

Roll No.

Total No. of Pages: 02

Total No. of Questions: 11

M.Sc. (BT)(Sem.-1)

APPLIED MICROBIOLOGY

Subject Code : MBT-102

M.Code : 75660

Date of Examination: 11-06-2026

Time: 3 Hrs.**Max. Marks: 70**

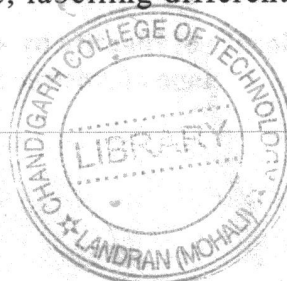
INSTRUCTIONS TO CANDIDATES:

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **SEVEN** questions carrying **SIX** marks each and students have to attempt any **FIVE** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Answer the following questions:

- (a) What are lytic phages? Give an example.
- (b) Draw a labelled diagram of a eukaryotic cell
- (c) What is the effect of substrate concentration on microbial growth?
- (d) Who discovered a microscope?
- (e) What is symbiosis? Give an example.
- (f) What are random mutants? What is their significance?
- (g) What is steady state in a continuous culture?
- (h) Name any two phytopathogens and their host.
- (i) What are the key regulators of bacterial metabolite production?
- (j) Draw growth curve of bacterial culture, labelling different phases.



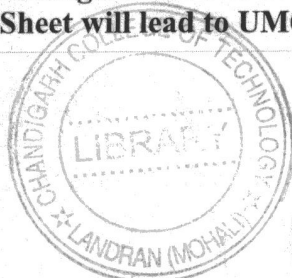
SECTION-B

2. Discuss the historical developments in microbiology.
3. How can anaerobic bacteria be cultured?
4. Discuss the fermentative production of ethanol.
5. Describe the kinetics of biomass growth and product formation in a batch culture.
6. Describe the factors affecting microbial growth.
7. What are the techniques for the improvement of industrially important strains.
8. Explain the role of microbes in food and fermentation industry.

SECTION-C

9. Describe the different types of microbial interactions and their significance.
10. Describe the morphology and structure of archaeobacteria.
11. Explain the energetics of anaerobic metabolism in microbes.

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Total No. of Pages: 02

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M.Sc. (BT)(Sem.-1)

GENETICS AND MOLECULAR BIOLOGY

Subject Code: MBT-103

M.Code : 75661

Date of Examination: 09-06-2026

Time: 3 Hrs.

Max. Marks: 70

INSTRUCTIONS TO CANDIDATES:

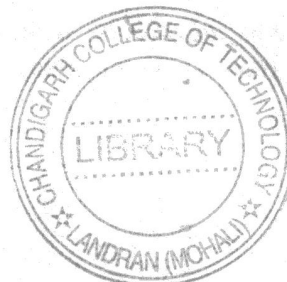
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2. SECTION-B contains SEVEN questions carrying SIX marks each and students have to attempt any FIVE questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION A

1. Give short answers of the following:

- (a) Differentiate between genetic mapping and physical mapping
- (b) Discuss applications of QTL mapping
- (c) Differentiate between germinal and somatic mutations
- (d) What are Hox genes?
- (e) Differentiate between linkage and crossing over
- (f) Draw well labelled diagram of tRNA
- (g) Difference between phenocopy and genetic trait
- (h) What is revealed by the shape of Cot curve?
- (i) Give role of DNA polymerase III and topoisomerases in DNA replication
- (j) Draw structure of chromatin fiber

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SECTION B

2. Describe extra chromosomal inheritance and provide examples.
3. Discuss structural, genetic and functional complexity of eukaryotic chromosomes.
4. Discuss role of transcription factors in controlling gene expression.
5. Describe RNA processing, including splicing of mRNA and the role of the spliceosome.
6. Discuss post translational modifications in eukaryotes.
7. Describe the process of translation in prokaryotes.
8. Describe RNA polymerase. Give its types and functions in transcription cycle.

