Write about the cryopreservation techniques used in cell culture.

Or

(b) Discuss about the steps involved in cell synchronization.

15. (a) Describe the characteristics and varieties of stem cells.

Or

(b) Explain about the potential applications of stem cell treatment in medicine.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the steps involved in plant tissue culture and its applications.

17. Write the importance of agrobacterium in plant tissue culture.

18. Describe about DNA vaccines. How they are used to treat diseases?

19. Explain the molecular mechanisms of apoptosis and their regulation.

20. Describe the application of animal cell culture in vaccine development and drug testing.

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S–3474

Sub. Code
23MBT2C3

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Biotechnology

GENETIC ENGINEERING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the nucleic acid manipulating enzymes?

2. Describe the term “Transformation”.

3. pSC101

4. Phasmids

5. List any four Eukaryotic vectors

6. Terminators

7. Hybridization sequencing

8. What are first generation sequencing methods?

9. Define-Chromosome Walking

10. Transgenic animal.

Part B (5 × 5 = 25)

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

11. (a) Explain about genetic engineering tools in detail.

Or

(b) Give a brief note on selection of recombinants.

12. (a) Discuss about Lambda bacteriophage vectors.

Or

(b) Elucidate the lifecycle of IncPa.

13. (a) Write a short note on vectors with adjustable copy number.

Or

(b) Elucidate the functions and life cycle of SV40.

14. (a) State about End — labelling.

Or

(b) Write short notes on Maxam and Gilbert sequencing.

15. (a) Explain about DNA microarray.

Or

(b) Discuss about molecular techniques in crop improvement.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Give an account on construction of gene libraries.

17. List the steps of cloning in gram-positive bacteria in detail.

18. Explain about In vitro synthesis of specific RNA

19. Discuss about PCR and its variants.

20. Write about the molecular techniques in prenatal diagnosis gene therapy.

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S–3475

Sub. Code
23MBT2E3

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Biotechnology

Elective – ENVIRONMENTAL BIOTECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. How can pollution be defined?

2. How do we describe soil erosion?

3. What does Biological Oxygen Demand (BOD) mean?

4. How is biomonitoring explained?

5. What do you understand by xenobiotics? Give two examples.

6. How would you define sedimentation?

7. What is meant by biofuels?

8. How can vermiculture be described?

9. What do we mean by bio-mining?

10. How is phytotoxicity defined?

Part B (5 × 5 = 25)

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

11. (a) List out the types of pollution.

Or

(b) Short notes on radioactive pollution.

12. (a) Explain the working principle of plug-flow reactors.

Or

(b) Write a note on engineering design of reactors.

13. (a) Describe physical methods of wastewater treatment.

Or

(b) Differentiate between aerobic and anaerobic processes in waste management.

14. (a) Explain how biosensors detecting toxic pollutants.

Or

(b) Discuss the role of bioreactors in biofuel Production.

15. (a) Short note on pesticide degradation by microorganisms.

Or

(b) Explain the role of composting in solid waste management.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss on air pollution: sources, effects, and control measures.

17. Describe on concept of engineering design of reactors with diagrams.

18. Write role of microorganisms in wastewater treatment with examples.

19. Describe bio-mining as eco-friendly approaches for environmental cleanup.

20. Explain microbial degradation of xenobiotics with pesticides and surfactants.

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S–3476

Sub. Code
23MBT2S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

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 the tissue regeneration?

2. Name two applications of tissue engineering.

3. Give an explanation of histolytic engineered tissue.

4. Define 3D cell culture in tissue engineering.

5. Outline extracellular matrix in tissue engineering.

6. What are orthopaedic tissue engineering nanocomposites?

7. List out the three functions of the pancreas.

8. Discuss the artificial womb.

9. Define skin tissue engineering.

10. What is the bionic pancreas?

Part B (5 × 5 = 25)

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

11. (a) Explain the role of growth factors in tissue engineering.

Or

(b) Outline the mechanism of cell differentiation.

12. (a) Clarify the types of tissue culture.

Or

(b) What is microgravity and its effects on the body?

13. (a) Describe the biological significance of the polymers employed in tissue engineering.

Or

(b) Discuss the properties and types of nanocomposite materials for tissue engineering.

14. (a) List out the symptoms, causes, and treatments for hepatitis.

Or

(b) Write the short notes on artificial heart and its working principle.

15. (a) Discuss the structural tissue engineering and its major applications.

Or

(b) Describe the neural tissue engineering.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Summarize the benefits and limitations of tissue engineering.