SECTION C

9. Describe the process of DNA replication in eukaryotes.
10. Describe different types of mutations. Discuss their causes and mechanisms of occurrence.
11. Write short notes on:
 - (a) Tetrad analysis and its applications in mapping genes
 - (b) Genetic code and its characteristics

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M.Sc. Biotechnology (Sem.-2)

MOLECULAR CARCINOGENESIS & THERAPY

Subject Code : MBT-213

M.Code : 76252

Date of Examination: 29-05-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying SIX marks each and students have to attempt any FIVE questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly:

- What is the difference between normal and transformed cell lines?
- Expand PDGF and state its function.
- What is erythropoietin?
- What is meant by differential gene expression?
- What are tumor promoters?
- What role do viruses play in carcinogenesis?
- What is the function of the H-ras gene?
- What diseases are caused by Epstein-Barr virus?
- What is gene therapy in cancer treatment?
- What are cancer vaccines?



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SECTION – B

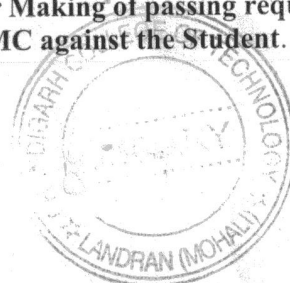
2. Explain the process of carcinogenesis and describe the factors responsible for the transformation of normal cells into cancer cells.
3. Discuss the role of growth factors in the regulation of cell proliferation, with reference to PDGF, IGF, and EGF receptors.
4. Explain the role of chemical carcinogens and tumor promoters in carcinogenesis.
5. Explain the structure and molecular features of oncogenes with suitable examples.
6. Discuss the role of Ras family genes (H-ras, K-ras, and N-ras) in human cancers.
7. Explain the role of any three human cancer viruses in cancer development.
8. Discuss the principles of cancer therapy, including chemotherapy, gene therapy, cancer vaccines, and their future prospects.

SECTION – C

9. Describe chromosomal abnormalities in human tumors and explain the significance of abl, myc proto-oncogenes, and the retinoblastoma (Rb) gene.
10. Describe the mechanism of action of tumor promoters and explain how they differ from initiators in chemical carcinogenesis.
11. Write short notes on the following:
 - (a) Role of retroviruses in oncogenesis
 - (b) Role of Large T antigen in tumor development

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M.Sc. Biotechnology (Sem.-2)

MOLECULAR CARCINOGENESIS & THERAPY

Subject Code : MBT-213

M.Code : 76252

Date of Examination: 29-05-2026

Time : 3 Hrs.

Max. Marks : 70

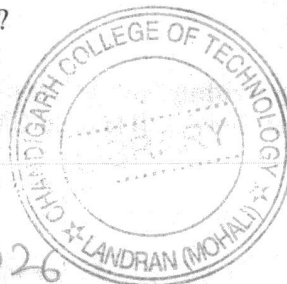
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SECTION – B

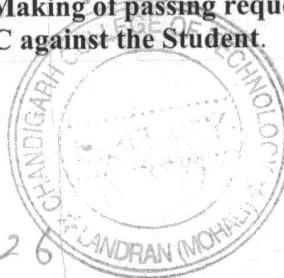
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Total No. of Questions : 11

PLANT TISSUE CULTURE

M.Code : 76250

Date of Examination : 25-05-2026

Time : 3 Hrs.

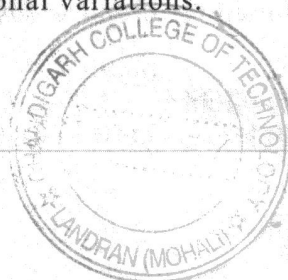
Max. Marks : 70

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3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

1. Write briefly :

- Explain applications of plant tissue culture in brief.
- Give two examples of plant cells showing totipotency.
- Define callus.
- Name any two plant tissues commonly used as explants.
- Define anther culture.
- Which hormone promotes root formation in *in vitro* culture?
- How is tissue culture used in the production of disease-free plants?
- What is the role of auxins and cytokinins in plant tissue culture?
- Define protoplast culture and its applications.
- Discuss challenges of somaclonal variations.

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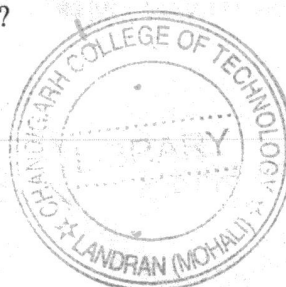


SECTION – B

2. Discuss the applications of genetic transformation in crop improvement.
Provide examples of genetically modified plants developed using tissue culture-based transformation techniques.
3. Compare microspore culture with anther culture in terms of methodology, efficiency, and applications.
4. Describe the stages involved in micropropagation for producing disease-free plants. Discuss the role of each stage in ensuring plant health.
5. Discuss the biosynthesis, storage, breakdown, and transport of plant growth regulators in detail.
6. Explain the role of auxins and cytokinins in regulating cell division, differentiation, and organogenesis in plant tissue culture.
7. Define cryopreservation. Describe the methods, significance, and applications of cryopreservation in the conservation of plant germplasm.
8. What are diploid plants? Explain their significance in plant tissue culture.

SECTION – C

9. Explain the key elements involved in the plant tissue culture technique. Discuss the importance of each element and how they contribute to successful *in vitro* culture.
10. Discuss the role of somaclonal variation in tissue culture. How can this variation be exploited for crop improvement?



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M.Sc. Biotechnology (Sem.-2)
BIOPROCESS ENGINEERING

Subject Code : MBT-205

M.Code : 76249

Date of Examination : 21-05-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying SIX marks each and students have to attempt any FIVE questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Describe briefly :
 - a) What is the role of mutagenesis in strain improvement?
 - b) What are overhead expenses in a bioprocess?
 - c) Draw growth curve of a bacterial culture and label the different stages.
 - d) What is scale-up in a bioprocess? Why is it important?
 - e) What is the principle of ultrasonication?
 - f) What are drum driers? What is their use?
 - g) How do microbes contribute to food preservation?
 - h) What is molasses? What is its composition?
 - i) Name any two microbes that produce food colours.
 - j) Define microbial transformation with suitable example.



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SECTION-B

2. Write a note on maintenance and preservation of cultures.
3. What is solid state fermentation (SSF)? What are the factors affecting SSF?
4. Describe the design and construction of a bioreactor.
5. Give an account on solid-liquid separation for recovery of a product.
6. What are the various methods for treatment and disposal of industrial effluents?
7. Discuss the production of alcoholic beverages by microbes.
8. Explain techniques for sterilization of media.

SECTION-C

9. Write a note on food fermentation need and significance.
10. Discuss the finishing techniques in bioprocesses.
11. How are various parameters in bioreactors monitored and controlled? Explain.

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Total No. of Pages : 02

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M.Sc. (BT) (Sem.-2)
ENZYME TECHNOLOGY

Subject Code : MBT-203

M.Code : 76247

Date of Examination : 18-05-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
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3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

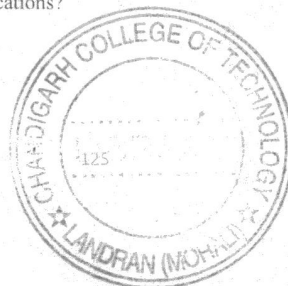
1. Describe briefly :
 - a) Define enzyme activity.
 - b) What is activation energy of a reaction?
 - c) What are coenzymes and cofactors? Give examples.
 - d) What is induced fit hypothesis? Who proposed it?
 - e) What is substrate and end product inhibition?
 - f) What is the need of cellular compartmentalization of enzymes?
 - g) What are oligomeric enzymes?
 - h) Define K_{cat} . What is meant by turnover number of an enzyme?
 - i) What are the advantages of using immobilized enzymes for industrial applications?
 - j) Describe industrial uses of lipases.