17. Discuss the role of 3D cell culture in tissue engineering.

18. Outline the structure and functions of extracellular matrix.

19. Give a brief explanation of the structure and function of organs.

20. Describe the therapeutic role of neural stem cells in neurological diseases.

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S–3477

Sub. Code
23MBT3C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Biotechnology

BIOINFORMATICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define EMBL

2. Expand BLAST.

3. Explain gap opening penalty?

4. Define PDB?

5. Describe the Swiss-PdbViewer with example

6. Explain VAST?

7. Write a note on the bioavailability

8. Define toxicity prediction?

9. Define ADMET.

10. Write any two steps in drug discovery

Part B (5 × 5 = 25)

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

11. (a) Explain the types of biological databases.

Or

(b) Describe the applications of internet in bioinformatics.

12. (a) Give a note similarity, scoring and gap penalty

Or

(b) Write a note on Needleman–Wunsch and Smith–Waterman algorithms.

13. (a) Explain genome maps and markers in bioinformatics.

Or

(b) Explain EST clustering.

14. (a) Write the short notes on phylogenetic analysis

Or

(b) Brief notes on RasMol and PyMol.

15. (a) Explain the medical applications of bioinformatics.

Or

(b) Write short notes on QSAR and its role in drug design

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain information retrieval from protein and DNA databases

17. Differentiate between global and local alignment with examples.

18. Explain protein structure database SCOP, CATH.

19. Discuss microarray designing with steps

20. Explain QSAR in detail.

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S–3478

Sub. Code
23MBT4C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Biotechnology

RESEARCH METHODOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Definition of basic research.

2. What does the basic concept of research involve?

3. How can a literature review be written in research methodology?

4. What are the main objectives of conducting research?

5. Write the five primary purposes of research.

6. How can the error in calculating the area of a square be determined?

7. What the reasons are open offices commonly used in research work?

8. What are the fundamental principles of sampling in research?

9. Write the steps should be followed to find journal articles on PubMed.

10. How are graphs generated and used in research for data presentation?

Part B (5 × 5 = 25)

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

11. (a) Name the four types of research problems.

Or

(b) Short notes on criteria of good research.

12. (a) How do you process and analyze data in research?

Or

(b) Elaborate the sampling fundamentals.

13. (a) What are the components of a research report?

Or

(b) How to make a research paper title with examples.

14. (a) How to publish articles in PubMed?

Or

(b) Describe about the WWW in research.

15. (a) Mention briefly about the presentation tool in research.

Or

(b) Describe about the advanced search technique in research.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the types of research with examples.

17. Describe the ANOVA in research methodology.

18. Enumerate the features for statistical data analysis.

19. Elaborate in detail about the Methodological approaches in web search research.

20. Discuss in detail about the role of Microsoft PowerPoint in the creation of research presentation.

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S–3479

Sub. Code
23MBT4E1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Biotechnology

Elective — STEM CELL BIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define a stem cell.

2. Define adult stem cells.

3. What is a stem cell niche?

4. What is the role of cap cells in the Drosophila ovary niche?

5. Name any two sources of stem cells for isolation.

6. What is the purpose of stem cell culture?

7. Define chromatin modification.

8. What is JAK-STAT pathway?

9. Mention one medical application of embryonic stem cells.

10. What is the major therapeutic use of bone marrow stem cells?

Part B (5 × 5 = 25)

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

11. (a) Describe the stages of differentiation m stem cells.

Or

(b) Write short notes on mesenchymal stem cells.

12. (a) Explain the concept of stem cell niche with suitable examples.

Or

(b) Write short notes on Oct4, Sox2, and Nanog genes in pluripotency.

13. (a) Explain any two methods of stem cell isolation.

Or

(b) Discuss the importance of culture media in maintaining pluripotency.

14. (a) Write short notes on X-chromosome inactivation in embryonic stem cells.

Or

(b) Explain the role of p53 in regulating different cell cycle checkpoints and apoptosis.

15. (a) Explain the role of hematopoietic stem cells in the treatment of leukemia.

Or

(b) Discuss the ethical concerns related to embryonic stem cell research.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the concepts of self-renewal and pluripotency in stem cells. How are they maintained and regulated?

17. Describe the organization and regulation of germline stem cell niche in Drosophila.

18. Describe in detail the different methods of stem cell isolation and their applications.

19. Describe the stem cell cycle and explain how it is regulated differently from the somatic cell cycle.

20. Discuss the ethics in human stem cell research.

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