SECTION-B

2. How is enzyme activity assayed? Explain.
3. Describe the mechanism of enzyme action.
4. Write a note on regulation of enzyme activity.
5. What are the different types of enzyme inhibition? Explain with suitable examples.
6. Discuss the large-scale production of enzymes.
7. What are multienzyme complexes? Explain their metabolic significance.
8. Write a note on enzymes as reagents.

SECTION-C

9. Describe the methods for purification of enzymes.
10. Discuss the structure and function of enzymes.
11. Discuss the kinetics of multi-substrate reactions catalysed by enzymes.



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Total No. of Pages : 02

Total No. of Questions : 11

M.Sc.(BT) (Sem.-2)

IMMUNOLOGY AND IMMUNOTECHNOLOGY

Subject Code : MBT-202

M.Code : 76246

Date of Examination : 14-05-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **SEVEN** questions carrying **SIX** marks each and students have to attempt any **FIVE** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION - A

1. Write briefly :
- a) Effector cell
 - b) Epitope
 - c) CD8+ cells
 - d) APC
 - e) Graft
 - f) Tumor evasion
 - g) Immuno-electrophoresis
 - h) TCR
 - i) B-cell maturation
 - j) Phagocytosis

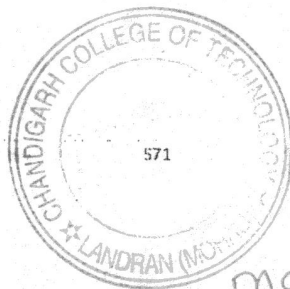
SECTION - B

2. Discuss the function of various types of Granulocytes.
3. What are antigen-antibody reactions? Explain the mechanism of the agglutination reaction.
4. What are cytokines? Give details of diseases caused by cytokine imbalance.
5. What are cancer oncogenes? Explain the mechanism of cancer induction.
6. Discuss in detail the process of production and purification of antibodies.
7. Explain the principle and application of Radioimmunoassay.
8. Write down applications of immunodiagnostics.

SECTION – C

9. What are the different types of antibodies and give their functions?
10. Discuss the structure and function of the class I MHC molecule.
11. What is transplantation immunology? Describe the mechanism of graft rejection.

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Total No. of Pages : 02

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M.Sc.(Biotechnology)(Sem.-2)
CELL AND DEVELOPMENTAL BIOLOGY

Subject Code :MBT-201

M.Code :76245

Date of Examination: 11-05-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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SECTION-A

1. Attempt the following :
- a) Complexity of eukaryotic chromosome
 - b) Cellular fate
 - c) Induction
 - d) Morphogenetic gradient
 - e) Competence
 - f) Embryogenesis
 - g) Organogenesis
 - h) Functions of Lysosomes
 - i) Production of gametes
 - j) Cot curve



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SECTION – B

2. Draw the structure of the plasma membrane and write down its functions.
3. Write down the functions of peroxisomes and glyoxisomes.
4. Describe the process of programmed cell death.
5. What is cleavage? Discuss various types of cleavage patterns.
6. Describe the process of pattern formation in *Drosophila*.
7. Discuss the organization of the shoot apical meristem.
8. What is phyllotaxy? Explain by giving suitable examples.

SECTION – C

9. Draw the structure of the endoplasmic reticulum. Explain its role in glycosylation, lipid biosynthesis, and intracellular transport.
10. What is Gastrulation? Describe the formation of three germ layers in animals.
11. Discuss the process of limb development and regeneration in vertebrates.

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Total No. of Pages : 02

Total No. of Questions : 11

M.Sc (Biotechnology) (Sem-3)

IPR, GOOD LAB PRACTICES AND BIOETHICS

Subject Code : MBT-304

M.Code : 76731

Date of Examination : 20-06-2026

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **SEVEN** questions carrying **SIX** marks each and students have to attempt any **FIVE** questions.
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SECTION-A

1. Write briefly:

- Discuss the importance of ethical issues in patenting.
- Discuss the various forms of traditional knowledge.
- Write a note on ownership of tangible and IP.
- Define invention and innovation with examples.
- Discuss objectives of IPR.
- Explain purposes of TKDL.
- What do you understand by 'Non-obviousness' while granting patents?
- Discuss the safety measures to handle toxic chemicals in laboratories.
- Write a note on radiation safety.
- Discuss concept of folklore.



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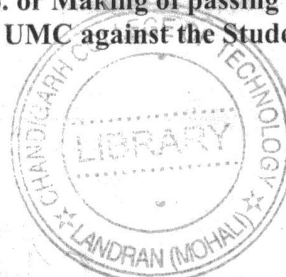
SECTION – B

2. Discuss the key ethical, legal and intellectual property issues arising from patent disputes involving neem, haldi and basmati rice.
3. (a) Discuss biosafety levels in context to biotechnology. (b) What are patentability criteria? Discuss patentability criteria for biological processes and products in India.
4. What is TRIPS agreement, and why is it considered a milestone in international intellectual property law? Discuss its main provisions, including the types of IPs it covers.
5. Discuss the major international standards that govern bioethics.
6. Discuss why traditional knowledge is important in the context of biodiversity, culture, and intellectual property rights.
7. Explain the challenges in protecting folklore, especially with regard to IPRs.
8. Describe the different types of patent searches and the methodologies involved.

SECTION – C

9. Explain biosafety guidelines and recommended 'biosafety levels' for infectious agents and infected animals.
10. Discuss the common offences and penalties related to violations of bioethical norms in research and what penalties are typically imposed.
11. Mention types of IPR. Describe all the stages from filing to grant of patents.

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M.Sc. (BT)(Sem.-3)
CLINICAL RESEARCH

Subject Code :MBT-313

M.Code :76735

Date of Examination : 17-06-2026

Time : 3 Hrs.

Max. Marks : 70

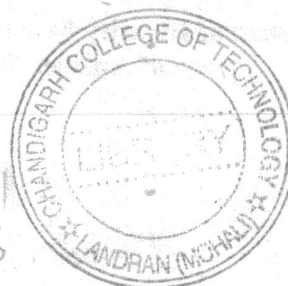
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SECTION-A

1. Write briefly :

- a) Explain the objectives of ICH and enlist ICH members.
- b) Explain the functions of the ICH steering committee and ICH secretariat.
- c) Discuss the limitations of uncontrolled trials.
- d) Define clinical practices.
- e) Discuss the purpose of the Investigator's Brochure (IB).
- f) Write a short note on guidelines on the need for carcinogenicity studies of pharmaceuticals.
- g) Write a note on the functions of the Institutional Ethics Committee (IEC).
- h) Explain the ICH harmonization process.
- i) Write a note on types of clinical research.
- j) Explain the history of clinical research.



SECTION-B

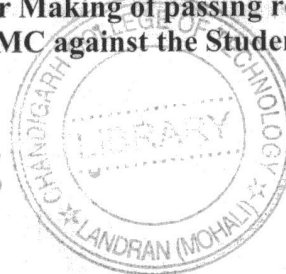
2. Define clinical research. Discuss the various career prospects in the clinical research industry.
3. Explain the clinical trial market in detail.
4. Explain the scope of clinical research. Mention important regulations that govern clinical research.
5. Explain various types of clinical research in detail.
6. Explain the organizational structure of ICH and discuss the principles of ICH GCP in detail.
7. Write a detailed note on the essential documentation for the conduct of a clinical trial.
8. Discuss the global and Indian perspective of the pharmaceutical industry.

SECTION-C

9. Discuss various methods of post-marketing surveillance.
10. Discuss the role of the Institutional Review Board and Independent Ethics Committee in good clinical practice.
11. Discuss in detail the guidelines for good clinical practices (GCP).

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Total No. of Questions : 11

M.Sc (Biotechnology) (Sem.-3)

M.Code : 76730

Date of Examination : 15-06-2026

Time : 3 Hrs.

Max. Marks : 70

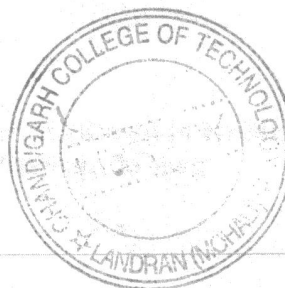
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SECTION - A

1. Write briefly :

- (a) What is genome sequencing?
- (b) Define genome comparison.
- (c) What are functional genomics studies?
- (d) Define TILLING.
- (e) What are microarrays?
- (f) What is transcriptome analysis?
- (g) Define proteomics.
- (h) What is protein digestion in proteomics?
- (i) What is tandem mass spectrometry?
- (j) Define protein expression profile.



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SECTION-B

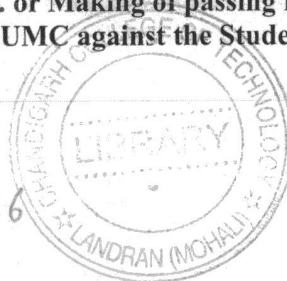
2. Explain genome organization in prokaryotic and eukaryotic systems.
3. Describe strategies used in genome sequencing.
4. Discuss ESTs and their importance in functional genomics.
5. Explain SAGE technique for gene expression analysis.
6. Write a note on microarray principles and applications.
7. Explain protein databases and tools used in proteomics.
8. Describe peptide separation techniques used in proteomics.

SECTION-C

9. Explain comparative genomics and its importance in evolutionary studies.
10. Describe mass spectrometry techniques used in peptide sequencing and protein identification.
11. Discuss applications of genomics and proteomics including protein interaction studies and mapping protein modifications.

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Total No. of Questions : 11

Subject Code :MBT 312

M.Code :76734

Date of Examination : 12-06-2026

Time : 3 Hrs.

Max. Marks : 70

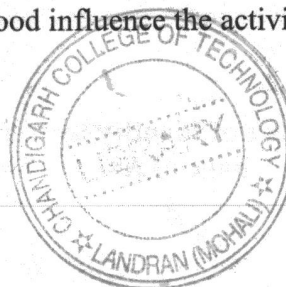
INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying SIX marks each and students have to attempt any FIVE questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

- What are the uses of oilseed crops?
- Name any two biosensors used for monitoring food quality and safety.
- Name any two microbial flavours commercially used.
- What are the uses of beta galactosidase and glucoisomerase?
- Who coined the term nutraceuticals and what does it refer to?
- What are probiotics?
- Name any two functional food of animal origin.
- Name any two enzymes used in the production of bioflavours.
- Which genes are involved in lipid and glucose metabolism?
- How micronutrients and macronutrients in food influence the activity of genes?



SECTION-B

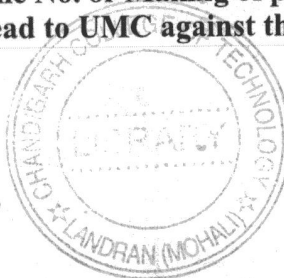
2. Write a note on safety assessment of functional food.
3. What is the scope and prospects of nutraceuticals? Explain.
4. Discuss the microbial production of biocolours.
5. What are biogums? Describe their use in food industry.
6. Write a note on production of organic acids.
7. Discuss the function of nisin and protein engineering approaches to enhance nisin production.
8. Which type of food are best for gut health?

SECTION-C

9. Write a note on gene-diet interactions.
10. What are biosensors? Describe their applications of biosensors in food industry.
11. Discuss the ways to enhance the protein quality of diet.

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May-2026



Roll No.

Total No. of Pages : 02

Total No. of Questions : 11

M.Sc. (Biotechnology) (Sem.-3)

BIOSTATISTICS

Subject Code : MBT/302

M.Code : 76729

Date of Examination: 10-06-2026

Time : 3 Hrs.

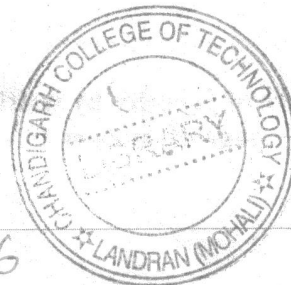
Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **SEVEN** questions carrying **SIX** marks each and students have to attempt any **FIVE** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. **Write a short note on :**
- a) What is a histogram?
 - b) Define mode.
 - c) What is dispersion?
 - d) Define standard error.
 - e) What is sampling technique?
 - f) Define regression.
 - g) What is normal distribution?
 - h) Define test of significance.
 - i) What are non-parametric tests?
 - j) Define residual error.



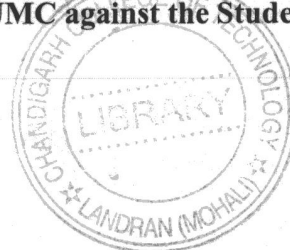
SECTION-B

2. Explain measures of central tendency and their importance in biological data.
3. Describe graphical methods of presenting statistical data.
4. Discuss sampling methods and their advantages.
5. Explain correlation and regression with biological examples.
6. Describe probability distributions with emphasis on binomial and Poisson distributions.
7. Explain chi-square test for goodness of fit.
8. Write a note on applications of biostatistics in experimental biology.

SECTION-C

9. Explain tests of significance for means, proportions and standard deviations.
10. Discuss analysis of variance and its importance in biological experiments.
11. Explain principles of experimental design including least squares, replication and precision.

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May-2026

Roll No.

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Total No. of Pages : 02

Total No. of Questions : 11

M.Sc. (BT) (Sem.-3)
GENETIC ENGINEERING

Subject Code : MBT301

M.Code : 76728

Date of Examination : 08-06-2025

Time : 3 Hrs.

Max. Marks : 70

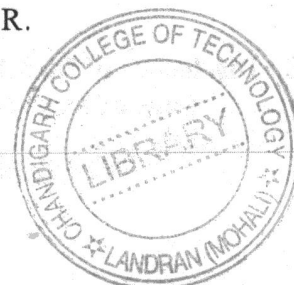
INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying SIX marks each and students have to attempt any FIVE questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :

- a) Mention one method for labeling DNA probes.
- b) Define Southern Blotting.
- c) What is the principle of Electrophoretic Mobility Shift Assay (EMSA)?
- d) Mention one advantage of yeast artificial chromosomes (YACs).
- e) What is the role of expression vectors?
- f) Define fusion tags and give one example.
- g) Explain the yeast two-hybrid system.
- h) What is gene knockout?
- i) What are genomic libraries?
- j) Differentiate between RT-PCR and Real-time PCR.



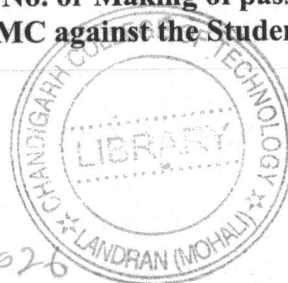
SECTION-B

2. Explain the principle and steps involved in Northern hybridization.
3. Describe the role of DNA labeling in hybridization techniques.
4. Discuss the structural organization and use of BACs in genome studies.
5. Write a note on mammalian expression vectors and their applications.
6. Explain electroporation and Gene gun as a method of introducing foreign DNA.
7. Discuss the use of transgenic animals in biotechnology.
8. Explain the principle and method of RAPD (Random Amplified Polymorphic DNA) technique.

SECTION-C

9. What is DNA hybridization? Explain different methods and its applications in gene mapping and diagnostics.
10. Explain in detail the strategies used for the production of transgenic animals with examples of their application.
11. Explain different types of PCR and their applications.

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